CHAPTER ONE
ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND STATEMENT OF THE PROBLEM

Effective cognitive development is indispensable in the process of obtaining knowledge (Tzuriel, 2001:49; Anon., 1998). Human beings acquire knowledge through literacy (language proficiency), numeracy (numerical proficiency) and life skills (human and social behaviour). In order to read, write and do arithmetic, learners rely on specific cognitive skills, such as attention, memory, symbolic thinking, comparison, categorisation, analysis and synthesis, problem-solving, and critical evaluation and reflection (Anon, 1998). The aforementioned skills indicate that cognitive development refers *inter alia* to the application of cognitive and meta-cognitive skills and strategies (Brewer, 2007:29; Wegerif, 2006:2; Sangwan & Chhikara, 2003:75) (*cf.* 2.2). In addition to this, cognitive functions for acquiring, processing and communicating information during learning, as well as emotional, attitudinal and motivational factors (non-intellective factors) play an important role in cognitive development and learning (Benjamin, 2009, Tzuriel, 2001:50-55, 72-73) (*cf.* 2.4, 2.7.5).

An international study, Pirls (*Progress in International Reading Literacy Study,* 2006), determining reading literacy among Grade 4- and Grade 5-learners worldwide, revealed that South Africa performed weakest of all participating countries (Fleisch, 2008:22; Rademeyer, 2007:2). The Western Cape Department of Education also conducted a research focusing on the literacy and numeracy skills of all Grade 3-learners (Wes-Kaap Onderwysdepartement (WKOD) (2006:2). This study revealed that only 36% of the participating learners could reach the literacy and numeracy outcomes expected of Grade 3-learners (Wes-Kaap Onderwysdepartement, 2006:2). A recent report from the Department of Education on learner retention in schools claims that only 46% of Grade 1-learners reach Grade 12 (Rademeyer, 2008:7). A high percentage of learners repeating grades is mentioned as one of the reasons for the above statement. According to the WKOD task team, there is a high percentage of learners repeating and dropping out of school between Grade 10

and Grade 12. The task team could not find a significant drop-out number between Grade 1 and Grade 2, although a significant number of learners repeat Grade 1. The reasons for learner retention in Grade 1 could be attributed to:

- inadequate school readiness programmes; as well as
- learning problems related to cognitive deficiencies which are not addressed in time (Wes-Kaap Onderwysdepartment, 2006:2).

Studies executed nationally and internationally on cognitive development with pre-school learners by Smith (2009); Wilson (2008); Swanson (2006); McFarlane (2006); Benjamin (2005); Jeon (2004); Pepler (2004); Du Plessis (2002); Hermanson (1998); Wenderoff (1998); Gunnels (1992); Alfassi (1990); Brito (1987); Martelli (1987); Cowan (1987); Ceballos (1986); Lewis (1986); Caroll (1984); Salvi (1983) and Morrison (1982) indicate that early intervention programmes can optimise cognitive development (*cf*. 2.5).

A synthesis of the aforementioned international and national research on cognitive development with pre-school and young learners conducted during the mid-eighties until the present revealed that:

- pre-school intervention does make a difference in the cognitive development of participants and should be effectively implemented at pre-school level because it optimises individual achievement and problem-solving skills (Brito, 1987; Martelli, 1987; Lewis, 1986; Salvi, 1983; Morrison, 1982);
- the cognitive structures of pre-school learners not only change with development, but can also become operative through explicit teaching efforts during the teaching process (Ceballos, 1986; Caroll, 1984);
- cognitive educational interventions prevent early failure in school (Cowan, 1987);
- dynamic assessment approaches in assessing the potential of learners for cognitive growth are extremely effective (Alfassi, 1990);
- early intervention enables the young learner to monitor, detect and self-correct errors and has the potential to improve the young learner's

capabilities and detect early developmental delays (Jeon, 2004; Gunnels, 1992);

- there is a need in the South African curriculum to teach learners thinking skills and a significant improvement regarding clear and precise thinking was evident in learners who took part in a cognitive development programme (Hermanson, 1998);
- educators' methods can change mental functions (Wilson, 2008; Du Plessis, 2002; Wenderoff, 1998);
- suitable teaching strategies and intentional guidance (mediation) that engage the learner effectively in the learning process lead to better concentration, attention and cognitive development (Pepler, 2004);
- cognition is modifiable and cognitive thinking and scholastic functioning in young learners can be optimised through mediation in a small short-term group intervention programme (Benjamin, 2005);
- young learners who undergo an early social and cognitive intervention programme, transit to school easier than those who are not exposed to such a programme (Smith, 2009; McFarlane, 2006; Swanson, 2006).

None of the aforementioned studies documented the effectiveness of a curriculum-based mediated learning approach for enhancing cognitive development among Grade R-learners in South Africa. In this regard, my[1] research makes a significant contribution.

In support of the belief of Reuven Feuerstein (Feuerstein, Feuerstein & Falik, 2010:25; Benjamin, 2009; Lerner & Johns, 2009:247-248; Fleisch, 2008:30; Tzuriel, 2001:50-55) I strongly believe that learning difficulties and cognitive deficiencies (if present) can be diminished if a Mediated Learning Experience (MLE) intervention is employed. My study was therefore built on the premise that mediated learning can optimise cognitive development among Grade R learners.

