

CHAPTER 7

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

In Chapter Seven I reflect on the initial aim and objectives of the study to determine whether, and to what extent, the cognitive development of Grade R-learners was optimised and if not, what effect the subsequent **Cognitive Enhancement Programme for Pre-schoolers (CEPP)** had on the cognitive development of the participants (*cf.* 4.2).

The rationale behind this chapter is to give evidence that the literature study, the empirical study as well as the implementation of the **CEPP** intervention contributed to the solution of the research problem. The aim of the study was formulated as follows: firstly, to determine 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. Secondly, if the cognitive development appears to be problematic, the aim was to design and implement an intervention programme based on the principles of mediation to optimise the cognitive development of these learners (*cf.* 4.2).

Aspects that are addressed in Chapter Seven include the following:

- Overview of the study
- Findings from literature
- Findings from empirical investigation
- Findings regarding aims of the study
- Acceptance or rejection of hypothesis
- Recommendations
- Limitations of the study
- Proposal for further study

7.2 OVERVIEW OF THE STUDY

In the following sections, I present a synopsis of the previous chapters to emphasise the gist of each chapter.

7.2.1 Chapter One

In Chapter One I orientated the reader regarding the problem statement of the study, namely the fact that cognitive development is not adequately addressed in South African schools, especially at pre-school level (*cf.* 1.2). This study demonstrated how cognitive development could be optimised among pre-school learners when instruction is based on the principles of mediated learning (*cf.* 1.2).

7.2.2 Chapter Two

In Chapter Two I discussed one of the central concepts on which the study was based, namely cognitive development. I undertook an extended literature study to highlight the importance of the various facets of the Grade R-learner's cognitive functioning. I explored the role of the educator in optimising the cognitive development of Grade R-learners (*cf.* 2.3), and examined key aspects that play a role in the execution of cognitive activities at Grade R-level (*cf.* 2.3.1), namely symbolic thought, cause and effect, classification, categorisation, conservation, problem-solving, basic concepts, number concept, scientific concept, memory, self-reflection and language). A number of factors influencing cognitive development (*cf.* 2.7), were highlighted. Two factors were of particular interest for the study, namely the teaching practice of the educator (*cf.* 2.7.7) and non-intellective factors (*cf.* 2.7.5).

The literature review enabled me to conceptualize the cognitive development of the Grade R-learner as follows:

- The application of cognitive and meta-cognitive skills (*cf.* 2.2);
- The application of cognitive functions in the Input, Elaboration and Output phase of the mental act (*cf.* 2.4); and
- The application of non-intellective factors (emotional, attitudinal and motivational factors) that may affect the successful execution of learning tasks (*cf.* 2.7.5)

In 2.8 I determined the best way according to which cognitive development could be assessed, by scrutinizing the merits of static and dynamic assessment. I found dynamic assessment, which focuses on a test-teach-test approach suitable for establishing cognitive change.

Chapter Two also investigated cognitive development within various theoretical perspectives (*cf.* 2.6) such as behaviourism (*cf.* 2.6.1), cognitivism (*cf.* 2.6.2) and constructivism (*cf.* 2.6.3). Since the cognitive constructivist perspective enables individuals to construct their own sense of learning material by forming relationships among the ideas, I found this perspective suitable as framework for my intervention (*cf.* 2.6.3.2).

The infusion and holistic approaches to cognitive development were found appropriate for my study, because in these approaches individuals are offered the opportunity to organise their thoughts, and reflect on their thinking and performance in a stimulating learning environment (*cf.* 2.9).

7.2.3 Chapter Three

Based on the theoretical perspectives of the cognitive constructivist theory, I focused on the Mediated Learning Experience, which enunciates the intentional intervention by the mediator of learning (educator or parent) in the learner's learning and cognitive development (*cf.* 3.2).

I appraised the importance of mediation for cognitive development (*cf.* 3.3), as well as the forms of mediation including strategies for more independent learning, after which I discussed the mediation process. The roles and competencies of the mediator were also examined intensively (*cf.* 3.4).

A theoretical perspective was required for my intervention and I looked at the views of **Vygotsky**, **Nyborg**, and the **Neo-Piagetians** (*cf.* 3.5). Since the Feuerstein perspective provides the most comprehensive view of mediation, my study was based on the perspective of Feuerstein's "Principles of MLE". I reported his theory in detail, which centres on the belief of cognitive modifiability through mediation (*cf.* 3.6).

7.2.4 Chapter Four

Chapter Four focused on a detailed clarification and explanation of the empirical research employed in this study. The pragmatic worldview framed my empirical research (*cf.* 4.3.2). By means of a concurrent mixed methods design I investigated the cognitive development of Grade R-learners and whether it could be optimised (*cf.* 4.3.3). Over a period of twelve weeks I applied intervention research in a quasi-experimental research design with 10 conveniently and purposively selected Grade R-learners (*cf.* 4.3.3) in two experimental groups, A and B, to examine the effectiveness of the **CEPP** for optimising their cognitive development.

Quantitative data by means of the CITM test were collected during pre-, post- and delayed post-tests (*cf.* 4.3.5.1), and focused on the participants' application of cognitive and meta-cognitive skills and strategies. Qualitative data by means of observations (*cf.* 4.3.5.2) were collected during the pre-, post- and delayed post-tests, as well as during the implementation of the **CEPP** in relation to cognitive functions and non-intellective factors. The inclusion of qualitative data throughout the study was to gain a deeper understanding and insight into the nature and quality of the participants' cognitive development. The quantitative and qualitative data were combined to reach a conclusion.

7.2.5 Chapter Five

Chapter Five involved the analysis and interpretation of data collected from Grade R-learners who participated in this study. I analysed and interpreted participants' performance by combining numerical and observation data (*cf.* 5.4). The pre-test results and initial observations revealed problems related to the learners application of cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors (*cf.* 5.2; 5.3). Based on these initial results, the intervention programme was designed and implemented. After the implementation of the intervention, the CITM test-results indicated statistical significant improvement in the application of cognitive and meta-cognitive skills and strategies for both Experimental Group A and B (*cf.* 5.2). In addition to the post-test and delayed post-test results, the observations also

revealed improvement in the nature and quality of the application of cognitive functions and non-intellective factors (*cf.* 5.3). The overall test and observation results illustrated that cognition is modifiable and that the participants' cognitive development was optimised (*cf.* 5.5).

