

CHAPTER SIX

AN INTERVENTION PROGRAMME TO OPTIMISE THE COGNITIVE CAPACITY OF GRADE R-LEARNERS

6.1 INTRODUCTION

As stated in Chapter 2 (*cf.* 2.3.1), young learners' active interaction and participation in learning activities teach them important skills imperative for cognitive functioning such as, among others, observation, interpretation, association, planning, communication, reflecting, organising and remembering information and problem-solving. These cognitive and meta-cognitive skills and strategies enable learners to know how to learn, which should be the ultimate goal of teaching (Arends, 2009:18; Papalia *et al.*, 2008:280; Bolani *et al.*, 2007:11; Van Staden, 2005:51).

In this study, specific cognitive and meta-cognitive skills and strategies crucial to the cognitive development of Grade R-learners were identified by means of a literature search. These skills were addressed by means of mediated learning in the **CEPP** in an interrelated manner in curriculum-based activities applicable for Grade R-learners in order to optimise cognitive development.

In addition to this, cognitive functions in the Input, Elaboration and Output phases of the learning process, as well as the non-intellective factors that play an important role in cognitive development and learning were also addressed by means of mediated learning in the **CEPP** in order to optimise Grade R-learners' cognitive development.

Chapter Six describes the **Cognitive Enhancement Programme (CEPP)** that was developed and implemented according to the principles of mediation to optimise the cognitive development of Grade R-learners. The following aspects will be discussed in Chapter Six:

- Intervention research.

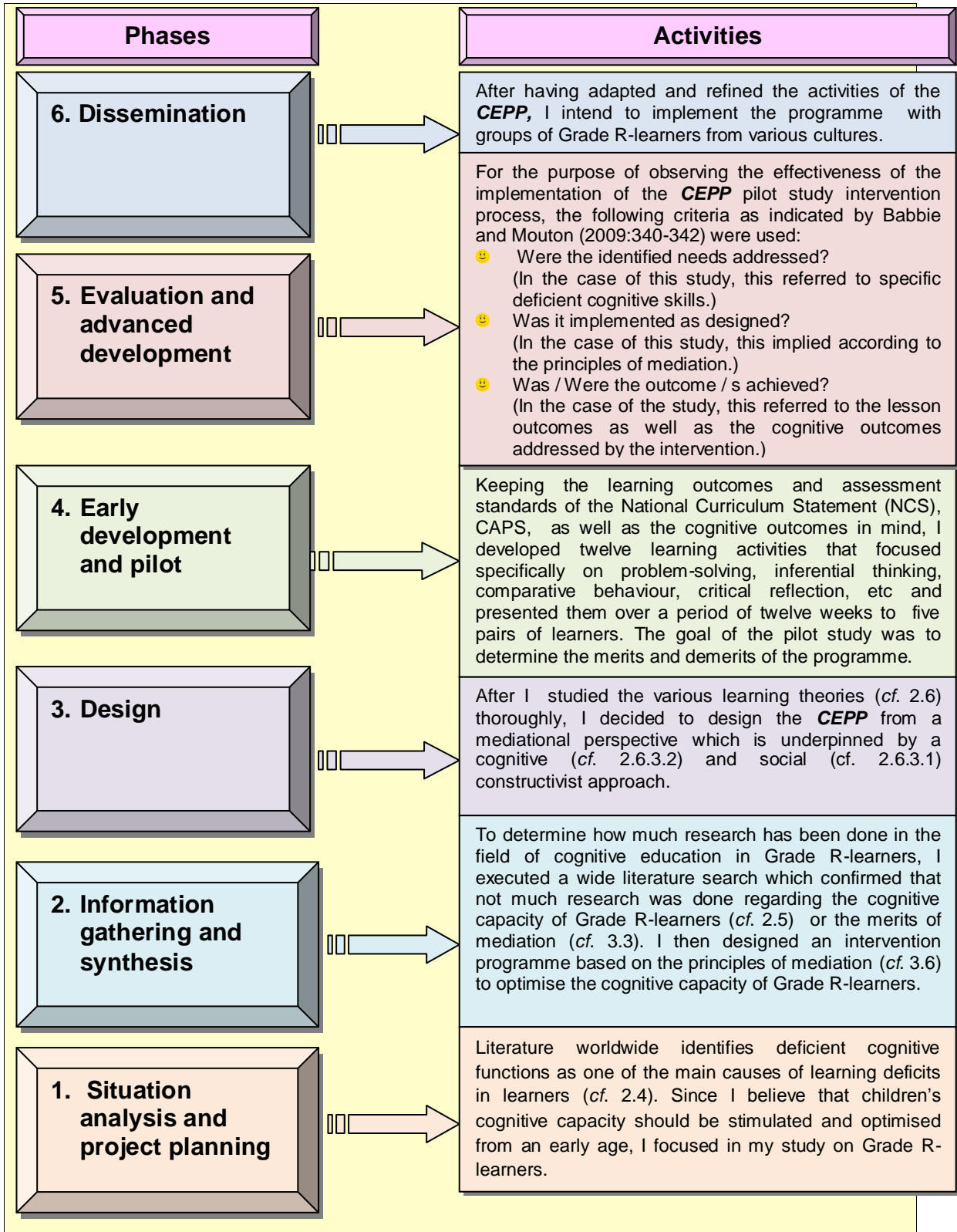
- How the literature review informed the design and implementation of the intervention
- Domains of **CEPP** intervention programme.
- **CEPP** intervention.

6.2 INTERVENTION RESEARCH

As mentioned earlier, intervention research formed part of the quasi-experimental research utilised in this study (*cf.* 4.3.4.1). Intervention research (*cf.* Figure 6.1) is regarded as an action taken by a helping agent (in the case of this study, the researcher) to optimise the functioning and well-being of an affected individual, family, group, community or population (in the case of this study, the Grade R-learners), to prevent and restore deficiencies and to improve quality of life (Fraser *et al.*, 2009:3-5; De Vos, 2005:394; De Vos, 2002b:413).

Since the **CEPP** aimed at intervening, enhancing and adjusting cognitive capacities of Grade R-learners, I utilised the design and development intervention model (D&D) of Thomas (*cf.* Figure 6.1; 4.3.4) (De Vos, 2005:394; De Vos, 2002b:397) that consists of six phases. In Figure 6.1 I provide an overview and summary of what the six phases entail. I wish to highlight the fact that my research focused on phases one to four (Fraser, Richman, Galinsky & Day, 2009:45-133):

Figure 6.1: Phases and activities of intervention research



(Adapted from Fraser *et al.*, 2009:45-133)

Before I provide detail regarding the **CEPP** intervention programme, I wish to explain how the extensive literature review which I conducted in Chapters Two and Three was of importance, as each of the aspects dealt with in these chapters informed the design and implementation of my intervention programme. Thereafter, I briefly highlight the way in which the pre-test results informed the design of the intervention programme

6.3 HOW THE LITERATURE REVIEW AND INITIAL PRE-TEST AND OBSERVATION RESULTS INFORMED THE DESIGN AND IMPLEMENTATION OF THE INTERVENTION.

In order to justify the extensive literature review, I wish to indicate how each aspect informed my conceptualization of cognitive development in the context of the study as well as the design and implementation of the **CEPP** intervention.

- A synthesis of the literature review on cognitive development informed my conceptualization of cognitive development as being a process according to which learners have to acquire higher and lower order cognitive and meta-cognitive skills and strategies to enable them to acquire and evaluate information (*cf.* 2.2). It is for this reason that my intervention programme focused on enhancing cognitive and meta-cognitive skills and strategies.
- Key elements of importance for designing activities to optimise cognitive development in Grade R (*cf.* 2.3.1) revealed to me that I had to focus on developing the following activities during the implementation of my intervention: symbolic thought, cause and effect relationships, classification and categorization, problem-solving, conservation, basic conceptual development, working with numbers, scientific concepts, enhancing memory and self-regulation.
- I was made aware of the fact that the mental activity involved in the learning process entails three phases, namely the Input, Elaboration and Output phase, and that each phase comprises the execution of cognitive functions that need to be well developed in order for learners to be successful in completing learning tasks (*cf.* 2.4.1-2.4.3). This information guided the

observation process during the research to establish where learners experience problems. In addition to this, the cognitive functions were addressed during the implementation of the intervention programme.

