Inclusion and differentiation: an examination of teachers' experience and perspectives in working with difference and learner potential in grade 1 mathematics classrooms in three schools in Grahamstown

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By

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DECLARATION

I, Alexandra Whittington-Jones, hereby declare that this research thesis is my own original work, that all reference sources have been accurately reported and acknowledged, and that this document has not previously, in its entirety or in part, been submitted to any University in order to obtain an academic qualification.

A. Whittington-Jones 8 February 2013

ABSTRACT

In South Africa, in July 2001, the National Department of Education released White Paper 6 which underpins the notion of inclusive education. It states that the needs of all children should be catered for within the South African educational framework. Subsequent guidelines from the Department (2005; 2012) also provide a strong focus on understanding individual children's learning styles and explain the concept and application of children's multiple intelligences. However, on closer examination, it seems that the inclusive education, as well as barriers to learning referred to in the abovementioned guidelines, are indicated to mean catering for children at the lower-ability end of the learning spectrum. This research begins to explore the notion that high potential children might require special attention, though not at the expense of those with learning impairments. An education system that provides inclusive education to children at both the lower and higher ends of the learning spectrum would be more equitable, and would give all children an equal chance of reaching their full potential.

One possible strategy for accommodating the diverse needs of learners is through differentiation (Department of Education, 2005). Differentiation is a way of teaching that aims to provide stimulating and enriching learning environments to a diverse group of children within a classroom. This might be achieved by separating the class into smaller groups based on ability, or by providing children with different tasks at the same time, with the same learning objectives but at differing cognitive levels (Rogers, 2007). Vygotsky's work on the Zone of Proximal Development (ZPD) and mediation provides a theoretical framework for proposing differentiation as a strategy.

The data was gathered through an in-depth examination (using a combination of classroom observations, document analysis and teacher interviews) of mathematics teaching in Grade 1 in three schools in Grahamstown. My analysis was based on Vygotsky's theories (the main tenets of which were the ZPD and scaffolding, as well as the role of socio-culture in learning), using Tomlinson's (1999) differentiated instruction framework to provide structure to the study.

The following themes emerged from the data: a focus on the teachers' understandings of differentiation; the use of grouping as a superficial form of differentiation; a lack of teacher preparation and understanding in relation to task differentiation; and an underlying sense of 'sameness' in teachers' understanding of their learners. In addition to the above, I did not observe evidence of real differentiation for high potential children and hope that this research contributes to extending teachers' training (both academic and in-service) in this area, convincing teachers of the existence and importance of critical

thinking abilities in our youngest learners, and initiating a move towards the drafting of Individual Education Plans for all our learners.

During the period of my research I have been convinced that the use of differentiated instruction in classrooms is the way forward in educational thinking, particularly as it relates to the notion of inclusive learning. Clearly there are challenges to be addressed in terms of school timetables, curricula, teachers' time frames and past education system inequalities such as we have here in South Africa.

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CHAPTER 1: INTRODUCTION

1.1 Context and Rationale for this Study

This research espouses the position that all children have potential, and that all respond differently as learners. Within an inclusive education system, it is recognized that children enter the formal educational environment with different levels of learning experience, different cognitive abilities, and different prior exposure to knowledge and, that they need to be supported in different ways to achieve their full potential. Using differentiated learning as an underpinning philosophy to support learners is one way to uphold values of inclusive education. Differentiated learning philosophies[1], in essence, acknowledge that each child is unique, and, understanding that most classrooms are constituted of mixed-ability groups, propose that a variety of methods and avenues are used to ensure that learning takes place (Tomlinson, 2003).

In countries where educational programs are 'inclusive' or based on the 'no child left behind' premise, what tends to happen is a focus on remediation or on lowering standards to accommodate the most basic levels of cognitive ability within the classroom. Often the needs of the child with high ability and/or potential are not fully accommodated in these classrooms. In inclusive education discourses, support often revolves around assisting teachers to cater for the needs of children with *barriers to learning* (Forlin, 2010; Beattie, Jordan and Algozzine, 2006). In fact, misunderstandings about differentiation - that it is a form of scaffolding for struggling learners rather than a method of meeting the unique needs of all levels of learners, (Hertberg-Davis, 2009) can actually contribute not only to making a differentiated classroom less interesting to high potential children, but also to making such children invisible. Research into 'giftedness' indicates that "all pupils have a right to a broad and balanced curriculum that allows them the opportunities to reach their potential" (Bates and Munday, 2005: 15). This suggests that high potential and/or gifted children ought to be catered for in an inclusive educational environment. Differentiation, understood from this perspective, is one way to cater for the unique needs of each child.

In South Africa, in July 2001, the National Department of Education released White Paper 6, which underpins the notion of inclusive education in this country. It states that the needs of all children should be catered for within the educational framework and proposes, "the central objective of this White Paper is to extend the policy foundations, frameworks and programmes of existing policy for all bands of education and training so that our education and training system will recognise and accommodate the diverse range

1 As defined by Tomlinson – 1999;2001; 2003; 2005; Sousa and Tomlinson - 2011

of learning needs" (Department of Education, 2001: 27). The details contained within the paper, although specifically mentioning disabled or impaired learners, are aimed at an education system that is inclusive at both the low-and high-ability ranges of the learning spectrum. The values that the White Paper espouses, such as "accepting and respecting the fact that all learners are different in some way and have different learning needs which are equally valued and an ordinary part of our human experience" and "enabling education structures, systems and learning methodologies to meet the needs of all learners" (Department of Education, 2001: 19), indicate that the potential of all children ought to be accommodated and supported within the South African educational framework[2].

Subsequent guidelines from the Department of Education (2005; 2012) also provide a strong focus on understanding individual children's learning styles and explain the concept and application of children's multiple intelligences.

This research is underpinned by the notion that children with high potential (often described as 'gifted and talented' or – more colloquially - 'bright') might require special attention, though not at the expense of those with learning impairments. An education system that provides inclusive education to children at both the lower and higher ends of the learning spectrum would be more equitable.

In the United States of America (USA), the 'No Child Left Behind' policy (US Department of Education, 2011), also promotes an educational arena in which the focus is on enabling the lower-performing students to achieve minimum requirements. The effect on the children with high potential is felt in many ways, one of which is the decrease in funding for 'gifted and talented programmes' as most states within the USA move towards placing their funding in areas which will assist the children at the other end of the learning spectrum, who need additional assistance (Colangelo, Assouline, and Gross, 2004). The United Kingdom (UK) has had a similar focus on raising the standards for accommodating children at the low ability end of the learning spectrum, often referred to as 'dumbing down' (Sykes, 1996; The Telegraph, 2009). The British Columbian (BC) curriculum (BC Ministry of Education, 2000), regarded as one of the most successful learning models in recent years, notes, "some children exceed expectations for their age in one or more spheres of learning, and their needs to learn to their fullest potential must be accommodated"

2 It is noted that given the inequalities and inadequacies of past South African education systems in bringing education to all, that the focus of White Paper 6, on ensuring a more equitable provision of education to all, is justified.

(British Columbia, Ministry of Education, 2000: 91) and goes on to expand on the concept of 'Individual Education Plans' (IEP's). Nonetheless, there has been some criticism of the BC system, particularly with reference to gifted learners. For example, Coulthard (2001: 1) notes, "Gifted and talented students, sometimes referred to as the "invisible learners" in British Columbia's K12 educational system, are often forgotten in legislative policymaking. While officially recognized under the province's "Special Education" banner, these students are frequently ignored when it comes to analysing educational needs, formulating policy, and allocating funding."

Singapore, another noted successful education system, specifically distinguishes between special needs and gifted learners. Special needs in this context refers to learning-impaired children and is not intended to be an all-inclusive term for all children with any special needs. Children perceived to be gifted are invited for testing during their 3rd year of primary school (equivalent to Grade 3 in South Africa) and if successful, are entered into the Gifted Education Program (GEP). These children are taught by specially trained teachers and are placed in classes in selected schools that receive an advanced curriculum (Ministry of Education, Singapore: 2011). This selection and separating out of gifted children presents as different from the other countries mentioned above who seem to have integrated inclusive education into the mainstream education programmes.

In countries such as the USA and UK, there are parent advocacy groups and national associations (such as the National Association for Gifted Children and National Association for Able Children in Education) that focus on the need to extend, enrich and otherwise cater for high potential children. South Africa does have a Mensan society for children, but this does not extend to advocacy work[3].

1.2 Context of the Study

Considering that in South Africa, under the auspices of inclusive education, children that are highly able are included with other children in mainstream schools, it is important to gain some insight into how they are catered for within the classroom setting. One issue that arises is a perceived lack of experience of

3 National Association for Gifted Children (www.nagc.org) – supporting the needs of gifted learners; and National Association for Able Children in Education (www.nace.co.uk) – supporting the daily work of teachers providing for pupils with high abilities whilst enabling all pupils to flourish. Mensa South Africa (MAGIC) – (http://www.mensa.org.za/MAGIC.html) – a collection of resources to assist parents with high IQ and gifted Children

teachers with regard to differentiating for high potential learners. Upon cursory examination of teacher training programmes such as the Post-Graduate Certificate in Education[4], there seems to be a strong focus on enabling students to teach to a 'norm' and thus little consideration given to teaching children who may fall within the high or low spectrum of ability. In particular, there is no specific mention of how to cater for high ability or high potential learners. Teachers who are teaching learning impaired learners may specialize in teaching these learners through courses designed specifically around their needs, but there is only one course in South Africa that deals specifically with gifted children (the Certificate in Gifted Child Education offered by UNISA). This was discontinued when Dr. Kokot retired from UNISA but was reintroduced in 2011, under the guidance of another lecturer.

Even without specialized training, teachers are expected to be able to recognize the behaviours of children with high potential and to provide them with challenging and stimulating learning opportunities in their normal classroom situation. Professor Kokot notes, "South Africa needs educators and parents who understand giftedness and its ramifications. It is a huge tragedy that giftedness has been deleted from teachers' training" (Kokot, 2011: 1). Many teachers adopt the attitude that 'it won't harm them' to be in an ordinary classroom space. Whilst it is possible that no harm will come to them, it should also be noted that they might not maximize their potential if they are not supported in their learning endeavours.

In my own experience, having a child that speaks early, has an excellent memory, manipulates numbers easily, has a voracious appetite for knowledge and an interesting sense of humour – all easily visible before the age of two - is a difficult space for a parent to operate in. It is very isolating to have a child who is perceived to be more able than other children in their age cohort. Terms like 'elitist' or 'pushy parents' spring to mind (Alvino and other Editors, 1989).

High potential children have learning needs that differ from those of other children in the same age range sometimes due to their asynchronous development (Neihart, Reis, Robinson and Moon, 2002; Distin, 2006). On their child reaching school a parent hopes to find guidance from teachers. But many teachers seem unaware, unable, or ill-equipped to identify such children. If identification does occur, many teachers seem unable or unwilling to deal with supporting their different learning needs in a classroom

4 I looked at the course outline documents for the PGCE at Rhodes University, UCT and UNISA and there was no mention in the brief descriptions of covering children's potential and how to deal with it.

setting. This can create difficulty for the child, as the learning support they require may not necessarily be available.

Teaching in the Foundation Phase supports the notion of differentiated learning[5]. Teachers are 'expected' to differentiate. It is in this context that this research raises questions on how differentiation actually occurs in Grade 1 classroom settings to support high potential learners. It focuses on mathematics classes as a suitable context in which to understand the broader aspects of differentiation.

This research, therefore, investigates perspectives and experiences of working with difference and learner potential in Grade 1 mathematics classrooms in three classrooms at three different schools in Grahamstown. It aims to gain insight into the decisions teachers make as well as how they differentiate as a way of catering for the needs of *all* learners.

1. 3 Research Objectives or Goals

The goal of this research is to examine teacher perspectives and experiences in working with difference and learner potential in three Grade 1 mathematics classrooms at three schools in Grahamstown.

The following main research questions guided this work:

What are teacher perspectives and experiences in working with difference and learner potential in three Grade 1 mathematics classrooms at three different schools in Grahamstown?

1. What are teacher perspectives on differentiated learning in mathematics in Grade 1?
2. What are teacher perspectives of learner potential?
3. What pedagogical strategies arise from the teacher perspectives and experiences?
4. What strategies (if any) do teachers use to identify and work with children's potential in mathematics?

5 CAPS FP 2012 notes that differentiation is a method of ensuring inclusivity.

1.4 Thesis Outline

This thesis will be presented in the following manner. Chapter 1 provided a context and rationale for the study, and an introduction to the research goals and questions.

Chapter 2 focuses on the theoretical underpinnings of this study. This in depth examination of learner potential starts with an overview of giftedness (as a lens through which to situate and understand the term 'learner potential') through history, focusing on the issues and debates that have arisen in the field. This is followed by a discussion on differentiation in education – how it has developed over time and what it means for our current educational model. I use Tomlinson's theories and Bloom's Taxonomy of learning as theoretical backgrounds which underpin the research. Consideration is also given to underlying educational and pedagogical theories such as those of Piaget and Vygotsky, as it is on the basis of these theories that much of the discourse on differentiated learning arises.

Chapter 3 focuses on research methodology and the paradigm in which this study is located. I begin with a discussion on qualitative research and the use of case studies. I follow this with descriptions on how the sampling was done and the sites chosen. This chapter also includes a description of the data collection techniques employed: in this case, observation, document analysis and teacher questionnaires and interviews. This chapter also encompasses details about the validity and reliability of the research, ethical considerations and limitations of the study.

In Chapter 4 I present the details and nuances of the research data that has been collected, structured according to Tomlinson's framework. Chapter 5 offers a synthesized account and interpretive discussion of the data presented in Chapter 4. Chapter 6 presents the recommendations and conclusion of the study. Essentially it provides a summary of the importance of this study based on the findings of the data

CHAPTER 2: LEARNER POTENTIAL and DIFFERENTIATION

2.1 Introduction

This research focused on the proposition of a differentiated learning philosophy - that all children have potential, and that all respond differently as learners, particularly depending on the right social environment to help them realize that potential. The main educational and pedagogical theories that support these assertions therefore provided key reference points for the study. Consequently, this chapter begins with discussions around the notion of giftedness and high potential and how this has evolved over time. This is followed by a synopsis of the thinking around the concept of differentiation in education. This encompasses the importance of differentiation, given the context and rationale already provided, and indicates how it is possible to differentiate for high potential learners in a classroom setting. The theoretical frameworks that support the teaching and learning philosophies of education include the ideas of Piaget and Vygotsky; a summary of their perspectives and their contribution to our understanding of inclusivity and differentiation is therefore provided and discussed.

The above perspectives, briefly outlined, provide the theoretical and pedagogical rationale for the importance of this study. Following on this, Tomlinson's differentiated learning framework (1999) is presented and discussed as a tool for examining teachers' perspectives and experiences of differentiated learning in Grade 1 mathematics classrooms. Bloom's Taxonomy and Nunley's Layered Curriculum are cognitive tools that are applied within the framework to analyse levels of cognitive demand and thereby aid understanding of differentiated learning in context.

2.2 Learner Potential and Conceptions of Giftedness through the Ages

In conceptualizing this work, I initially started with the idea that I would like to examine how teachers understood and responded to gifted learners within their classroom. As I engaged with the literature, it became clear to me that identifying gifted children was fraught with difficulties, and that the notion of giftedness had itself changed over time. A focus on 'potential' therefore seemed more appropriate. The discussion that follows therefore highlights historical shifts in thinking about giftedness to locate reasons for use of the term 'high potential' in this study, taking into account the integral linkages between 'giftedness', 'high potential' and notions of intelligence in the debates..

As early as the late 1800s, there were discussions around the field of giftedness, particularly in the area of education for gifted children. In 1869, Francis Galton's work 'Hereditary Genius' utilized statistical methods to explain how giftedness was derived from heredity and natural selection (Galton, 1892). By 1905, French researchers, Simon & Binet, had developed a test that was able to represent intelligence (as it was then conceptualized) with a single number. By 1916, Lewis Terman had printed the Stanford-Binet Intelligence Test and its popularity was cemented by its use in identifying individuals at both ends of the 'intelligence' spectrum for the war in 1917. These early tests and conceptions of giftedness were largely based on the work of Galton, who noted explicitly that intelligence was innate, that it was hereditary and that it "would be quite practicable to produce a highly-gifted race of men by judicious marriages during several consecutive generations" (Galton, 1892: 1).

In 1926, Lewis Terman published his work, 'Genetic Studies of Genius', the longest-running longitudinal study of gifted children, which concluded that gifted students were: "(a) qualitatively different in school, (b) slightly better physically and emotionally in comparison to normal students, (c) superior in academic subjects in comparison to the average students, (d) emotionally stable, (e) most successful when education and family values were held in high regard by the family, and (f) infinitely variable in combination with the number of traits exhibited by those in the study" (Terman, 1926; NAGC, 2011). This long-running study resulted in further works (Terman, Burks and Jensen, 1930) and still continues today. Premised on the supposition of 'nature' and innate traits, the definitions that Terman (1926) put forward continue in existence, as giftedness and high IQ continue to be equated in some conceptions of giftedness. In a similar vein, Charles Spearman derived a single unit which, he theorized, covered all areas of intelligent behaviour. He was then able to statistically analyse this unit and correlated results from mental testing, thus providing evidence that intelligence is all generated from a single trait (Spearman, 1927).

Around the same time, Thurstone (1928) began to dispute the notion of a single general intelligence and presented a composite intelligence encompassing seven primary mental abilities. Guildford, in his biography of Thurstone (Guildford, 1955) noted that Thurstone's work also initiated the move away from Intelligence Quotient (IQ) being represented by a single mental age, and he began using the mean and standard deviation method that is still used today to interpret IQ scores.

Cattell and his student Horn (Horn and Cattell, 1966) were other major contributors to the field of intelligence, with their proposition that intelligence is a combination of fluid ability (current, abstract and

adaptive intellectual abilities) and crystallized ability (applied knowledge). They developed a model known as the investment-model of ability, which proposed that crystallized ability emerged out of investment of fluid ability in a topic of knowledge (Horn and Cattell, 1966). They proposed that fluid intelligence was an individual's ability to reason and conceptualize around new information or use new problem-solving structures, whereas crystallized intelligence encompassed the depth and breadth of their knowledge and their ability to apply it in other situations. This theory was expanded in the 1980s by Carroll (1993) whose Three Stratum Theory included three layers (strata) - known as General, Broad and Narrow - to represent cognitive ability.

By the 1950s J.P. Guildford (1967) had conceptualized a structure of the intellect, which challenged the original notion that intelligence was an inherited, single aptitude, in contrast to the works of Spearman and Thurstone. Guildford (1979) based his theory on the notion that intelligence was a way of processing information which could be understood as a systematic collection of abilities or functions which enabled the processing of different types of information. He outlined over 150 different abilities, which, he felt, in combination formed the basis of intelligence. He separated these abilities into three main areas (dimensions) – Content, Product and Operations. He presented this 'Structure of the Intellect' (SOI) model, which is shown as a cube, with each of the three dimensions he proposes forming one side of the cube. Each possible ability is defined by a conjunction of the three categories, occupying one cell in the three-dimensional figure.

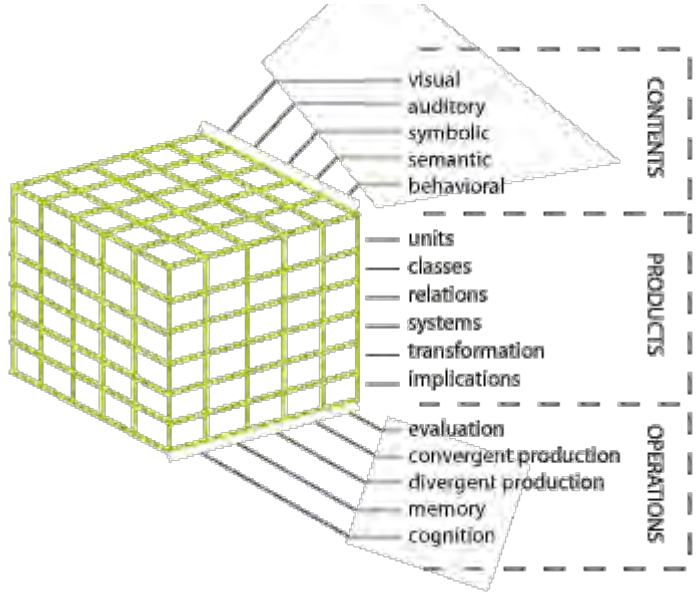


Figure 1: Guildford's Structure of Intellect (Culatta, 2011)

The ‘Content’ dimension is divided into five categories, the ‘Products’ into six and the ‘Operations’ into a further five, thus allowing for 150 possible abilities that his research showed comprise intelligence. Thus, his work centred on ideas not measured by regular intelligence tests: for example, divergent thinking (the ability to produce many and different answers to a question) and evaluation (to be able to think about various ideas after a brainstorming session) (Kirk, Gallagher and Anastasiow, 1993). Guildford showed the complex nature of intelligence and started the move away from viewing intelligence as “a monolithic global trait considered innate and absolute” (Jackson, 2010: 68). These researchers demonstrate the shifts away from the concept of intelligence as a single trait, as well as a move towards a conception of intelligence, not based solely on genetics.

Further research in the 1980s and 1990s centred on the premise that there are multiple components to intelligence, and that these are not only based on hereditary aptitudes, but are also affected by the social environment of the child. Sternberg & Davidson, in their edited 2005 work "Conceptions of Giftedness", present various current conceptions and understandings of giftedness, which although distinct, are interrelated in several ways. The general consensus there is that there is still a requirement to consider the needs of gifted children in classrooms today. In addition, they conclude similarly to Feldhusen (1989: 6) that “it is more productive to focus on gifted behaviours than to attempt to determine whether or not children are gifted.”

It can be seen from the above research that there has been a move over time from viewing intelligence and the associated concept of giftedness as a single intellectual ability that can be represented by a single numerical digit, to viewing it as a multi-dimensional faculty encompassing many and varied aspects. Giftedness, however, still remains a discussion area, since “a major controversy in the educational field remains about whether giftedness should be regarded as one overriding mental ability or as a series of special abilities” (Kirk *et al*, 1993: 121). This controversy has at its core the nature versus nurture debate. While much of this work embraces a more complex model of intelligence, the debates at its roots remain unresolved.

Renzulli, Reis and Smith present a three-ring (enrichment triad) model (Renzulli, Reis and Smith, 1981, in Tuckman and Monetti, 2011), where giftedness is defined as the convergence of task commitment, creativity and above-average ability. Renzulli *et al* (1981) introduced a strong focus on creativity and creative thinking as well as on productivity as important features of giftedness. Renzulli *et al*, (1981) also put forward an argument to move away from viewing giftedness as an absolute concept, in terms of which

children are labelled as either gifted or not. Since these labels are often the determining factors for entry and acceptance into gifted programmes, Renzulli *et al* feel that these rather inflexible criteria are not useful in the support of children's learning endeavours. They offer the position that giftedness might be considered as a 'relative or situational concept.' Renzulli *et al*, (1981) note that although the idea of multiple gifts and talents have become common, the main way of identifying and selecting gifted children remains through IQ testing. Based on the concept of gifted behaviours rather than 'being gifted', they offer a 'revolving door' identification model; noting that "performance in these situations should become part of our identification procedure, and the entire identification process should be built around a revolving door concept that allows children to flow into and out of various types of special services as various needs arise" (Renzulli *et al*, 1981: xi).

Howard Gardner (1999: 46) initially noted seven different intelligences (and later added a further two) suggesting the narrowness of a single conception of intelligence and by implication, giftedness. He proposes that children might have 'potential intelligences', which include, but are not limited to, abilities in the cognitive realm (Gardner, 1999, 2004)[6]. Gardner proposes that these distinct and separate abilities need specific attention in the educational arena. This means that 'gifted' does not necessarily apply to an academically achieving child, but to a child who has above average potential in one or more of the above-mentioned areas. From Gardner's work one notes "MI (multiple intelligences) offers a potentially more viable theory of cognitive functioning, particularly because it is based on and takes into account the nature of real-world intelligent behaviour" (Matthews, 1988: 100 in Robinson, Shore and Ennersen, 2007). The importance of Gardner's work cannot be underestimated. Instead of relying on the results of a test designed to uncover what children know at a point at time, the focus is on the multiplicity of intelligences that are potentially within a child. This understanding, similar to Renzulli's revolving door model, provides different ways of considering children's needs in school. These models seem to be indicating that a focus on a child's specific individual needs would be necessary, thus providing yet another justification for differentiation.

Common amongst recent international and national conceptions is an acknowledgment that giftedness encompasses multiple qualities, not all of which are intellectual. These underscore the limitations of IQ scores as measures of giftedness, arguing for the inclusion of factors such as motivation, high self-

6 Gardner's potential intelligences include: Linguistic intelligence, Mathematical intelligence, Visual-spatial intelligence, Interpersonal intelligence, Intrapersonal intelligence, Existential intelligence, Naturalist intelligence, Musical intelligence, Bodily Kinaesthetic intelligence.

concept, and creativity as important qualities in broadening conceptions of giftedness. It would seem, therefore, that the use of the term 'giftedness' is itself limited, hence the use of 'high potential' in this work.

The ideas above are rooted in conceptions of intelligence and giftedness as a continuum as well as being situated and embedded in a specific context and time. The idea that giftedness should 'have value for a specific culture' indicates that the concept of giftedness and gifted behaviours can vary across cultures. In fact, it has been shown that in more collectivist societies, giftedness is recognized in those that contribute to the well-being and cohesiveness of the community (Li, 2002; Zambrano, 1999; Romero, 1994; all in Alexander and Winne (Eds.), 2006). It also shows that if a society places little regard on a specific achievement either it then goes unnoticed, or it is not considered as evidence of giftedness, because it is not seen to be of value. This type of research shows that not only has the face of giftedness evolved over time, but that the conception of giftedness is different across different cultures. It is interesting to note that over the years, as sporting achievement has become more and more recognized and sought after in modern Western cultural regard, more definitions of giftedness include sporting ability (not necessarily linked to superior general ability or specific intellectual ability). Such an example underscores previous points about the shifting nature of the terms as well as their social embeddedness.

In a South African context, early definitions of giftedness defined by Haasbroek contend that, "pupils with an IQ of 130 or more who consistently achieve outstandingly in all or most subjects be defined as intellectually gifted, and that the pupils who consistently achieve outstandingly in only one subject or school activity, in a few subjects or school activities, or in respect of a particular personal quality or qualities be regarded as specifically gifted" (1988: 17). This is quite a traditional view of giftedness, in the sense that it accepts the notion of IQ being a gate-keeper for giftedness, but it does on the other hand also propose a variety of aspects of giftedness by also giving importance to subject abilities, school activities and personal qualities. However, currently in South Africa, a leading expert on giftedness, Professor Shirley Kokot, defines giftedness as (2001: 45) "an inherent potential, latent or realized, for above average achievement in one or more areas that have value for a specific culture. The realization of this potential is dependent on the nature and quality of the individual's relationship with aspects of reality in the home, school, society and the self throughout the lifespan."

Kokot's work (2001) provides the definitional basis for the term I use in this study since her definition not only encompasses all aspects of gifted behaviours identified by other authors, but she acknowledges the inherent nature of potential (nature/ genetics) on the one hand, and the importance of the social context (nurture) to enhance and support potential on the other. In her view, whilst good parenting, teaching and the appropriate environment might improve a child's chance of success and levels of achievement, it is not possible to 'make' a child gifted or to insist that they behave in a gifted manner. If the inherent potential is within the child, it is possible to develop that potential through best practices. The notion of 'latent' is important since it assumes a continuum and continuity in the construct 'potential'. Such conceptions allow for understanding of an individual's 'latent potential' and that some might not have reached their full potential either due to learning problems or any number of relationship issues (with parents, peers, self, and with objects and ideas – these talk to the social aspects of learning and development).

Based on the understanding that all children have potential, that all children are unique and that all potential can be developed using educational and social practices, this research has proposed the notion that all learners (including high potential learners) and their needs could be provided for within the context of a differentiated learning philosophy. This would not require that children be specifically tested and identified as gifted, but simply that their interests, readiness levels and learning styles be considered by the teachers in planning their curriculum. This conception allows children who excel in particular areas (for example. mathematics) to be extended and challenged in that area, but understands that the same child might be at a different level in another learning area (say, literacy). Teachers operating within the differentiated learning philosophy should be able to accommodate not only differences between learners, but also within learners.