7.2.6 Chapter Six

In Chapter Six I introduced the curriculum-based **Cognitive Enhancement Programme for Pre-schoolers (CEPP)** based on Mediated Learning Experience (MLE) to optimise cognitive development, which I developed and implemented with the Grade R-learners who took part in the study. The programme included the following components: cognitive and meta-cognitive skills and strategies, cognitive functions, non-intellective factors, efficiency, and task demands (*cf.* 6.4.1). An exposition of the content of each weekly session as well as an evaluation after each session is included on the compact disk at the back of the thesis (*cf.* CD)

7.3 FINDINGS FROM THE LITERATURE REVIEW

The important findings that emanated from the literature review will centre on the two focus points of the study, namely the cognitive development of the Grade R learner, and mediated learning.

7.3.1 Cognitive development of the Grade R-learner

Literature widely highlights the importance of cognitive capacity to optimise learning (Benjamin, 2006:1; Lerner, 2006:173; Tzuriel, 2001:49) (*cf.* 1.1). Research demonstrates that early comprehensive and intensive intervention is to the benefit of young learners, since early intervention prevents and/or decreases failure in school (Lerner & Johns, 2009:247-248; Fleisch, 2008:30; Rademeyer, 2007:2) (*cf.* 1.1). Due to South-African learners' poor performance in national and international studies, tasks teams recommended that access to early childhood development should increase, and adequate school readiness programmes related to the National Curriculum Statement from the Department of Education should be implemented (Wes-Kaap Onderwysdepartement, 2006:2) (*cf.* 1.1).

Critical outcomes identified by the South African National Department of Education clearly indicate that the cultivation of cognitive capacity should have

prominence in the South African Education system (Department of Education, 2002:1, 4) (*cf.* 1.1). Cognitive education assists learners to obtain proficient learning and thinking processes that will enable them to transfer already learned strategies to other learning areas. Cognitive development can be modified if intentional intervention by means of a mediational process occurs (Feuerstein *et al.*, 2010:25; Benjamin, 2009; Tzuriel, 2001:50-55) (*cf.* 1.1). Cognition is a complex concept consisting of specific cognitive and meta-cognitive actions. It involves an individual's conscious and intentional attempts to solve problems, as well as the unconscious and non-intentional processes involved in daily routine tasks, that require the application of cognitive and meta-cognitive skills and strategies (Donald *et al.*, 2010:218; Epstein, 2008:40, Brewer, 2007:29; Lerner, 2006:103, Wegerif, 2006:2; Kozulin *et al.*, 2003:2) (*cf.* 2.2, 2.2.1, 2.2.2.1, 2.2.2.2, Figure 2.1).

When considering the execution of cognitive operations and functions among Grade R-learners, one should take into account aspects, such as cause and effect, symbolic thought, problem solving, reasoning, classification and categorisation, basic concepts; number concepts, scientific concepts, egocentric behaviour, memory and language (Papalia *et al.*, 2008:269-353) (*cf.* 2.3).

Literature advocates an interrelated application of cognitive and meta-cognitive skills (*cf.* Table 2.1) to improve the quality and effectiveness of the young learner's thinking and that teaching should not be separated from teaching content (*cf.* 2.7, 2.9.2, 2.9.3).

Cognitive actions take place in the Input Phase, the Elaboration Phase and the Output Phase of the mental act, and require the application of specific cognitive functions, which are important for cognitive development (*cf.* Feuerstein *et al.*, 2010:71-82) (*cf.* 2.4). In addition to the cognitive functions, non-intellective factors that involve emotional, attitudinal and motivational aspects are also regarded as important in the cognitive development of learners (Benjamin, 2009; Feuerstein *et al.*, 2007:23, 24; Tzuriel, 2001:50-55) (*cf.* 2.7.5).

Cognitive development is best assessed through a Dynamic Assessment approach (*cf.* 2.8) which involves a test-teach-test situation that focuses on observation and helping a learner to learn and use cognitive and meta-cognitive skills and strategies better (Moore *et al.*, 2006:210).

Educators' classroom instruction play an important role in cognitive development (*cf.* 2.7.7) (Lerner and Johns (2009:190). Transformative teaching and learning that focus on cognitive and constructivist principles (*cf.* 2.6.2, 2.6.3) will provide opportunities for active, interactive, discovery and social learning, which are beneficial to cognitive development (Mc Gonigal, 2005:1-4) (*cf.* 2.7.7)

Feuerstein's theory of Structural Cognitive Modifiability (*cf.* 2.6.2.4) demonstrates that learning and adaptability can be improved by producing structural changes in the brain by means of the Mediated Learning Experience and dynamic assessment where intervention with regard to learning and using strategies to better understand a task is emphasised (*cf.* 2.8.2) (Tzuriel, 2001:47; Feuerstein, 1980:22).

7.3.2 Mediated Learning Experience (MLE)

Feuerstein's theory of MLE (*cf.* 3.6) is characterised by the application of twelve principles, namely intentionality and reciprocity, transcendence, mediation of meaning, mediation of a feeling of competence, mediation of regulation and control of behaviour, mediation of sharing behaviour, mediation of individuation and psychological differentiation, mediation of goal-seeking, goal-setting and goal-achieving behaviour, mediation of challenge, mediation of an awareness of the human being as a changing entity, mediation of the search for an optimistic alternative and mediation of the feeling of belonging (Feuerstein *et al.*, 2010:40-46; Fraser, 2006:10; Lidz, 2003:45; Tzuriel, 2001:25-27) (*cf.* 3.6.2). Mediated learning is a teaching approach that focuses on intentional intervention, where an empathetic human being intervenes in the learning process by placing himself between the learner and the stimulus and between the learner and the response. A main purpose of the intervention is to purposefully equip learners with the cognitive tools

necessary for effective, meaningful learning (Feuerstein *et al.*, 2010:62) (*cf.* 3.6).

Learners within a MLE classroom experience a decrease in fear of failure, are more able to develop cognitive and meta-cognitive skills and strategies, search for alternative answers (divergent thinking) and work in a more systematic and planned manner (Feuerstein *et al.*, 2010:71; Feuerstein *et al.*, 2007:18; Lomofsky, 2007) (*cf.* 3.3).

Following is a short discussion of the findings that emanated from the empirical investigation.

7.4 FINDINGS FROM THE EMPIRICAL INVESTIGATION

The major findings that were derived from the study are reported in accordance with the two focus points of the study, namely optimising cognitive development and the effects of mediated learning.