- Furthermore, the literature review revealed the important role that non-intellective factors (emotional, attitudinal and motivational) play during cognitive development and learning (*cf.* 2.7.5). This information also guided the observation process as well as the implementation of the intervention programme. Specific attention was paid to the learners' need for mastery, their frustration tolerance, the accuracy and precision with which they work, their fear of failure, their confidence levels as well as their vitality and alertness towards learning tasks during the implementation of the intervention.
- As I needed to frame my intervention programme within a theoretical framework for teaching and learning, my investigation into a variety of learning theories shaped my view of how teaching and learning should be implemented if cognitive development is viewed as the main aim. I concluded that active, interactive, scaffolded and mediated learning as advocated by the cognitivist and constructivist-learning theories hold advantages for cognitive development (*cf.* 2.6.3). In addition to this, the importance of discovery, problem-solving and social interaction during teaching and learning for cognitive development became clear (*cf.* 2.6.2.2; 2.6.3). I was convinced that a learner-centred, transformative approach (*cf.* 2.7.7) to teaching was more conducive to the development of thinking skills than a behaviouristic assimilative approach to teaching and learning which mainly focuses on the direct transmission of facts. It is however true, that a behaviourist approach cannot be completely excluded from teaching and learning, as the transmission of new facts or explanations of new concepts are very important before one can request learners to discover or solve problems on their own. In the context of my intervention programme, the behaviouristic approach was utilized only for the purpose of clarifying new concepts or rules to learners. The focus was on the learners who had to actively discover and apply new

knowledge by means of the cognitive and meta-cognitive skills and strategies acquired through the meditational approach that guided the implementation of the intervention.

- The exploration of factors that affect cognitive development enhanced my realisation of the fact that a study in cognitive development can be quite complex, due to the myriad of factors that can affect cognitive development. The numerous factors made me realise that in order to enhance cognitive development, one first has to identify the factor/factors that inhibit cognitive development in a learner in order to enhance the learner's cognitive functioning effectively. As these factors can differ from learner to learner, numerous challenges are provided to educators to address cognitive development on an individual level. As it was not possible to consider all these factors, I only focused on one, namely teaching practice being instrumental in optimising cognitive development. Furthermore, the nature of cognitive development among learners is not a generalizable phenomenon. Learners experience different problems related to cognitive problems, which calls for individual intervention. I therefore only worked with two learners at a time, to ensure that I accurately identified the problems the learners' experienced. Based on the aforementioned, I provided a detailed account of each learner's cognitive development and progression throughout the study on the CD included at the back of the thesis.
- The comparison made between the use of static or dynamic assessment for assessing the development of thinking skills (*cf.* 2.8.2) guided my decision towards a dynamic approach. A static approach, which only focuses on thinking skills as a product or outcome, would not have provided me with information regarding the learners' potential to benefit from a mediated approach towards the development of their thinking skills. Furthermore, a dynamic approach would enable me to obtain clarity regarding the nature and quality of the cognitive development of the learners.
- A study that focuses on cognitive development can utilize a programme, an infusion or a holistic approach to improve the development of thinking skills

(*cf.* 2.9). In the context of my study, the literature review guided me in deciding on a combined infusion and holistic approach which argues for an integration of thinking skills into subject content and the creation of a classroom climate in which everything that is done during teaching and learning, namely the choice of teaching methods and strategies, the type of activities, assessment approaches and the roles that the educators and learners play, speak of intellectual openness.

- Finally, my investigation into what a Mediated Learning Experience entails, guided the design of my intervention programme in accordance with the twelve principles of mediation (*cf.* 3.6.2), and the different RMI levels (*cf.* 4.3.5.2). During the implementation of the intervention, mediation was provided at different stages during the completion of learning tasks, namely **before** a task was started with the aim to prepare and create anticipation, **within** the context of a task before learners were expected to respond and **after** response had been given by providing feedback that emphasised correct responses and guidelines to correct mistakes
- My belief in the cognitive modifiability of learners were strengthened by the literature review (*cf.* 1.1), and prompted my attempt to implement the **CEPP** intervention, as I believed that cognitive change was possible among the learners who took part in the research.
- The pre-test results of the participants revealed that the interrelated application of cognitive and meta-cognitive skills and strategies appeared not to be effective (*cf.* 5.2). These results provided the rationale for designing an intervention programme with learning activities in which the learners' application of the cognitive and meta-cognitive skills and strategies were optimised. In addition to the pre-test results, the observation data that was collected during the pre-test phase revealed problems related to the application of cognitive functions in the Input, Elaboration and Output phases of the mental act, as well as non-intellective factors that could influence learning and cognitive development negatively (*cf.* 5.3). The data obtained from the initial observations directed me to focus on addressing cognitive

functions as well as non-intellective factors during the implementation of my intervention programme.

In the following section, I explain the different components included in the **CEPP** intervention programme.

6.4 COMPONENTS OF THE CEPP INTERVENTION PROGRAMME

The 12 principles of mediation (*cf.* 3.6.2) guided the implementation of the **CEPP**. According to Feuerstein *et al.* (2002:517-540) cognitive development involves the following components, which Feuerstein (in Lomofsky, 2007) depicts as a cognitive map.

6.4.1 Components involved in determining cognitive change

The following components can be distinguished, namely cognitive functions, mental operations, affective-energetic factors, efficiency and task demands (Feuerstein *et al.*, 2002:522-526). I adapted the aforementioned classification of components to reflect more clearly the conceptualization of cognitive development in the context of the study. The following components were included in the design and implementation of the **CEPP**.

6.4.1.1 Cognitive and meta-cognitive skills and strategies

This component entailed the pre-requisite skills and strategies essential in problem-solving behaviour and succeeding in learning tasks. I therefore designed tasks that provided opportunities concerning:

- participants' capacity to utilise abstract, figurative thinking when solving problems;
- the extent to which episodic grasps of reality emerge in the participants' functioning
- participants' capacity to recognise a problem and define it;
- the presence or absence of spontaneous comparative behaviour; and
- utilising super-ordinate concepts, such as *colour, shape, size, position, number, and letter* (Feuerstein *et al.*, 2002:522).

Furthermore, I also focused on equipping participants with cognitive skills for successful task performance and problem-solving behaviour by means of **operations, labels, relationships and concepts**. If these aspects are not present, they should be taught to participants through mediation (Feuerstein *et al.*, 2002:523-524). Operations can be regarded as rules or steps participants utilise to obtain, transform, manipulate, organise and act upon external and internal information. Certain prerequisites are necessary to produce and apply an operation, for example, classification, comparison, seriation and inferential thinking, etc. (Feuerstein *et al.*, 2002:133). The application of these operations was modelled to the participants before expecting them to execute these.

Focus was placed on the following operations in Sessions 1-12 of the **CEPP**: categorisation, comparison, classification, planned systematic behaviour, problem-solving, hypothetical thinking, mental representation, seriation and critical reflection. Some of the cognitive operations (categorisation, comparison, classification, planned systematic behaviour, problem-solving, and hypothetical thinking) were applied throughout the intervention and participants had the opportunity to revise and apply them together with the new cognitive operations, such as seriation and critical reflection (*cf.* Appendix 5: Session 1). All the cognitive operations were in line with what could be expected of Grade R-learners.

Labels, relationships and concepts for specific objects addressed by **CEPP** activities and tasks entailed circle, square, rectangle, triangle, up, down, top, bottom, middle, next to, left, right, before, after, similar and different.