My study extends the completed research by confirming that cognition is modifiable and that pre-school intervention holds potential for optimising

[1] Being a mixed method study which involves the researcher in an objective and subjective capacity, I opted to use the personal pronoun which depicts my personal involvement throughout the study.

thinking skills, if teaching and learning is based on a mediated learning approach. Learners who are exposed to early cognitive intervention might be more able to monitor their own performance, identify mistakes and correct them, which will prevent early school failure.

This study also supports the idea that early cognitive intervention based on mediated learning can enable learners to receive and process information in a systematic, exploratory and reflective way, especially if intentional teaching processes, such as mediation, are followed. Learners involved in early cognitive intervention by means of intentional teaching processes, such as mediation, can develop a need for precision and accuracy and demonstrate spontaneous comparative and inferential thinking behaviour as well as optimised higher order thinking skills (Pena, Gillam, Malek, Ruiz-Felter, Resendiz, Fiestas & Sabel, 2006:1038; Tzuriel, 2001:27; Kozulin & Presseisen, 1995:67-68; Haywood, 1994:27; Feuerstein & Feuerstein, 1991:11). If mediation (*cf.* 3.6.2) and dynamic assessment (*cf.* 2.8.2) are utilised in a combined approach, cognitive potential can be optimised, which will ease the transit to formal education in Grade 1 and correct them, which will prevent early school failure.

The WKOD task team recommends, among others, that access to early childhood development should increase, as well as adequate school readiness programmes related to the National Curriculum Statement from the Department of Education (Rademeyer, 2008:7; Benjamin, 2005:9).

In order to optimise learning, it is of the utmost importance to optimise learners' cognitive development in the pre-school years, because early identification of signs of possible learning difficulties will allow young learners to receive valuable early intervention which can lead to the prevention or decrease of failure in school (Lerner & Johns, 2009:247-248; Fleisch, 2008:30; Rademeyer, 2007:2; Dunn, 2004; Van Hamburg & Swanepoel, 1987:86, 87). Research demonstrates that early comprehensive and intensive intervention is beneficial for young learners, their families and society (Lerner & Johns, 2009:247-248; Fleisch, 2008:30; Rademeyer, 2007:2; Dunn, 2004; Van Hamburg & Swanepoel, 1987:86-87).

Pre-school education aims to (Paour & Cèbe, 1999:278):

- lay down the early foundation of later learning; and
- commit all learners to commence their school career with equal chances of success.

It is therefore imperative to prepare learners in South Africa to participate and function confidently in the context of a rapidly changing world (Bolani, Pissarra, Hendricks, Swanepoel & Opie-Jacobs, 2007:v). The aim of the South African Education Curriculum is to build a prosperous, democratic and internationally competitive country where creative and critical citizens can lead a purposeful life in a safe and prejudice-free environment (Department of Education, 2002:1). By means of quality education, the curriculum seeks to create multi-skilled, lifelong learners to participate critically and actively in society (Department of Education, 2002:4). The South African National Department of Education has identified certain outcomes, which direct all teaching and learning in South Africa. These outcomes are divided into two categories, namely critical and developmental outcomes and learning outcomes. The critical outcomes, among others, require that learners should be able to (Williams & Samuels, 2001; Department of Education, 2002:4):

- solve problems and make decisions using critical and creative thinking;
- collect, analyse, organise and critically evaluate information; and
- practise contextual thinking.

These critical outcomes clearly indicate that cognitive development should have prominence in the South African education system.

Although South Africa follows an Outcomes-Based Education (OBE)[2] approach where teaching is interactive and learner-centred and the emphasis is on how learners can apply what they have learned in order to solve problems, learners still have the inability to think analytically, even at this elementary level (Bolani *et al.*, 2007:2-4). In spite of various efforts from educators to optimise cognitive

[2] I acknowledge the fact that as from January 2012 CAPS (Curriculum and Assessment Policy Statement) replaces the NCS (National Curriculum Statement) in the Foundation Phase. This study, however, was completed while the NCS was still functioning.

development, it is evident from recently executed research studies that cognitive development is not adequately optimised in Grade R-learners.

Research widely promotes early intervention as being beneficial for young learners based on the following arguments of Lerner (2006:223):

Early intervention:

- optimises intelligence;
- promotes substantial gains in all developmental areas, that is, physical, cognitive, language, psychosocial en self-help;
- inhibits or prevents secondary disabilities;
- reduces family stress;
- reduces dependency and institutionalisation;
- reduces the need for special education services at school age; and
- saves the nation and society substantial health care and education costs.

Cognitive development is indispensable in the process of obtaining knowledge and is essential for building a basis for future learning (Benjamin, 2006:1; Lerner, 2006:173; Tzuriel, 2001:49; Anon., 1998). To respond to the demands of modern technology and social change, one of the goals of schools' academic curricula is to assist learners in acquiring proficient learning processes in order to positively respond to instruction and applying (bridging or transferring) these learning processes to other areas of learning beyond the direct instruction they have received (Feuerstein & Falik, 2010:4; Tzuriel & Shamir, 2010:49). To acquire proficient learning processes, learners' cognitive development should and could be actively shaped and modified if *intentional intervention* by means of a *mediational* process occurs (*cf*. 3.2; 3.3) (Feuerstein & Falik, 2010:4; Tzuriel & Shamir, 2010:49; Robinson & Lomofsky, 2010:39; Benjamin, 2009; Falik, 2006; Falik, 2001; Tzuriel, 2001:50; Vygotsky, 1986:13; Feuerstein, 1980:22; Piaget, 1972:54).