7.4.1 Optimising the cognitive development of Grade R-learners

Bearing in mind a number of complexities involved in a study on cognitive development with young learners (*cf.* 7.7), as well as identified limitations during the completion of the study (*cf.* 7.9) I wish to report the following preliminary findings that should be followed up with more controlled research.

The pre-test results and the observations conducted during the pre-test for both Experimental Group A and Experimental Group B revealed that the participants' cognitive development needed attention, and was still emerging. Although emerging, problems related to the application of cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors were detected (*cf.* 5.2, 5.3). With my research, I wanted to determine whether the cognitive development of the participants could be optimised.

The results of pre-test 1 revealed that participants of both Experimental Group A and Experimental Group B were more or less on the same cognitive development level in terms of the application of cognitive and meta-cognitive skills and strategies (*cf.* Table 5.1). In general it emerged from the pre-test results that none of the ten participants demonstrated well-developed lower and higher order cognitive and meta-cognitive thinking skills and strategies

such as memory, perception and language, or higher order thinking skills such as concept formation, problem-solving, decision-making, reflection, reasoning and creativity required at Grade R-level (*cf.* 5.4) (Bolani *et al.*, 2007:11). The observation data gathered during the pre-test indicated that participants experienced problems with the application of cognitive functions, as they *inter alia* worked in an unorganised, non-strategic manner and struggled to explain their answers. Their memory ability was weak and they had trouble in linking knowledge to existing understanding (*cf.* 2.3) (Bolani *et al.*, 2007:11; Van Staden 2005:50-51; Paour & Cèbe, 1999:283). They found it difficult to make observations; connections (interpretation), associations, plan their work, communicating their discoveries, and reflecting on their discoveries (*cf.* 5.4). Furthermore, non-intellective factors such as, confidence, interest, attentiveness, intrinsic motivation and independence appeared to require change (Benjamin, 2009; Feuerstein *et al.*, 2007:23, 24) (*cf.* 5.3.4).

After the intervention, statistical significant differences were noted between the pre-test and post-test results for the application of cognitive and meta-cognitive skills and strategies (*cf.* 5.2). These differences indicated that cognitive development was optimised after the implementation of the intervention. In support of the test results, the observations conducted during the post-test also revealed improvement in the nature and quality of the cognitive functions and the non-intellective factors (*cf.* 5.3). The participants became more independent, autonomous and self-regulated in the application of their cognitive functions. A change in the distance between the learners' contribution and those of me as mediator was noticed as the study progressed. Many of the participants required lower levels of RMI (Feuerstein *et al.*, 2002:531) (*cf.* 6.4.3). Furthermore, it seemed as if they strived to be more precise and accurate in their working ways. It appeared that they internalised the skills, strategies and functions acquired through mediation, and that cognitive changes were constantly present. Regarding the non-intellective factors, it seems as if the participants' determination to complete and correct their own tasks increased, which could be regarded as a sign of intrinsic motivation emerging (*cf.* 5.3.4). Broadly seen, combining the

quantitative data analysis with the qualitative data analysis proved that the cognitive development of the participants was optimised.

The observations indicated a continuous progressive improvement of the application of cognitive functions as well as a change in the non-intellective factors within both Experimental Group A and Experimental Group B, which could have contributed, to the improvement noted in the test results (*cf.* 5.3, 5.4). Both groups' best results were evident in the delayed post-test, which indicated that retention of skills and strategies acquired through the intervention took place, and that both groups benefited from the **CEPP**. The potential of the **CEPP** to optimise the cognitive development of Grade R-learners was thus confirmed.

The learners showed progress despite the fact that their cognitive actions were sometimes not yet completely independent (Tzuriel, 2001:49) (*cf.* 2.8.2.1; 5.3). After the intervention, the learners appeared to be more involved and enthusiastic when confronted with learning tasks, and open to mediation (Feuerstein *et al.*, 2007:18; Lomofsky, 2007) (*cf.* 2.6.2.4). This finding supports the argument of Falik (2006) (*cf.* 2.6.2.4) that adaptability is a natural part of young learners' development and mental readiness, as skills are in their emerging and flexible states.

Regarding the cognitive functions that play a role in cognitive development the following improvements were observed (*cf.* 5.3): attention, focus and independence increased; steps were applied during problem-solving, the execution of tasks were sequenced, impulsivity decreased, more precise and accurate responses were provided, trial and error responses decreased and spontaneous correction of errors occurred (Mearig in Feuerstein, 2010:272-273; Feuerstein *et al.*, 2007:18) (*cf.* 2.4.1-2.4.3, 3.3).

The above-mentioned findings are also supported by findings in literature.

Reuven Feuerstein's theory of Structural Cognitive Modifiability and its applied systems reveal how the learning and adaptability of each individual may be considerably optimised and further developed by producing structural changes in the brain, making the learner more modifiable, more able to learn and benefit from direct exposure to the environment and new experiences

(Feuerstein *et al.*, 2010:98; Benjamin, 2009; Feuerstein *et al.*, 2007:23, 24; Tzuriel, 2001: 50 – 55; 72-73) (*cf.* 2.4; 3.5.4). This finding is tentatively supported by the improvement in test results after the implementation of the intervention for both Experimental Group A and Experimental Group B, which signifies that the learners' cognitive development was modifiable, and optimised.

National and international studies also support the belief that early intervention programmes and mediated teaching strategies will optimise cognitive thinking and development (Smith, 2009; Wilson, 2008; Swanson, 2006; McFarlane, 2006; Benjamin, 2005; Jeon, 2004; Pepler, 2004; Du Plessis, 2002; Hermanson, 1989; Wenderoff, 1998; Gunnels, 1992; Alfassi, 1990; Brito, 1987; Martelli, 1987; Cowan, 1987; Ceballos, 1986; Lewis, 1986; Carroll, 1984; Salvi, 1983; Morrison, 1982). (*cf.* 1.1). This belief appears to be confirmed by my study. The improvement of Grade R-learners' cognitive development after the implementation of the **CEPP** intervention corroborates arguments in literature that the cognitive development of learners can be optimised even as early as pre-school age (*cf.* 2.5).

The completion of learning activities during the implementation of the intervention indicated that the participants experienced problems with the following: the execution of lower and higher order thinking skills, identifying beginning, middle and end sounds, language development, cause and effect reasoning, number concept, scientific concepts, egocentric behaviour, problem-solving, meta-cognition, and conservation of objects were most problematic. Their symbolic thought, basic concepts, classification and categorisation skills were less problematic (*cf.* 5.5).

