The effects of cognitive stimulation in the development of Mathematics, Literacy and Life-skills concepts in Early Childhood

by

Lauren Stretch

SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF EDUCATION

IN

PSYCHOLOGY OF EDUCATION

UNIVERSITY OF SOUTH AFRICA

STUDY LEADER: PROF. M.W. DE WITT

November 2009

DECLARATION

I declare that, '*The effects of cognitive stimulation in the development of Mathematics, Literacy and Life-skills concepts in early childhood*' is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Lauren Stretch November 2009

Signed .....

ACKNOWLEDGEMENTS

I wish to extend my sincere appreciation to the following people for their assistance and support during the duration of this study:

- My supervisor, Prof. M.W De Witt, for her tremendous patience, guidance, supervision and encouragement during this study.
- The principals, educators, parents and participants at the Early Childhood Centres for their willingness to co-operate, as well as their enthusiastic interest in this study.
- Mr Danie Venter for helping me with the vital statistics needed for this study.
- My dad, Richard Stretch, for the many hours he spent reviewing, correcting and assisting me in constructing a legible document, and for always encouraging me to keep going.
- To my family and friends for their support and encouragement.

ABSTRACT

THE EFFECTS OF COGNITIVE STIMULATION IN THE DEVELOPMENT OF MATHEMATICS, LITERACY AND LIFE-SKILLS CONCEPTS IN EARLY CHILDHOOD

By: L.K. Stretch

Degree: Master of Education

University of South Africa

Subject: Psychology of Education

Supervisor: M.W De Witt

Summary

This study was conducted in order to assess the effects of cognitive stimulation in early childhood. The quantitative study set out to test a target group of 40 children, ranging in age from two years to three and a half years, in order to determine the importance of stimulation and intervention from a young age. A pre-test evaluated the initial level of each child's cognitive abilities (mathematics, literacy and life skills). This was followed by a random selection of the subjects into experimental and control groups.

The experimental group underwent an eight-week intervention programme which focused on the primary concepts in each area of cognitive development. The control and experimental groups continued with their normal school learning programmes.

The results indicate that the impact of stimulation on young children is significant and there is a great difference in the abilities and understanding of concepts for those children which were stimulated individually, as compared with those children who were not so stimulated.

THE EFFECTS OF COGNITIVE STIMULATION IN THE DEVELOPMENT OF MATHEMATICS, LITERACY AND LIFE-SKILL CONCEPTS IN EARLY CHILDHOOD

Key Words:

Cognitive development

Stimulation

Mathematics

Literacy

Life skills

Concepts

Early childhood

Early childhood development

Education

Parental stimulation

Cognitive development

According to Woolfolk (2007: p22), Cognitive development refers to changes in thinking. It comprises the 'gradual orderly changes by which mental processes become more complex and sophisticated'.

Stimulation

Stimulation refers to different concepts and exercises that one can do with children, in order to enhance their abilities and understanding. It involves time and effort, and is a long-term and an ongoing process (http://extension.oregonstate.edu/catalog/pdf/ec/ec1301-e.pdf, 23/07/08).

Mathematics

Mathematical concepts are those which need to be developed in order to take part in day-to-day activities. Mathematical concepts are in the world around us, and children need to develop an understanding of these concepts and to be able to manipulate and effectively work with them (Metlina, 1991: p1-2).

Literacy

The development of language concepts is a process that begins very early in life. Humans are constantly communicating with one another and language development often results when children experiment with language in the world around them (http://en.wikipedia.org/wiki/Language_development, 15/03/2009).

Life skills

Life skills prepare and equip the child to deal with day-to-day challenges. They educate the child as to how one should act and react. Life skills teach morals and values, and also represent the psycho-social skills which develop reflective skills, such as problem-solving and critical thinking. They also assist in the development of self-awareness and they help to enhance positive self-esteem and self-actualization, sociability and the ability of children to deal with other people.

Concepts

According to Woolfolk (2007: p286), the definition of a concept comprises a 'general category of ideas, objects, people, or experiences whose members share certain properties'.

Early childhood

According to Gordon and Browne (2008: p8), early childhood refers to the period from birth to eight years old. For the purpose of this study, early childhood will refer to children in the age gap from conception to five years old.

Early childhood development

The early years of a child's life are years of rapid development and change (De Witt and Booysen, 2009: p10). According to McAfee and Leong (2007: p36), there are various facets of a child's early development, namely the physical, emotional, social, cognitive, normative and also the spiritual aspects of development.

Education

Education, according to Ornstein and Hunkins (2004: p273), is the process whereby children can gain competencies which enable them to be effective citizens in an ever-changing society. Education equips children through the provision of knowledge, skills, attitudes and values.

Parental stimulation

The role that parents play in their child's development is monumentous and has great implications on the child's totality, including his/her cognitive, physical, emotional, social and spiritual development (De Witt, 2009: p106). Awareness needs to be raised regarding the importance of parental involvement and interest. Very often the parents' role in stimulation is not seen as important, but research has shown that there is a clear and long-lasting benefit to be derived from parental involvement in the education system (Eliason, *et al.,* 2004: p49).

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTORY ORIENTATION

1.1 BACKGROUND

In order for children to flourish, the development and enhancement of their maximum capabilities and potential, as well as making the most of their period of existence, are of the utmost importance. The early years of a child's life are years of rapid development and change (De Witt and Booysen, 1995: p10). According to McAfee and Leong (2007: p36), there are various facets of a child's development, namely the physical, emotional, social, cognitive, normative and also the spiritual aspects.

A child should, by the age of three, have a strong foundation for his/her physical development, have developed the basis of his/her language skills and should be starting to develop an understanding and reasoning ability in regard to the surrounding world. Children at this age are ready and willing to learn. They thrive on knowledge and skills and are eager and willing to develop new abilities (De Witt, 2009: p11; Lindberg & Swedlow, 1985: p181).