The absence of mastering basic literacy, numeracy and life skills as indicated in recent research studies (*cf*. 1.1) provides some indication that intentional efforts should be undertaken to enhance the thinking skills of South African learners. This could lead to a national skills proficiency crisis, which could continue if action to address its root causes is not taken in the crucial phase for

schooling, namely the Foundation Phase (Grade R – Grade 3). Since brain cells grow rapidly during the Early Childhood Development period (0 – 9 years), this phase seems to be apposite to address potential problems related to cognitive development (Lerner & Johns, 2009:247; Patterson, 2008:257; Fleisch, 2008:30; Rademeyer, 2007:2; Lerner, 2006:220-222; Dunn, 2004; Ebersöhn & Eloff, 2003:14; Slavin, 1997:72; Van Hamburg & Swanepoel, 1987:86,87).

Flowing from the introduction, I formulate the problem on which this study focused.

1.2 PROBLEM STATEMENT

Despite continuous efforts by educators to optimise cognitive development among learners, recently executed research studies indicate that cognitive skills have not been adequately optimised in South African schools. It is of particular importance to optimise cognitive development in the pre-school years as this could prevent future failure during learners' school careers, as effective cognitive development is essential for building a basis for future learning. In the absence of research studies that document the effectiveness of mediated learning in optimising cognitive development of Grade R-learners in South Africa, this study demonstrates how cognitive development can be optimised among Grade R-learners when curriculum-based instruction is based on the principles of mediation. Since this study focused on a geographically bound group, investigated a deficiency and tested a programme with a particular language group, the study was a bounded pilot study.

Emanating from the problem statement, the purpose of the study is clarified in the next section.

1.3 PURPOSE STATEMENT

In an attempt to establish the cognitive development [3] of Grade R-learners and to determine the effect of a curriculum-based intervention programme, the ***Cognitive Enhancement Programme for Pre-schoolers*** (***CEPP***) (*cf*.

[3] In the context of the study the cognitive developmental level was conceptualized as the effectiveness and efficiency with which learners applied cognitive and meta-cognitive skills and strategies and cognitive functions and non-intellective factors (*cf*. 1.5).

Appendix 5; CD Section 1) based on the principles of mediation on their cognitive development, a *concurrent embedded mixed methods research design* (*cf*. 4.3; 4.3.4) (Creswell, 2009:210) was employed with Afrikaans-speaking Grade R-learners from the Fezile Dabi District of the Free State Department of Education.

The intent of this concurrent mixed method study was to firstly, determine the cognitive developmental level of the Grade R-learners, and secondly to establish whether the ***CEPP*** intervention programme could optimise the cognitive development of the learners. For this purpose I utilised the *Children's Inferential Thinking Modifiability* (CITM) (*cf*. 4.3.5.1) test to measure Grade R-learners' cognitive development level (application of cognitive and meta-cognitive skills and strategies) before and after the intervention.

At the same time, *observations* according to pre-determined categories were made during the administering of the CITM and the implementation of the intervention with Grade R-learners to optimise their cognitive development. The rationale being to obtain a deeper and holistic understanding of the nature and quality of the learners' cognitive development in terms of the application of cognitive functions and non-intellective factors.

The motive behind combining both quantitative and qualitative data was to combine *quantitative* trends and *qualitative* detail (Creswell, 2009:203; Creswell, 2008b:45; Tashakkori & Teddlie, 2008:22; Ivankova, Creswell & Plano Clark, 2007:260; McMillan & Schumacher, 2006:23; Creswell, Plano Clark, Gutmann & Hanson, 2003:209; De Vos, 2002c:363; Mouton, 1996:39).

This study will have significance for all educators of Grader R-learners as well as trainers of Grade R-educators, as educators and trainers are provided with a curriculum-based instrument (***CEPP***) that serves as a guideline according to which cognitive development in Grade R can be optimised.

1.4 RESEARCH QUESTIONS

My study was guided by the following two primary questions, which ultimately became the aim and objectives of the study (*cf*. 4.2):

1.4.1 Primary questions

Firstly, to what extent are Grade R-learners' cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors that play a role in cognitive development, developed, and secondly, if the cognitive development appears to be problematic, how can an intervention programme based on the *principles of mediation* be designed and implemented to optimise the cognitive development of these learners?

Within these two central questions, the following secondary questions unfolded:

1.4.2 Secondary research questions

- Which cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors need to be developed to optimise the cognitive development of Grade R-learners?
- What benefits does a mediational approach hold for optimising the cognitive development of Grade R-learners?
- To what extent are the Grade R-learners' cognitive and meta-cognitive skills and strategies developed?
- What is the nature and quality of the cognitive functions and non-intellective factors that play a role in cognitive development of the Grade R-learners?
- How can an intervention programme based on the principles of mediation be developed and implemented to optimise the cognitive development of Grade R-learners?
- To what extent and how can an intervention programme based on the principles of mediation optimise the cognitive development of Grade R-learners?

In the following section, the conceptual and theoretical frameworks that underpinned my research are explained.