Bearing in mind that all children have potential, and having understood that potential is fluid rather than fixed, this research focuses on children performing at the higher end of the learning spectrum, although the possibilities for differentiation are applicable to children at any level. Up until recently, the focus of research on high potential children has fallen mainly on the time of adolescence, with little work done on understanding what happens to high potential children when they enter school. This study is important because it begins to raise questions about how and whether educational contexts work and differentiate to ensure that children's needs are met from a much earlier age (Pfeiffer and Petscher, 2008; Sankar-Deleeuw, 2002).

2.3 Learner Potential and Differentiation in Education

Children start learning before they are born, and each child's experiences and interactions differ and are unique from their beginnings. By the time a child enters school they have already had their world shaped by their social and cognitive interactions. This means that by this time each child's potential has already been worked with. Individuals have already started to develop their own learning styles, have their own interests and are at varied levels of readiness to absorb new information. These children therefore require differential input to facilitate their educational learning. This is the basis for considering differentiated learning as a philosophy for enabling all children to learn and develop. While there is variability in the learning spectrum, this research focuses on children at the high end of the learning spectrum. Tomlinson (1999:2) says "in the context of education, we define differentiation as a teacher's reacting responsively to a learner's needs…. Differentiation is simply attending to a particular student or small groups of students rather than the more typical pattern of teaching the class as though all individuals in it were basically alike. The goal of a differentiated classroom is maximum student growth and individual success." Another definition of differentiation is "At the core of true differentiated instruction is the creation of multiple paths to learning for students so that they all have equal and, more important, appropriate access to the course curriculum" (Sacco, 2013: 1).

Differentiation is a way of teaching that aims to provide stimulating and enriching learning environments to a diverse group of children within a classroom. This might be achieved by separating the class into smaller groups based on ability, or by providing children with different tasks at the same time, with the same learning objectives but at differing cognitive levels. Of course, there are challenges to be faced in setting up an inclusive education system which responds to children's diverse needs. In order to differentiate, "All schools must:

1. Set suitable learning challenges for all pupils;
2. Actively engage in overcoming any potential barriers to learning;
3. Respond to all pupils' diverse needs" (Bates and Munday, 2005: 40)

This involves a big commitment and is an onerous undertaking.

One of the interesting facets of differentiated learning is that assessment is designed to measure not only levels of grade aptitude but also of development. Unfortunately highly able children are often able to meet their grade level criteria on a pre-assessment task and so teachers might well dedicate their time to

children who are not yet at grade level, whilst giving the able children 'busy work'. At the next assessment the very able children will still be performing at grade level, and so might achieve the grade norms and move up through the school system – but unless they have had the opportunity to experience differentiated instruction they might not have developed and grown in their own right (Winebrenner, 2000; Tomlinson, 1999). These children then have not had their needs adequately met because they are already performing at the standard required for their age cohort, but because of their abilities they are able and often keen to work on more complex and nuanced tasks in order to develop. According to Winebrenner (2000: 6), "to complacently accept their performance at regular competency levels, is to deny their equal right to appropriate education".

According to Alikhan (2011), there are some misconceptions around the notion of differentiation. Some critiques note that students should not be allowed to choose their own work, or to play education games in the classroom. But differentiated learning is not about allowing students freedom to do as they please within a classroom setting; it is about a teacher meeting each of her students at their level and facilitating their learning from that point on. Alikhan goes on to say that other critics cite assessment as an area of contention, that differentiated learning environments result in grading better abled students more harshly. But, again, this is not the point of differentiated learning. Assessment is a tool to assist in the children's development and those that are ready for more evaluative tasks will be assessed accordingly.

Rogers (2007: 391) notes, "educators who wish to implement research-based "best practices" must reconsider many of their previously held perspectives and must commit in more than words to developing the "full potential" of all learners, including the gifted and talented. To provide for the different ways that learners learn, in the case of this study, those with high potential, (consistent challenge, daily talent development, independent work, whole-to-part, fast paced, depth and complexity, limited drill and review), educators ought to reconsider whether (and how) they can manage increasingly heterogeneous and diverse classrooms. In most cases some form of grouping will need to take place to appropriately differentiate on a direct and daily basis."

Another aspect of learner potential and differentiated learning is how teachers perceive or understand various factors as evidence of giftedness. Although there is a paucity of literature about teachers' perspectives on gifted (or high potential) behaviours or attitudes in Grade.1 mathematics classrooms, studies of teachers of older children note factors such as the following: grasping new concepts more

quickly than other students; talking in the abstract and with more complexity about the concept; seeming to be instinctively mathematical; and having a great passion for mathematics (Bicknell, 2008).

The notion of differentiated learning has theoretical roots in the works of Piaget and Vygotsky, discussed below.

2.4 Educational and Pedagogical Theories supporting Differentiation

Consideration also needs to be given to the developmental and cognitive stages that children go through on their journey to adulthood, as these underpin what teachers teach and expect students to be able to understand as they progress through different developmental ages. Research into stages gives us a basic idea of what children should be able to do at each developmental stage, which has been linked to chronological age. This is, in turn, taken into account in the derivation of the Curriculum Assessment Policy Statements (CAPS) (Department of Basic Education, 2012). CAPS gives the essence of what a child should know in each learning area at the end of a specific grade and phase. Piaget and Vygotsky both provide insight into children's growth and development, and can also be linked to a differentiated learning philosophy.

Piaget

Piaget (1926, 1953) proposed a model of cognitive development that lays out in four stages, the progression of a child's development. Initially, in the sensory-motor phase the child (a new baby) is unable to understand himself as separate from his world, but by the end of this stage he is beginning to understand that he is a separate being who is a part of the world. Piaget noted that movement through these stages was based on a combination of social interaction, active experience and heredity. According to Piaget, as the child begins to understand object permanence and causality, he is able to separate himself from the world.

In the following phase, preoperational thought (from 2 - 7 years of age), children are very egocentric and are able only to centre on one stimulus at a time. They also engage in non-transformational reasoning which occurs when they focus only on the initial state and the final state and do not process the changes that have occurred – that is, they do not think logically. Another main element of this stage is the irreversibility of their thoughts – children at this stage are unable to reverse a judgment, they judge things

on their appearances. Next, Piaget indicates that children move into the concrete operational stage (7 – 11 years of age). This involves inversion – when the child is able to reverse problems of order or sequence. Children learn the ability to apply logic at this stage. In the final stage, formal operations, (ages from 11 – 15 years) children have grasped the ability to use logical reasoning to think things out for themselves (Tuckman and Monetti, 2011: 65).

Piaget's (1953: 21) conception of intelligence was that "[I]ntelligence does not by any means appear at once derived from mental development, like a higher mechanism, and radically distinct from those which have preceded it. Intelligence presents, on the contrary, a remarkable continuity with the acquired or even inborn processes on which it depends and at the same time makes use of. This is very difficult to measure, and does go some way to explain the effect of the environment on intelligence." Piaget's theory of intelligence presented a much more nuanced approach than previous theorists, in that he felt that part of intelligence manifests itself in the ability to adapt to a changing environment – he found both nature and nurture as intertwined important aspects of intelligence. His theory though, neglects to explain the effects of the social environment on learning (Papalia, Olds, and Feldman, 1998). Piaget's theories have been widely accepted, but are also criticized. In terms of this study, perhaps the most notable criticisms are works by other researchers that have shown that infants and toddlers demonstrate higher cognitive functioning than shown by Piaget's research (Gerow, 1996), and that there is no clear demarcation between the different stages – children have the ability to learn more than Piaget expected given the right situational environment (Gray, 1994).

Furthermore, Vygotsky criticized Piaget's early work for its lack of attention to the social aspect of intelligence. Where Piaget (1926: 56) noted "[I]n the first place, there is no sustained social life among children of less than 7 or 8; in the second place, the real social language of the child, that is, the language used in the basic activity of children – play – is a language of gestures, movements, and mimicry as much as of words", he was positing that thinking is developed in the individual first and applied to the social later. But Vygotsky, (1934: II) after further research, presented the opposite point of view, "In our conception, the true direction of the development of thinking is not from the individual to the socialized, but from the social to the individual".

Vygotsky

Vygotsky presented a different view on child development from that of Piaget. His research showed that adults can have an impact on the learning activities of children. He noted the importance of social interaction, which led to a social construction of meaning. The importance of language as a tool for children to internalize meaning as well as to gain understanding is an important aspect of Vygotsky's work (Berk and Winsler, 2002; Vygotsky, 1934). He builds on these concepts by adding the concept of the zone of proximal development (ZPD) – where someone (a peer, teacher or adult) assists a child to perform tasks that they would not have been able to do on their own.

The process of helping children move through their ZPD is termed scaffolding (Tuckman and Monetti, 2011: 76). Scaffolding is a central tenet of Vygotsky's theory. He showed a move away from the main theories of cognitive development that were prevalent at the time, constructivism, behaviourism and gestaltism, with this theory. Vygotsky felt that in the ZPD learning precedes development – the child does not have to be at a specific developmental level to learn a skill, but in the ZPD a child can learn a skill that goes beyond the child's actual developmental level. Development therefore, according to Vygotsky (1978) follows the child's potential to learn.

In an educational environment, peers and teachers can 'scaffold' others, thereby assisting them to achieve more than they could alone. Scaffolding is not fixed – it can occur in any situation with any individual who is more advanced. This can be located in the framework of inclusion, as high potential children (and indeed any children) can benefit from the support that scaffolding offers. Vygotsky's work also centres on the theory that children's development is affected by the social and cultural context in which they live, and that they can achieve much more through their interactions with other people. Vygotsky's work can be considered as an "attempt to understand how social and cultural influences affect children's development" (Berk and Winsler, 2002: 4; Donald, Lazarus, and Lolwana, 2008). It provides an understanding of the notion that intelligence is not necessarily innate, but is shaped by the child's social and cultural influences.

Vygotsky noted that the best way to extend children through their zone of proximal development was through tools and mediation. Tools can range from language to activities that assist children in assimilating learning; and mediation refers to the use of external interventions to enable children to extend their zone of proximal development. One possible strategy could be differentiated learning.

Both Piaget and Vygotsky believed that "there are two lines of development – the natural and the social – that interact continuously in the development of thinking. Each is important, and cognitive change cannot be understood without both" (Berk and Winsler, 2002: 109).

Summary of Theories

After examining conceptions of how children differ in their abilities, interests and readiness levels, the need for differentiation within the classroom becomes clearer. Theories of cognition derived from Piaget and Vygotsky were presented and discussed above and their implications for differentiated learning noted. Vygotsky's work, particularly, strengthens the argument for differentiated learning strategies, as he indicates the link between cognitive theories and differentiated learning – primarily through his understanding of the growth and development of the child through social interaction and through his proposition of the zone of proximal development. Vygotsky's work on the zone of proximal development, where teachers (and peers) scaffold children's learning and flexibly differentiate that support by setting different levels of cognitive demand for different learners, is a critical element of this research. Teachers can utilize scaffolding to differentiate for their mixed-ability groups in the classroom.

2.5 Theoretical Tools to Analyse Classroom Practice

In considering what form differentiated learning might take place practically, this research used Tomlinson's differentiated learning framework (1999) as a lens through which to examine and analyse teachers' perspectives and practices. Within Tomlinson's framework there are various elements that need to be considered. Bloom's Taxonomy and Nunley's Layered Curriculum are also utilized as tools within Tomlinson's 'Process' focus area. This is specifically to see if and how process differentiation (differentiation in terms of cognitive demand) has occurred.

Tomlinson's Differentiated Learning Framework

Tomlinson has been one of the main proponents of differentiated learning. Over a career spanning the last 30 years, Tomlinson has been a teacher, a programme administrator for struggling and advanced learners, a lecturer and an author in the field of differentiated learning. She believes fundamentally that children all learn in different ways and that teaching all children in the same way has long been proven ineffective. She also points out that separating children out has been beset with problems. She notes "so that leaves us with the third, unfortunately less common choice - keeping kids together in the context of high-quality

curriculum but attending to their readiness needs, their interests, and their preferred ways of learning. And we have a fairly good body of research to suggest that when you do that the results are pretty impressive. Differentiated instruction assumes a more positive mind-set: Let's assume they can all do good work, and let's attend to the ways that they need us to teach them in order to get there." (Tomlinson, 2008: 1)

Differentiation can thus be defined as "an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom – however, often, most teachers teach every child the same material in the same way, and measure each child's performance by the same standards. This approach seems fair somehow: no child is given special treatment or unfair advantage. Thus, teachers embrace the value of treating each child as a unique individual, while instructing children as if they were virtually identical." (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, and Reynolds, 2003:121)

Tomlinson (2008) provides an overview of what she would expect in a classroom where teachers were engaged in differentiated instruction. She describes factors such as 'respectful tasks' (where the teacher ensures that each child has tasks that are meaningful), 'flexible grouping' (based on skills, readiness and interest and changing fluidly as the needs of the children change – sometimes putting children with similar interests or cognitive needs together and sometimes having mixed groups) and 'teaching up' (starting with high-end curriculum and expectations and, through differentiation, scaffolding the children up). Tomlinson (1999) divides her framework into two main sections – the teachers' understanding of the students (their readiness, learning style and interests) and the teacher modifications (content, process, product and learning environment). According to Tomlinson, teachers initially need to gain an understanding of the students in order to modify the various areas to best facilitate the learners' learning. In each of these areas Tomlinson gives ideas and input into how to facilitate differentiation. The information gathered during the course of this research was analysed utilizing Tomlinson's approach – the teacher's discourse, process and pedagogy were considered using the following framework.

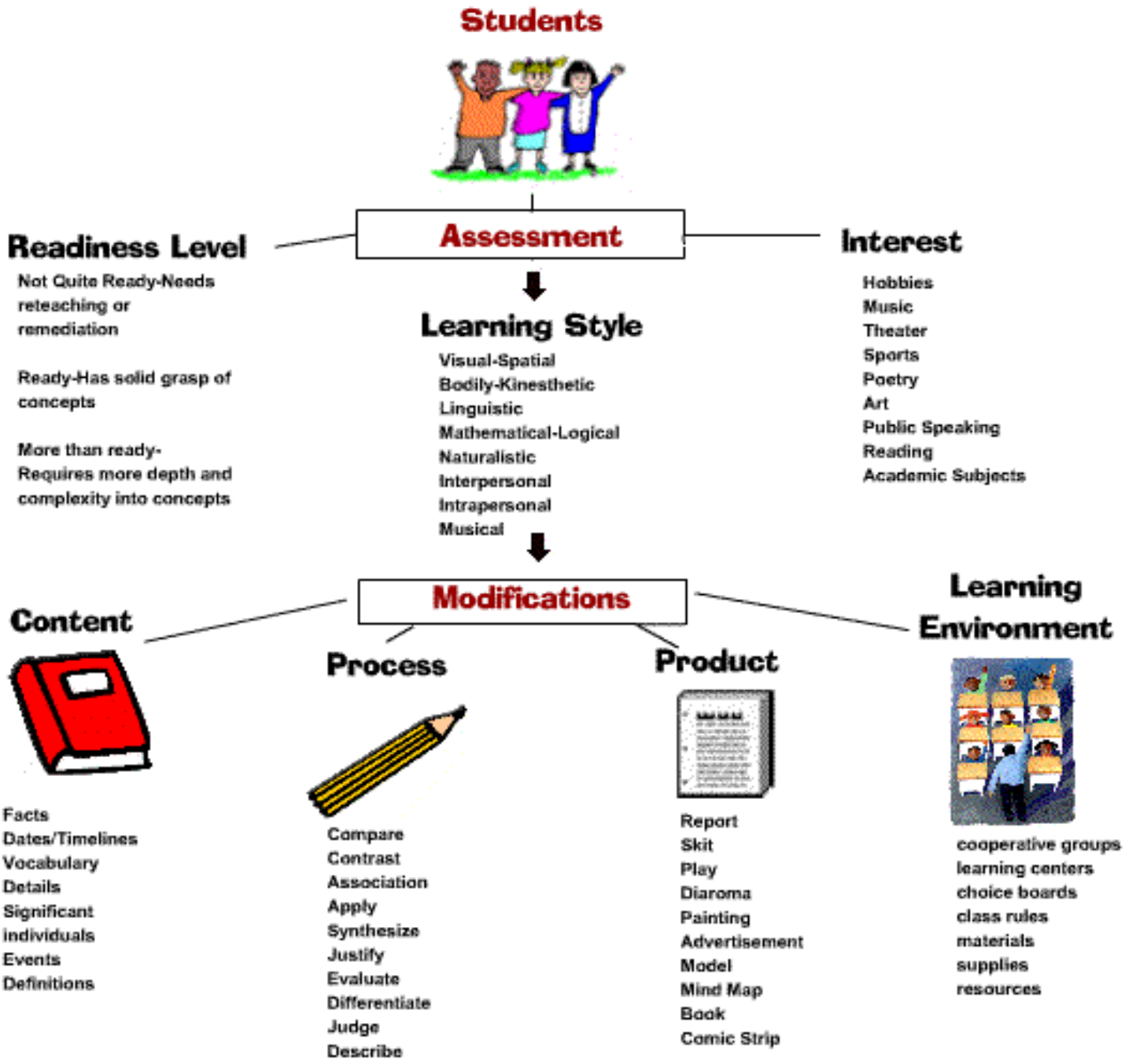


Figure 2: Tomlinson's Differentiated Learning Framework (1999)

Within the process teacher modification area, Blooms Taxonomy (1956) was utilized to examine the layers of differentiation, particularly concerning subject content. Nunley's Layered Curriculum (2001) is noted as a current modification to Bloom's taxonomy.

Bloom's Taxonomy

Bloom's taxonomy of educational objectives (Bloom, Engelhart, Furst, Hill, and Krathwohl, 1956) was used to analyse the cognitive demand of the tasks that the teacher sets the various groups of children (which is set out as the 'process' area in Tomlinson's framework). Bloom's taxonomy sets out six layers of human thinking. The first three are considered to be lower order skills and consist of functions such as knowledge, comprehension and application. This area involves thought processes such as retaining information, understanding the information and being able to retrieve it to use to solve particular problems. The three higher order thinking processes are listed as analysis, synthesis and evaluation. Individuals with the ability to analyse information are able to process information more deeply to come up with comparisons and to see patterns within the information. Synthesis involves putting the information together in a way that might involve making predictions, inventing, and making inferences based on prior knowledge. Evaluation is the ability to take various ideas to the end and compare them, in order to rank them or place a judgment on them, based on reasonable logical inductions and deductions (Bates and Munday, 2005: 52).

Tomlinson's model (1999) provides for placing differentiated expectations on the level of thinking required from the children. In some instances the expectation may simply be that a child describes, or compares and contrasts information, but in other cases evaluation, judgment, synthesis or association might be required. Other expectations include application of knowledge, justification of reasoning, or to differentiate between factors. These can easily be distinguished in terms of Bloom's taxonomy; a useful lens to use for discussing and analysing the work of the children and (in this study) the analysis of classroom-based mathematical tasks.

Bloom's taxonomy was further revised by Anderson, Krathwohl, Airaisian, Cruikshank, Pintrich, Raths and Wittrock (2001), who kept the first four stages the same, calling them Remembering, Understanding, Applying and Analysing. A difference occurred in the final two stages which have been reversed in the

revised model. After Analysing comes Evaluating (making judgements given the information) and finally Creating (which entails synthesizing the factors and putting them together in a different way).

In both models (Fig 3a and 3b respectively below), lower order thinking requires factual knowledge (simply remembering), followed by conceptual knowledge (a wider understanding required to understand and apply facts), then procedural knowledge (subject specific knowledge enabling manipulation of the information for analysis and evaluation) and finally metacognitive knowledge (knowledge of one owns cognition so as to use the other types of knowledge to create something new) (Anderson and Krathwohl *et al*, 2001).

Despite these revisions, the taxonomy remains largely the same, and particularly in the area of Grade 1 mathematics, procedural and metacognitive levels of knowledge are not indicated as relevant for this thesis. The focus of discussion is mainly the movement of the children through the lower order stages, and this study has therefore utilized Bloom's taxonomy in its original format.

Figure 3a: Bloom's Taxonomy for Thinking (1956)

Figures 3b: Anderson and Krathwohl's Taxonomy for Thinking (2001)

Nunley's Layered Curriculum

Bloom's taxonomy has been further interpreted, refined and utilized by Nunley (2002), who uses the taxonomy as the basis for what she refers to as the "Layered Curriculum" that represents different levels of thinking. Level C reflects an understanding of basic knowledge. Level B thinking is the ability to use that knowledge and apply it to a situation. Level A thinking calls for analysis and synthesis in order to make judgments based on acquired knowledge and reasoning. These correspond to Bloom's taxonomy, in that they move from lower to higher order thinking levels. Using her approach Nunley (2002) assists teachers in working with the concept of differentiated instruction, specifically focusing on assessment tasks that are designed to test the ability level of the learners, based on the learners' preferred methods of assessment. She puts forward the argument that educators should aim to have all children thinking and operating in layer A, as this is where critical thought takes place. These ideas derive from Bloom's taxonomy and represent current trends towards implementing differentiated teaching and learning strategies and assessment tasks.

Nunley gave an example of her Layered Curriculum during her presentation (2012) when she asked teachers to use the various layers in her layered curriculum in order to teach 'making chocolate chip cookies'. In the first layer (C) are the basics – the understanding of the recipe, dealing with reading and amounts, following instructions to complete the recipe. Layer B tasks involved applying the knowledge gained so for example this could be asking the learners to write their own recipe, adjust the recipe from chocolate chip to blueberries or research recipes on the internet. Layer A thinking, though, would require the learners to answer more complicated evaluative questions. For example, by asking about the appropriateness of teaching children how to bake chocolate chip cookies, you could facilitate a discussion on worldwide weight issues or starvation and hunger issues. These questions do not have, and are not expected to have, a correct answer. The objective is for the learner to gain a deeper understanding and reasoning around the research question. Dr. Nunley recommends that teachers expect every child to be able to answer 'A layer' questions, as this teaches critical thinking skills.

Nunley (2012) also has an interest in the link between differentiation and assessment. At a conference she asked a big audience of teachers if they felt they were good teachers. A big majority felt that they were. She then asked them to sing a song to show how good they were at teaching. Many of the teachers refused, citing the reason that 'I can't sing'. She then went on to say, well I have to grade you based on this singing assessment so shall I give you zero, in other words say that you are not a good teacher? There

was much laughter at this, but it was an interesting point of view. Assessment tasks do need to be varied to take into account learner difference, according to Nunley.

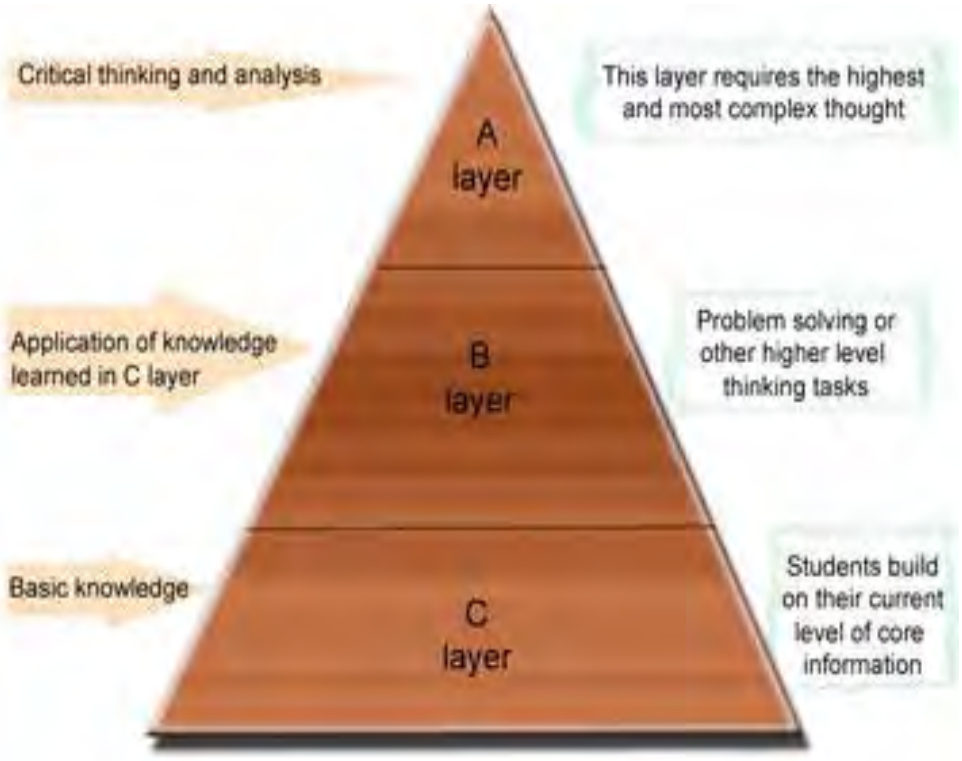


Figure 4: Nunley's Layered Curriculum (2002)

CHAPTER 3: RESEARCH DESIGN

3.1 Introduction

The aim of this research was to examine teacher perspectives and experiences in working with difference and learner potential in three Grade 1 mathematics classrooms in three different schools in Grahamstown.

This chapter outlines the research design decisions that enabled me to carry out the research. I begin by describing the methodology utilized, the site and sample chosen, and the research process. This is followed by a discussion on data collection strategies and data analysis techniques. I then present ethical considerations related to the study, as well as possible limitations and the significance of the study.

3.2 Methodology

It was important for a study of this nature that sought to understand perspectives and experiences to draw on a methodological orientation that enabled the researcher to interpret the situation from the perspective of participants. A qualitative orientation to the research seemed most appropriate in this instance. Qualitative research is appropriate when there is an issue that needs to be researched which requires a complex and detailed understanding. It requires collaboration with participants in order to understand the context of the research. According to Denzin and Lincoln (2005: 3), qualitative research "is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world." Researchers embody the phenomenon being researched in some form of representation, such as observation field-notes, interview transcripts, conversations, photographs, and recordings. They then try to make sense of, or interpret, the information that has arisen from the natural setting of the phenomenon (Denzin and Lincoln, 2005).

There are certain characteristics of qualitative research that make it an appropriate methodology for this work. These include notions of the researcher as a key instrument, the need for multiple sources of data, and the credence given to an inductive data analysis process. Qualitative research is about understanding participants' meanings and is therefore of emergent rather than

pre-determined design, meaning that the research arose out of the participants' understandings and experiences rather than being limited to answers to specific questions. This interpretive inquiry aims to provide a holistic account of the context-specific case (Creswell, 2007). Bearing these factors in mind, qualitative research is thus a suitable approach to adopt for the research question under study.

Within qualitative research, this work adopted an interpretive framework since it began with a set of questions to be answered, requiring that the researcher "collects open-ended, emerging data with the primary intent of developing themes from the data" (Creswell, 2003: 18). Interpretive studies assume that people create and associate their own subjective meanings as they interact with the world around them and that phenomena are understood through accessing the meanings participants assign to them. The reason for this in-depth approach is the importance of gaining a rich or thick description of the phenomena under consideration.

This research was conducted as a case study. A case study approach allows one to research a particular situation in depth. This research approach was thought to be the most useful framework for this study, as the researcher sought to gain an understanding of the phenomenon of differentiated learning by being immersed in the teachers' worlds and then providing a representation of their perspectives and experiences.

In this instance, 'case' refers to the phenomenon of 'differentiated learning', as represented by three teachers, one from each of the three participating schools. Utilizing a case study approach thus allowed for an in-depth detailed understanding of the phenomenon and allowed me to present the perspectives and experiences of the teachers under study. It also allowed for new and deeper insights to be made in light of the information presented (Riege, 2003; Babbie, Mouton, Vorster and Prozesky, 2007).

The interpretive case study allowed the researcher to situate the phenomenon in a 'real-life' setting, to see how the phenomenon occurred in a classroom setting and to understand and to begin to make sense of the nuances around the case. The three teachers, whose perspectives and

experiences are presented in the results in Chapter 4, provide the context for examining the phenomenon being researched.

3.3 Site and Sample

This study is located within the Cape Consortium Foundation Phase Teacher Education Research Programme (hereafter the Consortium). The Consortium was launched in 2011 and has as its main aims "research into teaching practices and teacher education practices, programme design of initial Teacher Education courses, and materials development for teacher education" (Bradfield, 2011). The research programme undertook purposive sampling of proportionately representational clusters. The purposive sample was selected according to criteria that require schools to be functionally isiXhosa speaking, not ex-model C, not multi-grade, with not less than 50 learners in Foundation Phase, and from selected districts. These districts more or less represent clusters in terms of size and quintiles (Kock and Nsubuga, 2011).