The learners who took part in the study might have experienced cultural deprivation due to a lack of MLE at home, and have therefore not yet acquired the cognitive tools to obtain maximum benefit from learning experiences (*cf.* 3.6.1.2) (Deutsch, 2003:30). Linked to the aforementioned, Tzuriel (2001:48) (*cf.* 2.8.2.1) argue that learners who are over-mediated, might become immune to mediation, which could have hold true for Participant 5 in the context of the study. This participant namely demonstrated extreme blocking behaviour towards mediation.

7.4.2 The effect of the CEPP intervention programme, based on the principles of mediation, on the cognitive development of Grade R-learners

From the observations, I observed that the participants' changed behaviour in terms of alertness, self-regulation and structured working ways, as well as changes related to attitude characterised by a more positive, active and organised outlook when approaching activities. These observations clearly point to the fact that the intervention based on mediated learning had a positive impact on their cognitive functioning and non-intellective factors (*cf.* 5.3). Changes regarding affective, emotional, attitudinal and motivational aspects that were addressed during the intervention appeared to have been retained and possibly affected the outcome of the test (*cf.* 6.4.1.3). The intervention programme contributed to changes regarding attention, persistence, concentration, independent functioning and self-regulation (*cf.* 6.4.1.4). In addition to this the intervention programme also contributed to participants being able to work from the familiar to greater complexity (*cf.* 6.4.1.2).

The observations regarding the nature and quality of the cognitive change revealed by the participants indicted a relative permanence in change, reduction of impulsivity, an openness to mediation, flexibility to change and application of acquired skills, functions and processes to wider contexts (Feuerstein *et al.*, 2002:526-527) (*cf.* 6.4.2). The participants' efficiency level improved in terms of rapid response, precision and energy put into tasks (*cf.* 6.4.1.4). These findings corroborate the findings in the literature, that mediated learning can play an important role in modifying the nature and quality of non-intellective factors that are intrinsically related to cognitive development (Benjamin, 2009; Feuerstein *et al.*, 2007:23, 24; Tzuriel, 2001:72) (*cf.* 2.7.5).

The observations conducted during the post-test also revealed changes related to the cognitive functions that are executed during the Input, Elaboration and Output phases of the mental act (*cf.* 2.4). After the implementation of the intervention, participants appeared to approach learning tasks in a more planned and systematic way, refrained from impulsive

behaviour, and demonstrated strategic behaviour for solving problems (*cf.* 2.4, 5.3). These findings support the arguments of Lerner (2006:188), Feuerstein *et al.* (2007:18) and Tzuriel (2001:28) (*cf.* 3.3) that mediated learning can improve deficient cognitive functions.

After the implementation of the intervention, the post-test results also indicated statistical significant improvement related to the application of cognitive and meta-cognitive skills and strategies (*cf.* 5.2).

Changes in the extent and nature of required mediation occurred (*cf.* 4.3.5.2). The participants developed from very passive learners who reacted on demands of the mediator at the onset of the study, to learners who spontaneously started reacting to tasks, internalising strategies, functions and rules and acted more autonomous, independent and self-regulated (Feuerstein *et al.*, 2002:530-540).

Following is a reflection on the attainment of the aim and objectives I formulated for the study.

7.5 FINDINGS REGARDING THE AIM AND OBJECTIVES OF THE STUDY

Firstly, the study aimed at determining 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. Secondly, if the cognitive development appeared to be problematic, the aim was to design and implement an intervention programme based on the principles of mediation to optimise the cognitive development of these learners. In order to achieve the aim, the following objectives guided the execution of the study.

7.5.1 Objective One

My first objective was to establish 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. This objective was achieved by means of a literature study.

The literature study identified the following cognitive and meta-cognitive skills and strategies as imperative for Grade R-learners (Donald *et al.*, 2010:218;

Epstein, 2008:40, Brewer, 2007:29; Lerner, 2006:103, Wegerif, 2006:2; Kozulin *et al.*, 2003:2) (*cf.* 2.2, 2.2.1, 2.2.2.1, 2.2.2.2, Figure 2.1).

- Paying attention, which includes concentration.
- Remembering, including storing and retrieving of information and memory.
- Interpreting, entailing inferential thinking.
- Classifying and categorising, such as considering different aspects of the data, rules of elimination, negation and searching for objects.
- Comparison where participants have to eliminate clues by simultaneously comparing, considering and negating options.
- Systematically analysing and synthesising information.
- Problem-solving of inferential problems.
- Evaluating (self-reflection) where participants have to cope with complex presentation of information.
- Inferring principles and deducing rules.
- Imagining possibilities by transferring strategies and rules.
- Generating strategies where participants eliminate and negate strategies and rules.
- Critical evaluation and reflection in order to improve general efficiency of performance.

The cognitive functions required for effective cognitive development involved the following actions linked to the Input, Elaboration and Output phases of the mental act, as identified by Feuerstein *et al.* (2010:71-82) and Benjamin (2009) (*cf.* 2.4). During the Input phase, learners need to gather information in a planned and systematic way and reveal strategic behaviour in solving problems. In the Elaboration Phase, learners should be able to identify a starting point when confronted with a learning task, compare various options for solving a problem and explain their solutions to problems. Finally, in the Output phase, learners should be able to communicate their final solutions of problems adequately.

The non-intellective factors that play a role in cognitive development were identified as openness to mediation, need for mastery, frustration tolerance,

confidence, intrinsic motivation and vitality and alertness (Benjamin, 2009; Feuerstein *et al.*, 2007:23-24) (*cf.* 2.7.5).

7.5.2 Objective Two

The second objective of the study was to evaluate the benefits of a mediational approach to teaching and learning for optimising the cognitive development of Grade R-learners.

I attained this objective by means of a literature review and an empirical study. The literature review (Feuerstein *et al.*, 2010:25-37; De Witt, 2009:55; Fraser, 2006:12; Lerner, 2006:92; Benjamin, 2005:50; Deutsch, 2003:31; Donald *et al.*, 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, 1991:11) signified the effectiveness of a mediational approach to improve the cognitive development of individuals (*cf.* 3.3).

The empirical research supported the above statement. From the test results, I concluded that the **CEPP** intervention contributed to optimising the application of cognitive and meta-cognitive skills and strategies of Grade R-learners, since both Experimental groups, A and B, demonstrated statistical significant improvement after the implementation of the **CEPP** intervention (*cf.* 5.2).