1.5 CONCEPTUAL FRAMEWORK

A thorough literature review revealed the gap in current research regarding the optimising of cognitive development among Grade R-learners in South Africa,

which merited my research. I utilised both primary and secondary sources and consulted recently published articles, appropriate books and journals, as well as literature from the EBSCO host, Eric, Sabinet, NEXUS databases and Internet. The key words that assisted me in my search for information and how they were conceptualized in the context of the research are briefly defined below to set the scene:

Cognitive development

Cognitive development is defined as change of mental, thinking and reasoning ability patterns, such as learning, attention, memory, language, thinking, reasoning and creativity (Donald, Lazarus & Lolwana, 2010:58; Eggen & Kauchak, 2010:30; Benjamin, 2009; De Witt, 2009:55-56; Lerner & Johns, 2009:164; Papalia, Wendkos-Olds & Duskin-Feldman, 2008:10; Brewer, 2007:29; Feuerstein, Feuerstein & Falik, 2007:23-24; Donald, Lazarus & Lolwana, 2006:20; Gallagher, 2005:13; Van Staden, 2005:50; Tzuriel, 2001:50-55; Bandura, 1986:485).

Cognitive development involves the development of cognitive and meta-cognitive skills and strategies (*cf.* 2.2) (Donald *et al*., 2010:218; Loubser, 2010:49; Brewer, 2007:29; Donald *et al*., 2006:26; Wegerif, 2006; Bjorklund, 2005:3; Louw, Van Ede & Louw, 2004:10; Sangwan & Chhikara, 2003:75).

Cognitive skills involve the application of skills for categorisation, classification, comparison and inferential thinking (Brewer, 2007:29; Nieman & Pienaar, 2006:78-79). **Cognitive strategies** are procedures that learners use to perform academic tasks. Cognitive strategies involve higher order thinking skills regarding problem-solving, decision-making and conceptualising of information (Epstein, 2008:40; Lerner, 2006:103, 188; Rivken, 2002:37; Paour & Cebe, 1999:281).

Meta-cognition involves an individual's awareness of and control over his cognitive processes (Donald *et al*., 2010:82; Eggen & Kauchak, 2010:217; De Witt, 2009:14,55; Lerner & Johns, 2009:172-175; Papalia *et al*., 2008:365-366;

Meltzer, Pollica & Barzillai, 2007:165; Feuerstein *et al*., 2007:23; Robson, 2006:70, 80-83; Bjorklund, 2005:167; Kuhn & Dean, 2004:268; Kozulin, Gindis, Ageyev & Miller, 2003:3).

Cognitive development also involves the application of **cognitive functions** in the Input, Elaboration and Output phases of the learning process (*cf.* 2.4) (Feuerstein *et al.,* 2010:71-82). These functions describe the way in which learners perceive sensory information, transform the information, store, retrieve and use the information in order to successfully complete tasks.

Non-intellective factors such as *inter alia* motivation, confidence, attentiveness and fear of failure are intrinsically related to cognitive change and development (*cf.* 2.7.5) (Tzuriel, 2001:72).

The conceptualization of cognitive development in the context of the study thus referred to optimising the application of cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors during learning and problem-solving.

Mediated Learning Experience

The theory of Mediated Learning guided the design and implementation of the ***CEPP*** intervention (*cf*. 3.6.1.3)

Mediated Learning Experience (MLE) refers to an interactional process in which the mediator (competent, skilled adult, educator, facilitator or even a peer) intervenes between the learner and a set of stimuli in order to unlock meaning to the learner and model the application of cognitive skills (Feuerstein *et al*., 2010:25; Tzuriel & Shamir, 2010:49; De Witt, 2009:55; Anon. 2008a; Fraser, 2006:12; Lerner, 2006:92; Benjamin, 2005:50; Deutsch, 2003:3; Donald, Lazarus & Lolwana, 2002:71;104;375; Lidz, 2003:63; Tzuriel, 2001:23-25; Tzuriel, 2000:392; Kozulin & Presseisen, 1995:69-70; Haywood, 1994:27,33; Feuerstein & Feuerstein, 1991:1). Dependability on a mediator

can be measured on a nine point scale which provides an indication of the nature and extent of mediation required by a learner. Levels 1-3 indicates high degrees of mediation, levels 4-6 moderate levels of mediation and levels 7-9 low degrees of mediation (Feuerstein, Feuerstein, Falik & Rand, 2002:531).

In the context of the study, evidence for the optimising of the cognitive development of the learners was *inter alia* interpreted in terms of the following: improved test results in applying cognitive and meta-cognitive skills and strategies effectively, a decrease in the required levels of mediation in order to apply cognitive functions more autonomously, and improving the nature and quality of the non-intellective factors that play a role during learning.

Dynamic Assessment

Dynamic Assessment involves an active test-teach-test approach concerning a learner's thinking, perception, learning and problem-solving. The process aims to determine the cognitive modifiability of the learner (Snow & Van Heme, 2008: 425; Falik, 2006; Lerner, 2006:72; Lidz & Gindis, 2003:100-101; Benjamin & Lomofsky, 2002:102-103; Tzuriel, 2001:6, 47-48).