However, my study began before the sampling process described above had been completed and hence includes two schools in the Grahamstown area that were not included in the final consortium-selected schools' listing. My selection of three schools therefore did not strictly adhere to the criteria applied in selecting the consortium schools. I managed to include an under-resourced, a well-resourced, and a private school. The under-resourced school was one of the schools selected by the Consortium for research purposes.

A well-resourced school was indicated as a school with access to educational resources, including a low (less than 25) pupil-to-teacher ratio, whereas an under-resourced school has a high (more than 30) pupil-to-teacher ratio and struggles with access to educational resources. The under-resourced school was also a non-fee paying school. The third was a private school that was included because in the initial stages of the study, I was allowed easy access to observe in various Foundation Phase classrooms for an extended period of time.

At the time of the study, the first school selected (Spring Valley School) ranked as well-resourced with a pupil-to-teacher ratio of 24 to 1 and access to educational resources. It is a fee-paying government school.

The second, a private school (Green Leaf School), had a pupil-to-teacher ratio of 16 to 1 and the third school (First Fountain School), which I defined as under-resourced, had a pupil-to-teacher ratio of 43 to 1. All three schools had more than one Grade 1 class.

Since all three schools had two Grade 1 classes, I was required to select one class to work with. In Spring Valley and Green Leaf the class selected for the fieldwork at both schools was chosen on the basis that the teachers responded promptly and enthusiastically to the request to participate in the study. First Fountain also had two Grade 1 classes with both teachers volunteering to participate. However, one of the two class teachers was a volunteer teacher who was only in her first year of teaching. Given that this study wanted to examine teacher experiences of the phenomenon, it made sense to select the teacher with more experience.

3.4 Research Process

I undertook to do this research in two phases. The first phase included an extended period of time in the field observing and having informal discussions on numeracy and literacy teaching practices in the Foundation Phase. I observed in all three grades during this phase. This was in order to familiarize myself with classroom practices in this phase, particularly given that I am not a teacher. I observed in three different classrooms at three different schools over a period of two weeks.

This observation included me volunteering to facilitate a Critical Thinking and Chess Club for Grades 2 and 3 at another local school over an extended period of two years, once a week for a 45 minute session. Participation in the Club also offered another layer to my understanding of the phenomenon under scrutiny. I was able to observe teachers working with children of different potential in the mathematical and logical thinking sphere of learning. I also worked with the children directly over the course of the two years under review, which gave me an insight into the relationship of teacher with learner in the classroom context.

The above processes assisted me in clarifying what aspects of teaching in the classroom I would be required to focus on, and gave me an understanding of my role as an observer in a Foundation Phase classroom.

The main phase of the research comprised observations, semi-structured interviews, informal discussions, and document analysis at the three selected schools. The private school in the final selection was one of the schools that I had also observed in the first phase of my research. The inclusion of this school did not compromise the data because the main phase of the research occurred a year later, at which time I observed a different cohort of Grade 1's at a different stage of their curriculum.

My original expectation was to interview teachers to gain insight into their perspectives prior to observation of their teaching practices. This was not always possible given the logistics of teaching in the Foundation Phase. The research process thus took different forms at each of the three participating schools.

At Spring Valley, I first observed and had informal discussions with the teacher throughout the observation period. I was only able to conduct a formal interview with the teacher at the end of the period of observation. At Green Leaf, I conducted the formal interview before observing classroom teaching practices. I had already had contact with this school during the first phase of my research and had done a preliminary observation period then so felt that I had an acceptable understanding of classroom practices. I conducted the formal interview with the teacher at First Fountain after a lesson, during the observation period. This notwithstanding, I held informal discussions with each teacher after every observation where necessary, and immediately thereafter recorded this in my field-notes.

3.5 Data Collection Strategies

To ensure reliability and validity of the data, I collected data in a variety of ways. In order to understand the real-life situations in the classroom, I used observations as the main source of data. I also made use of teacher interviews as well as document analysis focused on items such as term plans, lesson plans, and children's worksheets.

Class Observation

Observation is about describing a setting. Direct observation occurs when a researcher watches an activity, trying to remain unobtrusive and not becoming a participant, and is one of the main methods used to collect data in case study research (Denzin and Lincoln, 2005). Direct observations can take many forms which include reactive or non-reactive and either continuous or spot sampling (Russell Bernard, 2011). In this case, I was an unobtrusive participant observer, in that I was in the classroom observing and the simple fact of my presence would have made a difference in the classroom, but I did not work with the children or speak with them after our initial greeting, but sat quietly in a corner, listening and taking notes. My observation was continuous in that I was at each school for a period of time, daily, to observe a series of mathematics lessons.

Observations may be written, audio-recorded or video-recorded. The teachers in the study granted permission for me to audio-record the observed lessons. These recordings were then transcribed and used as the basis of the research data. Observations are often open-ended but may be formalized with the introduction of narrative and tabular evidence indicating the frequency of specific occurrences (Yin, 2011). I took field-notes and at the same time also used an observation sheet (Daily Class Observation Schedule: Appendix 1) to provide evidence of specific instances of items such as vocabulary used, physical items used by the teacher during teaching, and the daily grouping arrangements .

My observation period differed in the three schools based on the teachers' availability and the mathematics lessons that they were teaching during the period of their availability. I observed seven numeracy lessons at Spring Valley, five at Green Leaf and five at First Fountain. Spring Valley was the first school that I visited where I spent the first few lessons refreshing my understanding of teaching Foundation Phase learners as well as understanding my role as participant observer and observing the nuances around teaching Grade 1 learners in particular. At Spring Valley, the seven lessons observed allowed sufficient time for the teacher to cover two mathematical concepts.

I observed five numeracy lessons in Green Leaf where the teacher taught (revised) a variety of mathematical concepts daily. Since Green Leaf was the school that was also included in Phase 1 of the research this seemed sufficient time to gain insight into the teacher's practice. In First Fountain, the teacher was also focused on more than one content area, partially because she was revising previous

content covered, and partially because this seemed to be the teaching approach she adopted to cover the requirements of the syllabus.

Document Analysis

Documents were also utilized as a source of data. Reviewing documents provided insight into teachers' ideas and perspectives around differentiation before they work with the children in class by allowing an examination of the teachers' planning. It provides insight into how teachers view differentiation and how they distinguish between the various levels of cognitive ability in their class.

Over the duration of this study, as researcher, I asked the teachers at all three schools for their lesson plans. Mrs. Springer (Spring Valley School) provided a Term Plan (Appendix 2) and weekly plans (Appendix 3) for the two weeks that coincided with the class observations. Mrs. Green (Green Leaf School) provided a term planner for each of the 3 terms (Appendix 4). Mrs. Fount (First Fountain School) told me her lesson plan for the week, which she worked through and reflected on (Appendix 5) during the week. She based her plans on the Curriculum statements. She ended her week with an assessment task, which she also provided; to see how her children were performing in the concepts she had covered during that phase of teaching. In each case the teachers also provided copies of worksheets (or photos were taken of board work for the period under observation). These documents were analyzed in Chapter 4, to provide the researcher with insight into choices and decisions teachers made with regard to learner potential and differentiation.

Curriculum documents (Department of Basic Education, 2012) were useful in providing an understanding of the expectations for the 'norm'. These indicate what children in the specific grade are usually expected to achieve in that grade and provide a reference point in deciding the nature and form of differentiation required. These were obtained and are discussed in the next chapter.

Teacher Questionnaire and Interviews

The classroom observations and document content analysis were supplemented by formal and informal teacher interviews. Interviews are a common method of gathering data in qualitative research. Qualitative research interviews reflect a style of questioning that is appropriate by establishing a rapport between the interviewer and the participant. Any power relations between the interviewer and the participant need to

be minimized – although the researcher is asking the questions, the experiences that are being documented are those of the participant and thus a form of equality can be achieved. Many interviews are highly 'visible' but those of the qualitative researcher are usually of a sensitive nature and confidentiality is most important (King and Horrocks, 2010).

Interviews were semi-structured, which meant that the researcher initiated the interview with pre-prepared interview questions (Appendix 6, Teacher's Interview Schedule) but that (although each teacher answered the same questions) there was also scope for teachers to go into more detail on issues that arose out of the initial set questions. Questions were open-ended, and in each case although these specific questions were answered, supplementary questions were asked that were based on the answers of the teachers. The supplementary questions differed per teacher interview, depending on their answers and the need to gather more detailed information. The aim of semi-structured interviews was to understand the teacher's perspective and to gain insight into their perspectives, decisions, and choices regarding differentiation and learner potential in mathematics classrooms.

The formal interview was guided by the schedule of pre-prepared questions. At Spring Valley, this interview was held in the classroom, after the children had gone home for lunch on the last day of observation. At Green Leaf, the interview was held two weeks before the observation took place (as this was a time that was convenient to the teacher), which assisted us in selecting an appropriate time for the class observation. At First Fountain, the interview was held in the classroom after one of the observation lessons. The children were present in the classroom at the time, but had a task to complete; and another teacher was present to assist the children.

The informal interviews were simply discussions around points of clarification that arose during the day. Each day, when necessary, the teacher and I would discuss an issue that arose. Either I asked a question relating to the day's activities or the teacher would offer further comment or explanation regarding an instance that had transpired during the lesson.

3.6 Data Analysis Process

In qualitative research, "data collection and analysis usually go hand-in-hand to build a coherent interpretation. The researcher is guided by initial concepts and developing understandings that she shifts

or modifies as she collects or analyses the data" (Marshall and Rossman, 2011: 208). Marshall and Rossman also describe the way in which to go about data analysis noting that "typical analytic procedures fall into seven phases (1) organizing the data (2) immersion in the data (3) generating categories and themes (4) coding the data (5) offering interpretations through analytic memos (6) searching for alternative understandings, and (7) writing the report or other format for presenting the study" (2011: 210). For this study, in each instance data was collected, reduced and interpreted to result in the final thesis.

Once the observations had been collated, they were transcribed and translated (in the case of First Fountain) and then analysed for themes and patterns using inductive reasoning. Inductive data analysis means that interactive collaboration will occur with the participants around the patterns and themes that emerge. This process also occurred during the observation period and in the informal interviews, as these served to clarify issues that had arisen and allowed time for the researcher to understand the teacher's real perspectives. This collaboration ensures that the research fairly reflects the views of the participants (Creswell, 2007). Interview data and documents were also analysed thematically and all the data was categorized and written up using Tomlinson's (1999) framework as a guide for identifying issues around differentiation, particularly as it pertains to the high potential learner.

3.7 Validity and Reliability

Qualitative research is valid (i.e. the interpretation of the data is credible and trustworthy) if it reflects the themes and issues that have arisen from the research. It does not need to present an 'objective truth' (Maxwell, 2005). Using triangulation (i.e. collecting and analysing data from more than one source) is one way of ensuring the validity and reliability of the research in qualitative research. Reliability has been described by Lincoln and Guba (1985) as 'dependability' and they focus on an 'inquiry audit', which indicates how to make qualitative research more dependable. In qualitative research reliability (or dependability) is about ensuring the quality of the study, allowing the reader to depend on the research process and, therefore, findings. To ensure validity and reliability in this study, document analysis, interviews and observations were triangulated to gain a deeper understanding of the situation.

3.8 Ethical Considerations

Ethical issues in qualitative research go beyond respondent anonymity and include "respect for persons, beneficence and justice" (Marshall and Rossman, 2011: 47). These three areas of ethical concern were considered in this research. Respecting people themselves, their right to participate and also their right to privacy means that we respect people as individuals not as a means to an end, and that they are free to decide whether or not to participate in the research. They will also remain anonymous. Beneficence means that we should do no harm to those participating in the study. And justice refers to understanding who benefits from the study, particularly as it pertains to redressing past inequalities. Information pertaining to children and education is sensitive in nature, and the researcher ensured that schools, teachers and children remain anonymous.

The focus of the research is not on the children (who will remain anonymous in the research findings) but on the phenomenon of differentiated learning and on teachers' perspectives and experiences of differentiated learning. The aim and focus of the research was not to undermine schools and their relationships with children but to provide an initial understanding of the possibilities and potential value of differentiation as a strategy for dealing with high potential children in the heterogeneous classroom. More specifically, this meant gaining an in-depth understanding of how teachers view differentiation and learner potential with the overarching aim of improving teacher differentiation methods in Foundation Phase mathematics classrooms. In this context, although the research sought to critically assess various elements in regard to differentiation, the focus was towards uncovering any classroom-based practices that were extending and enriching children, in particular high potential children. This research thesis is designed to complement and contribute to the research requirements of the Consortium, and as such it will be available to the members of the Consortium, participants and Rhodes University upon completion.

Specifically in this research, the teachers' permission was sought before any observing or recording was done. In all cases the researcher had the permission of Rhodes University and the Consortium to proceed with the work. In the classroom the researcher did not record the children's names and the teachers and school names are only accessible in the raw data. I chose not to video-record, as I did not feel comfortable with having footage of the children available. Audio recordings were however made at all three schools. Finally, pseudonyms were used throughout the discussion in relation to the schools, the teachers and the children.

3.9 Research Limitations

There are limitations to this research. Initially when contact was made with the teachers at the various schools, an explanation was given of the study being done. This, as well as the situation of having an observer sitting in a classroom, could have caused the teachers to try and differentiate so that the observer had something to see. In each case though, the researcher did discuss this with the teachers and requested that they just continue in the usual manner. It was made clear to the teachers that the aim of the research was fairly broad, in that the researcher just wanted to gather information on the way in which Grade.1 mathematics classes operate. It was also explained that the observer is not a teacher, and was not there to judge the proceedings, merely to note what occurred in a classroom setting.

Another limitation of having the researcher present in the classroom was that it could have influenced the way the children behaved. However, in each of the three schools under observation, the children seemed to be very comfortable with having another adult in the classroom. They were curious and interested but at lesson time primarily concentrated on the teacher. The reaction of the children to the researcher was different at all three schools but in none of them was it unmanageable so that the teacher could not continue as she had planned. The researcher did answer direct questions from the children, but mostly did not engage with the children. Since the main focus of the research is the teachers' perspectives and experiences this limitation was not thought to have invalidated the research.

Because of the limited time spent with the schools and the limited number of schools chosen for the study, it would not be fair to say that these teachers' perspectives and experiences with regards to learner potential and differentiation can be generalized to other schools. All that is presented is a narrative summary and analysis of what transpired at these three schools.

3.10 Significance of the Study

The results of South African schools in world rankings in science and mathematics[7] are very poor. And yet, given the number of children in South Africa, it seems plausible that there must be many who are

7 The World Economic Forum Annual Report for 2012 placed South Africa last out of 62 countries, in terms of quality of science and mathematics education; The International Association for the Evaluation of Educational Achievement, in their TIMSS 2011 International Results in Mathematics report rate South Africa as one of the lowest achievers in a variety of areas related to the teaching and learning of

highly able in these areas. Given this and my own experience of having had a very able child in Grade 1, I wondered if these children were being overlooked in favour of assisting those with barriers to learning and teaching to the 'norm'.

I spent some time researching differentiation, specifically whether it occurs in a classroom setting and whether it would have an impact on our high ability children. I noted that throughout the world but specifically in South Africa there is a dearth of information regarding differentiation in the Foundation Phase. Since each child is unique it makes sense to differentiate the curriculum for them from very early on in their schooling. This study aims to raise awareness around inclusive education in South Africa: that is, it highlights an aspect of learner diversity and the need for differentiation to accommodate the needs of our Foundation Phase learners, potentially through the introduction of a focus on differentiation into Foundation Phase teaching curricula.

mathematics, with the additional note that average achievement could not be reliably measured because the percentage of students with achievement too low for estimation exceeded 25% and that the country average was significantly lower than the mid-point of the TIMSS 8th grade scale (with South Africa also using Grade 9 students instead of Grade 8).

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents the results of the study. I emphasized in the research design section (3.1) that the case is the phenomenon of differentiation under study and that the three classes were the context of the study that served as exemplars, rather than each being presented as a 'case'. However, in trying to develop an analytical framework, I realized that the nuances and richness of the data would be lost if I used a strictly thematic approach that would combine the data in ways that decontextualized the teaching practices of each teacher. Therefore, what follows is a presentation of the results of each teacher, set out per school, with further analysis later on in the chapter integrating the overall findings.

I contextualize the classrooms of each participating teacher within the environment of the school. I follow this with a brief description of the classroom, teacher and learners. These brief profiles serve as the backdrop to the main results that comprise the teacher's numeracy teaching practices.

Audio recordings provided a detailed description of the events that occurred at this school during the period of my observation. Due to space limitations, I have chosen to present the data in a summary format (that is, I summarize the happenings that occurred during the time of my observations) and then provide instances that highlight differentiation and learner potential through the presentations of children's worksheets, as well as excerpts from the audio recordings.

I present the main findings of each class using Tomlinson's framework (1999) to organize the discussion. Each school's data is structured according to the framework and is presented in the format covering assessment of learners (which is divided into 3 subsections – learners' readiness, learners' learning styles and learners interests) followed by teacher modifications (which is subdivided into learning environment, product, content and process) – see Figure 2 below for details.

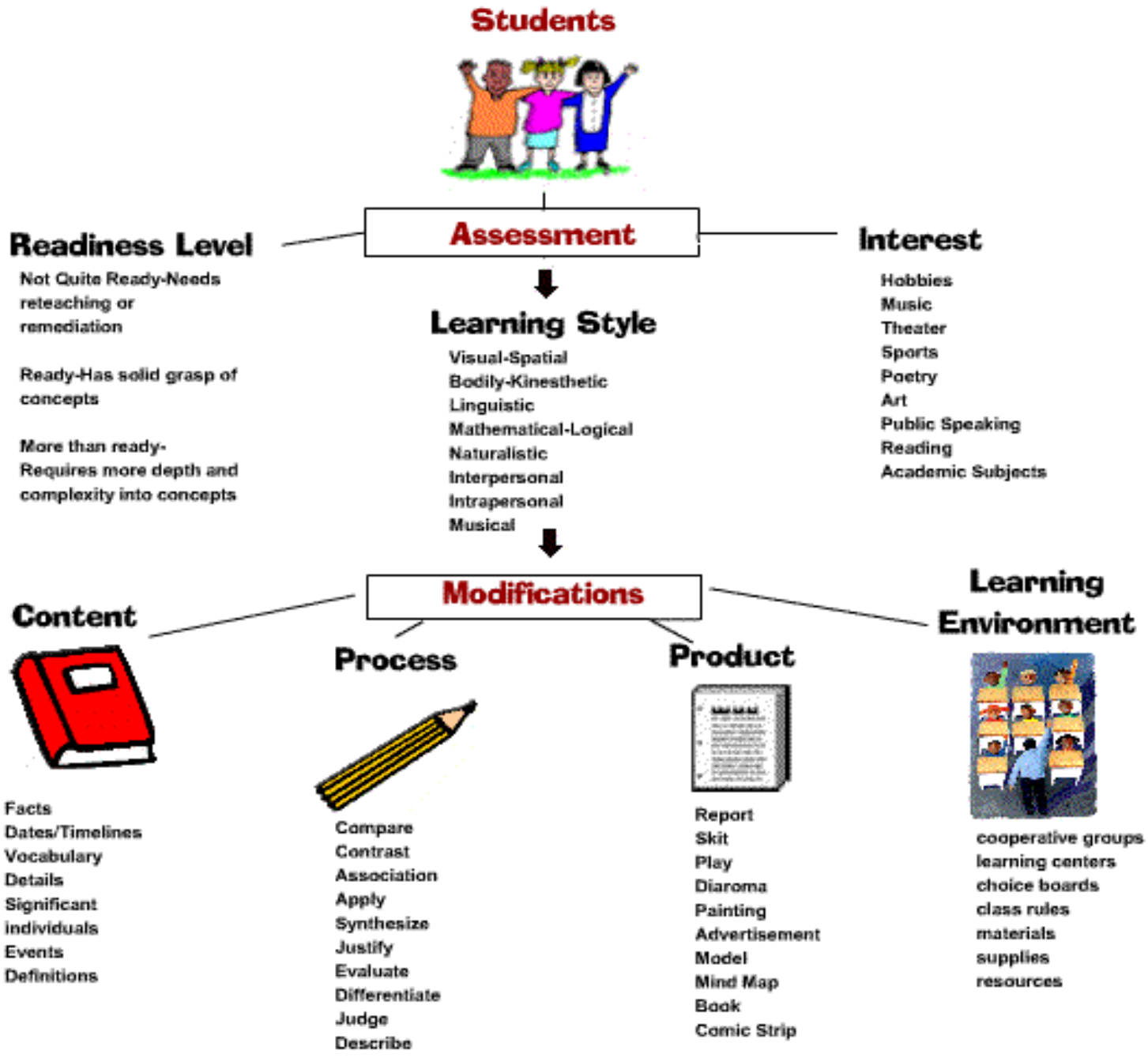


Figure 2: Tomlinson's Differentiated Learning Framework (1999)

4.2 Classroom and Teaching Practices

4.2.1 SPRING VALLEY SCHOOL

4.2.1.1 Context

School Context

Spring Valley accommodates learners from Grade R. to Grade 3, with more than one class at each Grade level. It is a former Model - C, fee-paying government school, and is well-resourced. It has a functional Governing Body. The school has been in existence for many years. Walking into the school I was greeted by friendly smiling faces, in an array of clothing (this school does not require school uniforms). It is a co-educational school environment. Teachers and children alike seemed very relaxed and the atmosphere was very welcoming. I made my way to reception and was helped by the secretary promptly and efficiently.

Classroom Context

The period of my observation was from 11-19 June 2012. The classroom of the Grade1s that participated in this research was situated in a prefabricated building at the back of the school, which was unattached to the main school building. The teacher mentioned that the reason for this was to accommodate an additional Grade R class.

The room was spacious and easily accommodated the 24 learners. The classroom was fairly cold, but there was a heater. The walls were decorated with various educational posters and activity charts, and other educational games were stored in the cupboards. The front of the classroom had a blackboard. There were enough tables and chairs to accommodate each learner with their own desk space. There was a carpet at the front of the class, a basin at the back of the class. The teacher's desk and chair stood oddly (and even awkwardly) in a position where it jutted out, obstructing movement in the classroom. Each child brought a satchel to school daily, with their homework and a snack in it. The satchels had out-of-the-way storage and the children had chair bags in which to store their daily stationery requirements. The children were very polite and greeted me, in chorus, warmly both as I arrived and as I left. All the lessons were conducted in English but there were also posters on the wall with items in Afrikaans.

The children's desks were placed at the centre of the room. They were arranged, at that time, into 4 groups of 6 children each. The teacher noted during the course of her interview that the room arrangement could change to suit the needs of the class in general. The desks had previously been arranged differently and then had been rearranged into the current format. Each desk seated two children and the arrangement looked like this:

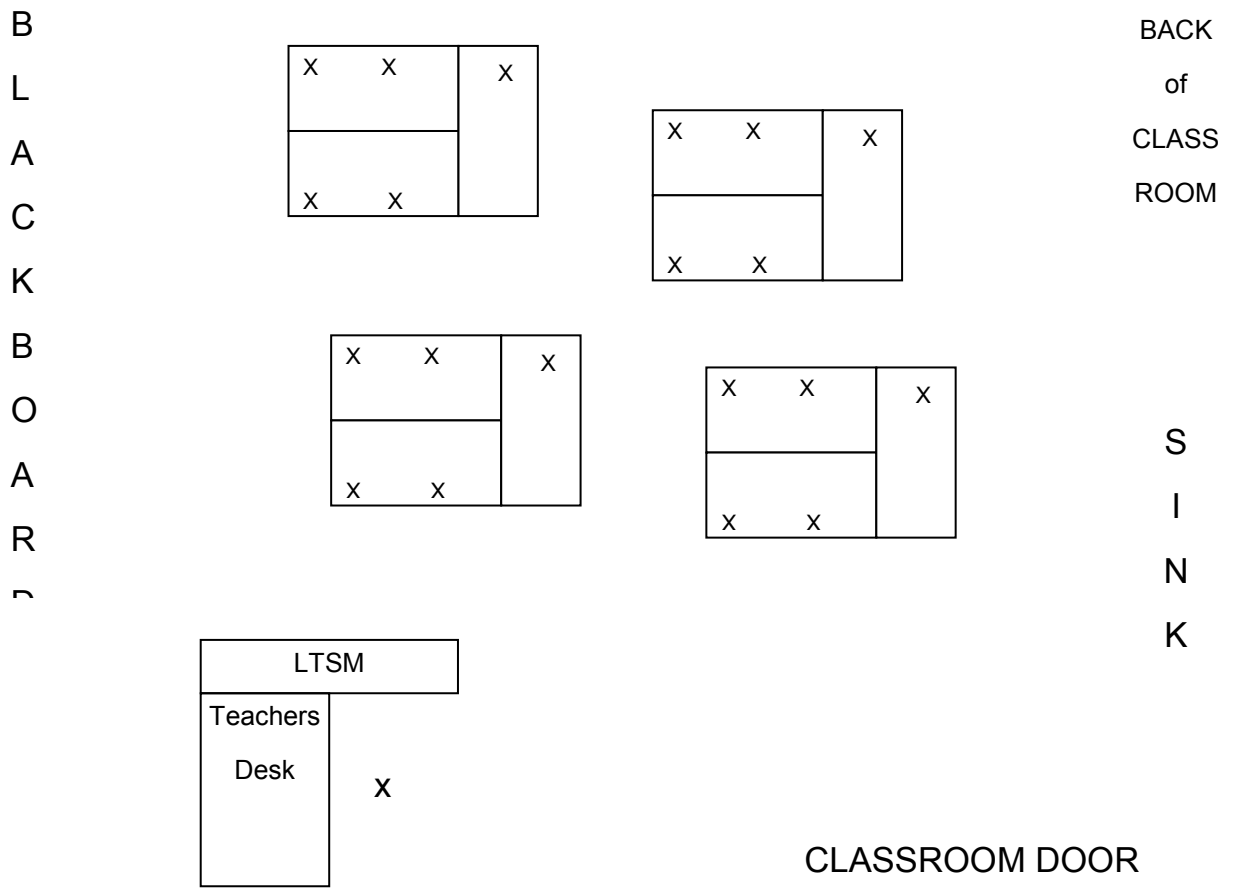


Figure 5.1: Spring Valley School – Participating Grade 1 Classroom Layout

Learner Context

Most of the children at Spring Valley, were African (isiXhosa speaking), with a few Coloured[8] (Afrikaans speaking) children and three White children (English speaking). It was clear both from the observations and from the teacher interview that many of the children in this class were second language English speakers. Although this made a difference for the teaching of reading, the teacher at this school did not feel that it had too much of an impact on the children's ability to learn numeracy as per the follow excerpt.

T (Teacher): "This is a very usual mix, Ya. Few "coloured" children that's home language is Afrikaans…"

R (Researcher): "Ok"

T: "And then the Xhosa home language…Xhosa……and then I've got 3 English speaking kids. That's English speaking at home language. The rest are all either Xhosa or Afrikaans.

R: "So it's quite difficult then because you're teaching in English?"

T: "Yes, it is, it is. And that's why…not massive…..you know the vocab is also there, but when you get to languages and the sounds because in Grade 1 we do the sounds, where we have to sound out things. Now….like an 'h' for them (referring to isiXhosa speaking children) is a 'chl'

R: "Ya"

T: "The language because we are sounding out and they learn to read and understand things so, ya, that makes it difficult to them because they are second language speakers."

R: "Second language speakers… and their numeracy. Does it…do they have different ways of acquiring like number concepts or do they think about numbers differently or is it just the same in the different cultures?"

T: "No, no, no, no very um… well I think all cultures have got their bright ones and their not so bright ones and children think. And that's why when we are on the carpet and I love actually when they are on the carpet and I give a problem to them and they have to come up with the answer. You know when they, they sort of figures it out themselves but most children you know the normal counting is fine but when it comes to doubling and halving and concepts that they have to understand then it is difficult for them. Maybe because of language or maybe just because they don't understand the numbers … ya."

Instructive in the excerpt above are the teachers' perspectives on difference. The teacher makes two points in this regard. The first relates to her perspectives on the link between language and numeracy

8 The previous government in the apartheid era divided the races into four groups: Blacks, Whites, Coloureds and Indians. Coloureds referred to people of mixed-race in a South Africa context.

learning and the second to the way she naturalizes ability as something innate. In regards the former, Mrs. Springer makes the point that teaching numeracy to second language learners is less problematic than teaching a language where phonetics and sentence structure play a part. She seemed to be of the understanding that all children acquired numerical concepts the same way irrespective of home language status. With regard to naturalizing children's ability, Mrs. Springer assumed that cognition is predetermined and not necessarily socially situated.