My role as mediator was to establish if participants possessed the required verbal, conceptual and operational skills to perform activities and tasks comprised in the **CEPP** and if not, expose them to tasks that varied in modality, complexity and abstractness. I then observed participants' learning process as they applied the above-mentioned skills (Feuerstein *et al.*, 2002:524).

6.4.1.2 Cognitive functions

During the implementation of the **CEPP** I addressed the difficulties participants experienced the Input, Elaboration and Output phases of the mental act during the CITM pre-test throughout the 12 weeks of the implementation of the intervention.

The **Input Phase** demanded accurate gathering of information, need for precision and accuracy, considering two or more sources of information, clear perception, receptive verbal tools and spatial and time orientation.

During the **Elaboration phase**, participants' planning behaviour, selection of relevant cues to solve a problem, summative behaviour, pursuing logical evidence, hypothetical thinking and strategies, internalisation, memory, categorisation, comparison, problem-solving and identifying relationships.

Behaviour observed in the **Output phase** comprised egocentric communication, blocking behaviour, visual transport, projection of virtual relations, transfer of rules, clear and precise language, impulsive behaviour, and precision and accuracy.

6.4.1.3 Non-intellective factors

This domain in the area of change includes affective, emotional, attitudinal and motivational aspects, which play an enormous role in the participants' effort to execute tasks successfully, as well as the level of applying pre-requisite cognitive skills (Feuerstein *et al.*, 2002:524). I therefore paid attention to participants' feeling of competence to ensure higher levels of cognitive functioning due to affective motivation. I specifically focused on extrinsic-intrinsic motivation, the need for mastery, fear of failure, locus of control, frustration tolerance, delight in successful completion of tasks, the need for independent working ways, curiosity, self-image, compliance in accepting originality and search for complexity, reflection and degree of egocentricity (*cf.* 2.7.5) (Benjamin, 2009; Feuerstein *et al.*, 2007:23-24; Tzuriel, 2001:50-55; 70-72). Change in the

aforementioned aspects motivated participants to further performance (Benjamin, 2009; Feuerstein *et al.*, 2007:23-24; Tzuriel, 2001:50-55; 70-72).

6.4.1.4 Efficiency

The changes that took place in participants' efficiency regarding cognitive functions are included in this domain and may be influenced by the affective-motivational aspects (non-intellective factors) explained above. The level of efficiency can be observed by the speed and precision with which a task has been executed. Deficiencies will be an indication that more mediation is necessary, while efficiency will be an indication that successful mediation and remediation took place (Feuerstein *et al.*, 2002:525).

Although I was aware of the interrelatedness of factors contributing to efficiency and change in each participant, my role as mediator in this domain was to observe changes regarding **attention**, **persistence**, **concentration**, level of **involuntary** behaviour, **independent** functioning and **self-regulation** (Tzuriel, 2001:72). The persistence of a participant to continue with a task even though he experienced difficulty in executing it, was a major indication of efficiency, in contrast to a participant who refused to engage in or deal with the tasks, as was the case with Participant 5 (*cf.* CD Observation Profile 1.5) who sometimes rejected any form of mediation (Benjamin, 2009; Feuerstein *et al.*, 2007:23-24; Tzuriel, 2001:50-55; 70-72).

Efficiency consists of several factors, for example the **rapid response** from the participants to stimulation, the **precision** with which participants execute tasks and the **energy** the participants put into the task (Feuerstein *et al.*, 2002:134-136). During the implementation of the **CEPP** the level of efficiency was established by means of observations.

6.4.1.5 Task demands

The task demands interacted with the cognitive and meta-cognitive skills and strategies, cognitive functions, non-intellective factors and efficiency within each participant to organise and produce responses linked to specific learning

activities (Feuerstein *et al.*, 2002:131). The task demands in the **CEPP** were reinforced over the 12 weeks of implementation and included the following: **planning behaviour** (*cf.* Appendix 5: Sessions 1-12), **problem-solving** (*cf.* Appendix 5: Sessions 1-12), **critical reflection** (*cf.* Appendix 5: Sessions 1-12), **mathematical reasoning** (*cf.* Appendix 5: Sessions 2, 4, 5, 6, 7, 8, 9, 10, 11, 12), **inferential thinking** (*cf.* Appendix 5: Sessions 1-12), **causal explanation** (*cf.* Appendix 5: Sessions 1-12), **prediction** (*cf.* Appendix 5: Sessions 1-12), **transfer of strategies and rules** (*cf.* Appendix 5: Sessions 1-12), **auditory discrimination** (*cf.* Appendix 5: Sessions 1-12), **focusing and memory** (*cf.* Appendix 5: Sessions 1-12) and **verbal tools** (*cf.* Appendix 5: Sessions 1-12), **parts/whole relationship** (*cf.* Appendix 5: Sessions 2, 5, 6, 12), **analysing** (*cf.* Appendix 5: Sessions 1-12), **association** (*cf.* Appendix 5: Sessions 1, 3, 4, 5, 6, 7, 8, 12), **perception** (*cf.* Appendix 5: Sessions 1-12), **inferential thinking** (*cf.* Appendix 5: Sessions 1-12), **conceptualising** (*cf.* Appendix 5: Sessions 1-12), **categorisation** and **classification** (*cf.* Appendix 5: Sessions 1, 2, 3, 4, 5, 6, 8, 11, 12), **comparison** (*cf.* Appendix 5 Sessions 1, 3, 4, 5, 6, 7, 8, 11, 12), and **seriation** (*cf.* Appendix 5: Sessions 2, 5, 8, 9, 10, 12).

In designing the learning activities for the intervention programme, I focused on content, modality, level of complexity and level of abstraction.

- **Content**

The content corresponded with the learning outcomes expected to be achieved by Grade R-learners according to the NCS. The following content was addressed:

The **Content** of the **CEPP** required participants to recognise basic colours, such as blue, green, red, yellow, white, black and orange. They had to compare and classify the colours, learn new vocabulary (triangle, rectangle, circle, square, diamond). New content with regard to shape recognition, direction (left, right, next to, above, behind) and sequence were dealt with. The learning tasks *inter alia* entailed shape recognition, relationships between shapes, comparing shapes, vocabulary, such as *big, small, medium, big, bigger*, recall regarding the

colour and characteristics of shapes. Learners also had to discuss picture cards, categorise counters (according to colour), compare counters, determine quantity, to do simple addition calculations. New vocabulary, such as *plus, more, put together, equal, estimate*, was learned. Session 10's **Content** included task demands such as comparing counters, breaking down numbers, determining quantity, and new vocabulary, such as *minus, subtraction, less than, take away, equal, estimate*, was learned.

The learning content facilitated the development of the participants' direction, visual memory, and categorisation, vocabulary, explanation and problem-solving skills. The participant's educational and experiential background, for example assimilated prior learning, as well as the participant's cultural experience, also influenced the mastering of content. These factors lead to different levels of competency in coping with the content. If the participant is not acquainted with the facts, content or experience, it is necessary to assist him in mastering the content before he can be expected to focus on cognitive operations targeted for change (Feuerstein *et al.*, 2002:132). During the implementation of the **CEPP** I ensured that participants possessed thorough pre-knowledge and vocabulary related to each task and activity before engaging in it.

- **Modality**

Modality involves the various ways or “languages” in which a task is presented, for example verbal tasks, pictorial tasks, numerical tasks, figural tasks or a combination of these, which vary from imitations and meta-linguistic communication to traditional methods separated from the content (Feuerstein *et al.*, 2002:132).

The modalities utilised in Sessions 1, 2, 3, 5, 6, 7, 11 and 12 were figural, pictorial, verbal and symbolic. The modalities utilised in Sessions 4, 8, 9 and 10 included a numerical modality. A variety of modalities was included, which catered for a variety of learning style needs.