Children's Inferential Thinking Modifiability Test (CITM)

The CITM is a strategy based dynamic assessment procedure that attempts to determine how much learners have benefited from a mediational teaching approach (Snow & Van Heme, 2008:425; Falik, 2006; Lerner, 2006:72; Lidz & Gindis, 2003:100-101; Benjamin & Lomofsky, 2002:102-103; Tzuriel, 2001:6, 47-48; Pena *et al*., 2001:2).

In the following section, I briefly elaborate on the theoretical framework that underpinned the study. The theoretical framework is explained in detail in section 2.6.

1.6 THEORETICAL FRAMEWORK

A cognitive constructivist theoretical framework guided this study (*cf*. 2.6).

In order to answer the research questions, I had to identify a suitable research paradigm (*cf*. 4.3.2) that would direct the choice of a research design (*cf*. 4.3.3), research strategy *(cf*. 4.3.4), research participants, methods for collecting data (*cf.* 4.3.5) and statistical procedures to analyse the data (*cf*. 4.3.8).

In the following sections, brief explanations of what each entailed are provided. Chapter Four provides comprehensive information regarding each aspect (*cf*. 4.3).

1.7 RESEARCH PARADIGM

For the purpose of my study where I systematically collected, analysed and interpreted the data to better understand the cognitive development of Grade R-learners, I found the *pragmatic paradigm* (world view) the most appropriate for my study, since I believe that working with human beings involves certain actions, situations and consequences, and that human beings should be understood from an objective and subjective stance. The pragmatic framework focuses on the research question and the employment of different methods to answer the research question (Creswell, 2009:10).

As the purpose of this study was to optimise the cognitive development of Grade R-learners and to gain a deeper understanding of how the ***CEPP*** enhanced their cognitive development, it was clear that I had to utilise quantitative and qualitative methods to collect data. I considered pragmatism to be the best framework to guide the collection and analysis of data with regard to the cognitive development of Grade R-learners, as pragmatism regards quantitative and qualitative methods as compatible, so that both numerical and text data can be collected and analysed to answer and understand a general research problem (Theron & Grosser, 2010; Creswell, 2009:10;18; Morgan, 2008:32, 57-58; Ivankova *et al*., 2007:263; Tashakkori & Teddlie, 2003:45).

Bearing the pragmatic framework in mind, I made use of a combined *quantitative* and *qualitative* research design to answer the research question.

1.8 RESEARCH DESIGN

For this study I chose a *concurrent embedded mixed methods design* in conducting the research (Grosser & Theron, 2010; Creswell, 2009:14; Creswell, 2008a; Idler, Hudson & Leventhal, 2008:391-392). This type of approach is employed when intervention is conducted and quantitative data is collected and supported by qualitative data before, during and after an intervention (Creswell, 2009:203; Creswell, 2008b:45; Tashakkori & Teddlie, 2008:22; Ivankova *et al.,* 2007:260, 267; McMillan & Schumacher, 2006:23; Leedy & Ormrod, 2005:95; Creswell *et al*., 2003:209).

Since I wanted to determine the extent to which the **cognitive and meta-cognitive skills and strategies** of the learners was developed and could be optimised quantitative data was collected during the administering of the CITM pre-test and post-test. I also wanted to gain a deeper understanding of the cognitive development of the learners, and therefore, qualitative data related to the application of **cognitive functions and non-intellective factors** were collected during the administering of the CITM test and the ***CEPP*** intervention phase by means of observations, in order to support and strengthen the results obtained with the quantitative data.

The embedded approach utilises a primary design that guides the project and a secondary database that takes a supportive role in the procedure. The quantitative data, which focused on the learners' application of cognitive and meta-cognitive skills during the test activities, addressed the effect of the intervention and the qualitative data explored the nature and the quality of the application of the cognitive functions and non-intellective factors that play an important role in cognitive development before and after the intervention (Creswell, 2009:214).

1.8.1 Quantitative research design

Quantitative research was chosen for this study, because I wanted to obtain numerical data related to the cognitive development of the learners. I also intended to select precise measurement and analysis to confirm the theory of mediation, namely that learners' cognitive development can be optimised and to determine a cause and effect relationship (the effect of the ***CEPP***

intervention on cognitive development) (Creswell, 2009:4; Creswell, 2008b:46; Morgan, 2008:30; Ivankova *et al*., 2007:254; Maree & Pietersen, 2007:145; McMillan & Schumacher, 2006:23; Fouche & Delport, 2002:79). I also chose a quantitative research design as I tested hypotheses that provided tentative solutions to the research problem (*cf.* 1.13).

1.8.2 Qualitative research design

Qualitative research was also chosen for this study, since I strived at gaining greater insight into and understanding of the nature and quality of the cognitive development of Grade R-learners in a particular setting (Ivankova *et al*., 2007:257; Nieuwenhuis, 2007b:76; McMillan & Schumacher, 2006:26,317; Henning, Van Rensburg & Smit, 2005:3; Fouchè, 2002:275-276).

1.9 RESEARCH STRATEGY

1.9.1 Quantitative research strategy

The quantitative strategy (*quasi-experimental research*) and qualitative strategy (*observation study*) were executed simultaneously (*cf*. 4.3.4.1; 4.3.4.2; Figure 4.4).