Observations made by the co-observer and myself indicated that the implementation of the **CEPP** intervention influenced the cognitive development of the Grade R-learners' positively. The observations pointed towards a continuous progressive improvement in the nature and quality of the application of cognitive functions and non-intellective factors among the Grade R-learners (*cf.* 5.3), which could be attributed to the **CEPP** intervention.

7.5.3 Objective Three

Objective Three set out to examine to what extent the cognitive and meta-cognitive skills and strategies of the Grade R-learners were developed. I achieved this objective by means of an empirical research, which included pre-, post- and delayed post-tests. The pre-test results for both Experimental Group A and Experimental Group B indicated that participants' application of

cognitive and meta-cognitive skills and strategies needed attention (*cf.* Table 2.1, *cf.* 5.2).

In my research I therefore focused on determining if the Grade R-learners' present emerging application of cognitive and meta-cognitive skills and strategies could be optimised.

7.5.4 Objective Four

The fourth objective of my study was to understand the nature and quality of the cognitive functions and non-intellective factors that play a role in the cognitive development of the Grade R-learners. I achieved this objective by means of the empirical research that focused on collecting data by means of observations.

The observation data that was gathered during the pre-test also revealed problems related to the development of cognitive functions in the Input, Elaboration and Output phases of the mental act, as well as that change was required regarding the non-intellective factors (*cf.* 5.3). The participants worked unorganised, did not plan their work and could not communicate their answers. Factors such as confidence, interest, alertness, motivation and self-regulation required attention (*cf.* 5.3.1- 5.3.4).

In my research I therefore focused on determining if the Grade R-learners' present application of emergent cognitive functions and non-intellective factors could be optimised.

7.5.5 Objective Five

The fifth objective of my study was to determine how an intervention programme based on the principles of mediation, could be developed and implemented to optimise the cognitive development of Grade R-learners. The thorough literature study regarding the theoretical principles of Grade R-learners' cognitive development enabled me to develop the **CEPP** programme strictly according to the guidelines in the literature which involved the incorporation of the following components: the 12 mediation principles (*cf.* 3.6), cognitive and meta-cognitive skills and strategies, cognitive functions, non-intellective factors, efficiency and task demands appropriate for Grade R-level (Arends, 2009:18; Papalia *et al.*, 2008:280; Bolani *et al.*, 2007:11; Van

Staden, 2005:51) (*cf.* 2.4; 2.7.5. 2.3) The design of the **CEPP** intervention is discussed in detail in Chapter Six.

7.5.6 Objective Six

Objective Six entailed to establish to what extent can an intervention programme based on the principles of mediation optimise the cognitive development of Grade R-learners. This objective was achieved by means of the empirical research, which comprised data collection by means of testing and observations.

After the implementation of the intervention, the post-test results indicated statistical significant improvement related to the application of cognitive and meta-cognitive skills and strategies (*cf.* 5.2).

From the observations, I observed that the participants' changed behaviour in terms of alertness, self-regulation and structured working ways, as well as changes related to attitude characterised by a more positive, active and organised outlook when approaching activities. These observations clearly point to the fact that the intervention based on mediated learning had a positive impact on their cognitive functioning and non-intellective factors (*cf.* 5.3). The observations conducted during the post-test also revealed changes related to the cognitive functions that are executed during the Input, Elaboration and Output phases of the mental act (*cf.* 2.4, 5.3.1-5.3.3). After the implementation of the intervention, participants appeared to approach learning tasks in a more planned and systematic way, refrained from impulsive behaviour, and demonstrated strategic behaviour for solving problems (*cf.* 2.4, 5.4).

As all the objectives set out with the study were addressed, I carefully concluded that the aim of the study was achieved.

With the commencement of the study, a few tentative hypotheses were formulated, because it was important to accept or reject the formulated hypotheses in order to indicate which tentative solutions held true for the study.

7.6 ACCEPTANCE OR REJECTION OF HYPOTHESIS

The following tentative null and alternative hypotheses were formulated for this study (*cf.* 1.12):

- **The null hypothesis**

H_0 = A cognitive intervention programme based on mediation will have no statistical significant impact on the cognitive development of Grade R-learners' cognitive capacity.

- **The alternative hypotheses are formulated as directive and non-directive**

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

H_a^2 = A cognitive intervention programme based on mediation will have an influence on the cognitive development of Grade R-learners.

The H_0 is rejected and H_a^1 and H_a^2 are accepted due to the following significant statistical significant differences in the pre-, post- and delayed post-test results after the implementation of the **CEPP** intervention within both Experimental Group A and Experimental Group B. The difference between post-test 1 and pre-test 1 for Experimental Group A, revealed a statistical significant difference in favour of the post-test ($p < 0.05 = 0.042$) after the implementation of the intervention. Similar results were noted for Experimental Group B. A statistical significant difference was noted between their post-test 2 results (after the intervention) and their pre-test 1 results ($p < 0.05 = 0.041$). Both sets of results indicate that the cognitive intervention programme had a statistical significant impact on the cognitive development of Grade R-learners and therefore the null hypothesis is rejected. The statistical significant impact noted leads me to **accept H_a^1** and conclude that the improvement was not attributed to chance, but to the impact of the **CEPP** intervention.

The above discussion indicates that a relationship between the **CEPP** intervention and cognitive capacity is evident; therefore, I tentatively **reject H₀** and **accept H_a¹ and H_a²** as valid hypotheses.

The latent potential of the **CEPP** intervention for optimising the cognitive capacity of Grade R-learners is thus supported in this study.

During the study I became aware of the complexities involved when conducting a study on cognitive development with young learners. How I dealt with the complexities are briefly elucidated below. I acknowledge that they could have posed limitations to the interpretations, which I made regarding the nature and quality of the learners' cognitive functions and non-intellective factors.

7.7 COMPLEXITIES INVOLVED IN THE COGNITIVE DEVELOPMENT OF YOUNG LEARNERS

Cognition is not directly observable and cannot be directly assessed, because we cannot see the process (Bjorklund, 2005:2). We can however **infer** what is happening in the minds of learners by assessing certain aspects of their behaviour. What can well be assessed are the cognitive and meta-cognitive skills and strategies that underlie performance, such as, among others, concentration, memory, inferential thinking, classification and categorisation, comparison, analysing and critical evaluation and reflection (Bjorklund, 2005:2-3). In my study, I utilised the Children's Inferential Thinking Modifiability Test (CITM) for this purpose (*cf.* 4.3.5.1) (Tzuriel, 2001:82; Tzuriel, 1990:2-11).