During the period of my observation (which happened to be during winter), the children at this school were friendly and welcoming. They seemed to be warmly dressed and happy. The teacher noted that most of the children came from fairly stable backgrounds, and had parents that were employed. The teacher stated that quite a few of the learners in her classroom lived with grandparents as primary caregivers due to parents being employed outside of the Grahamstown area. In most cases, there was a reasonable level of parental involvement and commitment. Tomlinson (1999) indicates that the learning environment is very important so it was useful to note that the basic requirements for the comfort of the children (factors such as safety, hygiene) were met. The teacher also noted that these children had all been to Grade R, many of them to the school's own Grade R. She viewed the completion of a good Grade R. as vital to the child's success in Grade.1.

Teacher Context

Mrs. Springer has had many years of teaching experience. She is a White Afrikaans speaking woman, teaching various first and second language Grade1s in English. She was enthusiastic and motivated, and appeared willing to 'go the extra mile' for the children. For example, many of the daily resources the teacher needed during the observation period were brought in each morning from home by the teacher herself.. She was empathetic to learner backgrounds, and clearly took an interest in each child's home situation. From my observation it was seen that the children were at ease with her – they felt confident to ask her questions, and to interrupt when they didn't understand. She responded to the children, assisted them and disciplined them when necessary.

4.2.1.2 Summary of Observations

As mentioned, the period of observation at Spring Valley was June 11th – June 19th 2012. These dates were selected so as to fit in with the school's requirements, as well as to enable me to be with the class at the beginning of a series of lessons on a new concept. I wanted to observe the teacher teaching them

something new and taking them through to the end of the concept. The timetable at Spring Valley was organized so that the children began their day with either numeracy or literacy lessons, after morning assembly. Seven numeracy lessons were observed at Spring Valley during the course of the seven days of observation. On the first day of observation, the children were learning a new concept - 'Capacity' – which continued over a period of four days. This was then followed by three days on 'Halving'. I have selected the three lessons on 'Halving' to present in more detail, as I spent the first few days observing the group dynamics and getting a sense of how the class operated.

On the first day of explaining about halving to the whole class, the teacher brought an orange, a pear and a banana into the classroom and demonstrated halving with each fruit to the whole group, who were sitting at the front on the carpet. She showed how, with the orange, one could give a bigger bit or a smaller bit to the other person, but that halving meant sharing only when the two people involved had the same amount. She also showed the children how halving a pear only worked if one halved it vertically, because if one halved it horizontally, the bottom (fatter bit) would be different to the top (thinner bit). She spent quite a bit of time explaining that for it to be 'half' it must be in two pieces and they must be the same size (equal). By then drawing on the board, and showing the children how to draw a dotted line down the centre of a picture, the teacher showed them how to 'halve' a butterfly or a face. Once they seemed comfortable with this, she handed out the following worksheet to all the children. The children were required to halve the picture with a dotted line and colour the two halves differently (Figure 5.2). The children remained together as a group for the entire numeracy lesson.

At the beginning of their second lesson (the following day) on this concept, the children continued with completing the worksheet handed out the day before (Fig. 5.2), after the teacher had reiterated the information she had given them the day before, emphasizing the concepts 'halving' and 'equal'. She then handed out another worksheet (Fig. 5.3) for the children to go on to, once they had completed the first one. This was because she was preparing to take small groups of children to the carpet, for small group work on sharing. For this second worksheet, they had to cut out the two halves, stick them together on a blank piece of paper and colour them in, to make the halves into wholes.

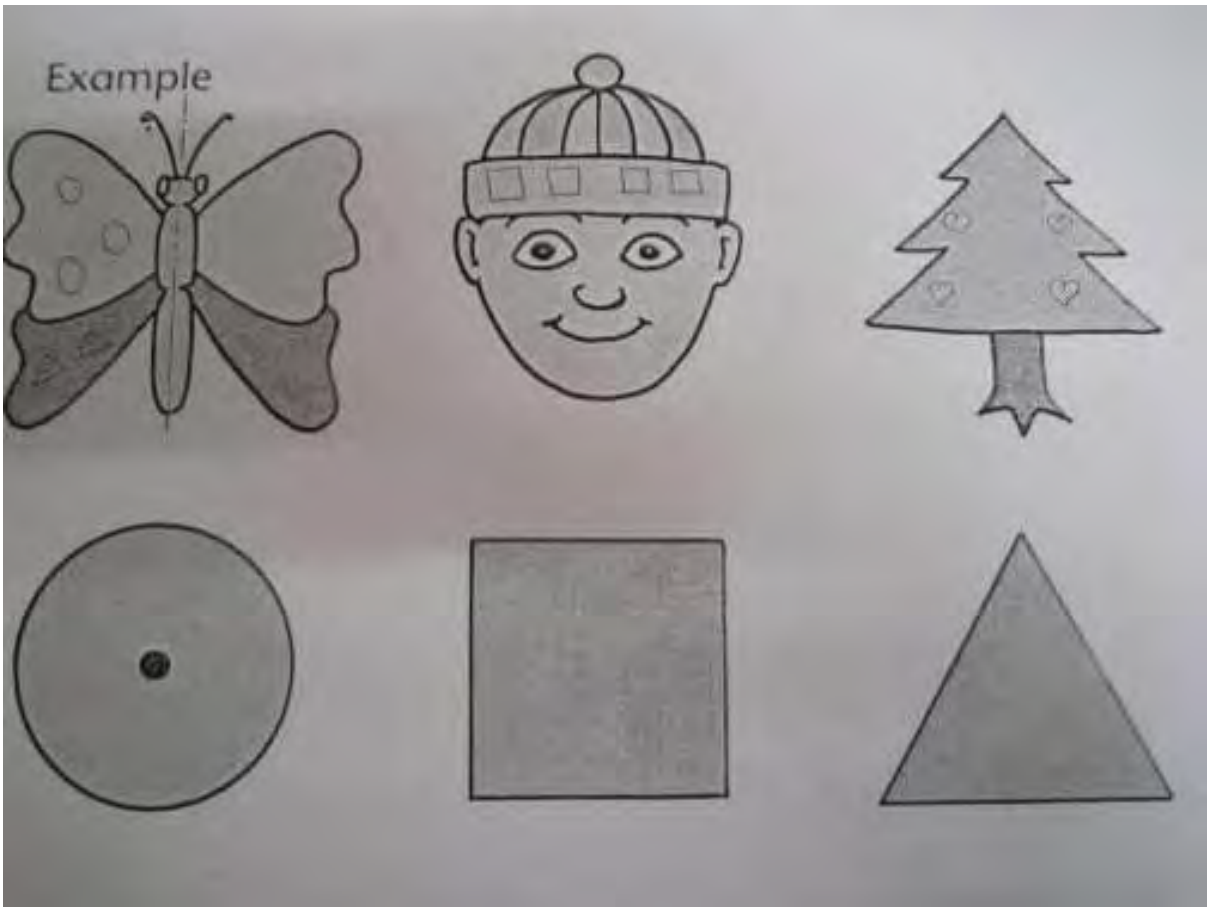


Figure 5.2: Halving Worksheet 1

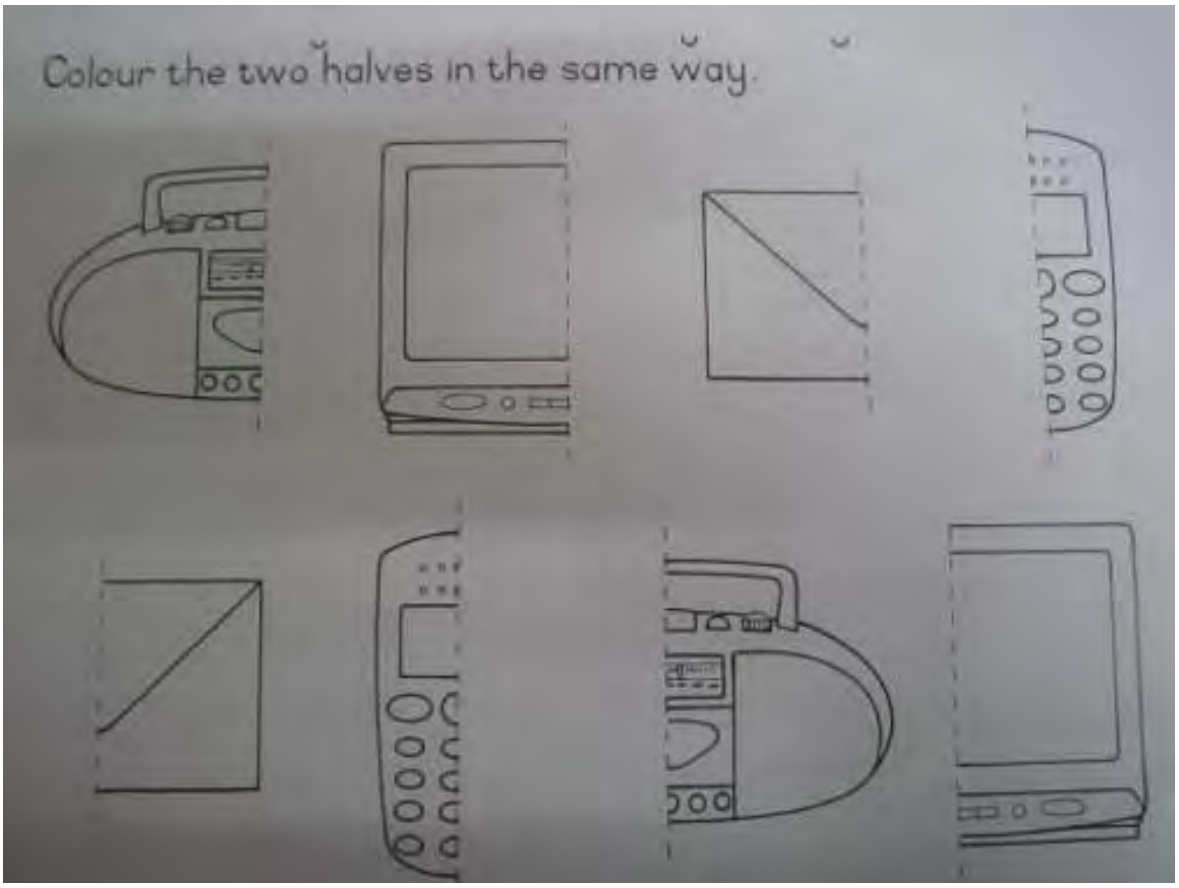


Figure 5.3 Halving Worksheet 2

All the children received the same two worksheets. The use of faces and dotted lines (Fig 5.2) to explain halving seemed confusing, and related more to symmetry than to halving. The colouring in, cutting out and pasting together worksheet activity (Fig 5.3) also seemed an inappropriate activity for halving as it pertains more to matching. Figure 5.2 required the children to be able to follow an instruction to draw a dotted line, to colour in and to recall that the two sides should be of a different colour. Figures 5.3 required that the children could visually recognize that two pictures were the same and to be able to cut these out and stick them together onto another pieces of paper. The level of thinking (recall and recognition) required for these activities would fall into Bloom's lower order thinking levels of comprehension and knowledge. Tasks such as colouring, cutting and pasting do not comprise part of Blooms taxonomy but rather are developmental areas such as fine and gross motor co-ordination.

The children were busy with these worksheets for the remainder of the lesson as well as for the subsequent two lessons, when they weren't busy on the carpet with their small group work. What follows is a transcript of the small group lessons as they occurred.

Teacher (T): "Put your name on the blank paper, cut out halves and stick together"

Teacher hands out worksheet pages to monitors per group.

T: "Group 1 to the carpet"

T: "We are going to share sweets" (handing out a page with a picture of empty bags on it).

T: "You must share the sweets equally between the two children. (Hands out different numbers of

counters to the children in the group).

Children place their counters on the bags.

Learner (L): "But mine won't share equally, I have this one left"

T: "Well done. That is called a remainder. So you have shared two each, which is equal, and you have one left over. That is called a remainder."

Teacher (handing out counters 'sweets'): "Remember what LX's problem was? Count out your sweets and share them out equally.

Children with even number of sweets (10) easily place their sweets in the correct places.

Child with 13 sweets put 6 sweets onto each bag and had a remainder of 1.

Child with 9 sweets put 4 sweets onto each bag and had a remainder of 1.

T: "Well done. You can go back to your seats and go on with the worksheet. Group 2 bring your pencils and come to the carpet."

T: "We are going to share out some sweets" (handing out a page with a picture of empty bags on it).

T: "You must share the sweets equally between the two children. (Hands out different numbers of

counters to the children in the group).

T:" Alright here are your sweets (counters). Count them out first, and then share them. How would you share them?"

The children place their counters on the bags.

T: "Remember that they must be divided equally"

L Y: "One for you, one for you, one for you, one for you, one for you, one for you, one for you, one for you

L Z: After some time (seems to be working it out in his head), he carefully places the correct number of counters in the bags, 6 and 6.

Teacher (shaking her head but laughing): "That is correct."

Two learners received even numbers of sweets but seemed unable to share them out.

T (collecting in all counters and giving them out again): "Let's have another turn. Let's start by writing down the number of sweets we have. If you get stuck you could draw pictures of the number of sweets that you have. Let's draw our sweets……okay let's share them out"

Some children draw a line down the middle. One child (with 8 sweets) hasn't drawn his sweets in an orderly way.

T: "How can he share them out?"

L: draws 4 more and 4 more sweets

T: "That looks like 16. See, you have 8 here and now 4 and 4.

L: "Can we rub out?"

T: "How would we take away on paper? What about like this" (teacher crosses out half of the sweets).

The teacher takes at least twice as long with this group as with the first group. They only share out even numbers and many of them are not confident with that.

T: "Ok, we're done. Please go and do the worksheet at your desks. Group 3 bring your pencils and come to the carpet."

T: "Children please remember how we need to work quietly at our desks"

T (to Researcher): "On a Monday the children are always more restless because of rubbish they eat on the weekend"

T (giving the worksheet with the picture of the bags on it):"Remember that halving means being the same."

T: "You must share the sweets equally between the two children. (Hands out different numbers of

counters to the children in the group).

T:" Alright here are your sweets (counters). Count them out first, and then share them. How would you share them? Look this is how we do it (places the counters out onto the bags)"

Learner counts her counters into piles on the carpet.

T: "No, on the bags"

Learner moves her counters onto her paper.

T: "No, you need to put them into the bags"

Learner moves her counters onto her neighbours page. She then moves them again onto her page and onto the bags.

The teacher works round the circle one child at a time.

T:"Write the number in the middle. Write half the number in this side and half the number on that side. Okay now count out the counters into the bags. Alright with this one (indicates the second bag) try it by yourself."

The teacher divided the class into three groups. Each group comprised eight children each and were called Group 1, Group 2 and Group 3 respectively. The teacher started with Group 1, moved on to Group 2 and ended off with Group 3. The lesson took longer than the teacher had initially expected; she mentioned to me during one of our informal discussions afterwards. This was because a number of the children struggled more with the concept of halving than she had originally anticipated. The teacher also noted that there was time for her to spend a little more time with the children because in teaching Grade 1's, one had to be prepared for some concepts to take longer than expected and others to take quicker than expected for the children to grasp, thus rendering planning a complicated exercise. The grouping was clearly related to the teacher's perception of the child's mathematical ability (Group 1 was the high ability group), but the work they covered was so similar as to render the grouping more-or-less meaningless except that it was easier to teach eight children at a time, rather than the whole group, in this instance.

On my final day of observation, the teacher started the lesson with a 'mixed group'. These were children that were not necessarily from any of her formal groups but rather whom, based on her marking of the worksheet that they did together on the carpet the previous day, still had not seemed to understand the concept of halving. She went through the process that she had completed the previous day again with these children. Once she was satisfied that the children had all understood the concept (they had to answer various questions throughout the process as she checked on their progress), they went back to their seats. The teacher then gave all the children another worksheet to complete (Figure 5.4).

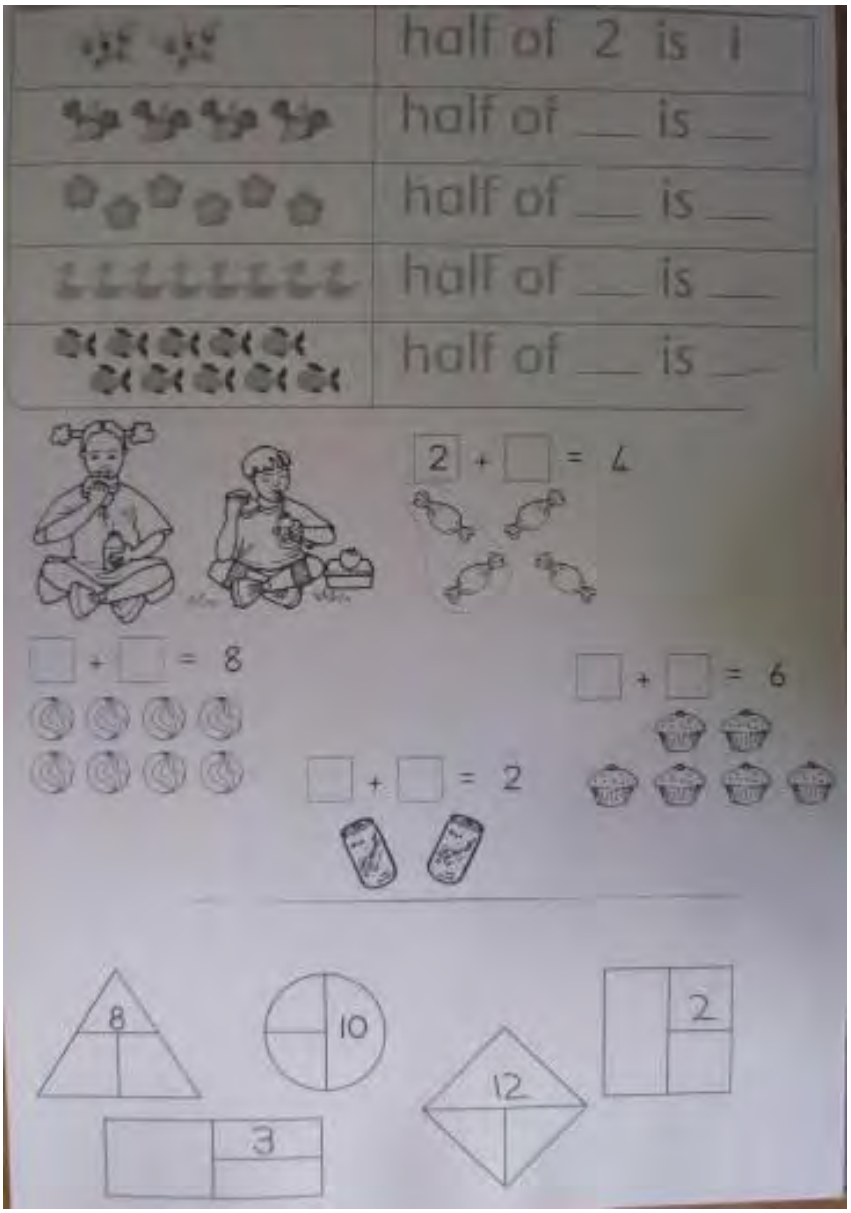


Figure 5.4: Halving Worksheet 3

This worksheet required some more rote learning and counting as the children had to remember how to get from halves to wholes. The last question with the shapes divided up into three portions (attempting to show two smaller equal sides the same and one bigger one which was double the smaller ones) was very confusing. The use of three portions seemed irrelevant to the work on halving. The triangle shape with the big number 8 at the top and the two 4's to be completed in the larger bottom sections seemed designed to confuse the children. It might have been an attempt to enable the children to apply their knowledge rather than just recall it, but the layout and structure, as well as the content was not easily understandable.

After the teacher had spent some time explaining this worksheet, the children attempted it on their own, whilst the teacher recalled Group 1 for some extension work. They had had much less time with the teacher on the previous day as they had managed to count out their counters in about 5 minutes against the 20 minutes per group required by the other two groups. This group then received a further 5 minutes on 'extension work', still meaning that they had less group time with the teacher than the other two groups. Their extension work involved a brief discussion on quarters and quartering, which is discussed in more detail below.

Analysis of Differentiation Using Tomlinson's Framework

In looking at differentiation and specifically differentiation for the high achiever in this study, Tomlinson's framework was used to make sense of the data. Tomlinson divided her framework into two main areas – the assessment of students (learners) in terms of their readiness, learning style and interests – and the modifications the teachers can make in terms of the learning environment, the product, the content, and the process.

Assessment Factors: learner readiness, learning style and interests

Drawing on the Vygotskyian theory, particularly his concept of the Zone of Proximal Development (Berk and Winsler, 2002) (meaning that each child learns best at the point at which they require support to complete the task – where the task is neither too easy nor too difficult), it seems logical that differentiated learning is underscored by this value - that children who are faced with a task that they can easily do are bored and not challenged, and that children who are faced with a task that they cannot comprehend are frustrated and disheartened. Equally, it is clear that children in classrooms today are not homogenous in ability, interests, background, motivation, culture - that each child is, in fact, unique. Therefore, it stands to reason then, that giving all children the same task to do, in the same way will not result in the same learning for all. Differentiated learning asks teachers to take into account each child's uniqueness in their teaching pedagogy.

Further, it has been noted that "it might not be too long before technology pushes schools to personalize education in even more structural ways, so that students are no longer grouped by age, but by

competency" (Heussner, 2012). In schools that adopt the Montessori approach, the age of the child is less important (within broad developmental bands) than a child's interest and readiness. Grouping by competence rather than by age could assist in the promotion of differentiated instruction. Tomlinson (1999, 2003) notes three learner focus areas that need to be assessed before modifications to teaching and learning can be made – readiness level, learning style and interest.

Learner Readiness Level

Tomlinson (1999) values time spent understanding and getting to know ones students before spending time differentiating the curriculum. I asked the teacher at Spring Valley how she got to know her Grade 1's before school and at the beginning of the year, as follows:

> *R: "Ya. Well that leads me to the next questions as well, then – how do you get to know these children? I presume because you've got a Grade R class here, that quite a lot come up from your own Grade R class?*
>
> *T: "ya….yes"*
>
> *R: "So before you get a class in do you meet them, or do you find out about them or do you just come in on Grade 1, day 1 and that's it"*
>
> *T: "No….no…..ya, and that's it"*
>
> *R: "And how do you learn about them then as children?"*
>
> *T: "We've got baseline assessment, where they must come in being able to do certain things, you know, like…um…..write their name, or count to 5, or…there's baseline things. Now, in the first two or three weeks, you try to cover that, just to see where is every child, and according to that you sort of group them, and so okay, those still need that, those still need that, you know you can quickly see which ones……this is the basics that they should know when they come to Grade 1. They should have covered this in Grade R. So, ya, we call it the baseline assessment and then it's more or less from there where you group them into the groups that they need to be in."*

In this case, the teacher does not spend time before the initial entry into Grade 1 getting to know the children, but she has a small class (24 children) and feels that she is able to spend adequate time getting to know them at the beginning of the year.

Learner Learning Style

The teacher was asked about the learning styles of the children and whether this had an impact on how she taught them. She responded as follows:

T: "Absolutely, that's where you try to explain on the carpet by showing things, because then they can see the things, and then written application where they have to write it and you talk about it all the time. And there's, you know, where they can physically touch the things because some children only learn through movement and they can touch the things and they can do the things. That's why counters, and hundred charts, and number lines and those kinds of things must be available to them all the time, so that they have something to work with because some can just work in their minds and they can understand it. And some can just listen to you and they can understand. Some you have to show and that's why the, um, worksheets also must have pictures so, you know, pictures that they have to draw or pictures that they can colour or, you know, more a visual thing but also a hearing thing and then obviously where they can touch and do with things. And that's why I also, I try to, when I say it; I try to show it at the same time. You know, on the board, write on the board but also say it so they see it and hear it and ….ya."

Consequently, this teacher showed awareness that the children might have different learning styles. She mentioned that children of this age often need concrete aids to assist them in understanding of concepts. Although the teacher used written aids, visual aids, concrete aids and verbal aids in teaching the children, the tasks and assessments that I observed were all worksheet based with no differentiation based on learning style, learner need, or cognitive demand.

Learner Interest

One of the factors that can be considered when looking at differentiation is the teachers' experiences of and perspectives on the grouping of children. There is discussion in the literature around whether groups should be split by ability or should be mixed-ability groups. In fact, Tomlinson (2003) also sees the opportunity for groups to be split according to interests, according to the assessment tool used, or even according to learning type, rather than restricting the options to ability or mixed-ability groups. During the interview the teacher was asked 'Do you group the children when teaching maths?" and "How do you choose if and when to group the children?" She noted that the children were grouped and that these groupings were by ability. She grouped both types of groups (for small group work and for seating at the tables) in the same manner. On the whole, these types of groupings are both by ability, although the teacher notes also, *"In the first term, I had more together so you can sort them out and see who goes where. Personality wise as well."* This shows that she takes factors other than ability into account when arranging her grouping, but does not always translate this knowledge when she plans learning opportunities in the mathematics lesson.

She also showed a slight move towards flexible grouping when she noted,

> *So then I see okay, after I mark the work that they do by themselves, independently, on their own, hopefully, because they do maar take clues from each other, then I see okay, this child still don't understand. Then I will take that group irrespective if that child is in the first, or the last or the middle group, then I will take all those children to the carpet that I see don't understand this anymore and I'll explain it again to them.*

What the teacher indicated in her discussions was that although the children have main groups that they are allocated to, based on their ability, she calls them back after an assessment task when she needs to, based on their performance in that task. This does not affect their 'formal' group placing but keeps ability groups together in relation to specific content. She also noted that during the course of the year, children were able to move between the groups depending on their progress.

This notwithstanding, this teacher did not differentiate the tasks given to students even though she acknowledged and recognized varying abilities within and between the groups.

Teacher Modifications

Teacher modifications include considerations of the learning environment, the product, the content, and the process

Learning Environment

Tomlinson gives some ideas of what can be modified in terms of the learning environment – for example grouping, materials, class guidelines and routines and supplies and resources. I noted that the teacher started the lesson by teaching the concept to the whole class on the carpet and here the resources and materials used were the same. As the teacher separated the children out and began teaching to the smaller groups, she utilized the same worksheets (see Figures 5.2, 5.3 and 5.4) for all the children and used the same counters as sweets, with the same terminology as evidenced by the excerpt above. Her way of teaching was the same with all three groups and the way she spoke to them was the same.

She did, however, show Groups 2 and 3 how to draw the answers, in case they didn't have counters to work with.

Draw them. No, no don't write the number now, draw the counters. Draw the counters for me. ……Right and then you share your counters in half"…….. "Well done…….you've put two circles around it. That shows each child gets two. What other ways can you show me? Well done. You have a line between the two; that one has got four and that one has got four."

This was not done with Group 1, as they did not require this additional aid to work out their halving.

The concepts covered in each group were the same. Group 1 went through the material much quicker than the following two groups, and as such, got an additional turn on the carpet on day 3, where they were able to progress to quarters, which was an instance of differentiation in content. The teacher presented the group with slightly different information but essentially the concept was the same and the thinking required by the children to understand the concept of quartering was not substantially different from that required for halving. In the same way as she taught halving the teacher says:

T: "Ok, get a piece of paper each and fold it equally"

The learners all fold a paper in half.

T: "Is that in half? Do the two sides make a whole?

Ls (chorus): "Yes"

T: "Ok. Can you fold it equally again?

Ls (excited): "Yes"

T: "Do you know what that is?

L: "A half and a half?"

L: "A piece and a piece?"

T: "It is a quarter. It is just like a half except that it is divided into four pieces. And the four pieces must all be the same size, or equal.

L: "Oh yes."

T: "But if I fold it like this, it is not quarters? (folding unevenly). Okay. Do you understand? Would you like to do a worksheet?