As random selection of the research participants was not possible in the context of this research where I worked with intact, already established groups of subjects, a quasi-experimental design was chosen to perform the quantitative research (Grosser & Theron, 2010; Creswell, 2009:158-159; Creswell, 2008b:313; McMillan & Schumacher, 2006:273). Quasi experimental research does not control for the influence of all variables on the research results, and therefore alternative explanations for research results cannot be excluded (McMillan & Schumacher, 2006:227). A *multiple baseline design* was chosen (Leedy & Ormrod, 2005:229). This design requires at least two groups of participants who are exposed to baseline assessment, then subjected on rotation basis to an intervention, and their progress tracked and assessed over time (Leedy & Ormrod, 2005:227). Ethical issues discouraged me from using an untreated control group in the context of the research (Leedy & Ormord, 2005:229). In my study, the CITM test was administered prior to the intervention to both experimental groups that took part in the study, and thereafter intervention was introduced at a different time for each group.

All types of experimental research involve some form of intervention (Welman, Kruger & Mitchell, 2005:78). As part of the quantitative study, I also conducted intervention research (*cf*. 4.3.4.1; 6.2; Figure 6.1). The main aim of intervention research is to implement an intervention with people who experience a specific problem (De Vos, 2002b:413). For the purpose of this study, the ***CEPP***, a curriculum-based intervention programme based on the principles of mediation, was implemented to optimise cognitive development among Grade R-learners (*cf.* Appendix 5; CD Section 1). As the intended study aimed to pilot the intervention programme, I focused on phases *one* (Problem analysis and project planning), *two* (Information gathering and synthesis)*, three* (Design) *and four* (Early development and pilot testing) of the intervention process. How these phases were addressed in the study are highlighted in Chapter 6 (*cf.* 6.2; Figure 6.1).

1.9.2 Qualitative research strategy

1.9.2.1 Observation study

In my study, I preferred to perform my observations in the role of participant as observer (Merriam, 2009:119) over an extended period of 12 one hour sessions, since I believed this would provide me with an adequate amount of data. I considered a structured running record for the co-observer and an anecdotal record strategy for me to be the best observation mechanisms since, according to Cohen, Manion & Morrison (2007:397-398), a pre-determined and structured observation schedule is more efficient if the observation entails the recording of the *incidence*, *presence* and *frequency* of elements which compare one situation with another (*cf*. 4.3.4.2). In my study, I was not concerned with frequency but rather with the nature and quality of the application of the cognitive functions and non-intellective factors that play a role in the cognitive development of the learners. My observations took place in a classroom setting where the execution of activities required a structured approach (*cf*. 4.3.5) (Cohen *et al*., 2007:408; Nieuwenhuis, 2007b:85; McMillan & Schumacher, 2006:207).

1.10 DATA COLLECTION METHODS

Both quantitative and qualitative data were collected by means of pre-tests, post-tests, delayed post-tests and observations, respectively. In the following two sections I briefly discuss the quantitative and qualitative data collection methods separately and elaborate on the use of both in Chapter Four (*cf.* 4.3.5).

1.10.1 Quantitative data collection methods

For the purpose of this study a dynamic assessment test (*cf.* 4.3.5.1), The Children's Inferential Modifiability Test (CITM) (Tzuriel, 1990:2-11) was utilised as a pre-test, post-test and delayed post-test on a rotational basis with two experimental groups, A and B. The aim of the test was to determine the application of cognitive and meta-cognitive skills and strategies (*cf.* Table 2.1) in the completion of the test activities.

1.10.2 Qualitative data collection methods

In order for the researcher to gain a deeper insight into and understanding of the cognitive development of Grade R-learners, the co-observer and I systematically observed and recorded the application of the participants' cognitive functions (*cf.* 2.4) as well as the non-intellective factors that play a role in cognitive development (*cf.* 2.7.5, Appendix 7). The observations were done during the pre-teaching, pre-test, implementation of the ***CEPP*** intervention, the post-test and delayed post-test phases of the research process (*cf*. 4.3.5.2) (Nieuwenhuis, 2007b:84-86). It was important to determine whether problems were manifested in the way in which the participants approached tasks.

According to Feuerstein *et al.* (2010:505), it is necessary to conduct qualitative observations in the context of research that focuses on cognitive development in order to provide information on the cognitive development process as it is emerging and how it orients behaviour in different directions from the present cause of functioning.

In this embedded design, the qualitative data provided a supportive, secondary role in a study based primarily on the quantitative data. The mixing, timing and

weighing of the quantitative and qualitative data occurred during the research process as encapsulated in Figure 4.1 (*cf*. Figure 4.1) (Creswell, 2009:207-208).

In order to increase the reliability of the study, the progress reported in the numerical data for the application of the cognitive and meta-cognitive skills and strategies (*cf.* Table 2.1) could be strengthened by the qualitative observations which tracked the progression and improvement of the participants in the application of cognitive functions (*cf.* 2.4) and non-intellective factors (*cf.* 2.7.5) when handling cognitive tasks.

1.11 SAMPLING AND PARTICIPANT SELECTION

1.11.1 Quantitative sampling

Two sampling methods can be utilised in a quantitative study, namely **probability** sampling methods and **non-probability** sampling methods (*cf*. 4.3.6.1). In my study I utilised non-probability sampling methods (*cf*. 4.3.6.1).