In the **CEPP** I ensured that participants were familiar with the modality of a specific task and that I was aware of the cognitive functions present in each

participant. I strived to present verbal, pictorial, numerical and figural tasks, which corresponded with the CITM to ensure that participants whose verbal mode was not as competent received various opportunities in other modalities (pictorial, figural, numerical) before I assumed that a cognitive function was problematic. According to Feuerstein *et al.* (2002:132), difficulty responding to a task presented in a particular modality may be caused by cultural differences and/or specific impairments in that particular modality.

- **Level of complexity**

Complexity can be explained as the quality and quantity of information received. The more familiar participants are with the information, even though there is a great deal of information, the less complex the act. Less familiar information will require more complex involvement of mental acts during task completion. In the **CEPP mediation** was directed from familiar towards dimensions of greater complexity (Feuerstein *et al.*, 2002:134). (*cf.* 6.4).

- **Level of abstraction**

Abstraction can be defined as *the distance between a mental act and the object upon which it operates* (Feuerstein *et al.*, 2002:134) and includes the difficulty participants experience when attaining to a higher level of functioning. In order to correspond with the CITM the **CEPP**, activities and tasks were created in such a way that they gradually changed from concrete to abstract, and from familiar to greater complexity.

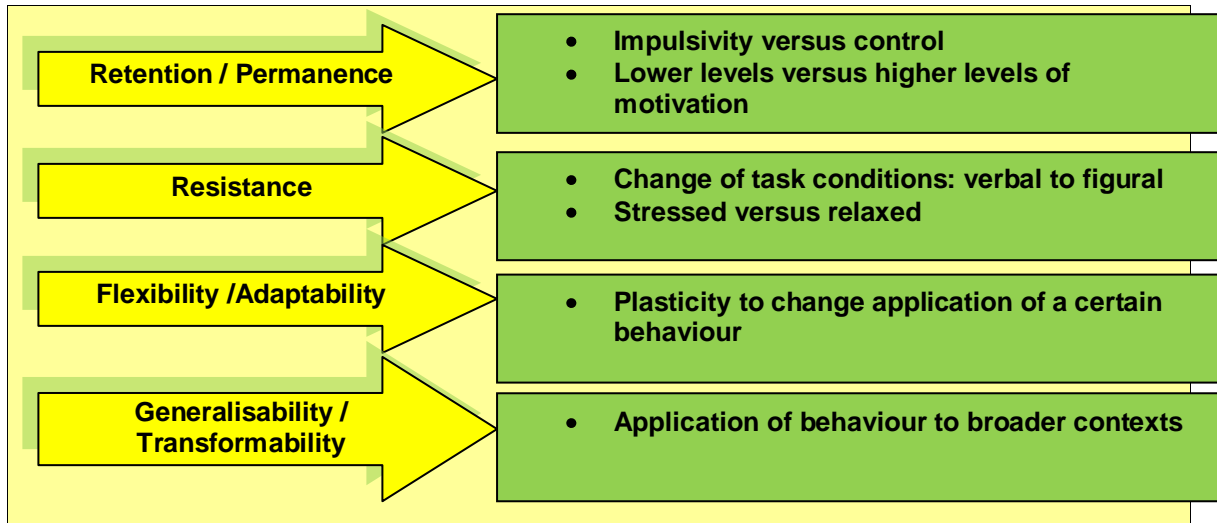
Complexity and **Abstraction levels** were low in Sessions 1-3, low to medium in Sessions 4-6, medium in Sessions 7-9 and medium to high in Sessions 10-12 (*cf.* Appendix 5: Sessions 1-12). The intervention moved gradually from a concrete to an abstract level which was more challenging to the learners.

6.4.2 Understanding the nature and quality of cognitive change

The nature and quality of change involved an understanding of changes that occurred in the cognitive functions and non-intellective factors (Feuerstein *et al.*, 2002:526 Figure 6.2 depicts the nature and quality of cognitive change

according to Feuerstein *et al.* (2002:526-530) that was utilised in the context of the study in interpreting the observations.

Figure 6.2: Nature and quality of cognitive change



- **Retention / Permanence**

This quality refers to the **constancy**, **re-occurrence** and **permanence** of **change** due to mediation under identical circumstances or nearly identical to the original emergence of new behaviour. An example could be a change in the level of **impulsivity** as opposed to a higher level of **control** and a **lower** level of motivation versus a **higher** level of motivation (Feuerstein *et al.*, 2002:526-527)

- **Resistance**

Resistance includes the application of acquired behaviour in other situations which may or may not differ from the initial task and involves variations in motivation and affect, as well as modality and complex stimuli. Resistance takes place when the participant withstands the pressure of various situational, affective and task conditions. The ability to maintain control over impulsivity when stress situations are present is also an indication of resistance (Feuerstein *et al.*, 2002:527).

- **Flexibility / Adaptability**

Flexibility and adaptability refer to the application of the attained behaviour in situations that are not the same as those where retention and permanence were observed and focus on the sequence of change in the participant after he has been exposed to tasks and rules which do not require the application of the learned behaviour. Individuals who rigidly apply modified behaviour still show a lack of adaptation, but the individual who has learned to modify the application of newly learned behaviour due to a different situation may be considered as flexible (Feuerstein *et al.*, 2002:528).

- **Generalisability / Transformability**

This aspect deals with the adaptive, functional and transcendent nature of the structural cognitive change in the individual's behaviour that will most probably be available in the individual's future behaviour (Feuerstein *et al.*, 2002:529-230).

6.4.3 Changes in Required Mediation Intervention (RMI)

A participant's cognitive modifiability is optimised by an observable change regarding **distance** between **his** contributions and those of the **mediator**. The more the participant produces towards successful completion of activities, the better (Feuerstein, *et al.*, 2002:531). The RMI was determined on a 9-point scale (Feuerstein *et al.*, 2002:531) as explained in section 4.3.5.2.

6.4.4 General: examples of CEPP activities

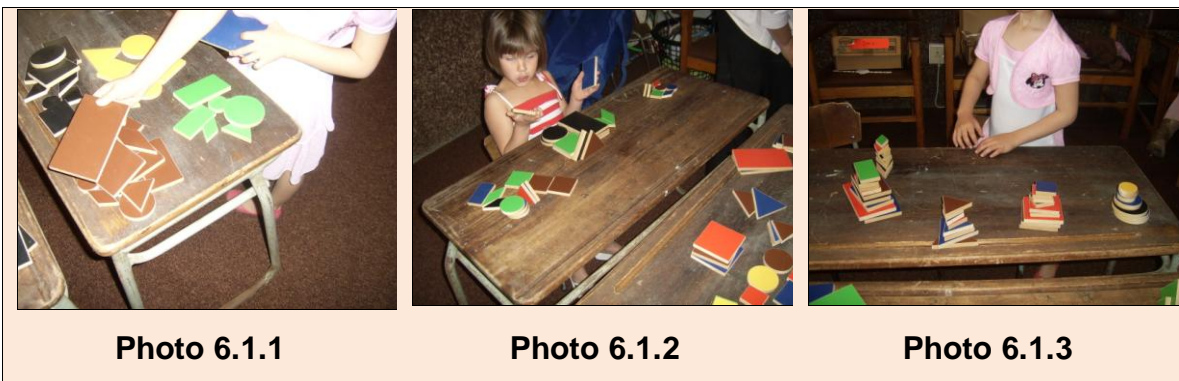
In line with the literature review and the Learning Outcomes for Grade R as set out in the National Curriculum Statement (Department of Education, 2002:1) the **CEPP** activities were designed and implemented as evidenced in the explanations and inclusion of photographs below. The **CEPP** activities were designed in such a way that participants started by working from the concrete to more abstract activities (cf. Appendix 5: Sessions 1-12). The **CEPP** was also created keeping the following key elements in mind which play a critical role in the development of cognitive functions in the pre-school learner as discussed in

Chapter Two.(*cf.* 2.3.1.1-2.3.1.11). In the subsequent sections, examples of the activities used during the intervention, are presented.