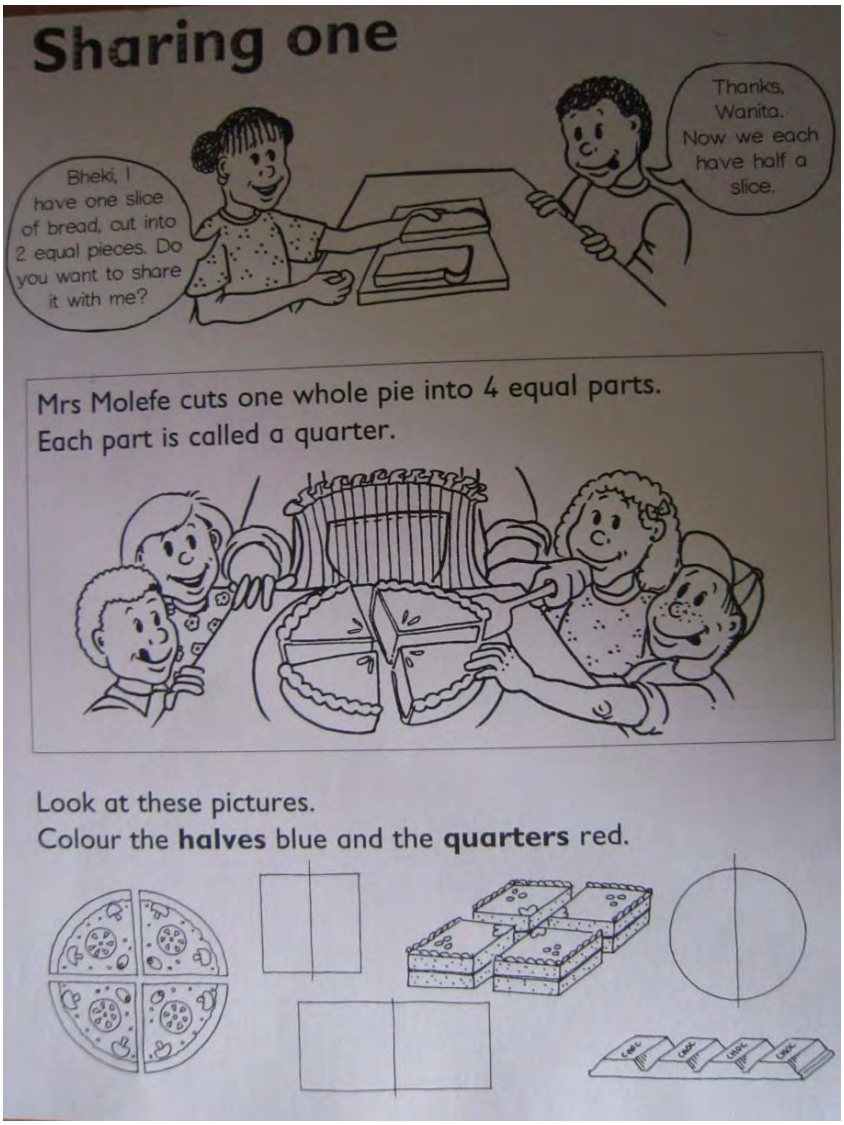


Figure 5.4: Quartering Worksheet

This worksheet places very little difference in terms of cognitive demand on the children, in that they need to be able to recall the number of pieces in a half and the number of pieces in a quarter in order to colour the pieces correctly. While they recall two things instead of one, like the other groups, it still is in Bloom's lower order thinking skills, as no application or understanding required to complete the task.

In the interview, the teacher also mentioned that sometimes there wasn't enough time for her to use the more hands-on methods that she would like to use with these young children. She noted that she was required to get through a certain amount of curriculum in the year, as the following excerpt shows:

> *T: "They like the doing things. Always. I mean even with the halving and the sharing, if they can fold things and do…."*
>
> *R: "Ya"*
>
> *T: "And you know the more, you know can do so much more, but the time is a bit limited. You know, you have to get through something in a certain time. But there is a baseline one, that's what I say, you know, you can go so much deeper into capacity but they only have to know this…"*

Product

By product, Tomlinson refers to the tasks set, particularly assessment tasks. In an attempt to understand the extent of differentiation, one needs to examine whether the children are allowed the freedom to choose different methods of completing their tasks (e.g. completing a worksheet, drafting a mind-map or scripting a play) as well as the level of complexity allowed in their answers. The latter aspect would be to consider whether the teacher is looking only for a specific learned answer or whether she would also require originality and discussions.

In Spring Valley's case, worksheets represented the assessment task, and all the children were given the same assessment task (see Figures 5.2, 5.3 and 5.4). There was no difference in either the level or complexity of the assessment task (all the worksheets were the same) or the way the assessment was done (the children were all assessed based on the worksheets).

However, after their second visit to the carpet, Group 1 was introduced to quarters and they were given a new worksheet (Figure 5.5) to do. No children from any of the other groups completed this worksheet. All the children within Group 1 received and completed this worksheet in class. This worksheet was very similar in content to the previous worksheets. I did not observe any other methods of assessment, other than worksheets and ongoing informal question and answers during class. Questions that the teacher asked were those of clarity and confirmation requiring recall rather than understanding or application. For example she asked frequently *"What does half mean?"* and *"How many pieces are there if we divide something in half*" and *"Are the pieces the same size, or not?"* There did not seem to be any cognizance taken of the learners' learning styles or interest in these assessment techniques.

Content

The content that the three groups were exposed to was significantly the same. The teacher used the same vocabulary to explain the facts and concepts to the children, as can be seen in the lesson excerpt.

She also taught Groups 2 and 3 how to draw out counters in case they did not have the physical items, but did not do this with Group 1. The other area where there was some level of differentiation for Group 1 was that they progressed on to the concept of quarters, but it was really about the terminology used rather than conceptual differentiation. As mentioned, the understanding required for halving is very similar to that required for quartering.

I have discussed grouping above and it is clear that the grouping arrangements in this classroom were based on ability (albeit a limited conception of this term) rather than on interest or learning style.

Bloom's taxonomy of educational objectives or thinking (Bloom, Engelhart, Furst, Hill and Krathwohl, 1956) was used to analyse the tasks that the teacher set the various groups of children. As discussed previously, Bloom's taxonomy sets out six layers of human thinking. The first three are considered to be lower order skills and consist of items such as knowledge, comprehension and application.

There was little process differentiation at this stage. Although Group 1 was introduced to some slightly more technical concepts, the requirement for the learners was still at the lower levels of Bloom's taxonomy – the children were given information and required to understand and apply it in a limited manner. There was no extension of the concept to the higher levels of thinking such as analysis, synthesis and evaluation. The teacher offered manipulatives and hands-on support (Tomlinson, 2004) for those who needed it (counters or drawing as evidenced in the excerpt), and attempted to provide more depth for the advanced learners by recalling Group 1 at the end of the lesson to allow them to move on to quarters.

Overall, the level of differentiation in the classroom remained at a superficial level, with groups composed more for convenience than with consideration given to learning styles, cognitive demand, and the outcome of learning (process and product).

4.2.2 GREEN LEAF SCHOOL

4.2.2.1. Context

School Context

Green Leaf is open to children from Grade 00 and runs all the way through to Grade12 (Matric). However, the school campuses are housed separately, with the Grade 00 and Grade R classrooms being together, Grade 1 through to Grade 7 being a separate Junior School and Grades 8 to 12 being housed in a separate High School. It is a co-educational school. Upon entering the school, I was struck by the orderliness of the children. Although many children greeted me politely, there was no 'shouting out', just quiet, adult-like greetings. As I walked to the classroom, the various learners and teachers I passed greeted me and offered their assistance. The children seemed to take pride in their school uniforms, as their appearance was neat and tidy.

Classroom Context

During the period of my observation (23rd – 27th July 2012) I spent my time in a Grade 1 classroom at the end of a long corridor of classrooms in the main Junior School building. The children had space outside the classroom to store their satchels and lunch boxes. The classroom was big, light and airy, with various educational posters and aids on the walls and around the classroom, such as weather boards and alphabet and number charts. The children's artwork around the themes of the 2012 Olympics and Wild Animals was beautifully displayed in areas of the room. The classroom was carpeted and the children each had their own desks. The children were polite but quiet and greeted me calmly, after prompting from their teacher, when I arrived. All the lessons were conducted in English. The teacher's desk was at the front of the class.

When I inquired about the desk arrangement, the teacher noted that the arrangement reflected, (more or less), a combination of 'mixed ability pairs' and some seating that responded to the children's personalities. She particularly tries to ensure that a weaker child works with a stronger one. With this type

of arrangement, she has to ensure that the stronger child is not responsible for all the work, and the weaker child 'just copying'. To counter this, after they have completed a section of work, both children in the pair get to explain their solutions to the class. This allowed Mrs. Green (the teacher) to assess whether the weaker learner understood the solution that he or she was presenting, by asking probing questions. The teacher felt that this was an appropriate arrangement for this class, particularly given that there were a number of learners with special needs. There were only 16 learners in this class and so the teacher had enough space to rearrange the seating when she wished to do so.

The children's desks were arranged in the following shape:

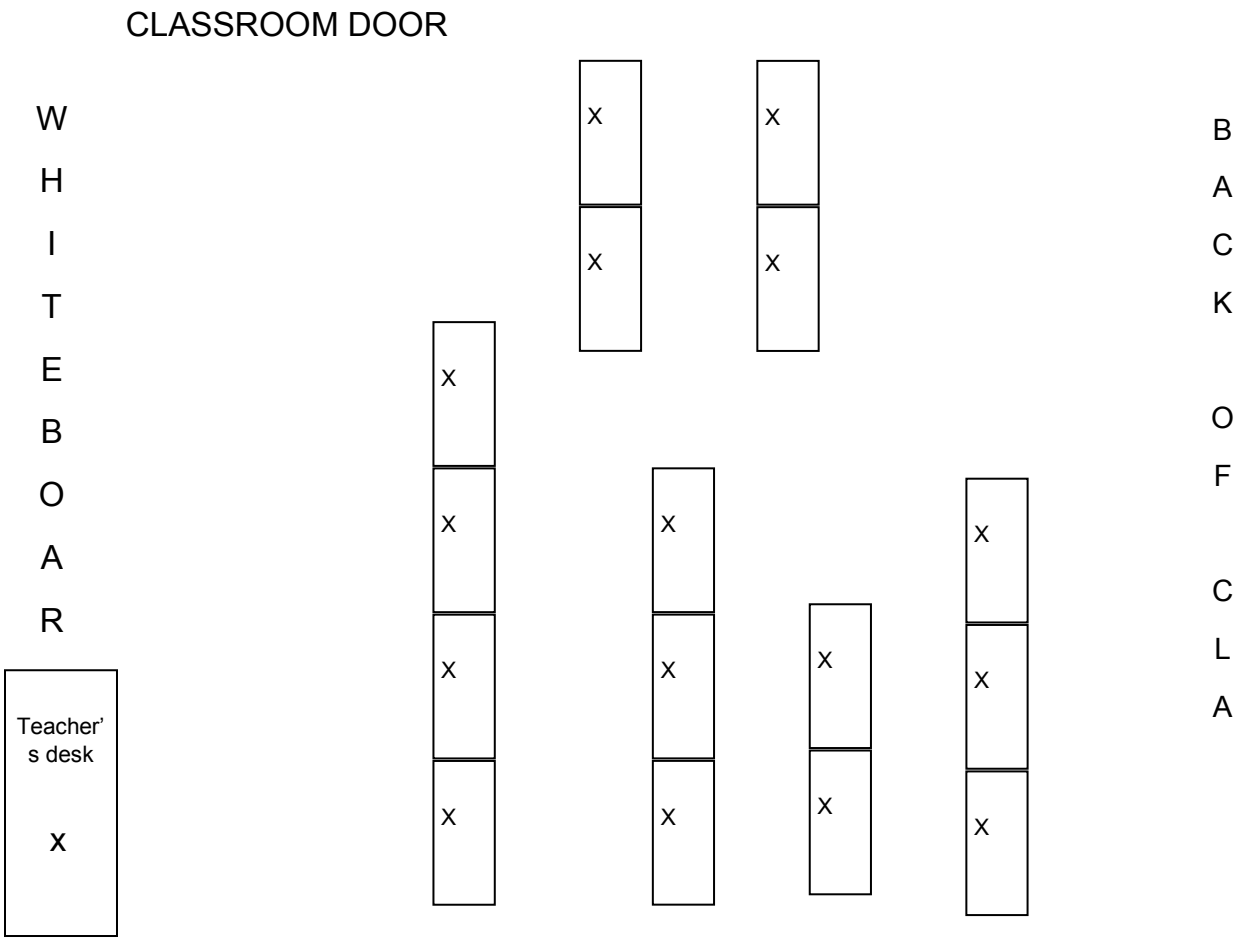


Figure 6.1 Green Leaf School – Participating Grade 1 Classroom Layout

Learner Context

Most of the children at this school are second language English speakers, with their first languages being either Afrikaans or isiXhosa. The class was taught in English. This teacher felt that home language had a big influence on the learning and teaching of both reading and numeracy. Issues that arose in numeracy were for example, isiXhosa children had difficulties in grasping concepts such as 'more' and 'less', requiring more time spent in this area than would otherwise have been necessary. Afrikaans speaking children count differently than English speaking children for example twenty-one would become een en twintig (one and twenty) which became confusing as the children deal with units, tens and hundreds. The implication, as noted by the teacher, was that the children have conceptual difficulties with the difference between the English and Afrikaans numerical methods, rather than cognitive difficulties in understanding the work.

Most of these children came from families in which both parents work, and four of the group were boarders. The teacher also noted that all the children in her grade had been to a Grade R though not necessarily the school's own Grade R She felt that there was a big difference between the ways in which information was presented in Grade R and in Grade1 and as such, Grade R success was not specifically a good indicator of school success. However, she felt that learners who had been to a good Grade R were school-ready in other ways that were invaluable for the smooth functioning of a Grade1 classroom. These type of factors included items such as listening to and following multiple instructions, waiting to take your turn, and paying attention to the teacher.

Another issue, which arose strongly in this group, was special needs. According to the teacher, *"Around half the class has special education needs which include remedial, language extension, speech therapy, occupational therapy and Attention Deficit Hyperactivity Disorder.*" She was able to point out the various children who had been professionally diagnosed and who were then assisted and supported during class time, as well as having individual interventions with the special needs teacher on a regular basis. It was interesting to hear first-hand some of the challenges that a teacher faces in the classroom context, and also instructive in that she did not, in this instance, perceive high potential children to have special needs.

Teacher Context

This teacher had been teaching for over twenty years at the Foundation Phase level. She is a White English speaking woman. She was very calm with the children and during the period of my observation, they responded well to her. She had an issue in class where the children simply did not understand a concept (pairs) and she went home and thought of a solution. The following day, she brought her own family's pairs of socks so that each child would have a pair of socks for the discussion that followed - "*Right, now I've got something for each of you, that is going to come back to me, I'm sure, you might want to hold your nose when it comes to you. Okay"* She showed resourcefulness in her approach to problem-solving. She was able to bring the concept of pairs down to a level at which the children were able to understand and which they could relate to because of its familiarity. The children were quiet and well-behaved. This was because the teacher was calm and because the class was small. The silence might have made it difficult for someone to behave differently, and so might predispose the class to conformity, which is the antithesis of differentiation.

4.2.2.2 Summary of Observations

This school was a school that I had observed at initially (see Chapter 3), in order to get a feel for how Grade1 classes operate. Although this was a different cohort of Grade1s, the teacher and classroom were the same and the teaching methods were the same. I observed at the school for the period 23rd to 27th July 2012. The teacher taught to the whole group during the course of my observation.

Before I started with my observation of mathematics, I was able to observe the children in their computer mathematics lesson. There is a computer room at the school and the children do a computer based mathematics programme once a week. It captures the children's results so that the teachers can see how they are doing and allows them to progress at their own pace, enabling differentiation in this area. This resource is well-utilized and the teacher allows some children only to access addition and subtraction exercises whilst others are allowed to start with basic multiplication and division. These do not extend the children because they are only allowed to go on with concepts they have already understood, but does allow them to progress at different rates.

According to the Vygotskyian ZPD theory, children are learning if they are supported in such a way as to allow them to complete a task with support that they would not have been able to do alone. In the case of

the computer-assisted mathematics, the children are allowed to progress as their own ability indicates. If a child can do addition she or he will be allowed to do it on the computer; if they can do multiplication they will be allowed to do it on the computer. There is not much time in this class for the teacher to explain concepts so it is based on the children's knowledge. This notwithstanding, superficial differentiation does occur as the teacher is able to give each child access to different questions. I observed how the teacher started off by assisting all the children to log in but once they were in the programme she gave them different sections to go to. However, the tasks within each section did not move the children up the scale in terms of Bloom's Taxonomy. They might have been able to work with slightly bigger numbers (adding and subtracting up to twenty instead of up to ten) but the concepts were the same.

The main concept that was covered during this week was understanding pairs, although the plan for the week had been revision of a variety of numbers. As the issue with pairs arose (at the end of my first day of observation), it subsequently took a few lessons to deal with it adequately. The children struggled with what had initially seemed to be a simple concept and it took the teacher some skill to impart the knowledge that the children required. On the first day, I observed the children completing a worksheet, which included a question on pairs. The teacher then went on to explain about pairs on the following day and actually brought in socks to demonstrate pairs the day after. After she was satisfied that a large percentage of the class understood pairs, she moved on to revising other numerical concepts.

On the first day of my observation, the teacher revised basic numerical concepts, mainly working with numbers, counting on, adding and subtracting. However, one of the questions on the first worksheet that the children did was about pairs of socks and the children all struggled with it (Figure 6.2: see question 4 below).

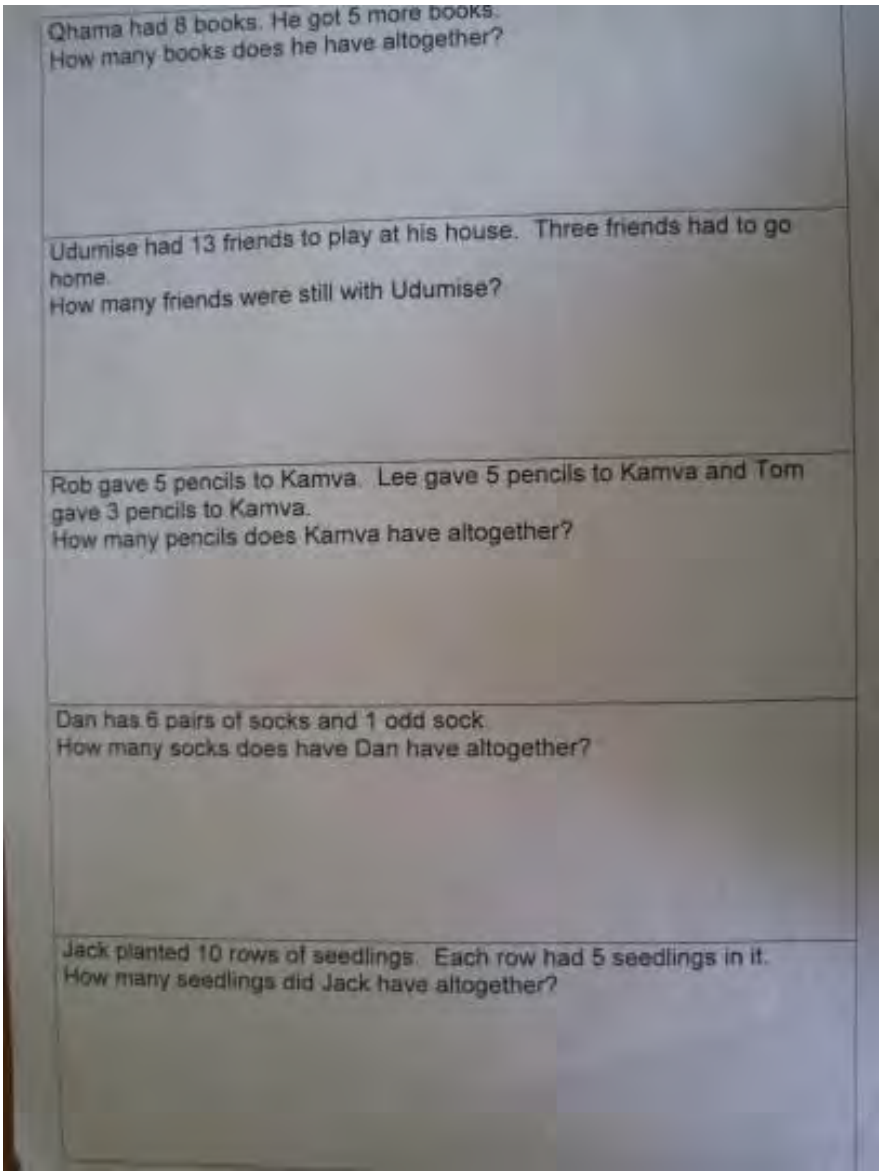


Figure 6.2 Pairs Worksheet 1

The teacher went through this worksheet with the children as follows:

> *Teacher (T) and class (reading together): Qhama has eight books. He got five more books. How many books does he have altogether?*
>
> *T: Right, there's one word in that story that gives us a clue whether it's going to be a plus or a minus. X?*
>
> *Learner (L) X: More?*
>
> *T: That is one of the clues, there's actually another one. Just put your abacus down, the noise is getting to me). Y?*
>
> *L Y: Plus!*

T: It is a plus, but which word in the story gives a clue that it's going to be a plus?

L Y: Gets?

T: Gets more, which is what X said. There's another one. Z?

L Z: Got.

T: We've said that, there's another one, A?

L A: More.

T: We've said that, there's another one. Okay, let's read it once more, I'm going to see if you can maybe get it, otherwise I'm going to tell you.

T and class: Qhama has eight books. He got five more books. How many books does he have altogether?

T: B?

L B: Um, I've got...

T: No, don't tell me how to do it; I want to know which word gives us a clue that it might be a plus sum? C?

L C: Altogether.

T: Well done. Altogether! It means you've got to put those together. Okay, I'm not saying any more. Udumise -that's that long word)

T and class: Udumise has thirteen friends to play at his house. Three friends had to go home, how many friends were still with Udumise.

T: Okay, let's read it again, I'll read it with you.

T and class: Udumise had thirteen friends to play at his house, three friends had to go home, how many friends were still with Udumise.

T: Sorry, I left a word out there. In other words, how many friends were left there? Okay, I'm not going to say anything more. Alright, lets' read.

T and class: Rob gave five pencils to Kamva, Lee gave five pencils to Kamva, and Tom gave three pencils to Kamva.

T (aside to learner): You're not reading with us

T and class: How many pencils does Kamva have altogether?

T: Alright; that's quite complicated, because Rob gave five pencils to Kamva, Lee gave five pencils to Kamva, and Tom gave three pencils to Kamva - how many does he have altogether? There's a clue... we spoke about it earlier. Okay. Right, we're not going to talk about it now, we'll chat just now. Next one! This one, I need you to picture in your mind. Okay.

T and class: Dan has six pairs of socks and one odd sock.

T: Okay, picture in your mind, Dan has six pairs of socks, and one odd sock. Okay. We're not working it out now, but just think about it. Lets' read the next part:

T and class: How many socks does Dan (teacher aside: oh, there's a mistake) have altogether (teacher aside: there's one word that shouldn't be there).

T: Alright last one, last one. Jack.

T and class: Jack planted ten rows of seedlings.

T: Little plants, little seedlings.

T and class: Each row had five seedlings in it.

T: D, I don't see you reading with us, I know you're listening, but I want to see you reading. Okay, it had five seedlings in it...

T and class: How many seedlings did Jack have altogether?

The teacher engaged the children in the task, through a question and response technique. She probed and sought responses that demonstrated understanding rather than only recall. The teacher read with them and asked them questions of understanding as she went through the questions. The children were then required to read the questions again by themselves before settling down to work in their pairs. Some of the pairs worked quickly and confidently and some did not. They spent the remainder of the lesson completing these worksheets. The teacher walked round the classroom looking at the children's work as she went. She noticed that many of the children struggled with the concept of pairs (question 4). She invited me to walk amongst the children's desks as they worked, and I too saw that they were struggling with working out the answer to Question 4.

The next lesson (on the following day), the teacher spent engaging children in activities that underpin the concept of pairs. She spent much time with them and it went like this:

Teacher (T):Don't worry about your blocks right now - straight in front of you! A, we're waiting for you. Right, I want this answer: How many shoes do you have on your body? How many shoes do you have on your body? Answer.

Learners (L): Two?

T: And now listen to this question: How many pairs of shoes do you have on your body? How many pairs of shoes do you have on your body? X?

L X: Two.

T: Are you sure? Because, look at your feet, how many shoes have you got?

L X: One, two.

T: Now if I give you one of my shoes with your shoe, will you have a pair? No. Okay but how many shoes are in a pair of shoes?

L X: Two.

T: Okay, so if I say how many pairs of shoes have you got?

L X: Two.

T: Think carefully: how many shoes make up one pair?

L X: Two.

T: So how many pairs are you wearing?

L X: Two.

T: [inaudible], help her?

L X: One.

T: You've got one pair of shoes, because you've got two shoes on your feet. Okay, if you had two pairs, then you would have how many shoes, [Jude]?

L X: Four.

T: You would have four.

L X: Four legs!

T: Right. Now. I want, um, Y to stand. And I would like Z to stand. Okay, now this is all linking up with what we're going to do just now with the story sum, it's quite important. Right, Z, how many pairs of shoes do you and Y have? How many pairs?

L Z: Um, one.

T: You have one, how many does Y have?

L Z: Two. One!

T: One. So how many do you both have?

L Z: Um... two.

T: Two pairs, right? Now, how many shoes do you have together?

L Z: Four.

T: Four, right, well done, sit down. J stand. K, stand. And A, stand, please. Right. A, think carefully. How many pairs of shoes do you have?

L A: One.

T: And K?

L A: One.

T: And J?

L A: One.

T: How many pairs of shoes do you have altogether?

L A: Um... (two, four six...), six.

T: How's that?

L A: Six.

T: Pairs... We're going to begin again: how many pairs do you have?

L A: One.

T: And you?

L K: One.

T: And you?

L J: One.

T: And altogether, how many pairs?

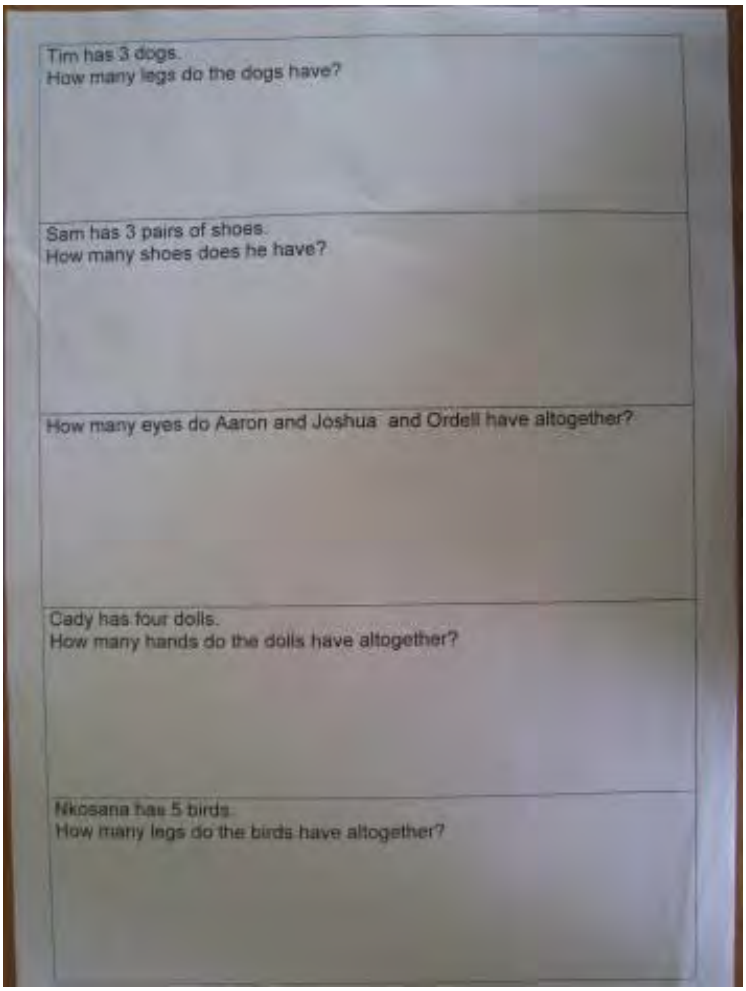
T: Three! One, plus one, plus one is three. How many shoes do you have altogether? Two... plus two is four... plus two?

L A: Equals six!

From the above excerpt it is seen that the concept was a difficult one for children to grasp, despite the teacher using the children as resources in the classroom. In other words, even when there were three children standing and the number of shoes is correctly answered at 6, the children struggled to give the answer in pairs. Interestingly, the teacher did not wait for children to respond, but rather offered the correct answer at the end of the excerpt. In addition, counting out made it difficult for children to translate the number into the concept focused on by the teacher.