I utilised a **convenient** and **purposive sample** (*cf*. 4.3.6.1) (Grosser & Theron, 2010; Maree & Pietersen, 2007:178), because I made use of people who were willing and readily available to take part in the research, and purposively assigned participants to one of the experimental groups based on their pre-test performance.

The population for my study comprised all Grade R-learners in South Africa, and as it was not possible to do research with all these learners, the study population only included Grade R-learners in the Fezile Dabi District of the Free State Department of Education. Due to time and logistical constraints, as well as the intensive nature of the intervention programme, one Grade R class (n=20) from a primary school in Sasolburg who was willing to take part in the research was conveniently chosen and approached to take part in the study. All twenty learners wrote the pre-test, and based on the pre-test results, the sample was identified from the group of twenty learners. The sample comprised ten learners who were purposively selected and then randomly assigned to an experimental group A (n = 5) or B (n = 5) based on their pre-test results (*cf.* 4.3.6.1). The sample was heterogeneous regarding gender and

homogeneous regarding test performance, culture (white and Afrikaans speaking) and age (born in 2004 = 5 years old).

Because two participants had to work together in a group during the implementation of the intervention, I purposively selected learners who had more or less the same achievement level based on the first pre-test to form groups. I hoped that this type of grouping would avoid them hampering each other's performance during the implementation of the intervention (*cf*. 4.3.6.1).

The selection was made as follows: four learners who obtained the highest pre-test scores, four learners who obtained average pre-test scores and two learners who obtained the lowest pre-test scores. The selection of participants is discussed in detail in Chapter Four (*cf*. 4.3.6.1).

In each of the aforementioned performance groups two learners were randomly allocated to an Experimental A (n=2) and an Experimental B group (n=2), except for the learners who obtained the lowest pre-test scores. In this group only one learner was allocated to an Experimental A (n=1) and an Experimental B group (n=1) respectively. The reason for this selection was that the two learners who obtained the lowest pre-test scores appeared to need more intensive mediation than the other learners did. The Experimental A group and Experimental B group on rotational basis received the ***CEPP*** intervention in pairs. A main purpose of implementing the intervention with two groups was to enhance the validity of the findings obtained for the effect of the intervention.

1.11.2 Qualitative participant selection

The ten learners who were purposively selected for the implementation of the intervention were also the participants who were observed as part of the qualitative study (*cf*. 4.3.6.2).

The sample size was small and culturally and geographically bound. This is in line with the view of Mouton (2009), who indicates that intervention research with a group that is small and geographically bound, provides the possibility to obtain more reliable results regarding the effectiveness of an intervention.

1.12 VARIABLES

I acknowledge that a variety of intervening variables, such as motivation, culture, language, interest and ability (*cf.* 2.7) can have an impact on the development of thinking skills among Grade R-learners. However, for the purpose of this study the focus was on the impact of the ***CEPP*** (intervention programme). Due to the small sample, it was not possible to employ statistical procedures to establish the impact of other variables on the cognitive development of the learners. Furthermore, it was also not the purpose of the study to determine the impact of these variables on the cognitive development of the learners.

The **dependant variable** in this study was identified as **cognitive development,** while the **independent variable** was the ***CEPP*** intervention (De Vos, 2002a:33; Maree & Pietersen, 2007:147).

1.13 HYPOTHESES

Although a quasi-experimental design was utilised and no final claims could be made as to impact, only **tentative hypotheses** were formulated that should be followed up with more controlled studies (Leedy & Ormrod, 2005:223). The following tentative null and alternative hypotheses were formulated for this study:

$\mathbf{H_o}$ = A cognitive intervention programme based on mediation will have no statistical significant impact on the cognitive development of Grade R-learners.

$\mathbf{H_a^1}$ = A cognitive intervention programme based on the principles of mediation will have a statistical significant impact on the cognitive development of Grade R-learners.

$\mathbf{H_a^2}$ = A cognitive intervention programme based on the principles of mediation will have an influence on the cognitive development of Grade R-learners.

1.14 THE ROLE OF THE RESEARCHER

As this research had a qualitative component, I had to consider how my role as researcher could maybe compromise the collection of data. The aspects related to myself being an instrument in data collection are highlighted in Chapter Four (*cf*. 4.3.7).

1.15 DATA ANALYSIS AND INTERPRETATION

1.15.1 Quantitative data analysis

I made use of descriptive statistics as well as non-parametrical inferential statistics (*cf.* 4.3.8.1) (Ivankova *et al*., 2007:256; Pietersen & Maree, 2007a:198). I utilised the data obtained from the CITM test to calculate frequencies, percentages, means, standard deviations and medians for the various test measurements (Babbie & Mouton, 2001:459; Jansen, 2007:19). In this study where a small sample was utilised (less than 30), it could not be assumed that the sampling distribution was normal, therefore **non-parametric statistical** procedures were applied (*cf*. 4.3.8.1) (Pietersen & Maree, 2007b:233, McMillan & Schumacher, 2006:308).

The Mann-Whitney U test (*cf*. Table 5.2), which is the non-parametric equivalent of the t-test (parametric), was used to compare the pre-test, post-test and delayed post-test results of the two independent groups (Experimental group A and B) of participants (Pietersen & Maree, 2007b:233; Swanepoel, Swanepoel, Van Graan, Allison, Weideman & Santana, 2006:62; Steyn, Smit, Du Toit & Strasheim, 2003:135).