6.4.4.1 Cognitive skills and strategies

An example from **CEPP** (*cf.* Photo 6.1) illustrating the application of cognitive skills and strategies is that participants were presented with a number of different **shapes** in different **colours** and sizes. They were instructed to group together the shapes that were **alike** (*cf.* Appendix 5: Session 5).

Photo 6.1: Cognitive strategies applied to the study: grouping



(Wooden blocks made according to the example of Dr Louis Benjamin's Basic Concept Programme)

All the participants utilised their own strategies to categorise the shapes, as can be seen in Photo 6.1. Some categorised their shapes according to colour, others according to size and others according to shape. After the exercise, participants had the opportunity to explain in pairs how they categorised their shapes, listening and learning from one another. Another example from the **CEPP** illustrates participants having to group similar objects together (coloured disks), which includes skills such as categorising, classification; comparison, etc (*cf.* Photo 6.2.1). They had to decide why they believed the objects were the same (according to colour) and conceptualise other objects with the same characteristics, e.g. the colour yellow reminded them of the sun or cheese or a sunflower (*cf.* Photo 6.2.2). This includes skills such as problem-solving, reflection, interpreting, evaluation, etc. The colour black reminded them of an owl or of coal (*cf.* Photo 6.2.3), which involves inferential and transfer skills, as depicted in Photo 6.2:

Photo 6.2: Cognitive skills



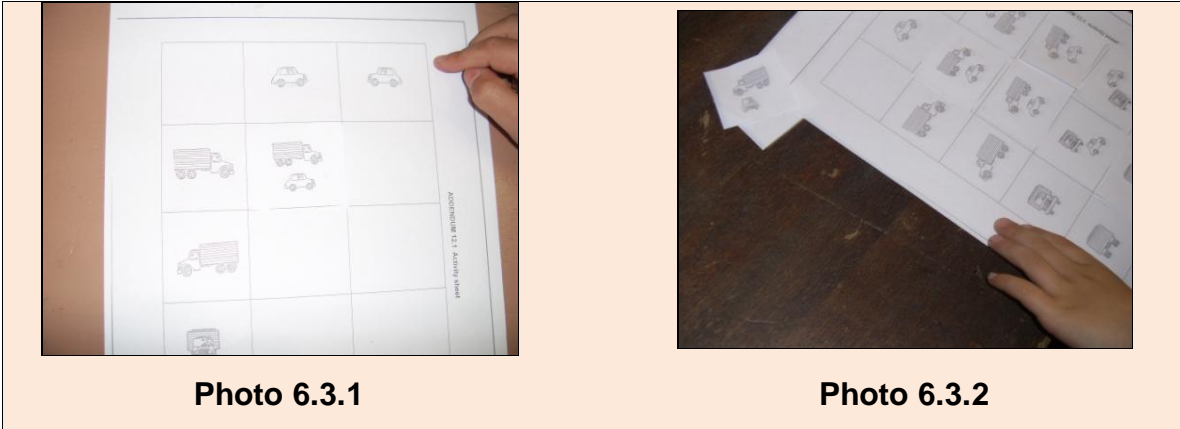
6.4.4.2 Perception Activity

Perception activities such as concept of time and direction, similarities and differences, spatial relations, visual motor, visual perception, visual discrimination, auditory perception and auditory discrimination had to be completed by the participants (*cf.* Appendix 5: Session 12).

During Session 12, the participants' perception was mediated in groups of two, except for the participant who obtained the lowest score in the pre-test. I acted as his partner. Initially, participants had to walk **towards** me, **away** from me, to my **left**, to my **right** and **past** me. They also had to execute these actions with the other group member (use and develop memory, use imagination, use and develop language skills, use senses, solve problems, use reasoning, explain conclusions, make decisions). Participants were then presented with an activity sheet (*cf.* Appendix 5: Session 12 and Photo 6.3). They were asked what they saw on the activity sheet and whether all the pictures were the same (use and develop language skills, use reasoning, make decisions, test solutions, explain solutions). Participants were then asked to close their eyes and imagine they were a car in a very busy street, with traffic and pedestrians coming and going from all possible directions (they could choose the fabric and colour of the car). They had to tell the group what they saw, how they felt and what their experiences were (use imagination, use and develop language skills, use senses, solve problems, explain conclusions). Participants received different

cards indicating various directions which they had to place in the correct square on the activity sheet (use reasoning, make decisions, test solutions, work logically and solve problems) (cf. Photo 6.3.1 and 6.3.2).

Photo 6.3: Perception activity



6.4.4.3 Active involvement

In the **CEPP** participants actively took part in all the activities presented to them. They were, for example, requested to walk, crawl and hop on shapes to determine the characteristics of the shapes (cf. Appendix 5: Session 5). They were then offered the opportunity to form various shapes with pieces of string (cf. Photo 6.4.1). After this exercise, participants had the opportunity to manipulate big three dimensional shapes (cf. Photo 6.4.2) to determine which shapes could roll and why others were not able to roll.

Photo 6.4: Active involvement in activities

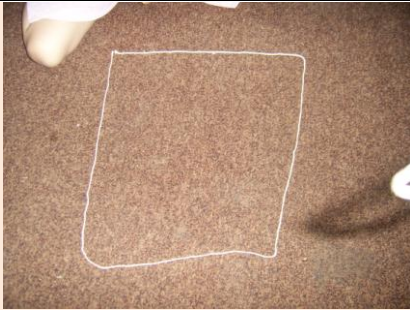


Photo 6.4.1



Photo 6.4.2

6.4.4.4 Symbolic thought

In the **CEPP** participants had ample opportunity to develop their symbolic thought by means of various activities (*cf.* Appendix 5: Session 4; Photo 6.5).

Photo 6.5: Symbolic thought (Smartie graph)

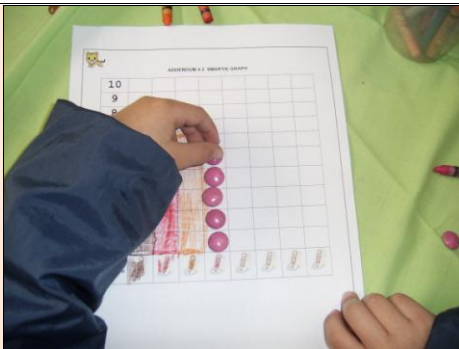


Photo 6.5.1

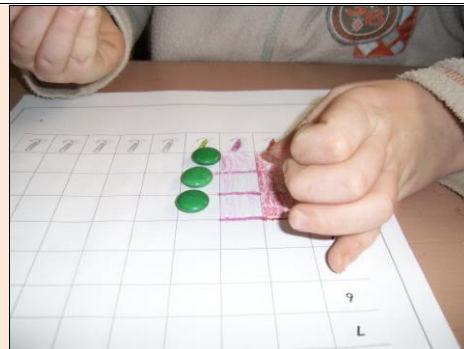
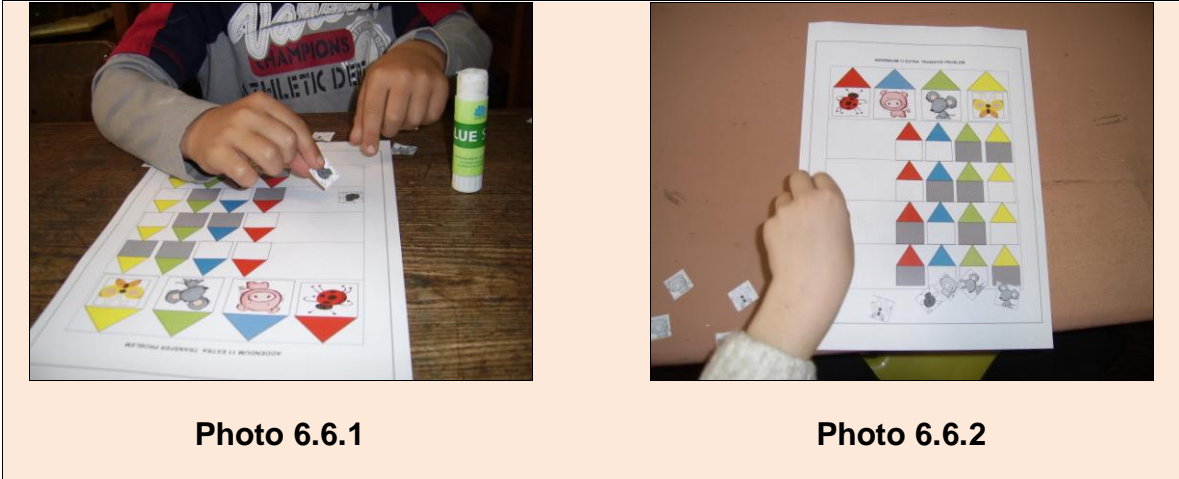


Photo 6.5.2

6.4.4.5 Cause and effect

In all the sessions participants received transfer activities to complete, during which they had to remember principles, rules and strategies, and work in an organised manner. Most of the participants struggled to remember to work in an organised manner and through mediation had to be reminded of the starting point (*cf.* Photo 6.6.1). In this activity participants had to predict the effect if the picture was put in the wrong “street” (*cf.* Photo 6.6.2).