Rather than persist with the lesson, the teacher went back to the worksheet of story sums (Figure 6.2) and sent 6 children (whom she had identified as able to work through the worksheet on their own) to their seats to work on their corrections. The remaining children worked through the sums on the carpet with the teacher. No explanation was given as to the decisions made by the teacher about who should go to their desks and who should remain on the carpet.

The next day the teacher arrived with a bag full of pairs of socks. The children were excited. As a whole class lesson, each child got to choose a pair of socks. Some socks were rugby socks; some were ankle socks and others various types of socks. She unrolled a pair; showed how there are two socks, and stated that each set of two socks was called a pair. She proceeded to play a game. She said "I want you (pointing to a child) to 'buy' 3 pairs of rugby socks", and the child had to respond by going around the group and choosing 3 pairs of rugby socks. All the children were involved and helped the person who was unable to understand the game. By the end of the lesson, all the children seemed to grasp the concept of pairs. The teacher handed out another worksheet as follows.



. Figure 6.3 Pairs Worksheet 2

The questions were intricately set up so as not to mention the word 'pairs', but to assess the child's understanding of the concept nevertheless. One child finished the worksheet in less than 5 minutes and requested to be allowed to go on to her 'blue book'. The teacher said to the child *"yes, continue with pages 6 and 7"* and the child continued with additional work out of a workbook, not related to the work that they had been doing in class. The teacher noted in an informal discussion that she did have extra work for the children to complete if they finished their work early, but that she did not always like to give them the extra work to do as she felt like she was being punitive by imposing this when they were doing what was required of them.

In walking around the class to look at their work, I noted that around half of the children were drawing out the pairs required in the story sums and easily understanding the questions required of them. The remaining children were trying but did not seem to have grasped the concept of pairs yet. Despite the teacher clearly understanding the range of potential and ability within her classroom, each child received the same worksheet. The worksheets required slightly more thinking from the children, in terms of Bloom's taxonomy, as they had to be able to understand the concept of pairs and apply it to the questions, rather than using simple recall or naming.

The teacher mentioned that even though not all of the children had fully grasped the concept, she would continue on to other work the following day. She commented that she would revisit pairs later in the year to see what the children have assimilated and retained. For the remainder of the week she worked on adding and subtracting and she ended the last lesson with an adding and subtracting speed test, in which the children had 2 minutes to complete as many sums as they could A few children worked very quickly and finished early but most put down their pencils after the full 2 minutes. They marked their own work. At the end the teacher asked children to stand who got the same or more than they did last time and around half the children stood. The teacher then asked any children who were happy with their work to stand, and all of the children stood up. It was a very nice end to a test environment that could be construed as being detrimentally competitive.

Assessment Factors

Learner Readiness Level

This teacher spent a lot of time getting to know her children, even before the first day of Grade 1. She indicated during her interview that many of the Grade 1 children would come from their own Grade R class. For these children, she would get the reports and assessment files before the end of the year prior to their Grade 1 year. She would spend time reading and assessing children's files and would liaise with the Grade R teacher to discuss matters arising out of the files that would be pertinent to the children. All prospective Grade1's, including those from other pre-primaries, are usually invited for an orientation afternoon where the teacher would get to meet each of the children and their parents before the term started. This approach indicates that this teacher feels that there was a lot to be gained from having a solid understanding of the child and their environment, before they even entered the classroom. There was much data-gathering occurring, from different perspectives, before the children entered Grade1. This

would be a solid and informed starting point from a differentiation perspective, as she would have the chance to get to know the children as individuals, which promotes an understanding of their needs, abilities, and interests.

During our interview, Mrs. Green noted that once school started, she felt that it took about three weeks for her to get to know the children in her class better. She would engage with all the children orally (chatting to them to find out more about them), she would interact with them in class and she would informally observe them as a group. She also mentioned that during this time, and indeed, for the first two months of the school year, she would teach to the class as a whole. She would only be in a position to rearrange her class after she had got to know them properly. This is an important aspect of Tomlinson's framework, and this teacher put effort into getting to know her class well, which would enable her to differentiate for them, should she choose to do so.

Learner Learning Style

This teacher volunteered the information that *"part of the reason for teaching to the whole group for two months is so I can get to see how the children learn – I mean, are they visual or auditory or kinaesthetic learners"*. To her, children's learning styles are also an important aspect of getting to know the children. She felt that in developing numeracy at this age, there was a big jump from the pre-school type rote learning to the more conceptual learning of Grade1. She noted that most numeracy work, for her, fell into the category of kinaesthetic learning – that is, the children did better with understanding the concepts if they were involved in them using concrete, tactile aids, for example the physical pairs of socks, and the standing up and down of the children previously discussed. According to Gardener (2004) and Tomlinson and McTighe (2006) there are 7 different learning styles, but these three (visual, auditory and kinaesthetic) seem to be the most commonly recognized, particularly at this age.

This teacher was knowledgeable and aware of the importance of learning styles and included various aspects of these in her routines. She read through the words with the children. She told the children what to do and she showed them what to do, then she asked them how they could go about doing it. She allowed the children the time to explore different possibilities of how to go about doing the work, suggested various methods of using concrete aids and brought in her own where necessary. Although she

does this for the whole group, the various learning styles are all covered, thus assisting the children to be successful in their numeracy work.

Despite Mrs. Green's acknowledgement of the different learning styles and the differences within children's potential, the evidence shows that she taught the same level cognitive demand work tasks to all the children at the same time. Even though her class was quite diverse, she noted that she taught to the whole class, particularly at the beginning of the year, which seems to indicate that she feels the children are at the same level.

Learner Interest

An important aspect of differentiation is grouping, and whether or not the teacher groups the children in her class, and if so, how she selects the groups. This teacher teaches to the whole group much of the time, but she has a fairly flexible arrangement of sending children back to their desks to work and keeping other children with her on the carpet. In one of the lessons that I observed Mrs. Green started by teaching the concept to the whole class, but she sent children back to their desks as they acquired the concept she was teaching. In discussing this, she noted that the children who were sent back to their desks could vary, depending on the task at hand. This was a fairly flexible grouping arrangement. Mrs. Green also noted that she had two formal small groups for mathematics – the circles and the triangles – and that these were based on ability. I did not observe the use of this grouping arrangement during the week, but this seemed to be a more formal ability grouping than I observed.

Mrs. Green has arranged her class into mixed-ability pairs, imputing that the strengths of the stronger child will help the other child's understanding. She also takes their personalities into account by seating quieter children next to more boisterous ones. She has the learning-disadvantaged children (children who have been assessed by specialists as requiring more assistance, such as deaf children, dyslexic children and children with Attention Deficit Disorder) in the front where she can keep an eye on them.

In discussions about grouping, this teacher does not refer to children's interests at all. The children all cover the same syllabus and complete the same worksheets and assessments. There are extra workbooks for those who complete their required tasks early and also activities such as 'dot-to-dots' on a table at the

back of the classroom, where children can go and work once they have finished their class work. There is a special needs teacher who works with the children who require more individual attention (those formally diagnosed). These children are pulled out of the classroom for one-on-one lessons daily. As I observed, the special needs teacher would arrive in the doorway and call out the name of the child who she would be teaching. That child happily left the room with the minimum of fuss and disruption. On the child's return the teacher and class would welcome him/her back into the classroom and the child would be reabsorbed into the lesson.

Teacher Modifications

Learning Environment

The teacher at this school showed a great capacity to work with the different needs of children. In terms of modifying resources, she got the children to identify what in their classroom might help them. She kept probing until she got a variety of answers.

T: Now, we're probably not going to get more than the first three stories done. What are some of the ways you could work out; what could you use?

LX: On the blocks.

LY: Number line.

T: Blocks. What? Number Line.

L Z: Number line.

T: Okay, we've said number line.

L A: umm, fingers?

T: Fingers!

L B: [shakes abacus]

T: Abacus. Okay.

L C: Abacus.

T: Said that.

L: Your own brain.

T: Your own brain! Doing what?

L: Counting on.

T: Counting on, or counting back. Good.

L: Pictures

T: Pictures! I think that more or less covers it - can you think of any other things you could use? But those are some of the things you do so far. Right, get together with your partner, with a pencil, and we'll soon get started.

Although I felt that Mrs. Green assisted in modifying the learning environment in terms of materials, supplies and resources, I did not see evidence of modifications in other areas recommended by Tomlinson (2003) such as learning centres, class rules, choice boards and cooperative groups. Although Mrs. Green had a good grasp of learning styles and learner readiness, more emphasis could have been placed on learner interest and this would have necessitated these further modifications in the learning environment. She spent time getting to know her students and understanding their differences, but this did not translate into differentiation for the learners. In fact, it seems as if, in some instances the teacher assumed in her learning environment that because many of the children came from their Gr. R class, that they had the same content knowledge and the same experiences and thus she noted that she taught to the class as a whole particularly at the beginning of Gr.1. This is despite the fact that she acknowledges differences in learner learning styles and readiness levels.

Product

By product, Tomlinson was referring to the tasks set, particularly assessment tasks. In trying to understand differentiation, the intention is to examine whether the children are allowed the freedom to choose different methods of completing their tasks (e.g. drafting a skit, doing a painting or making a model) as well as the level of complexity allowed in their answers – whether the teacher is requiring only specific answers or whether she considers complexity and creativity. In Green Leaf's case, timed worksheets represented the formal assessment task, and all the children were given the same worksheet. There was no difference in either the level or complexity of the assessment task or the way the assessment was done. All the class worksheets were also the same and the teacher specifically noted *"they all cover the same syllabus"*. The extension work (extra workbooks and activities at the table at the back) were not assessed. It was interesting that the teacher taught in a variety of ways, which encapsulated how she understood learning styles, but that this did not seem to extend to the assessment tasks.

Content

The content that all the children were exposed to was significantly the same. The teacher used the same vocabulary to explain the facts and concepts to the children. My 'Daily Maths Group Observation' records show that the teacher used words such as altogether, more, take away, pairs, number sentence, and counting on in the same way to all the children at all their various ability levels. Since Mrs. Green was mainly teaching to the whole group, during the period of my observation, this stands to reason. When the children were working in pairs, the teacher still talked to the class as a whole, so the teacher rhetoric was the same. The teacher explained to me that at this age, a lot of the information is new to all of the children, and as such, the content is generic. This surprised me, as there were clearly children who understood what they needed to know and finished their work quickly, correctly and competently. These children might have benefited from exposure to other, more complex information.

Process

As with the other schools, Bloom's taxonomy of educational objectives (Bloom *et al*, 1956) was used to analyse the various tasks that the teacher gave to the children.

The teacher at this school seemed to be operating mainly in the lower order skills area. However, she moved all the children slightly up the framework, as the questions on her worksheets required a little bit of interpretation and understanding before the knowledge could be applied. She moved the class towards the 'application' tier in Bloom's model, albeit in an undifferentiated manner. The children that coped easily with the work were not advanced into the higher order thinking skills, neither were they expected to advance by providing variations to the task.

4.2.3 FIRST FOUNTAIN SCHOOL

4.2.3.1. Context

School Context

This school caters for children from Grade R to Grade 8. It is a co-educational school, and mainly caters for children from the surrounding township areas – mainly children who are within walking distance of the school. This is a government, non-fee-paying school. In comparison with other schools that I have

observed at and visited during the course of my research, it was disappointing to experience the vast disparity in economic and social situations, particularly given the 19 years of democratic rule that South Africa has enjoyed. The school does have a uniform, but not all of the children wear it, and some wear parts of it (reflecting the poverty levels in the surrounding area). This economic background underpins the general impression of untidiness and a lack of cohesion within the school. The air of neglect impacted on my expectations of the quality of schooling that I might find in these less than ideal circumstances. The language of learning and teaching is isiXhosa but switches to English in Grade.4 in accordance with the National Education Act (Department of Education, 1996) and South Africa Schools Act (South African Government, 1996). The school has been in existence for many years, and is well-established. On entering the yard, I was not greeted by any children, although any adults who I met said 'Hello'. The reception area was empty and consequently I was pleased to find someone in the yard, whom I was able to ask for directions to the class I was observing in.

Classroom Context

During the period of my observation at this school from 30th July to 3rd August 2012, I noted that the dynamics within the classroom changed substantially depending on the weather. The class was very cold, with paint peeling off the walls, tiled floors with tiles missing and windows with no curtains. There were posters on the walls such as alphabet charts and number translation charts (English/isiXhosa), as well as other educational aids such as 'Days of the Week', 'Months of the Year' and even various phonetics charts. Most of these posters had been hand written by the teacher, partially because the school does not have the funding to spend on items such as these, and partially because they are very specific items with regard to the translation into the two languages.

The room was big and light, but not big enough for the approximately 44 children it is supposed to cater for. When I mentioned the size of the class, I was told by another visitor that in the previous year, this teacher had had 73 children in her class, but that this year they had changed the school to allow for two Grade 1 classes. The teacher of the other Grade 1 class is a volunteer. The class has desks for 30 children, but instead of sitting two to a desk, in many instances, the children sat three to a desk, meaning they could accommodate up to 45 learners when or if they were all present.

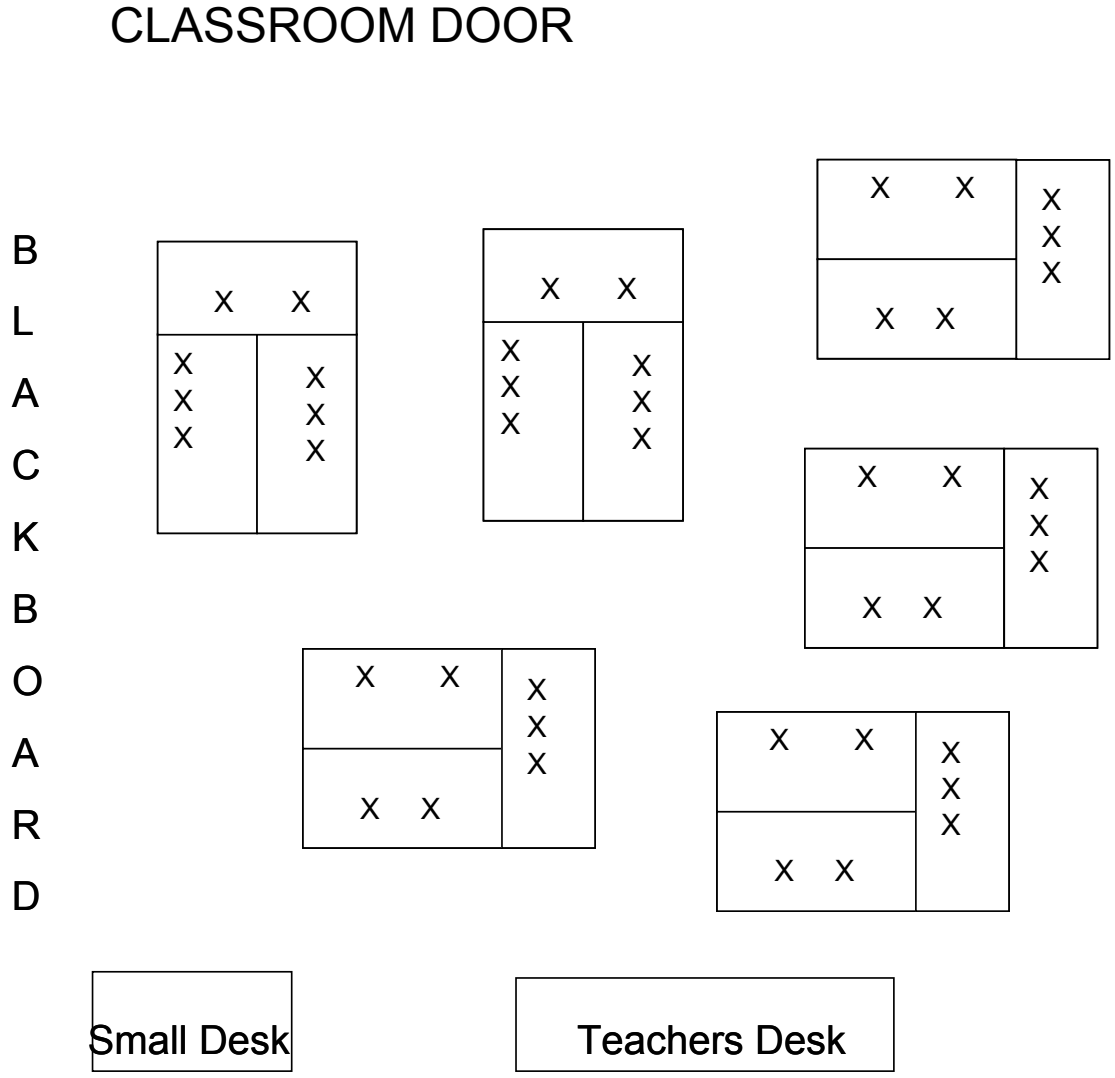


Figure 7.1: First Fountain School – Participating Grade 1 Classroom Layout

The class attendance at this school was very erratic. On one day, we reached a high of 32 out of 44 children present and on another day a low of 16, which the teacher indicated was because of the terrible weather. On each day different children arrived. It was very difficult for the teacher to plan for and teach to a group, when the numbers of children who arrived on any given day changed; and not only the number of children changed, but also the specific children who came to school changed daily. The teacher felt that it was very difficult because she had to cover the curriculum but she also could not 'leave behind' any child who joined in. Therefore, it was a huge challenge to get everyone up to the same standard in each of the learning areas. The teacher had made every effort to make the classroom a welcoming space for the

children and there were posters around the room, as well as many posters made by the teacher – with, for example, numbers, sounds and children's birthdays.

The physical learning environment at this school was an area where there could have been improvement. The classroom was cold. Many of the children were not warmly dressed and lots of them sounded as if they had coughs and colds. However, the teacher had done her best to ameliorate this, by bringing a piece of carpet for floor work and her own heater to school daily. This school is also a Feeding Scheme School, meaning that a meal was provided for children at about 10 o'clock.

Learner Context

The learners at this school are all Black isiXhosa speaking children. On the whole, they come from the surrounding area, which is a poor area, although some of them live further away and have to catch a taxi to get to school. Many of their parents are seasonal workers, meaning that sometimes they are employed and other times not. Some of the children come from further away, and as a result are often absent from school. As the teacher notes, *"for instance, three of them are not present today, they live far away. But they do travel. But they do not come every day."* Attendance is quite poor on a Monday, according to the teacher, as often the parents have not got the children's school clothes ready after the weekend. On social grant days, many of the parents take their children with them to claim their grants. On very wet or cold days, many children do not come to school at all. Those that did arrive at school on the very wet and cold days during the period of my observation were not warmly dressed, often having bare feet on freezing days. Parental involvement or lack thereof was noted by the teacher – she mentioned that many of the parents do not have books at home, and many of them do not help their children with their homework.

Teacher Context

The teacher of this school is a Black isiXhosa-speaking woman who teaches the children mainly in isiXhosa, but also with English words for items such as counting, days of the week, and months of the year as per the CAPS (Department of Basic Education, 2012) requirements. In Grade 4, these children will be expected to learn in English (Department of Education, 1996 and South African Government, 1996) so, to assist with the transition from learning in their home language to learning in English, the children are exposed to a blend of languages from early on. The teacher has had many years of teaching experience. She has a variety of issues to cope with – a large class, absenteeism, poor parental

involvement and a lack of resources. Yet, she comes to school daily with enthusiasm and a patient demeanour. In speaking to her it became apparent that she was very invested in the lives of her Grade 1's to the extent that she would take school work home with her to share with children who live in her area (far from school) who hadn't made it to school that day. *"But because they live nearer to where I stay, I sometimes call them and do some of the activities with them because they are not too far from me. R: But it's extra work for you. T: Ya, its extra work."*

She was also very clear in her role in relation to two specific children in her class. One of these children was a repeat Grade 1 candidate who the teacher noted needed individual teaching time – which she gave when she could; and the other was an extremely bright child who needed extra work much of the time as the basic Grade 1 work presented was easy and she completed it quickly. The teacher strove daily to accommodate the diverse needs of these children, in a large group of children all requiring her attention.

4.2.3.2 Summary of Observations

In this school, I observed numeracy lessons over a period of 5 school days from 30th July 2012 to 3rd August 2012. This was before the end of the third term. The teacher did not mind which lessons I observed. She started her day with Literacy and finished off the lesson when I came in to observe the Numeracy lessons. During the course of my observations, I was most struck by the use of song/chanting in her lessons; a daily occurrence. The teacher made use of songs to encourage retention of basic information in the children. The children started their day by chanting the days of the week, and months of the year in isiXhosa and in English. They discussed the date each day. I am not sure of the efficacy of using chanting as an educational tool – it does help the children to remember the facts, but doesn't impart any content knowledge or understanding so it might make it difficult for them to interpret the information and use it in any setting other than the one in which they have learned it. Chanting has an important role in rote learning and recall and as such, is a valuable and useful educational tool. However, in terms of Bloom's taxonomy, recall and rote learning are at the bottom of the hierarchy and by using this methodology, all the children in this class are located in this bottom area of cognitive demand. See the example on the next page (the children are chanting in chorus together):

Teacher (T): What day is it today?

Children (C): its Thursday...its Tuesday...

T: What day?

C: Thursday

T: let us sing the days of the week

C: Sunday-cawa, Monday-mvulo, Tuesday-lwesibini,

Wednesday-lwesithathu, Thursday-lwesine...

T: What did we say - its Thursday? Thursday today.

C: Yes

A typical example of how and what the children were learning about follows (Figure 7.2). The first (very basic) set of number work is written up at the front of the classroom on the blackboard and the children sit at their desks most if not all of the time. The children, after writing the date in their books, copy these off the board and set to work completing them (using bottle tops as counters if they need to). For the second set of numbers (see below) the teacher gathers the children around her at the board, pulling the disruptive ones close to her side. Then the class works through the questions together on the board.

10 + ☐ = 16

8 + ☐ = 12

8 + ☐ = 11

9 + ☐ = 17

10 + ☐ = 18

Figure 7.2: Numbers Board work

Teacher (T): What does that sum mean, let us all read it.

Learners (L): 10 plus box equals sixteen

T: What is to subtract those in the box, and how many are we going to subtract?

L: We will subtract ten.

T: There they are. We have done that.

T: How many are left in the box? Let us count them.

T: In your books are you going to put bottle tops?

L: No teacher

T: How are you going to do it?

L: We are going to put sticks

T: Poles! How many sticks?

L: There are will be sixteen (1…2…3…4….5….6….7….8….9…10….11….12…13…14….15….16))

T: Let us check them, how are we going to check them?

L: We are going to count them again.

T: Let us check the number again and see if they are sixteen.

L: 1…2…3…4….5….6….7….8….9…10….11….12…13…14….15….16

T: Who can remind me how many are we going to count

L: 1…2…3…4….5…6….7….8….9…10

T: What do we do on the tenth one?

L: We make a full stop

T: What do we do after that?

L: We count the remaining

T: We count the remaining and put them where?

L: In the box

T: Let us count them

L: 1….2…3….4….5….6

T: What are we going to put in the box?

L: Six

T: Here is another one let us read it

L: 8 plus box = 12

T: Let us repeat it

L: 8 plus box = 12

T: How many are we going to make X?

X: 12

T: Let us do it quickly

L: 1…2…3…4….5….6….7….8….9…10….11….12

T: Do we count more than twelve

L: No

T: X what next?

L: We count them to make sure they are really 12

T: What next Y what next?

Y: We subtract 8 teacher, we subtract 8

T: Good Y, subtract 8

T: Z! Let us count the remaining

L: 1…2…3…4….5….6….7….8

T: Where do we put the number?

L: In the box

T: Put it in the box. Is there anyone who did not hear how we do it? There is also bottle tops if you want to count using them. Let us go to our board X this side. Here is the first one, what are we going to do, how many sticks?

T: Here is the following one, let us read it

L: 8 plus box equals 11

T: Repeat

L: 8 plus box equals 11

T: How many that we are going to do?

L: 11

T: Subtract how many?

L: Eight

T: Put the remaining where?

L: In the box

T: Here is the following

L: 9 plus box equals 14

T: Let us repeat

L: 9 plus box equals 14

T: We are going to do how many?

L: 14

T: Subtract how many?

L: Nine

T: Okay and count the remaining and put them?

L: In the box

T: Read

L: Ten plus box equals eighteen

T: Let us repeat

L; Ten plus box equals eighteen

T: We are going to do how many?

L: Eighteen

T: In order to be sure that you are right, you must do what?

L: Count them

T: To be sure how many they are. To be sure they are eighteen. How many sums are we going to do?

L: 1…2…3…4….5….6….7….8….9…10….11….12…13…14….15….16….17…..18"

During the period of my observation, Mrs. Fount (the teacher) worked on basic arithmetic (adding up double digit figures as above), counting, counting in 2's and 5's, discussing shapes and the concepts of

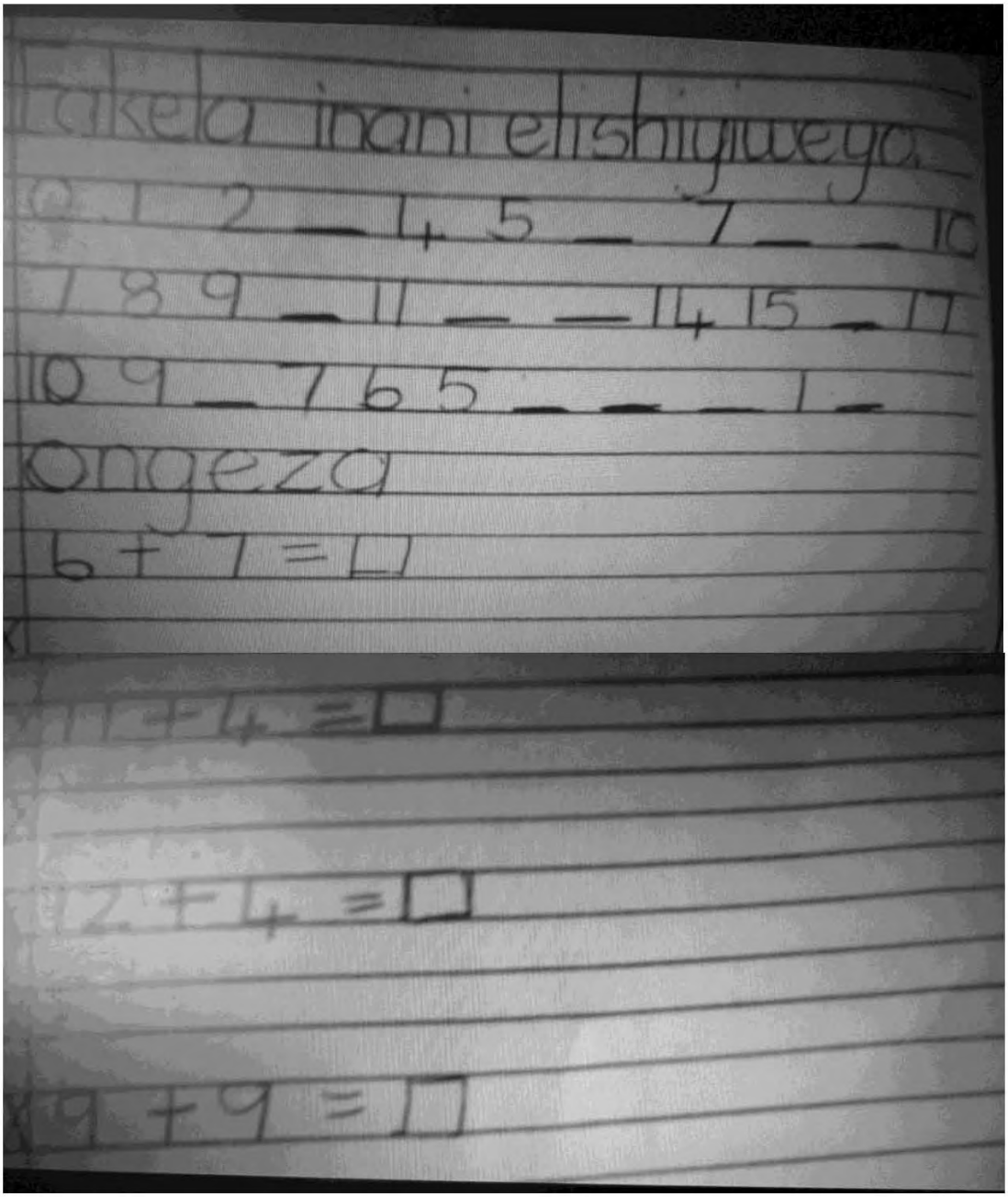
‘more than’ and ‘less than’ and ‘between’. Mrs. Fount covered counting in detail and explained how the number of dots equals a numeral and also a word.