The Wilcoxon signed-rank test (*cf*. Table 5.3; Table 5.4), which is another non-parametric test similar to the t-test (parametric), was utilised to compare the differences between the pre-test, post-test and delayed post-test results within each of the groups.

An independent statistician from North-West University together with a trained facilitator on the principles of dynamic assessment and mediated learning assisted in capturing, analysing and interpreting the data.

1.15.2 Qualitative data analysis

I made use of **deductive** as well as **inductive** content analyses to make meaning of the data obtained from the observations (*cf*. 4.3.8.2). The deductive data analysis was guided by predetermined categories found in the literature regarding cognitive functions in the Input, Elaboration and Output phases of the thinking process, as well as characteristics related to non-intellective factors (*cf.* 2.4; Appendix 7) (Feuerstein *et al*., 2007:18; Benjamin, 2009). An inductive data analysis was also utilised by looking for new meaning that

emanated from the data self (McMillan & Schumacher, 2006:364). The procedures employed for the qualitative data analysis are explained in detail in Chapter Four (*cf.* 4.3.8.2).

1.16 QUALITY CRITERIA

To produce valid and quality research, I adhered to the criteria to guarantee the reliability; validity and trustworthiness (dependability, transferability, confirmability, credibility) of my research as discussed in Chapter Four (*cf*. 4.3.9).

1.17 ETHICAL CONSIDERATIONS

I adhered to ethical issues in this study, because when human beings are the objects of a research study, data should never be acquired at the expense of participants (*cf*. 4.4) (Creswell, 2009:87-92; Strydom, 2002a:62). How I translated ethical principles into practice in the context of my study is explained in detail in Chapter Four (*cf*. 4.4).

1.18 CHAPTER SUMMARY

Chapter One provided a synopsis of the study by shortly introducing the purpose, motivation, literature search and methods utilised for conducting this research.

I highlighted the importance of cognitive development that should be developed and optimised as early as the Early Childhood Development period, which stretches from birth to nine years of age (*cf*. 1.1).

In 1.3 I stated the purpose of and the motivation for the study, namely to optimise the cognitive development of Grade R-learners from the Fezile Dabi District of the Free State Department of Education by implementing an intervention, the *Cognitive Enhancement Programme for Pre-schoolers* (***CEPP***) (*cf.* 1.3; 6.4; Appendix 5; CD Section 1).

I conducted the study from a pragmatic worldview (*cf*. 1.7) and utilised a concurrent mixed methods design (*cf.* 1.8) with combined quantitative and qualitative research designs simultaneously to collect and investigate information regarding the cognitive development of Grade R-learners (*cf.* 1.9). The rationale for using a concurrent mixed methods design was the fact that I

needed an in-depth understanding of the cognitive development of the Grade R-learners (*cf.* 1.9).

For the quantitative research, I chose quasi-experimental research, because it allowed me to collect numerical data systematically and objectively from a specific population (Grade R-learners). For this study, the multiple baseline design was chosen, because I did not select participants randomly, and worked with an already established group of participants. As part of the quantitative study, I also conducted intervention research (*cf*. 1.9.1), since I implemented the ***CEPP*** intervention after conducting the CITM pre-test and initial observations which highlighted specific problems that the participants experienced with the execution of cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors (*cf.* 5.2.2, 5.3). The focus was on the first four steps of intervention research, namely: problem analysis and project planning, information gathering and synthesis, design and early development and pilot testing.

For the qualitative research observations in the form of structured running records as well as anecdotal records (*cf.* 1.9.2) were chosen to assist me in gaining deeper insight and understanding of the nature and quality of the cognitive development among Grade R-learners in a particular setting. Observation records were compiled by a co-observer and myself during the pre-teaching, pre- and post- and delayed post-tests, as well as during the implementation of the ***CEPP*** (*cf*. 1.9.2.1*)*. The delayed post-tests served the purpose of a retention test to establish to what extent cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors that were optimised during the intervention, were retained in the absence of mediation.

Participant selection/sampling (*cf.* 1.11) comprised Grade R-learners in the Fezile Dabi District of the Free State Department of Education. From an initial group of twenty conveniently selected learners, I purposively selected a sample of ten Grade R learners (n=10), who I randomly assigned to Experimental Group A and Experimental Group B. The sample was heterogeneous regarding gender and homogeneous regarding culture (white and Afrikaans-speaking), cognitive performance and age. I purposefully chose

a small culturally and geographically bounded sample in order to enhance the reliability of the results regarding the effectiveness of the ***CEPP***.

The quantitative data analysis followed non-parametrical procedures by utilising descriptive and inferential statistics (*cf.* 1.15.1), while the qualitative data analysis followed an inductive and a deductive content analyses linked to pre-determined observation criteria (*cf.* 1.15.2).

Quality criteria (*cf.* 1.16) played an important role throughout the research in order to ensure reliability, validity (*cf.* 1.16.1) and trustworthiness (*cf.* 1.16.2), as well as compliance with ethical principles (*cf.* 1.17).

A detailed discussion on the cognitive development of the Grade R-learner and dynamic assessment are examined in Chapter Two.

"Intelligence is not a static structure,
but an open, dynamic system
that can continue to develop
throughout life...!"

~ Feuerstein ~