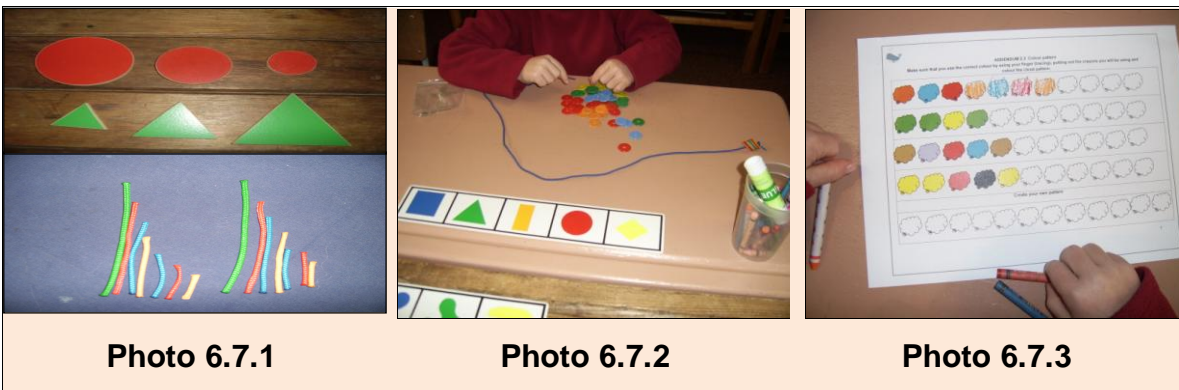
Photo 6.6: Cause and effect



6.4.4.6 Classification and categorisation

One type of classification or categorisation is the ability to distinguish living from non-living things. Although Piaget believed that young learners assign life to non-living objects (called animism), later research proved that even 3- to 4-year olds understand that people are alive and dolls are not and that plants and animals can grow, decay and, when injured, heal (Papalia *et al.*, 2008:269).

Photo 6.7: Classification and Categorisation



6.4.4.7 Problem-solving

Throughout the **CEPP** participants were exposed to solving problems verbally and to numerical problems (*cf.* Appendix 5: Sessions 1-12; Photo 6.8).

Photo 6.8: Problem-solving

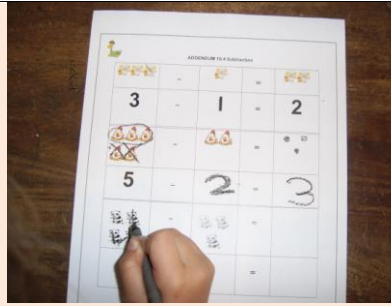


Photo 6.8.1



Photo 6.8.2



Photo 6.8.3

6.4.4.8 Conservation

In the course of the **CEPP**, participants had the opportunity to practise the conservation skills via physical objects such as unifix blocks, counters and parts of whole shapes (cf. Appendix 2: Session 8; Photo 6.9.1; Photo 6.9.2).

Photo 6.9: Conservation



Photo 6.9.1



Photo 6.9.2

6.4.4.9 Basic concepts

The **CEPP** was designed to address basic concepts in all the sessions (cf. Appendix 5: Sessions 1-12; Photo 6.10.1; 6.10.2).

Photo 6.10: Basic concepts

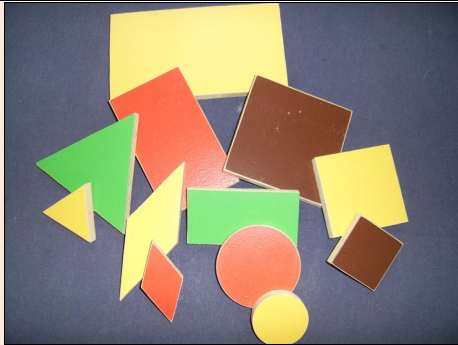


Photo 6.10.1



Photo 6.10.2

6.4.4.10 Number concept

During this activity, participants develop adding strategies by counting on their fingers or using other objects. By the time the young learner enters formal school he has a devised basic “number sense”. This includes counting, number knowledge (ordinality), number transformations (simple addition and subtraction), estimation (which group contains more or less) (cf. Appendix 5: Session 4; Photo 2.11.2) and recognition of number patterns (1 + 1 = 2) (cf. Appendix 5: Sessions 9, 10; Photo 6.11.3) (Papalia *et al.*, 2008:270, 353).

Photo 6.11: Number concept



Photo 6.11.1



Photo 6.11.2



Photo 6.11.3

6.4.4.11 Scientific concept

During the **CEPP** participants were confronted with scientific concepts and spatial relations. One of the aspects assessed in the output phase was egocentrism (cf. Appendix 5: Sessions 1-12).

Photo 6.12: Spatial relationship



Photo 6.12.1



Photo 6.12.2

6.4.4.12 Memory

Memory and creating strategies were attended to throughout the **CEPP**. Not only were learners expected to remember concepts, rules, principles and strategies, they also had to remember 24 pictures according to certain categories: pets, farm animals, wild animals, marine animals, insects and animals with feathers (cf. Appendix 5: Session 12).

Photo 6.13: Memory



Photo 6.13.1

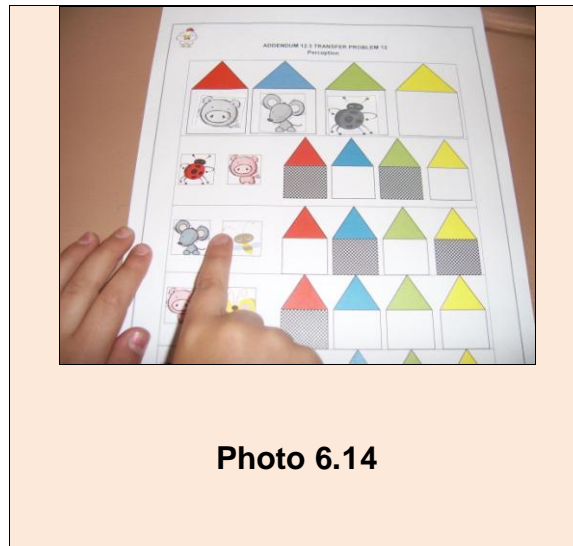


Photo 6.13.2

6.4.4.13 Self-reflection and meta-cognition

Participants were encouraged to reflect during the **CEPP** in order to correct their own mistakes, assess their own work and become aware of their own thinking (cf. Appendix 5: Sessions 1-12; Photo 6.14).

Photo 6.14: Self-reflection and meta-cognition



6.4.4.14 Language

Participants had to listen to instructions carefully, explain their answers, communicate their thoughts, identify letters and rhyme words, identify beginning, middle and end sounds of three-letter words such as “bus”, and elaborate on picture cards shown to them (cf. Photo 6.15). Photo 6.15.1 depicts the letters participants had to identify and build with clay, as well as use to build various words starting with a specific letter, while Photo 6.15.2 illustrates the activity during which participants were requested to find words that sound the same. Participants added a vast number of words to their vocabulary throughout the **CEPP**.