The **cognitive functions** and **non-intellective factors** that are difficult to assess, but can be **observed** are those functions and processes associated with the Input, Elaboration and Output Phases of the learning process, as well as the emotional, attitudinal and motivational factors that can impact on cognitive development. For this purpose, I employed observations in the context of the study.

There does not seem to be a sequence according to which thinking skills should be taught. I therefore kept in mind the context best suited for initial lessons and transfer examples, taking into account the order in which content

objectives are usually taught in the pre-school year, as well as the developmental phase of the learners (Eggen & Kauchak, 2010:278; Dewey & Bento, 2009:337; Brewer, 2007:4). In other words, I committed myself to developmentally appropriate practice (DAP) as supported and encouraged by the Department of Education (Eggen & Kauchak, 2010:219; Brewer, 2007:4; Wes-Kaap Onderwysdepartement, 2006:12).

Cognitive development is an uneven process, which does not occur in the same way for all children. Different children will develop to higher cognitive skills at different times and in different learning circumstances, and therefore require individual intervention if problems occur (*cf.* 2.7). Due to time constraints, it was not possible in the context of the study to track the influence of all variables on the individual learners' cognitive development. Therefore, the learners who took part in the study might require further differential approaches to optimise their cognitive development.

Learners' cognitive development may also be influenced by several different factors, which need to be identified in order to apply successful remediation or intervention (*cf.* 2.7). In the young child the development of personality, physiological and cognitive features reflected in learning skills and socialization develop hand in hand and with neuro-physiological structures (Feuerstein *et al.*, 2010:271-272). The influence of these factors complicates the assessment of a young learner's cognitive development, as well as the fact that their cognitive skills and functions are still in the process of development and difficult to define as deficient. Therefore, Feuerstein *et al.* (2010:271-272) (*cf.* 2.4.3) suggest that the following aspects need to be considered when assessing the cognitive development of the young learner:

- cognitive functions that are not yet developed;
- cognitive functions that are developed but not manifesting themselves in an observable way;
- cognitive functions are developed but some deficiency or adequacy exists;
- cognitive functions are developed but not practiced, therefore leading to them being fragile or not applied appropriately; and

- cognitive functions that appear in an inappropriate way on certain tasks but not on others. These aspects were considered as far as possible in the interpretation of the observation data. My interpretations were mainly based on the notion of the learners' cognitive functions being emergent, which leaves room for the functions to be practiced and applied in order to be optimised (*cf.* 2.4.3, 5.3).

7.8 RECOMMENDATIONS

In my recommendations I will focus on the central aspects addressed in this study for enhancing Grade R-learners' cognitive development by means of the **CEPP** intervention. I suggest that these recommendations apply to in-service as well as pre-service educators who will require training in order to address cognitive development at Grade R-level effectively. The Department of Education should play an instrumental role in emphasizing and supporting a cognitive focus in education.

7.8.1 Recommendations regarding cognitive development

This study emphasised the importance of optimising Grade R-learners' cognitive development by means of the principles of mediation, since effective cognitive development assists learners in acquiring competent learning processes (*cf.* 3.3, 3.6) (Feuerstein *et al.*, 2010:25; De Witt, 2009:55; Fraser, 2006:5; Benjamin, 2005:50; Deutch, 2003:37; Lidz, 2003:63; Tzuriel, 2001:24; Tzuriel, 2000:394; Kozulin & Presseisen, 1999:69-70; Feuerstein, 1980:22). This literature review indicated that ineffective cognitive development among Grade R-learners could lead to lifelong developmental and learning difficulties (*cf.* 1.1). The critical outcomes of the South African Education system indicated that the nurturing of cognitive capacity should have prominence in the curriculum (Department of Education (2002:1, 4) (*cf.* 2.2), and teachers should accept this challenge and structure their teaching practices in order to achieve this ideal.

Cognition is regarded as higher mental processes, which guide the acquiring, understanding and modifying of information (*cf.* 2.2.1). Although cognition cannot be directly assessed, the cognitive and meta-cognitive skills and strategies that initiate performance can be assessed (Bjorklund, 2005:2-3).

These processes or skills include, among others, memory, inferential thinking, classification, categorisation, comparison, problem-solving, analysing and reflection (*cf.* 2.2). Educators should therefore make cognitive thinking an integral part of instruction by purposefully planning activities to optimise the cognitive development of learners, and assess the effectiveness of the application of cognitive and meta-cognitive skills and strategies (Epstein, 2008:40; Brewer, 2007:29; Lerner, 2006:103) (*cf.* 2.2.2).

Student educators and in-service educators should be equipped with knowledge and skills to create and develop developmental appropriate learning environments and learning experiences to optimise cognitive development. In this regard, student educators should be made aware of the importance of cognitivist and constructivist principles for teaching and learning (Hughes, 2008:63; Lerner, 2006:104; Troutman & Lichtenberg, 2003:14, 15) (*cf.* 2.6.2, 2.6.3). Student educators should be able to provide learners with opportunities to be actively involved in their own learning (*cf.* 2.3).

Research worldwide, as well as my study, confirm that a lack of Mediated Learning Experience (MLE) causes problems related to the application of cognitive functions in the Input (*cf.* 2.4.1), Elaboration (*cf.* 2.4.2), and Output Phases (*cf.* 2.4.3) of the mental act (Feuerstein *et al.*, 2010:71-82; Feuerstein *et al.*, 2007:18; Benjamin, 2009). The cognitive actions are important for perceiving, transforming, reducing, elaborating, storing, retrieving and using information (*cf.* 2.4). Pre-service and in-service educators should be trained to realise that these functions also play an important role in cognitive development. Furthermore, they should become acquainted with knowledge and skills on how to improve these functions among learners.

The importance of changing negative emotions and attitudes during teaching and learning and cognitive development should also receive prominent attention (*cf.* 2.7.5). If these negative emotions and attitudes are not addressed, they may lead to dissatisfaction with oneself, feelings of frustration, low-self-concept, refusal to learn, resistance, fear of failure and withdrawal from learning, as was evidenced in this study (Benjamin, 2009; Feuerstein *et al.*, 2007:23, 24; Tzuriel, 2001:50-55) (*cf.* 2.7.4).