This teacher’s manner of teaching differed substantially from teachers at the other two schools that I visited. I found the use of boxes to be a confusing way to explain addition. In fact, it was more a representation of subtraction. The work that the children were expected to do was complicated, but it seemed to be due to the way in which the concepts were taught rather than the content of the work. The use of boxes and the amount of board work seemed very abstract, and the focus on chanting and the similarity of the items presented as a strategy for learning off by heart, rather than teaching for understanding. Mrs. Fount taught to the whole group for the time that I observed, except for one lesson in which she selected a group of about 8 learners. She called these children aside to a small desk at the side of the classroom where she then continued to explain the concept they had been working on. The other children went back to their seats and continued with their board work. Mrs. Fount clarified later that she noticed that these children did not understand the lesson and so she had explained it to them again.

At the end of each week, the children did an assessment (revision) worksheet, which the teacher used to gauge whether or not they understood the concepts she taught them. Unfortunately, assessment day in the week of my observation coincided with child grant day so there were only 19 children in attendance in class. The assessment was in the form of a worksheet that had been handwritten by the teacher and photocopied for the children (Fig 7.3 below). The teacher gave clear explanations of what was expected and also answered the questions of some of the children during the assessment. The same worksheet was given to all the children, with little consideration of their levels of understanding, interests, needs or learning styles.

Some children completed this worksheet in approximately 10 minutes, whilst many of the others took the entire lesson (about an hour) and were still unable to complete it. Those that finished were sent off around the classroom to look at phonics charts on the wall, without instructions other than ‘read’. No assessment followed this additional task. After that, they played games with cards and bottle top counters on the floor at the front of the classroom.

The worksheet was based primarily on recall and so was in the lowest zone of Bloom's taxonomy. Even though the last question required that children work independently, it still did not place a cognitive demand that would push learners from recall to understanding. This question was particularly badly answered by the group of children who completed the task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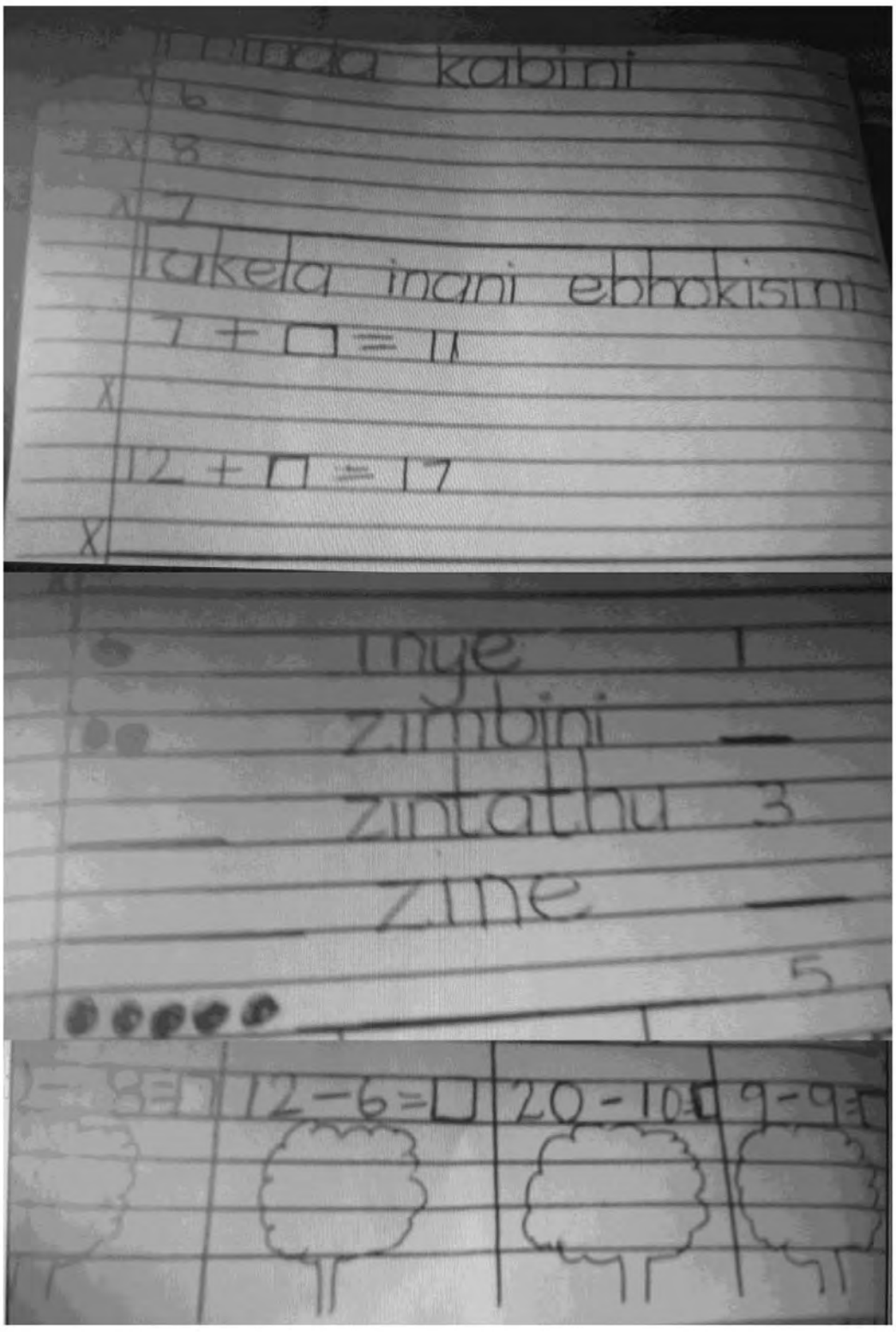

Figure 7.3 Assessment Worksheet

Learner Assessment Factors

Learner Readiness Level

I asked the teacher during the course of the interview, how she got to know the new Grade 1 children in her class. Some of the children had come up from their attached pre-primary (Grade R), but many of them had not attended a pre-primary school at all. There were no meetings between the teacher and the children before Grade1, but the teacher spent time engaging with them to get to know them, during the course of the first few days.

R: "You've got a big class ,although I believe it is smaller than last year, when I hear that lady said you had 73"

T: "Yes"

R: "How do you get to know the children? How do you….Do you do anything different? How do you learn about the kids that are coming into your class new? Because these children don't all come from a Grade R? Maybe it is their first time at school? What do you do to get to know them?

T: "I don't think anything special. I know them as I interact with them…so interaction and engagement in their activities, that's how I get to know them…at first. And some of the parents do come …"

R: "okay"

T: "…and talk about their children. Maybe like "teacher could you look after her, because there was this kind of problem at home, that may cause a child not to develop or to progress"

As can be seen, the teacher got to know the children in her class at the beginning of Grade 1 by being involved with them and interacting with them in class. There were no other activities that formed part of the children's orientation to the school. Attending Grade R and parental involvement are two major factors cited by the teacher in relation to the child's school readiness. Many of the children at this school come to school before they are school ready. This places an additional burden on the teacher. She also had quite a few children who came to school in the year that they turned six rather than in the year that they turned 7 (which is the preferred age in South Africa).

Learner Learning Style

The teacher and I also discussed the way in which children learn. She was very clear that at this age the children learn by doing and by being involved. How she integrated this into her lessons, was by introducing the concept at the beginning whilst she stood at the board. Thereafter, whilst still at the board, she gave the children the opportunity to come up and complete a sum on the board – making sure that various children got their turns. She also made sure that the children had counters, so that they could 'count out'. She noted specifically, *"... with numerals it is best to start with concrete, then from concrete to semi-concrete, then to abstract"*. She gave an example of when she asked the class to count wheels. She told the children that one car had four wheels and asked them how many wheels three cars had. They went outside to the parking lot and counted out the wheels on three cars to get to their answer.

Despite Mrs. Fount's understanding of the various learning styles, it seemed that she was distinguishing by the age cohort that she was teaching, rather than by the individual child's needs. She felt that children of this age had a different learning style than older children, more practical, but her understanding did not extend to individual differences between the children in her class.

Learner Interest

Again I was interested in how the children were grouped and I asked the teacher about this as part of the interview. She indicated that she grouped them according to their abilities in the different learning areas, but didn't seem to take cognisance of their interests or learning style as the following excerpt shows.

> *"Teacher (T): I group them according to their abilities"*
>
> *Researcher (R): "According to their abilities, okay. For math's or for reading or what?*
>
> *T: "For everything. Because a learner may be good in mathematics and poor in literacy. So, as we have noticed I have taken this one because she belongs to that group in literacy, because we are doing literacy now, so I rearrange them.*
>
> *R: "Okay, so you move them as you need to. Do they do different work, the groups? "*
>
> *T: "No, not now. But when I am doing assessment I give them different work, according to their level. In fact, I give them work that I know they will be able to do. They do know that work. They do know all that."*

It was interesting to note that although the teacher did teach to both the whole group and to small groups in this class, the content was the same. Although the teacher did group the children at the desks and also took aside various groups for numeracy teaching during the period of observation, the groups seemed to

be flexible in that she would choose whomever needed to be in that group for that particular content area. She did spend time particularly with the weaker students who came up to a small desk on the side of the room and worked with her there with bottle top counters. The children who finished first and easily (and there was one specific child who found the work very basic and worked quickly and well) were given work to do around the classroom (mainly reading) or additional pages to do in their work book.

Teacher Modifications

Learning Environment

Other than grouping (discussed above), in terms of Tomlinson's framework, the only other item that was modified was resources – the teacher did let some of the children count abstractly, while other she showed how to draw 'sticks' and still others utilized the bottle-top counters. The teacher also felt that she modified the time spent on each learning area – depending on the speed at which the children grasped the concept, but also on the number of children present. Sometimes her flexible grouping seemed to cater for those that were behind not because they were weak students, but because they had missed the explanatory lesson on that area. The teacher did not have much by way of educational resources available to her, and she did her best to modify the environment within these limitations.

Product

When Mrs. Fount came to assessments, although she didn't vary the style of assessments (all the children were given worksheets), she did vary the content so that the children had questions that they were able to answer. Looking at Figures 7.2 and 7.3 it is clear that the board work is formulaic and that this was repeated in the assessment task, where the first questions required rote repetition of facts: for example, where the children are required to recall specific number sequences. The last question of the assessment worksheet required that children apply their rote knowledge to do a calculation. While this shifts emphasis in cognitive demand, it nonetheless was still at a conceptual level that demanded very little knowledge application by learners. The school does a lot of assessment, on the whole, as they are required to take part in the Annual National Assessments (ANA's)[9].

9 The ANA tests were introduced by the Department of Basic Education to measure the country's improvement in learning in specific grades and subjects. ANA tests require all public schools, and independent schools subsidized by government, to conduct the same grade-specific language and mathematics tests. (Department of Basic Education, 2013)

Content

The content that the various groups were exposed to was significantly the same – mainly because most of the teaching was done with the group as a whole. The teacher used the same vocabulary to explain the facts and concepts to the children.

My 'Daily Maths Group Observation' records show that the teacher used words such as *count, backwards, forwards, before, in between, after*, number names in isiXhosa and English, *plus, minus, subtract, equals,* and *in the box* with all the children. Although the teacher made an effort to extend the children presumed to be 'brighter' that she noted in her class, much of the extension work was not related to numeracy. For example, learners who completed sooner than the rest of the class were required to learn phonics words off the wall charts, once they had completed the numeracy tasks. There was no real attempt to extend children's thought processes as Bloom's taxonomy suggests.

Process

There was little process differentiation at this stage, in terms of Blooms taxonomy. Although some of the learners were allowed to complete the given tasks at a faster pace, the follow-on additional work was not an extension of the concept they were working on, but other work designed to keep the child occupied. The requirement for all the learners was still at the lower levels of Bloom's taxonomy; the children were given information and required to recall and, in some instances, apply it in a limited manner. There was no extension of the concept to the higher levels of thinking such as analysis, synthesis and evaluation and there was a lot of rote learning in which the children learned knowledge items in a prescribed order, which did not facilitate current or future understanding of the concepts presented.

Chapter 5: ANALYSIS AND DISCUSSION

5.1 Synthesis of Results

The goal of this research was to examine teacher perspectives and experiences in working with difference and learner potential in three Grade 1 mathematics classrooms at three schools in Grahamstown.

The following main research questions guided this work:

What are teacher perspectives and experiences in working with difference and learner potential in three Grade 1 mathematics classrooms at three different schools in Grahamstown?

The sub-questions included:

4. What are teacher perspectives on differentiated learning in mathematics in Grade 1?
5. What are teacher perspectives of learner potential?
6. What pedagogical strategies arise from the teacher perspectives and experiences?
7. What strategies (if any) do teachers use to identify and work with children's potential in mathematics?

After considering the research data from the three different schools where data was collected, the findings were collated across the various school environments to give an overview of the various similarities and differences experienced across the schools. The objective of this chapter is to present information to demonstrate the extent and nature of differentiation. These learnings around teacher's experiences and perspectives with regard to learner potential and differentiation are synthesized and presented below.

Learner Assessment

Learner Readiness Level

This study found a clearly directed focus on gaining an understanding of the children before they entered Grade 1 at only one of the three schools observed. Here the teacher spent time familiarizing herself with background information about the children before they entered formal schooling. At all three schools it was clear that the teachers were interested in understanding their learners' readiness levels by spending time getting to know them at the beginning of each year. The teachers from all three schools were in agreement that a good Grade R year played an important part in the children's readiness levels. It was not clear what constituted a 'good' Grade R.

Although most of these children came from a Grade R class, it was assumed in Grade 1 that most of them did not know the concepts covered and that they would all need to be exposed to the same concepts, at the same time, in much the same way. Much of the teaching was to the whole group, indicating that the teachers, even though they knew and understood their learners, did not think that differentiation was appropriate, particularly at the beginning of Grade 1. In fact, two of the three teachers indicated the inappropriateness of differentiating at this early stage of Grade 1. The observation here is that teachers assumed a sameness, not only in the children's levels of preparedness for the more formal school environment but also in the cognitive demands that lessons might place on the children, and in the children's learning styles, interests, and needs.

My observation and experience proved contrary to the teachers' perspectives. In each class, I observed children who clearly had prior knowledge of the information being presented in class, and yet at no time were these children extended to higher order thinking levels. In addition to this, my experience as a facilitator at a Club at a local school, in addition to my experience with my own children, indicates that children as young as Grade R have a wide range of personal experiences and do not all require the same content knowledge at a specific point in time. Teacher practices that assumed children to be identical across a range of competencies, abilities, interests and needs created conditions in which teachers continually taught to the 'norm'. In some instances, the lack of differentiation and systematic, all-encompassing assessments might have resulted in teachers actually teaching *below* the norm for the majority of children.

Learner Learning Style

All the teachers interviewed knew about the different learning styles, with visual, auditory and kinaesthetic styles mentioned as the most common. The teachers also unanimously noted that for this age group of children, concrete aids were often essential for the teaching of numeracy. In all cases, the teachers used aids (fruit, socks, car wheels) to physically show the children the concepts that were being covered. However, while teachers recognized the developmental stage (in Piagetian terms) and the attendant needs of children associated with particular developmental stages, this knowledge served to generalize learner needs and learning styles in the teachers' understanding rather than to differentiate or distinguish specific learning styles at the level of the individual. One teacher incorporated some variation in the same lesson, a shift towards a more inclusive pedagogy; albeit still a challenge for the teachers observed.

Teacher practices showed some signs of differentiation; mainly at the level of 'extra' work, rather than in consideration given to the scope, depth and level of cognitive demand. Some teachers allowed for variations in calculations while others distinguished between those who needed resources and those who could do without. I noticed in all the classes that the children who grasped the concepts more quickly were allowed to do their calculations in their heads, whilst other children needed to draw the essence of the sums and still others used counters to understand the concepts. However, the children that were able to use a more abstract form of reasoning to solve the problem, were not then set other higher order thinking tasks, but were sent back to their desks to complete more basic worksheets or to do other activities at a similar level. Thus, none of the teachers considered variation in the cognitive demand of the task, while keeping the content focus constant; but rather adopted a model of 'more' work as a proxy for 'extending the child'.

Learner Interest

Interestingly, this area was the least developed in terms of the teachers' experience and perspectives. Although the teachers all worked on getting to know their children and assessing their readiness to learn in various areas, as well as indicating and understanding learning styles, none of the teachers actually indicated that they took the children's interests into account at any point during the preparation or teaching of their lessons.. It was clear that the teachers had a curriculum to 'get through' and that they related to having children of different ability levels in their classrooms, but there was little evidence of working with children who showed particular interest or grouping children with an interest in an activity

together. In some instances this could have been because of time factors and class size but it seemed as if the teachers did not pay much attention to this aspect of their class.

In some ways those schools that had Afternoon Clubs ameliorated this tendency, as the children were then able to choose to attend the clubs which interested them, and they could gain further exposure and extension in that environment.

In some schools, great pride was taken in the presentation of the children in their uniforms, looking tidy and neat. The children felt part of the school family. This strength in unity can present as a challenge to differentiation, as uniformity and conformity are often established as a norm. This might make it difficult for children with different interests to raise these, for fear of being different from the other children in their class. Perhaps this helps to explain why interests were a neglected area within the educational framework of these three teachers.

Another area of interest is the issue of grouping which forms a major part of Tomlinson's (1999) framework. Although all the teachers used the concept of grouping and gave reasons for choosing specific groupings/pairings, none actually used the groups as anything more than seating arrangements. Each group was exposed to substantially the same content and process. During my observation, I noted that the 'higher potential' groups finished their work more quickly, which resulted in them being returned to their desks more quickly than the groups of 'lower ability'. The net effect of this was that the higher potential groups got less time with the teacher during small group time; assuming that they 'knew' the work or potentially cottoned on much quicker. They then went back to complete tasks that were at a similar ability level to those being used with the rest of class, a practice that mitigated against these children operating in their ZPD. In the case when a higher ability group was recalled for additional work, the examples changed but the level of cognitive demand remained constant.

Teacher Modifications

Learning Environment

According to Tomlinson (1999, 2003), the teacher utilizes her assessment of the learners' readiness levels, learning styles and interests to modify the way she plans to teach. The teachers in this study were

all creative in the aids that they brought to school, or utilized to teach the children. The two schools with smaller classes, that were fee-paying schools, seemed to have more access to educational resources (such as educational posters and games), but the teacher in the remaining school seemed more resourceful.

Some of Tomlinson's recommendations include a spatial environment that is flexible. This could mean varied kinds of furniture such as different size and shape tables, physical spaces allocated for quiet individual work, as well as areas being set aside for collaborative work. Introducing items such as a rug or a comfortable chair is a way of showing the learners that the classroom is an open friendly space, where they can feel comfortable. The classroom structure should allow students to move from the whole group to small groups, pairs, and individual learning experiences, thus accommodating children who learn in different dynamics. The classroom structure will also set the tone of the way in which the teacher works with the various set-ups: how she reacts to groups or individuals, for example.

Although the teachers in the Foundation Phase had all engaged to some extent with this aspect of differentiation, using seated table arrangements and carpet work as the mainstay components, the variations seemed very traditional and not particularly creative. Two of the schools had either a table or corner where learners could go after they had completed the required task, to engage in other educational activities either by themselves or as a group. The nature of the tasks though, seemed to maintain the norm, rather than expect and enable children to be extended or to be operating in their ZPD. The normalization (and standardization) of children's ability at this stage of their learning remained stark throughout this research.

Product

According to Tomlinson (1999), a product is something that is produced by the students whereby they show that they have learned the concept. If a child cannot do worksheets and is continually assessed on a worksheet basis, is the assessment truly showing the child's ability in the area being assessed, or simply their ability to complete a worksheet?

At all three schools I observed at, the children were all assessed (formally) based on their completion of worksheets (the same worksheet being completed by all members of the class). There was therefore very

little differentiation with regard to formal assessment. However, informal assessment was done on an ad hoc basis throughout the periods of observation. The formal assessments are, by and large, what matter in the formal schooling system in South Africa. Teachers understood this and operated to fulfil the assessment demands rather than also consider learner needs and demands.

Content

In the area of content Tomlinson (1999, 2001, 2003) states that all students need to be given access to the same concept, principles and skills that are being taught. Differentiation occurs when the teacher adjusts the level of complexity required from different students and uses different teaching strategies to teach to different children. The result is that children all learn the same content but in different ways.

In each school, I noted that the content was largely the same – the teachers in each case used the same vocabulary and the same teaching methods to teach the same content. In some cases, children were quicker than others to gain the required understanding; however, this did not usually lead to these learners getting to apply a more complex thought process around the same content, but rather in less time being spent with them. If they were offered additional work, it was not necessarily related to the work they had been doing, and was usually offered on an individual basis with little guidance from the teacher other than an initial indication of what these learners could get on with. Participating teachers therefore treated extension work in an ad hoc rather than carefully thought-through manner.

This again meant that whilst a high ability child might finish work early and even sometimes get extension work, generally they would work on this alone and without support from the teacher, which indicates that they were not operating in their ZPD. Children require scaffolding if learning is to be meaningful; an aspect that was left largely unattended to by teachers whose classrooms I observed. Perhaps these situations point to a good opportunity, in schools with the resources, for high potential learners to receive the same amount of scaffolding as their low potential counterparts through a pull-out programme that could allow them individual time with a teacher to support them in reaching their full potential.

Berger (1996) notes that high ability students particularly benefit from content modification in the form of integrating traditional content areas, which promotes the acquisition of integrated understanding. This was not an option in any of the schools visited.

Process

In the area of process, I have used Bloom's taxonomy as a guiding framework to help me establish whether the teachers at the three schools were differentiating teaching and learning. Tomlinson (1999, 2001, and 2003) envisages process differentiation as creating space for children to think around the content and move from functions such as understanding and knowing, through to more complex processes such as making critical evaluations and synthesizing information. The link between Tomlinson and Bloom is clear. Providing all the children with the same content at the same level is not moving them towards higher order thinking skills.

In my own experience, it is clear that children as young as two years old can think creatively and solve problems. My husband and I were discussing how to move children and suitcases over the holiday period and we could not arrive at a mutually satisfying solution. Our daughter, then aged two-and-a-half, suggested that we strap our suitcases to the roof of the car! After listening attentively to her contribution and further discussion, we purchased a roof box! Even though she did not know that roof boxes existed, she was able to find a creative solution to our problem. She had arrived at that conclusion through listening to our conversation, deducing our requirements, finding a solution and recommending it.

My experience at the three schools was disheartening from this perspective. Teachers rarely gave children the opportunity for creative problem solving or critical analysis. Specific content knowledge was deemed very important and all three teachers mentioned 'getting through the curriculum'. Indeed, from my observation and experiences it was clear that children as young as Grade 1 volunteered the answer 'we do not need to know that, the teacher says it is not for Grade 1', which is an indictment of our ability to keep the children learning and developing at their pace, rather than at that indicated in the curriculum. According to Tomlinson (1999), differentiation forces teachers to shift their thinking from completing the curriculum, and compels them to move closer to catering to individual student needs.

In First Fountain School particularly, there was a lot of rote learning which undermined the teacher's attempts at differentiation. However, this teacher was operating in very trying circumstances, with little support. In Spring Valley, learners had more freedom to discuss their issues, but the teacher still worked closely with her curriculum and did not modify the process or content. The teacher at Green Leaf had a better understanding of the nuances of her children, was more adept at following their lead and had smaller classes to manage, but this did not translate into scaffolding the children to reach their full potential.

5.2 Emergent Themes

After considering the evidence from the three schools, I discerned some interesting themes.

Grouping

In each school, the teacher recognized the uniqueness of the children in her class and acknowledged it. They were also aware that the children had differing levels of cognitive functioning and one of the ways that they used to respond to this was to group the children in ability groups for small group work. However, interestingly, the cognitive demand required of the different groups barely varied at all. Although the children that had been recognized as higher ability or lower ability were separated into different small groups, the work that they were given, the approaches that were used and the assessments required of all the children were substantially the same.

The use of grouping seemed to be more about convenience in terms of teaching size, than about planning to actually differentiate in terms of content or process for the children. It was more about group structure than about any meaningful attempt to differentiate so that learners could operate in their ZPD's with the necessary support.

Teachers' Understanding of Differentiation

Another insight that arose from my study was that of the teachers' understanding of differentiation. Each of the teachers in the study seemed to know what differentiation was. However, after further discussion, it became apparent that the extent of their understanding was limited to the fact that all children are

different, and did not extend to using this information to create different learning experiences for the children. It was also noticeable that the teachers corralled the children's learning spaces by sticking to the curriculum prescribed by the department. This is frustrating for children who are able to function at a higher cognitive level than that set out in the curriculum document. Some children are able to meet the requirements of the curriculum easily, yet they are not challenged and enabled to develop in their own right, as their abilities are not being catered for.

A further challenge in this area is that of the teacher's content knowledge. In some instances, teacher's content knowledge seemed to be weak; with teachers choosing inappropriate tasks, using confusing language to explain tasks, and not having the ability to deconstruct the various constituent parts necessary to understand particular concepts. Such a shortcoming in teachers' own content knowledge would make it difficult for them to differentiate in a meaningful way, particularly for those children at the higher end of the learning spectrum.

Despite teachers saying that each child is unique and talking about the different learning styles, the evidence in this small sample was overwhelmingly that all the children in each class were taught the same content, in the same way, and their grasp of the content is also assessed in the same way. The teachers' understanding of differentiation, as evidenced in the use of grouping and through the type of assessment, is superficial.

Task Selection

One of the peculiar factors highlighted through this study was the choice of tasks, specifically those chosen by the teachers for their learners. Incongruities arose in areas such as the appropriateness of the task at hand in terms of content (both mathematical and in general), and its level of complexity in terms of Bloom's taxonomy. These notwithstanding, the aspect of task selection that was most relevant to the case study on differentiation was the disjuncture between the teachers' discourse (around getting to know their children, about different learning styles, and children's differing levels of ability), and their classroom practice in selecting tasks, which by and large reflected sameness. This echoes the findings in the 'grouping' and 'teachers' understanding of differentiation' themes already discussed indicating a prevailing tension between the teachers' discourse vis-à-vis differentiation and their practice of differentiation in the classroom.

The teachers all indicated an understanding of difference and learner potential and from their interviews they perceived that they were differentiating where necessary, in their opinion. However on closer examination it seemed that the differentiation was very superficial. The understanding of the children's differences in terms of learning styles, readiness and to a lesser extent interest, did not include a concerted effort to extend the children up the levels of Bloom's taxonomy through engaging them in different tasks, different learning environments or different assessment methods. The evidence shows that generally, differentiation did not occur to any meaningful extent.

Level of Readiness

Another emerging theme was that of the importance of learner readiness. Participating teachers unanimously noted that a child having gone to a 'good' Grade R was of vital importance for a successful Grade1 year. In their discussions, they mentioned a variety of aspects that could affect the child, such as their home background, language, race, and situational context; each stated that the children were all different. However, in none of these instances was the actual content of a child's knowledge considered to be an explicit factor of their uniqueness. Some of the issues that were highlighted as considerations might even have predisposed the teachers to a stereotypical view of the children. This in turn, would have had an effect on the teacher assumptions about the child's school entry knowledge. From my limited experience with children as a mother, researcher and ad hoc afternoon club teaching assistant, it was evident that the basic knowledge and cognitive abilities of children from similar situational contexts were very different. Again, a culture of sameness was strongly imposed upon learners from similar backgrounds who happen to be in the same class. Little consideration was given to contextual factors that might predispose children to experiences that potentially enhance their learning before school: above the norm.

Chapter 6: RECOMMENDATIONS AND CONCLUSION

It became apparent over the course of my observations, that the sampled teachers' rhetoric of differentiation and their classroom practice in this regard were vastly different. Each teacher valued the uniqueness of the children in their class explicitly but on closer examination failed to extend this approach to the teaching and learning practices within their classrooms. I did not observe evidence of real differentiation for most children, let alone those with high potential. My hope is that this research goes towards extending teacher training in this area (both academic and in-service), convincing teachers of the importance of nurturing critical thinking abilities in our youngest learners, and initiating a move towards the drafting of Individual Education Plans for all our learners.