Photo 6.15: Language



Photo 6.15.1



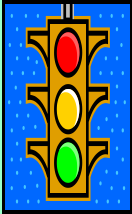
Photo 6.15.2




Photo 6.15.3

The implementation of the **CEPP** was based on the mediation principles of Reuven Feuerstein as summarised in Table 6.2. In Table 6.2, I provide a summary of how I applied the principles, as well as the symbols utilized to make learners aware of important working ways they had to acquire during the completion of tasks in their groups.


Table 6.2: MLE principles utilised in the CEPP



MLE Principle	Meaning	Symbols utilised in CEPP	Examples of applicable questions asked during the implementation of the CEPP	Description of principles utilised in CEPP
		<p>Attention</p> 	<p>MLE Principle 1, 2, 5, 8</p>	<ul style="list-style-type: none"> * Before each session, the importance of paying attention during the session was emphasised. * Learners had to strive towards avoiding impulsiveness. * They always had to ask themselves: "Am I doing what is required?" <ul style="list-style-type: none"> - Red = Stop and listen - Orange = Think and look - Green = Do (commencing with the activity after he had made sure he knew exactly what was required of him).

<p>1. Intentionality and reciprocity</p>	<p>*The mediator should intentionally awaken a shared desire to learn and purposefully engage the learners' attention with the learning process.</p> <p>*By transforming the stimuli and awakening the learners' interest and curiosity, the mediator will foster a cognitive change in them.</p> <p>*The focus should not only be on how, but also on why the mediator executes an action. *The mediator could engage the learners by making eye contact, tone of voice, or elaboration.</p> <p>*This principle deals with the what, who, where, when and how of learning.</p>	<p>Focused attention</p>	<p>Question: What do you see?</p>	<p>* The learner's attention was focused on the concept through my intentional actions.</p> <p>* My intention was to:</p> <ul style="list-style-type: none"> • teach and change the learners' mental state; • intentionally awaken a shared aspiration to learn; and • create an awareness of the learning process.
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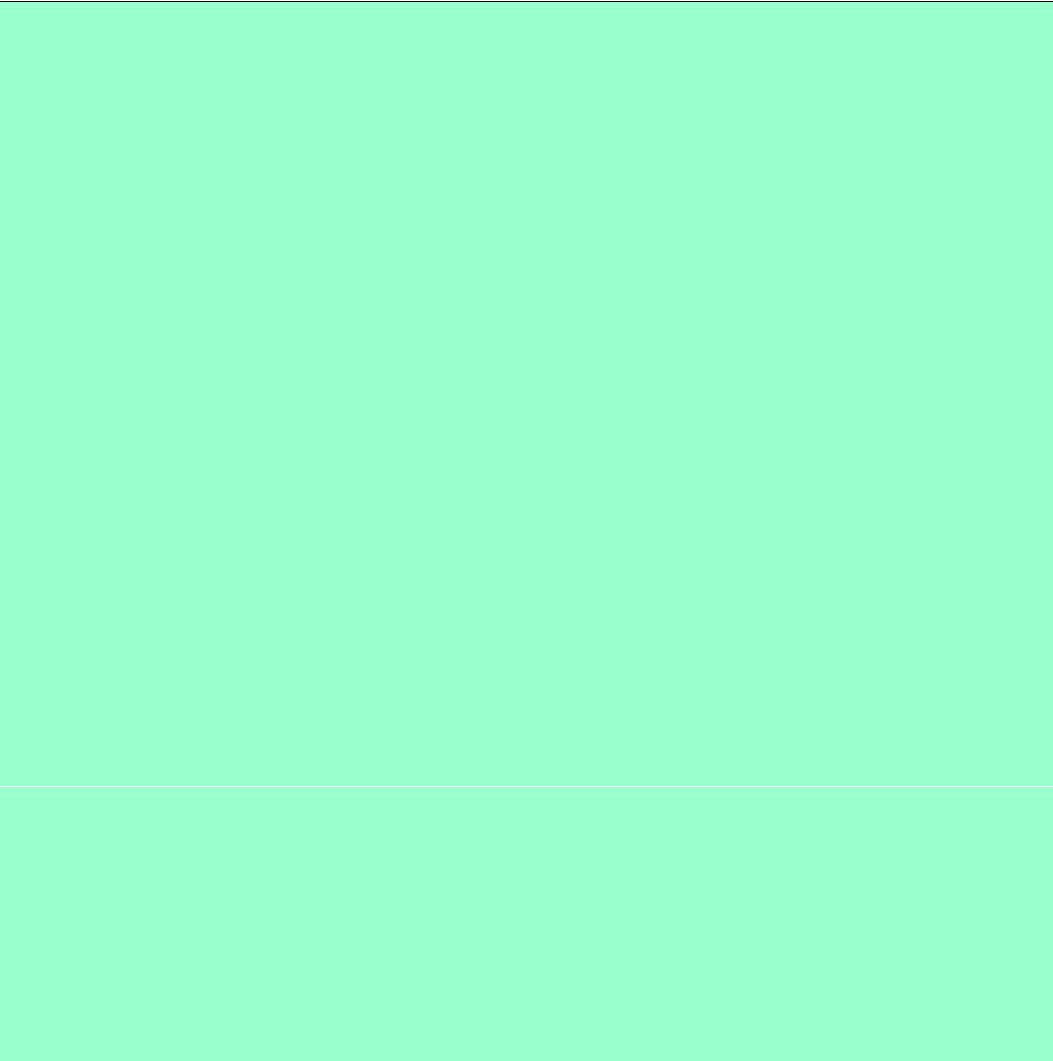
<p>2. Transcendence</p>	<p>*The mediator goes beyond the immediate learning experience.</p> <p>*The learners should:</p> <ul style="list-style-type: none"> • bridge or apply learning from current experiences to new experiences; and • know how and where learning can be applied in other situations. <p>*This principle deals with the what, who, where, when and how of learning.</p>	<p>Bridging and transfer</p> 	<p>Applying , problem-solving, generalising competence and control of behaviour, transcendence</p> <p>Question:</p> <ul style="list-style-type: none"> * Can you explain how you would sort these blocks into groups according to colour and shape? * Can you see a circle anywhere in the class? * Look at the “o” in the alphabet, can you tell me something about the shape of this letter? 	<ul style="list-style-type: none"> * Concepts taught were now used to solve problems that involve application of various higher order cognitive functions, such as categorisation, seriation and classification. * I encouraged the learners to approach problems in a systematic manner in order to induce relationships and thereafter to deduce solutions. * Learners were also encouraged to make broader associations with the concepts. * I ensured that generalisations were consistent, by making use of rules or principles. * Learners were actively encouraged to link their knowledge of concepts to other areas of associated knowledge, which required the application of cognitive functions.
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<p>3. Mediation of meaning</p>	<p>*Learners should understand the value of relevance, as well as the search for meaning and interaction and enthusiasm.</p> <p>*Meaning is linked to cultural roots which influence the nature of the values to be transmitted.</p> <p>*Learners should be encouraged to search for meaning and causation in the context of their own situations.</p> <p>*This principle deals with the <i>why</i> of learning.</p>	<p>Meaning</p>	<p>Question:</p> <p>What is the name of this shape?</p> <p>Yes, this is a circle, but how do you know it is a circle?</p>	<p>* I repeated the name of the concept (already known).</p> <p>* The mediational strategies to teach the names of concepts are closely associated with the meaning of the concept within the learners' milieu.</p> <p>* Learners had to become owners of their own ideas.</p> <p>* Concepts were extensively explored during this step.</p> <p>* Mediational strategies required extending beyond directive teaching and educator demonstrations, e.g. small experiments that highlighted similarities and differences.</p> <p>* Learners explored through my verbal elaboration and peer discourse.</p> <p>* These actions were guided by my questioning procedures aimed at promoting thinking to assist with the process of knowledge transformation. I strived to:</p> <ul style="list-style-type: none"> • promote development of own personality; • allow different approaches to solving problems and to learning styles; • help learners to understand the meaning, value and relevance of what was being done. <p>* This motivated them to search for meaning.</p>
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<p>4. Mediation of competence</p>	<p>*Feelings of competence are related to motivation.</p> <p>*The mediator should foster appropriate task-related competence in the learners.</p> <p>*The mediator should provide opportunities for learners to interact with tasks they can master.</p> <p>*This experience will lead to feelings of success.</p> <p>*The mediator should give positive feedback and support.</p>	<p>Challenge and feelings of competence</p> 	<p>Question:</p> <p>How many answers did you have correct?</p> <p>Learners were also rewarded with gold stars for completing their work and for good cooperation during the sessions</p>	<p>*In the CEPP I encouraged learners to:</p> <ul style="list-style-type: none"> • set their own realistic goals; • develop ways to achieve their goals; and • evaluate whether they have achieved their goals <p>* The CEPP consisted of challenging but not too difficult tasks so that learners did not become demotivated.</p> <p>* Activities were created in such a way that the learners experienced a feeling of mastery and success.</p> <p>* I assisted the learners to achieve competence by giving positive feedback, which helped them to believe that they were competent.</p> <p>* All of these factors contributed to the learners' positive reaction to challenges.</p> <p>* Learners were also encouraged to set their own goals.</p> <p>* I also encouraged them to plan properly before starting with an activity.</p>
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<p>5. Mediation of self-regulation and control of behaviour</p>	<p>*The mediator should assist learners to monitor their own behaviour in order to develop:</p> <ul style="list-style-type: none"> * meta-cognitive behaviour; *self-reflective functioning; and *a need for controlled and planned behaviour. <p>*This will assist learners to reduce impulsiveness and encourage them to think before acting or speaking.</p>	<p>Self-reflection</p> 	<p>Question:</p> <ul style="list-style-type: none"> *Close your eyes. Create a picture of the circle in your mind? *How do you feel about your work today? * Is there anything you would change? 	<ul style="list-style-type: none"> * Learners were required to develop a permanent mental representation of a concept. * I facilitated the process by guiding learners away from concrete representations and encouraged abstract conceptualisations. * I strived to involve learners in self-regulating activities. * I also attempted to make learners aware of their own potential for change. * Activities were created so that learners could assess themselves by determining their own progress. * Learners had to realise that small changes and success would lead to bigger changes and success.
<p>6. Mediation of sharing behaviour</p>	<p>*The mediator should be aware of the need for sharing behaviour.</p> <p>*The mediator should encourage co-operative learning between learners and promote participation with others.</p> <p>This principle also promoted the feeling of belonging.</p>	<p>Sharing behaviour</p> 	<p>Question:</p> <p>Can you explain to us your answer or how you did it?</p>	<ul style="list-style-type: none"> * I strived to create a co-operative environment where learners could learn from each other. * During activities they had to share their thinking and emotions through communication. * Learners were encouraged to use their own creativity and imagination and to do their own work and come up with their own examples.