All educators should be made aware of the value of mediated learning for optimising cognitive development (Fraser, 2006:1, 6) (*cf.* 2.7.10). By acting as a mediator of learning, (*cf.* Figure 3.2), the educator not only starts to understand the needs of the learners, but also plans to accommodate learner differences, adapts teaching strategies, uses medium of instruction effectively and creates a warm learner-friendly environment (*cf.* 3.4). All of the aforementioned characteristics are important to optimise cognitive development (Fraser, 2006:2).

Educators should also be made sensitive to why some learners perform cognitively better than others do, as well as how to rectify cognitive problems or enhance and optimise fragile and emerging cognitive functions (*cf.* 2.7). Inherited as well as environmental factors affect an individual's performance. Factors that may impact on learners' cognitive capacity are cultural neglect and social environment (*cf.* 2.7.1), language (*cf.* 2.7.2), perception (*cf.* 2.7.3), genetic factors (*cf.* 2.7.4), non-intellective factors (*cf.* 2.7.5), parents and home (*cf.* 2.7.6), educator's classroom practices (*cf.* 2.7.7), educator training (*cf.* 2.7.8), lack of resources (*cf.* 2.7.9) and a lack of mediated learning (*cf.* 2.7.10) (Lerner, 2006:226). In order to optimise cognitive development educators should have a thorough background on these aspects in order to establish which of the factors pose barriers to the cognitive development of a learner in order to provide differentiated approaches to cognitive development of learners. Educators should examine their own classroom practice in terms of the opportunities provided for cognitive development (*cf.* 2.7.7), since classroom practice plays an important role in optimising cognitive development. They should receive training regarding ways according to which intellectual openness and transformative learning can be created (*cf.* 2.7.7).

The assessment of cognitive capacity also plays an important role and educators should be familiar with the difference between static assessment (*cf.* 2.8.1) and dynamic assessment (*cf.* 2.8.2). Educators should know that dynamic assessment focuses on providing mediated learning that is responsive to the young learner's needs (*cf.* 2.8.2). Dynamic assessment

empowers learners to correct errors spontaneously, which leads to a decrease in impulsivity and trial-and-error responses (*cf.* 3.2).

I recommend that higher educational institutions should incorporate the cognitive constructivist teaching-learning principles and the principles of MLE (*cf.* 2.6.2, 2.6.3, 3.2, 3.6) in their curriculum for educator training, not only in the Foundation Phase, but also in the Intermediate, Senior, and FET Phases, because these approaches promote cognitive development. Current pre-school training programmes are regarded as ineffective (De Witt, 2007:2; Williams & Samuels, 2001) (*cf.* 2.7.8). Therefore, the training of pre-service teachers to optimise cognitive development should become a national priority.

7.8.2 Recommendations regarding the *CEPP* intervention based on the principles of mediation

Due the increase of various challenges and transformation in schools during the past few years, young learners need to be provided with the necessary skills and support to reach their full potential by intentional efforts from competent adults (or peers) to help them organise and understand information in ways that are more effective.

Since MLE equips educators to lead learners to work systematically, understand problems, internalise efficient cognitive strategies, instil self-regulated behaviour and make use of meta-cognitive strategies, a mediational approach to teaching is vital to optimise learners' cognitive thinking skills (Fraer, 2006:9; Feuerstein & Feuerstein, 1991:3; Tzuriel, 2001:24) (*cf.* 3.2).

During the implementation of the *CEPP* intervention, I realised that participants and educators who took part in the study were not aware of mediational teaching as an approach to optimise cognitive development. It is therefore of the utmost importance to awaken educators to the advantages of a mediational approach as a teaching strategy. This approach will optimise learners' cognitive development throughout the entire curriculum. The Department of Education should provide educators with the theoretical background and practical applications of MLE during in-service-training sessions.

It is imperative for educators to create suitable learning experiences for optimising cognitive development by means of MLE (Feuerstein *et al.*, 2010:19, 20; Fraser, 2006:19) (*cf.* 3.4). Educators should be well prepared and learning experiences should be well structured in order for the learners to execute instructions and activities successfully. Since MLE teaches learners to communicate effectively, deal with conflict, solve problems and explore alternatives, it is important to monitor learners' progress and give them feedback (*cf.* 3.4). Active interaction between learners and their mediator should always exist.

Educators should also realise that learners could be deprived of MLE in their homes, and are therefore not adequately prepared to cope with tasks and to recognize mediation offered to them (Tzuriel, 2000:394) (*cf.* 2.8.2.3).

Although it is important to realise the advantages of MLE, educators should recognise that MLE is only one of many methods that can be used effectively as a teaching method in the classroom.

7.9 LIMITATIONS OF THE STUDY

All educational research has limitations. In this study, the period of the implementation of the **CEPP** could be regarded as a limitation. It is possible that other results could have been generated if the **CEPP** intervention was implemented over a longer period than the twelve weeks in my study.

The fact that I was more experienced with the presentation of the programme when conducting the **CEPP** with Experimental Group B, could have influenced the results. I could have been more aware of problems that occurred during the implementation of the intervention with Experimental Group A and avoided these during the implementation with Group B. This could have benefited Experimental Group B.

The CITM test could have posed a limitation to the research for learners whose preferred style of learning is verbal and not visual, especially during the test phase, where no mediation is provided, and the verbal interaction is absent.

I also acknowledge that aspects such as motivation, normal maturation, concentration, as well as the implementation of the **CEPP** in two separate

sessions, could have influenced the results. The intervention could have been more effective with individuals, as groups work can pose disadvantages to progress and achievement (*cf.* 4.3.6.1).

It was not possible to determine with certainty the extent to which the cognitive functions required for effective mental activity were developed among the participants at the onset of the study. As the learners were still very young, and based on my observations of the situation I was lead to believe that the cognitive and meta-cognitive skills, strategies, functions and non-intellective factors were not yet developed, but emergent as they did not manifest themselves in adequate and appropriate ways. Furthermore, intensive mediation was required in the context of the study, which points to the fact that the skills, strategies and functions might not have been well developed (Feuerstein *et al.*, 2010:272-273). I however acknowledge, that cognizance has to be taken of the fact that the cognitive skills could have been developed but did not manifest themselves in an observable way, or they were developed but due to a lack of practice appeared to be fragile and deficient (*cf.* 7.7).

A thorough examination of factors that can pose barriers that prevent learners from benefiting from mediation also needs to be conducted, which will allow for a differentiated approach to cognitive development. This was not done in the study. These factors refer *inter alia* to indirect, distant factors such as genetic factors, the environment of the learner, the socio economic status of the learner, learning preferences, language proficiency, motivation, emotional balance, cultural factors and maturation levels, as well as close and direct factors, which refer to opportunities for mediated learning impact on the extent to which learners benefit from a meditational approach.