During the period of my research, I have been convinced that the use of differentiated instruction in classrooms is the way forward in educational thinking, particularly as it relates to the notion of inclusive learning. Clearly there are challenges to be addressed in terms of school timetables, curricula, teacher perspectives, and teachers' time frames. In addition, the past education system inequalities in South Africa continue to etch their mark on the education experience of young children.

Subban (2006: 940) notes that Tomlinson's "working definition of differentiated instruction reflects Vygotsky's socio-cultural theory, the main tenet of which lies in the social, interactional relationship between teacher and student". Tomlinson (2004 in Subban 2006: 940) also points out that "the difficulty of skills taught should be slightly in advance of the child's current level of mastery" (thus linking with Vygotsky's zone of proximal development) and concludes that using differentiated instruction is a strategy to deal with the issue of the diversity of learners who might have differing social and cultural competences, different learning styles and multiple intelligences. She suggests that it gives teachers the space to think creatively about supporting all their students successfully. I hope that this research goes some way towards making differentiation a reality in the classrooms of our little ones as soon as possible.

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8. APPENDICES

Appendix 1

Daily Maths Group Observation		
Lesson plan seen	YES	NO
Teaching to who	WHOLE CLASS	SMALL GROUP
Date:	Area of Mathematics Learning:	
Task		
Resources utilized		
Key vocabulary used (difference to other group, if any)		
Key learning objectives (difference to other group, if any) 1. 2. 3.		

Implications for learner potential/ differentiation: planning and next steps

Appendix 2: Term Plan: Spring Valley School

TERM: 2 GRADE: 1

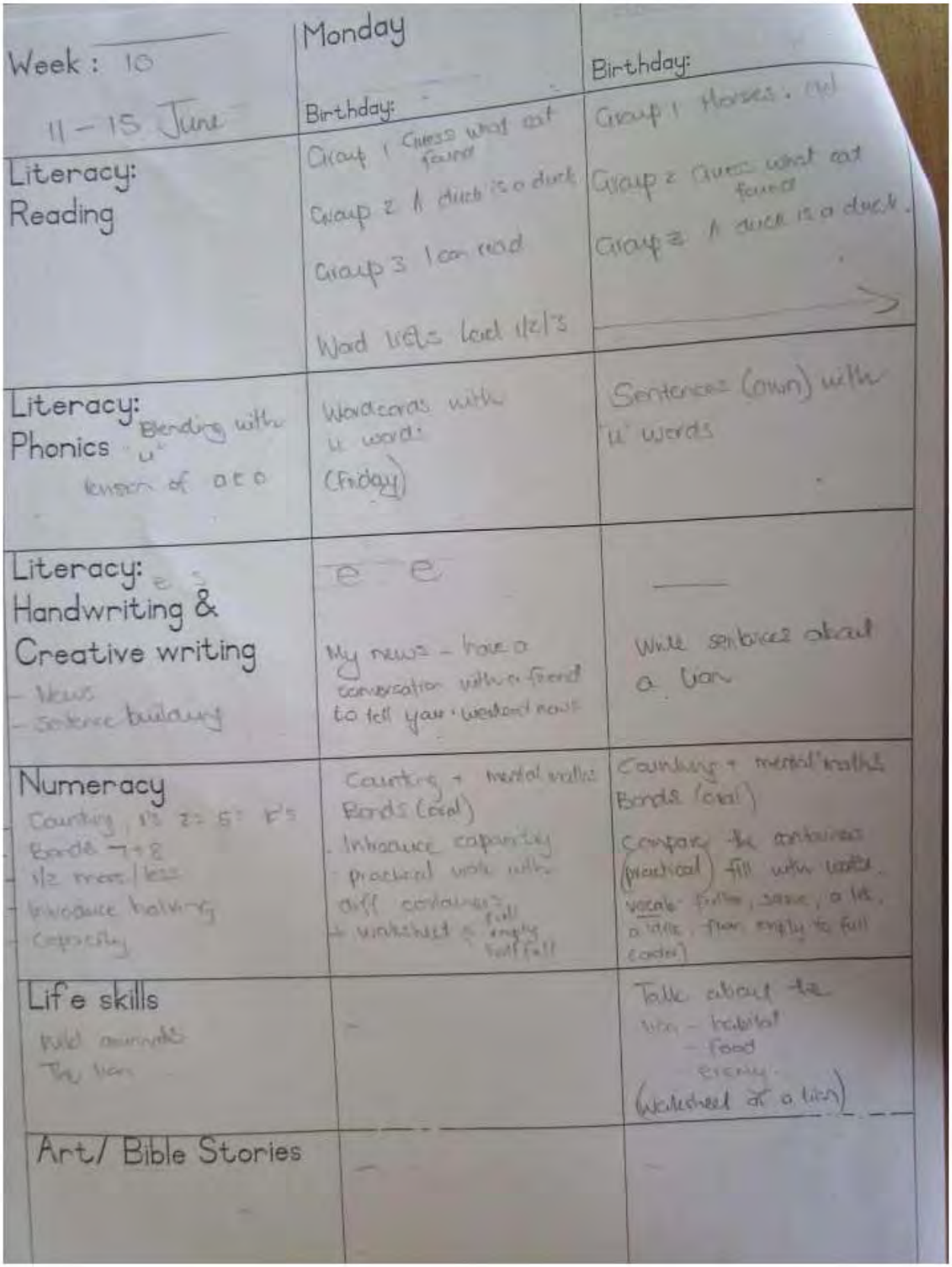
	NUMERACY	LITERACY				LIFE SKILLS	
		Phonics	Reading and Written English	Writing	Afrikaans First additional language	Environment Study and Outings	Art, Drama, Phys Ed, Scripture, Music, other
Week 1 **10 – 13** **April** (4 days)	**Revise counting up to20** Forwards & Backwards Ask: What comes before after 1 more / less **(1 -10)** Number concept 6 Revise addition bonds 5	Check knowledge of all single sounds Letterland Complete all letters left over from last term	- Reading groups My holiday – written work. - Sentence building. * *Recognizes and names letters of alphabet.* * *Distinguishes between different phonemes.*	Correct manipulation of writing tools. Revise all patterns from Term 1 Patterns and letters that match on 17mm lines v,w,k	Liggams-dele, woordeskat	- Autumn – the turning of seasons (time). - Colours of Autumn leaves Autumn walk	**Scripture:** Talk about Easter and the symbols. **Art:** Make and Autumn picture.
Week 2 **16 – 20** **April** (5 days)	Counting *1 - 30* Orders numbers up to 1 - 6 Revise bonds 5 Introduce Bonds 6 Number concept 7 Add and subtract single digit numbers. Estimation of objects (1-10)	Blending with 'a' Start with phonics books	- Reading Groups - Sentence building. * *Uses illustrations to interpret the meaning of a story.* * *Recognizes high frequency words*	Introduce Patterns and letters that match on lines X,z	Liggams-dele, woordeskat	Autumn – Hibernation and migration.	**Scripture:** Continue with Easter Story/ the Crucificton **Art:** Continue with Autumn picture.

Week 3 **23 – 25** **April** (3 days)	Counting 1 – 30 Bonds of 5 mixed. Simple word problems (+). Revision of number names (1-8). Number concept 8 Introduce doubling and continue to work with it	Blending with 'a' Sentences with 'a'	-Reading in Groups - List of Autumn vocab. * *Reads simple written materials e.g. labels.* - Sentence building. Creative writing – My cat	Patterns and letters that match on lines N,m,r	Liggams-dele, woordeskat	Different parts of my body – parts that I cannot see e.g. lungs, heart, stomach, brain, skeleton	**Scripture:** The miracles of Jesus. 1. The changing of water into wine. John 2: 1-12
Week 4 **2 – 4** **May** (3 days)	Counting 1 - 40 Bonds of 6 Count in 2's → 20 and repeated addition of 2. Copies and extends number patterns of 2's Simple word problems Number concept 9 Money – recognize and identify coins	Blending with 's'	Reading in Groups Word lists	Patterns and letters that match on lines M,r,h,	Liggams-dele, woordeskat	My family Dangers in the home Keeping safe when home	**Scripture:** The loaves and the fishes. **Art:** Mother's day gift / card.
Week 5 **7 – 11** **May** (4 days) 1 day for schools birthday	Counting 1- 40 Bonds of 6 Count in 2's → 20 Simple word problems (- / +) Money – Recognize and identify notes	Blending with 'e' Sentences with 'e'	Reading in Groups Sentence building The school's birthday * *Uses letters to form words and short sentences*	Patterns and letters that match on lines H,b,p	My verjaarsdag	The school's birthday Celebrations	**Scripture:** The Good Samaritan **Art:**

Week 6 **14 – 18** **May**	Counting 1 - 50 Bonds of 6 Count in 2's – 40 / 1's to 50 Simple word problems (- / +) Number concept 10 (flard cards with building up of 10)	Blending with 'o' Sentences with 'o'	Reading in Groups Sentence building ** News: Recounts and distinguishes personal experiences.*	Patterns and letters that match U,y,	Wilde diere	Wild animals vs Tame animals Endangered wild animals	**Scripture:** The friends that brought the lame man to Jesus
Week 7 **21 – 25** **May**	Counting 1 - 50 Revise all bonds. Counting in 10's and repeated addition of 10's Copies and extends number patterns of 10's Number patterns 2, 4, 6...	Blending with 'a' Sentences with 'a'	Reading in Groups - Sentences correlating with reading. Word lists Creative Writing – My dog	Patterns and letters that match T,f,j	Wilde diere	Wild animals The Rhino	**Scripture:** The healing of the deaf man
Week 8 **28 May – 1 June**	Counting 1- 50 Counting in 5's and repeated addition of 5's Copies and extends number patterns of 5's Bonds 7 One more/one less Data handling. (Counting wild animals) Measurement – long/short/longer/ shorter	Blending with 'e'	Reading in Groups Sentence building – - News Word lists	Patterns and letters that match C,a,d,	Wilde diere	Wild animals The Elephant	**Scripture:** Healing of the blind man

Week 9 **4 – 8** **June**	Counting 1 – 50 Counting in 2's, 5's 10's Bonds of 7 Leading into 2 more Problem solving – Counting in 2's Measurement – capacity Estimate, measure, compare, order and record.	Blending with 'u' Sentences with 'u'	-Reading in Groups ** Match captions with pictures.* ** Answers questions about a story.* - Sentence building – Phonics sentences Writing News Word lists	Patterns and letters that match G,e,o,	Wilde diere	Wild animals The giraffe	**Scripture:** Jairus' daughter
Week 10 **11 – 15** **June**	Counting 1 – 50 Counting 2's, 5's 10's Bonds of 7 Problem solving 2 more Introduce Halving and continue to work with it.	Blending with 'i' Sentences with 'i'	Reading in Groups Sentence building Word lists	Patterns and letters that match G,q,s	Wilde diere	Wild animals The Lion	**Scripture:** Let all the children come to Jesus **Art:**
Week 11 **18 – 22** **June**	Counting 1 – 50 Counting 2's, 5's, 10's Check number names 1- 10 Shapes, 2-D, circles, triangles and squares, sort, work with and create a picture – leading into data handling Holiday	Blending with 'r' Sentences with 'r'	Reading in Groups Sentence building Word lists	Revise and catch up on all patterns and letters.	Wilde diere	Finish off all wild animal work	Revision

Appendix 3: Weekly Plan: Spring Valley School



Week: 10 11 – 15 June	Monday Birthday:	Birthday:
Literacy: Reading	Group 1 Guess what eat found Group 2 A duck is a duck Group 3 I can read Word lists load 1/2/3	Group 1 Horses: (x) Group 2 Guess what eat found Group 3 A duck is a duck.
Literacy: Phonics Blending with 'u' lesson of a t o	Wordcards with u words (Friday)	Sentences (own) with 'u' words
Literacy: Handwriting & Creative writing - News - Sentence building	e e My news – have a conversation with a friend to tell your weekend news	Write sentences about a lion
Numeracy Counting 1's 2's 5's 10's Bonds 7+8 1/2 more/less Introduce halving Capacity	Counting + mental maths Bonds (oral) Introduce capacity Practical work with diff containers full empty half full + worksheet	Counting + mental maths Bonds (oral) Compare the containers (practical) fill with water vocab: full, same, a lot, a little, then empty to full (order)
Life skills Wild animals The lion	-	Talk about the lion – habitat – food enemy. (worksheet of a lion)
Art/ Bible Stories	-	-

Wednesday	Thursday	Friday
Birthday:	Birthday:	Birthday:
Group 1 Going to the shops Group 2 Horses (old) Group 3 Guess what cat found Word lists level 1/2/3 →	Group 1 Horses (new) Group 2 Going to the shops Group 3 Horses (old)	Group 1 Group 2 Horses (new) Group 3 Going to the shops
	- Games with u words - Write on white boards u words	- Test with u words
—	so so se se si si	—
Count + mental maths Bonds capacity - Estimate/guess how many spoons into container " " yogurt cups " " Count it afterwards	- Count + mental maths - Bonds - Introduce formal measuring liter / milli liter - introduce concept of half (with liquids)	- Count + mental maths - Bonds - halving - introduce - cut - fruit - fold - paper - draw line through a picture - Divided into 2 equal parts
Music	— Computers	—
Afrikaans vocab + lees die Rammstock boek		Bible story Art - favourite thing in the world

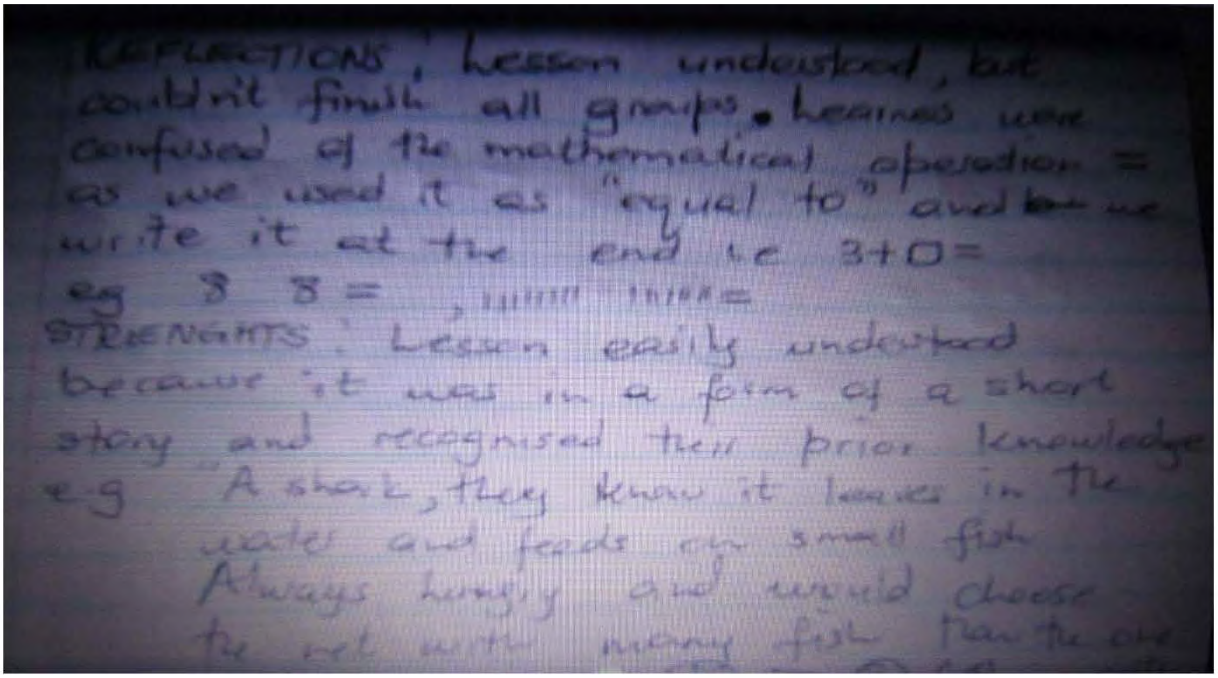
Week : 11 18 – 22 June	Monday Birthday:	Tuesday Birthday:
Literacy: Reading	Group 1 No school today Group 2 Picnic for Tortoise (old) Group 3 Horses (new) List words L 2/3 →	Group 1 Picnic for tortoise (new) Group 2 No school today Group 3 Picnic for tortoise (old)
Literacy: Phonics Blending with "i" revision of a e o u	i words in phonic books.	Wordcards with i words
Literacy: Handwriting & Revise + catch up on	all letters + patterns	
Creative writing - My news } Fri Sat - My own story } Sun	Draw 3 pictures: - - Fri - write a sentence or - Sat 2 about each - Sun day →	finish
Numeracy Count in 1's 2's 5's 10's - Revise number names - Revise capacity - Continue with halving	Counting Bonds - Work in groups on carpet - Demonstrate halving with counters - Incorporate double - Children at table → worksheet on 2 half make one whole (pictures - cut - paste)	Counting Bonds halve - Worksheet on halve with pictures - On carpet - halving with number sums / story sums add / sub. sums - Group 1 - introduce quat
Life skills Finish off all wild animal work	—	Finish + colour all worksheets about wild animals (catch up)
Art/ Bible Stories Bible story		
...		

Appendix 4: Term Plan: Green Leaf School

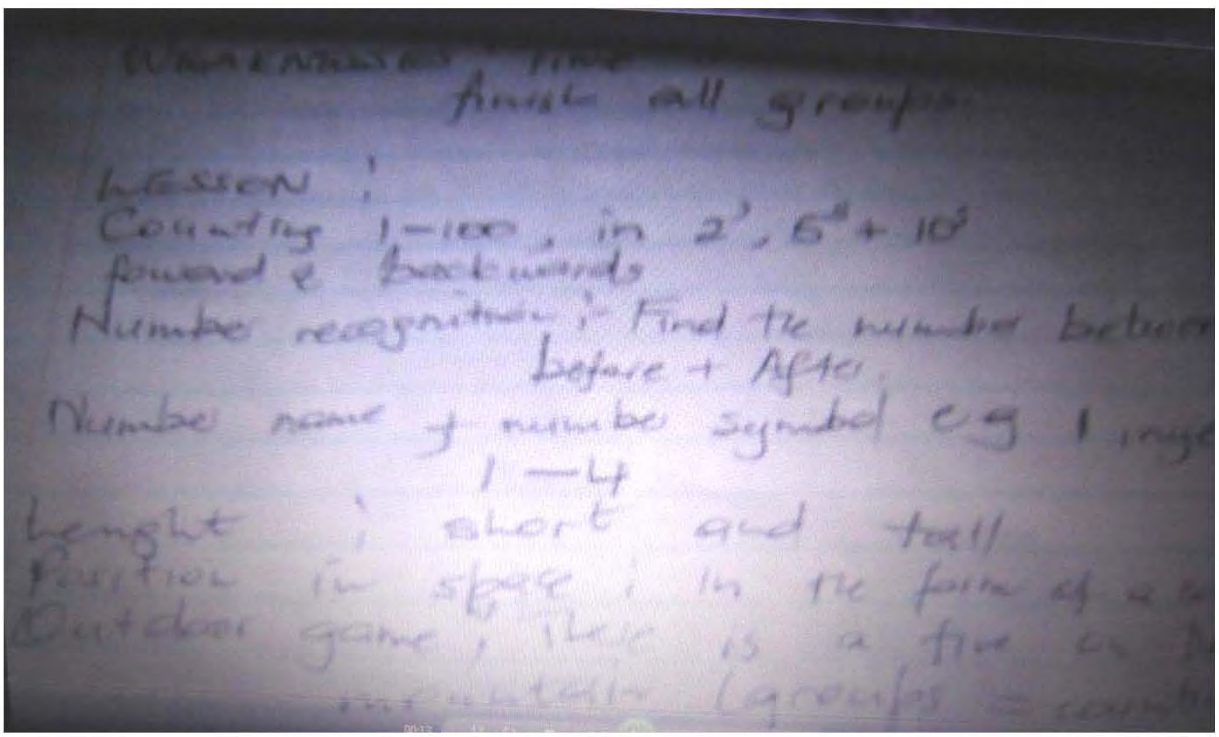
MATHEMATICS – GRADE 1					
TERM 1		DATE	TERM 2		DATE
LO 1	NUMBERS, OPERATIONS, RELATIONSHIPS		LO 1	NUMBERS, OPERATIONS, RELATIONSHIPS	
AS1	COUNTING OUT 20 OBJECTS		AS2	COUNTS TO 50 ON ABACUS,NUMBER-LINE/SQUARE	
AS2	COUNTS TO 20 AND BACK with or without NUMBER-LINE			COUNTS IN MULTIPLES OF 2	
AS3	READS AND COPIES NUMBER NAMES AND SYMBOLS TO 9		AS3	READS AND COPIES NUMBER NAMES AND SYMBOLS TO 20	
AS4	NUMBER CONCEPTS TO 10 MORE,LESS,BEFORE,AFTER,BETWEEN		AS5	NUMBER CONCEPTS TO 20 MORE,LESS,BEFORE,AFTER,BETWEEN	
AS7	ESTIMATES UP TO 9 OBJECTS		AS6	IDENTIFIES ODDS AND EVENS TO 20	
AS8	IDENTIFIES +,- AND = SIGNS		AS9	DOUBLES AND HALVES NUMBERS TO 10	
AS7	WRITES A NUMBER SEQUENCE USING + - =		AS5	SOLVES MONEY PROBLEMS	
AS8	ADD AND SUBTRACT WITH 1 DIGIT NUMBERS		AS7	+AND – 1-5 TO ANY NUMBER UP TO 20	
AS9	SOLVES PROBLEMS USING CONCRETE OBJECTS, DRAWINGS		AS7	COMPLETES REPEATED ADDITION OF 2 AND 5	
AS10	EXPLAINS SOLUTIONS TO AS9		AS7	NUMBER SENTENCES WITH MORE THAN 1 OPERATION	
AS11	REVISES SOLUTIONS OF PEERS		AS8	MENTAL CALCULATIONS WITH +AND – TO 5	
	ORDINAL NUMBERS TO 10				
LO2	PATTERNS, FUNCTIONS AND ALGEBRA		LO2	PATTERNS, FUNCTIONS AND ALGEBRA	
AS1	PATTERNS + SEQUENCING OF NUMBERS AND PICTURES AND OBJECTS			NUMBER PATTERNS TO 20	
AS2	ODDS AND EVENS TO 10			EXTENDING PATTERNS	
LO3	SPACE AND SHAPE (GEOMETRY)		LO3	SPACE AND SHAPE (GEOMETRY)	
AS1	IDENTIFIES 2D SHAPES: triangle, square, rectangle, circle, oval		AS1	RECOGNISES 2D SHAPES AND 3D OBJECTS	
AS2	BASIC CONCEPTS – COLOUR, SIZE, SHAPE DESCRIBES PROPERTIES OF SHAPE/OBJECTS AND COLLECT AND SORT		AS3	BUILDS 3D OBJECTS WITH CONCRETE MATERIAL	
AS3	SYMMETRY OF SELF AND OBJECTS		AS4	SYMMETRY IN NATURE	
AS6	POSITION IN SPACE – IN FRONT , BEHIND, LEFT, RIGHT, ABOVE,BELOW, IN ,OUT ETC				
LO4	MEASUREMENT		LO4	MEASUREMENT	
AS2	VOCABULARY: TIME: EARLY, LATE, AFTERNOON, EVENING, MORNING, DAYS OF THE WEEK		AS5	CAPACITY – CUPS, SPOONS, LITRES ETC	
AS3	SORTS IN SEQUENCE: YESTERDAY, TODAY, TOMORROW			LENGTH – STEPS, HANDS ETC	
	SIZE: BIG BIGGER BIGGEST, SMALL SMALLER SMALLEST,SHORT,LONG,TALL, FAT,THIN ETC			TIME: MONTHS OF THE YEAR, O'CLOCK AND HALF PAST	
LO5	DATA HANDLING		LO5	DATA HANDLING	
AS1	COLLECTS AND SORTS DATA IN CLASS		AS2	COLLECTS AND DISPLAYS DATA ON A PICTOGRAPH	
AS3	GIVE REASONS FOR ABOVE SORTING		AS6	EXPLAINS SOLUTIONS USING CONCRETE OBJECTS/DRAWINGS – NUMBERS TO 20	

MATHEMATICS – GRADE 1				
TERM 3		DATE		
LO 1	**NUMBERS, OPERATIONS, RELATIONSHIPS**			
AS2	COUNTS FORWARDS AND BACKWARDS ON ABACUS,NUMBER-LINE/SQUARE TO 100			
	COUNTS IN MULTIPLES OF 2, 5 AND 10 USING NUMBER SQUARE(Fwds+Bkwds)			
AS3	READS AND COPIES NUMBER NAMES AND SYMBOLS TO 100			
AS5	NUMBER CONCEPTS TO 100 MORE,LESS,BEFORE,AFTER,BETWEEN			
AS6	IDENTIFIES ODDS AND EVENS TO 20			
AS6	SOLVES PRACTICAL PROBLEMS INVOLVING SHARING AND GROUPING UP TO 20			
AS7	+ AND – 1-9 TO 20			
	+ AND – WHOLE TENS 20+30, 30-20			
	COMPLETES REPEATED ADDITION AND SUBTRACTION WITH 2, 5 AND 10			
AS8	MENTAL CALCULATIONS WITH + AND – TO 10			
AS9	DOUBLES AND HALVES NUMBERS TO 20			
AS5	SOLVES MONEY PROBLEMS			
LO2	**PATTERNS, FUNCTIONS AND ALGEBRA**			
AS2	IDENTIFIES AND DESIGNS PATTERNS WITH NUMBERS UP TO 100			
LO3	**SPACE AND SHAPE (GEOMETRY)**			
AS6	SELF IN POSITION ACCORDING TO CLUES			
LO4	**MEASUREMENT**			
	MEASURING: MASS: g, KG			
	TIME: O'CLOCK, HALF PAST			

Appendix 5: Reflections: First Fountain School



REFLECTIONS; Lesson understood, but couldn't finish all groups. Learners were confused of the mathematical operation = as we used it as "equal to" and we write it at the end i.e 3+0=
eg 8 8 = , ||||||| ||||||=
STRENGHTS: Lesson easily understood because it was in a form of a short story and recognised their prior knowledge e.g A shark, they know it leaves in the water and feeds on small fish. Always hungry and would choose the net with many fish than the one [illegible]



WEAKNESSES: [illegible] finish all groups.
LESSON:
Counting 1-100, in 2's, 5's + 10's forward & backwards
Number recognition: Find the number between before + After.
Number name + number symbol e.g 1 [illegible]
1 — 4
Lenght: short and tall
Position in space: In the form of a [illegible]
Outdoor game, there is a fire in [illegible] mountain (groups = countin[illegible]

Appendix 6: Teacher's Interview Schedule

Thank you for agreeing to see me, and spend some of your valuable time talking to me, as part of my research. The information that I gather from you and your school, will be collated with that of other participating schools in an attempt to understand teachers' experiences and perspectives in working with difference and learner potential. This work will form part of my Master's degree, but will also be part of a larger undertaking – as my research is part of a Consortium that is working with strengthening Foundation Phase teaching in South Africa.

Please may I record our interview so that I can refer back to your answers during my analysis?

Research Question	Main Question	Probing Questions
Preliminary data	1. What type of backgrounds do the children in your class come from? 2. What in your view is the ideal environment for children to learn?	What challenges do you have in this regard – based on different backgrounds, abilities, learning styles
What are teachers' experiences in working with differentiation for learning in a mathematics classroom?	3. At the beginning of the year how to you get to know your children (specifically Gr.1's)? 4. Are there particular things that you need to be aware of/think about in preparing to teach them? 5. Does this type of knowledge help you to plan?	In terms of their background, abilities, learning styles, learner potential
What are teachers' perspectives on differentiated learning in mathematics in Grade 1?	6. What are your thoughts about how children learn? 7. How does this influence how you plan to teach? 8. How do you plan your maths lessons? What factors do you take into account? 9. Does this differ from the way you plan reading lessons? 10. Do you group the children when teaching maths? 11. How do you choose if and when to group the children?	Why do you take those specific factors into account? Whether yes or no, why or why not? Why? Both in terms of content and the specific children in the group i.e. what criteria you use to decide

What are teacher's perspectives of learner potential?	12.	Have you ever had a gifted child in your class? If so, what led you to this conclusion and how did you cater for that child's needs in your maths class?	
What strategies do teachers use to identify and work with children's potential in mathematics?	13.	Can you give me examples of how you cater for high potential children in your class and ensure that these children have appropriate work to do?	Is this for each lesson or just for some lessons?