<p>7. Mediation of individuation and psychological differentiation</p>	<p>*Mediated emotional modifiability leads to individuation and self-identity, together with social and sharing behaviours.</p> <p>*The mediator should value and recognise individual differences and opposing responses.</p> <p>*The mediator should encourage autonomy, independence and creativity in the learners' thinking</p>	<p style="text-align: center;">Integrated with the aforementioned MLE principles 1-6</p> <ul style="list-style-type: none"> • Allowing learners to solve problems on their own in their own unique way • Learners were encouraged to select their own strategies to complete tasks • Learners were encouraged to continue even if tasks became more difficult • Learners were purposefully requested to explain what new information they had required that they did not have before the completion of an activity • Learners were made aware of the fact that there was always an answer or solution to a problem
<p>8. Mediation of goal seeking, goal setting and goal achieving behaviour</p>	<p>*The mediator should direct learners to plan, set and achieve goals.</p> <p>*Goal-directed behaviour towards personal and academic achievements should be promoted.</p>	
<p>9. Mediation of challenge</p>	<p>*Learners should be assisted not to be afraid of challenges, but to rather meet the challenge.</p> <p>*They should also be assisted to develop the cognitive skills necessary to adapt accordingly.</p>	

<p>10. Mediation of change</p>	<p>*The mediator should express an active modification approach.</p> <p>*The mediator should also believe in change and adaptability.</p> <p>*Mediators should be aware of and recognise even the slightest change in learners.</p>	
<p>11. Mediation of searching for an optimistic alternative</p>	<p>*The mediator should strive to instil positive thinking and behaviour in learners that should continue throughout life.</p> <p>*The mediator, as well as the learners, should always believe that something is possible.</p> <p>*This will encourage learners to search for various ways to solve a problem.</p>	
<p>12. Mediation of feeling of belonging</p>	<p>*To be able to bond with others enables the learner to go beyond his own, immediate needs and link his experiences with others, including an extended family or similar group.</p>	

As the **CEPP** intervention was conducted as a pilot study, the merits of the programme were also evaluated, in order to make improvements and adaptations. As it was important to determine what worked and did not work during the intervention, I evaluated each of the intervention sessions against a set of pre-determined criteria. The evaluations are presented after each of the twelve sessions on the compact disk that is included at the back of the thesis (*cf.* CD Intervention sessions).

The twelve-week programme that was followed with participants can be viewed on the compact disk included at the back of the thesis (*cf.* CD).

6.5 CHAPTER SUMMARY

I decided to develop an intervention programme to optimise the cognitive development of Grade R-learners because of participants' poor results in the CITM pre-test related to the application of cognitive and meta-cognitive skills and strategies. Observations conducted during the pre-test also revealed problems related to the cognitive functions and non-intellective factors.

In Chapter Six, I focused mainly on the development and implementation of the **CEPP** intervention programme to optimise the cognitive development of Grade R-learners, related to the aforementioned aspects.

I investigated intervention research (*cf.* 6.2), since it aims at preventing problem areas and enhancing specific skills, and I incorporated the views of Fraser *et al.* (2009:45-133) and De Vos (2005:394). I also indicated the various phases of intervention research and how the phases were applicable to my study, which were (*cf.* Figure 6.1): Situation analysis and project planning (Phase 1), Information gathering and synthesis (Phase 2), Design (Phase 3), Early development and piloting the intervention(Phase 4).

I discussed the components that were included in the **CEPP** intervention programme, namely cognitive and meta-cognitive skills and strategies (*cf.* 6.4.1.1), cognitive functions (*cf.* 6.4.1.2), non-intellective factors (*cf.* 6.4.1.3), efficiency (*cf.* 6.4.1.4) and task demands (*cf.* 6.4.1.5).

I provided some examples of activities accompanied by photographs to illustrate the active and interactive relationship between the participants and the mediator during the implementation of the **CEPP** intervention (cf. 6.4.4) linked to the following: **cognitive skills and strategies** (cf. 6.4.4.1), **perception** (cf. 6.4.4.2), **active involvement** (cf. 6.4.4.3), **symbolic thought** (cf. 6.4.4.4), **cause and effect** (cf. 6.4.4.5), **classification and categorisation** (cf. 6.4.4.6), **problem-solving** (cf. 6.4.4.7), **conservation** (cf. 6.4.4.8), **basic concepts** (cf. 6.4.4.9), **number concept** (cf. 6.4.4.10), **scientific concept** (cf. 6.4.4.11), **memory** (cf. 6.4.4.12), **self-reflection** and **meta-cognition** (cf. 6.4.4.13) and **language** (cf. 6.4.4.14) .

The chapter was concluded by providing a summary of how I applied the principles of mediation in the context of the study (cf. Table 6.2).

Chapter Seven contains information regarding the findings, conclusions and recommendations of the study.