The small geographically and culturally bound sample complicated the generalisation of the results. The research design is also only suitable for the formulation of tentative hypotheses. This study should be followed up with more controlled, true-experimental and extended studies and larger groups of participants to conclusively claim that the **CEPP** intervention can optimise cognitive capacity.

Presently, the intervention programme is only available in Afrikaans. Translation of the programme into other languages could make it accessible to educators and learners in wider contexts.

Being an initial pilot study, and bearing the limitations and complexities involved in a study on cognitive development with young learners in mind, the study still makes a valuable contribution to theory and practice as motivated below.

7.10 CONTRIBUTION OF THE THESIS

7.10.1 Contribution to theory

My study **confirms present theory** in the literature where it is argued that cognition is modifiable and that mediated learning proves to be an effective approach in optimising cognitive development at Grade R-level (Feuerstein *et al.*, 2010:71; Lomofsky, 2007; Tzuriel, 2001:29; Grosser, 1999:41) (*cf.* 3.3; *cf.* 5.2, *cf.* 5.3).

The results of my study also **extends current empirical research** on the effectiveness of mediation for enhancing cognitive development, by reporting the effectiveness of mediation with Grade R-learners which appears to be an under researched area (*cf.* 1.1). In addition to the aforementioned, my study indicated that retention of cognitive and meta-cognitive skills and strategies, cognitive functions and non-intellective factors is possible in the absence of mediation (*cf.* 5.2). This finding could point to the fact that once structural change regarding the aforementioned skills, strategies, functions and factors have been internalised through mediation, they apparently remain permanent.

I argue, that the qualitative improvement observed in the cognitive functions and non-intellective factors of the learners who took part in the research, contributed to their improvement in test results. In this regard, my research thus supports the findings in the literature review that deficient or fragile cognitive functions as well as non-intellective factors play an important role in cognitive development (Benjamin, 2009; Feuerstein *et al.*, 2010:71-82; Feuerstein *et al.*, 2007:23, 24; Tzuriel, 2001:50-55, 72-73) (*cf.* 2.4, 2.7.5).

Through the principles of mediation, my study indicated that it is possible to act upon cognitive and meta-cognitive skills and strategies, cognitive functions

and non-intellective factors and orient behaviour in a different direction and change the present way of functioning (Feuerstein *et al.*, 2010:71-82; Benjamin, 2009; Tzuriel, 2001:50-55) (*cf.* 2.4, 2.7.5, 5.2, 5.3).

Finally, the results derived from my study supports the findings in the literature, that mediated learning can enhance the autonomy of the learning in executing learning tasks (Feuerstein *et al.*, 2007:18; Lomofksy, 2007; Lerner, 2006:188; Tzuriel, 2001:24-28) (*cf.* 3.3). My study indicated that learners developed from being very dependent on me as the mediator, to learners who were more autonomous, confident and in charge of their own learning (*cf.* 5.3)

7.10.2 Contribution to practice

In the absence of curriculum-based intervention programmes based on the principles of mediated learning to optimise cognitive development in Grade R, the **CEPP** intervention programme places a valuable and usable tool in the hands of Grade R educators. The **CEPP** intervention programme could act as a guideline regarding how educators could go about structuring opportunities in the classroom for optimising learner's cognitive development, and increasing self-regulated learning.

The utilisation of the **CEPP** intervention programme can enable Grade R educators to move closer to attaining a strong cognitive focus during their teaching, which is in line with what the NCS envisages. The **CEPP** intervention provides guidelines to Grade R educators on how to shape and modify the learning environment to facilitate and enhance cognitive change through mediation.

The **CEPP** provides guidelines to educators on how to create conditions that promote effective learning, which *inter alia* refer to the following: the implementation of the **CEPP** intervention programme provided evidence that flexibility, readiness and a desire to understand can be enhanced among Grade R learners. The **CEPP** also indicated that through mediated learning order can be introduced in a learner's approach to learning. Through mediated learning a feeling of competence was created and impulsivity restrained. The **CEPP** intervention provided participants with the opportunity to share and participate with others as well as to think and express

themselves in their own special way, enhancing their feeling of belonging and individuation.

Linked to my study, I would like to make the following proposals for further studies.

7.11 PROPOSALS FOR FURTHER STUDY

This study can be further expanded by looking at the following:

- The impact of deficient social skills on young learners' cognitive development.
- Conducting research to determine the impact of other aspects such as age, socio-economic background, gender, culture, motivation, attitude and self-image, on the development of cognitive development in young learners.
- Conducting research to verify the influence of MLE on the reading and spelling ability of young learners.
- Research can be conducted to investigate the effect of improved cognitive and meta-cognitive skills, cognitive functions and non-intellective factors on the various elements that play a role in the cognitive development of Grade R-learners (*cf.* 2.3, 2.4, 2.7.5).
- The same research could be executed in schools of other cultures and languages to clarify the influence of MLE on these learners' cognitive development.
- The impact of MLE on the cognitive development of learners in the Intermediate, Senior and Further Education and Training phases could be investigated.
- Interviews with the educators of the learners could have provided insight into the learners' cognitive processing during normal class instruction. This could have provided information regarding the transferability of the cognitive skills acquired during the intervention
- Only tentative hypotheses were formulated for the study. The acceptance or rejection of the hypotheses needs to be followed up with larger numbers

of participants from a variety of contexts in more controlled true experimental studies.

7.12 CONCLUSION

It is imperative for educators and parents to realise that optimising cognitive capacity at an early age is extremely important for the subsequent successful completion of a child's school career, and that it is indeed possible to optimise cognitive development. Furthermore, educators should not accept that the cognitive development of learners is optimised at home.

The implementation of MLE to optimise cognitive development is confirmed by various studies worldwide, as well as by the present study. In order for South African learners to perform better academically and to acquire important skills, their cognitive development should be optimised as early as the pre-school years. Early identification of cognitive difficulties can lead to early intervention, which in turn could decrease and even prevent failure in school.

Only by placing a strong focus on cognitive education, the children of South Africa can be provided with skills and strategies to function confidently in the context of a rapidly changing world, and can a prosperous, democratic and internationally competitive country be created where multi-skilled, lifelong learners can critically and actively participate in society.



*"If intelligence is modifiable,
and can be taught and learned,
education has a much greater role
than might have been previously believed"*

~ Feuerstein ~