According to Hendrick and Weissman (2007: p 2-3, p71), each child consists of five 'selves' or domains. These exist for the child in the context of his/her family and environment, as opposed to mere subject matter in the objective world around them. The five selves include the physical, emotional, social, creative and cognitive facets of selfhood. These five domains need to be viewed in conjunction with one another, as all domains affect and influence one another, resulting in the importance of the child being viewed in totality (Hendrick et al., 2007: p2-3, p71).

In this research project the researcher will deal with three aspects of cognitive development, namely mathematics, literacy and life skills.

Most children are exposed to some form of mathematics from birth and are constantly exposed to people discussing things from their environment, including shopping, shapes, numbers, age, sequence, and more. Although the child acquires mathematical concepts through experiencing the numbers in context, it cannot be assumed that the child has developed an understanding of numbers, merely because he/she has encountered numbers and counting (Seefeldt & Barbour, 1998: p452-453).

Mathematics is a part of our daily lives and it helps to develop logical thinking; it also requires a sense of drive and motivation. Mathematics has an appeal for children and adults because there is a cognitive or aesthetic response. This feeling of satisfaction will drive children to deepen their mathematical knowledge and ability and will aid educators in their understanding of the processes associated with learning and understanding the development of mathematical skills (Metlina, 1991: p2; Lindberg *et al.*, 1985: p181-182).

According to Metlina (1991: p7), '*The important task on forming elementary mathematical notions beginning in the three-year-old group. The children's later mathematical development depends on how successfully their first perception of the quantitative relationships and the spatial forms of real objects is organised. The development of such fundamental concepts as number and geometric figure are based in modern mathematics on set theory'.*

The importance of the development of mathematical concepts in early childhood is imperative for future learning to be successful in all the other areas too. In early childhood children should be taught and given an opportunity to experience numbers and abstract concepts, in order to provide them with an understanding, as well as to develop their thinking and reasoning.

De Witt (2009: p98) quotes McConnell and Rabe (1999: p2), when she maintains that early literacy can be described as, *'The skills, competencies and attitudes that precede, but directly influence, a child's beginning to read'.* Reading and literacy need to be things that are enjoyable for children from a young age. The roles of the parent and family are monumentous in developing a healthy literacy experience for the young child, which will prepare them for future language development. Lilly *et al.* (2004: p36), believe that the role that families take on in laying a groundwork for a future of successful reading and writing is imperative.

According to Soderman and Farrell (2008: p108), open communication between parents and teachers is absolutely mandatory.

The development of language starts from a very young age, even before children begin speaking. According to Soderman *et al.* (2008: p9), children that have been exposed to the practicalities of a print-rich environment with good stimulation from a young age, are able to distinguish patterns and correlate sounds with intangible symbols more efficiently. Receptive and expressive language form a major portion of language development and understanding.

Receptive language underpins the understanding of words and their meanings, and expressive language is the child's ability to express himself vocally (Lilly *et al.*, 2004: p16). According to Lilly *et al.* (2004: p16), '*Children's receptive language learning is usually several months ahead of their expressive language.'* This is clear with a young child – they are able to follow instructions and can understand what is being said to them long before they are able to express themselves fully.

Young children determine their own concepts of words, alphabet letters and the meaning of words; they are able to be creative and imaginative. Over time these concepts become increasingly more predictable and conventional. The journey of a child in becoming a mature reader and writer is very important. In order for one to understand the child's reading and writing, knowledge of the journey and concept development are both critical (McGee & Richgels, 2008: p11).

Life-skills development and general knowledge refer not only to knowledge which the child possesses, but also to their view on self, life itself and those in their milieu. According to Gordon and Browne (2007: p526), there are four primary areas with which children struggle that cater for their affective development: 1) They are unable to control their emotions; 2) They are unaware of the importance of developing good social skills and etiquette; 3) Children have a deep creative urge that needs to be satisfied; 4) Children need to acknowledge their Creator and have an understanding of where they are from, how they are loved and why there are here.

These concepts of development take place in the context of personal identity and encompass self-concept, self-esteem, body image and identity (De Witt, 2009: p119 – 120).

According to De Witt (2009: p250), '*Life skills and their transmission have become buzz words, and qualities such as self-assertion, adaptiveness, creativity, independence, positive thinking and survival are now the norm'.*

1.2 PROBLEM ANALYSIS

Prior to identifying the problem, the analysis of the problem needs to first be presented. This analysis illuminates some surrounding issues and clarifies the context of the study. It is a

stepwise process, consisting of exposition, exploration and the formal statement of the problem (http://www.idrc.ca/en/ev-56596-201-1-DO_TOPIC.html, 16/05/09).

1.2.1 Exposition of the problem

Parents want the best for their children, and want to see their children succeed and excel. Gordon *et al.* (2008: p596), have stated that, '*When a society values its children, it takes the responsibility for providing a quality of life for them*'. Parents and families are the child's first educators; they not only teach language and day-to-day concepts, but also instil values, morals, religious beliefs, and ethics (Gordon *et al.,* 2008: p307). There is little preparation involved in becoming a parent, and so many parents feel inadequate and uneducated in their role as a parent.

It seems that many parents and care-givers are unaware of the developmental levels and steps in the development of children and thus feel ill-equipped and unable to effectively stimulate and enhance their children's development (Gordon *et al.* 2008: p315).

Parents and families often incorrectly think that because their young child can count to 50 by rote and write the number names they have a deep understanding of mathematics (Lindberg, 1985: p182). During the early stages of a child's life they need to understand words and concepts, such as more, less, several and some, bigger and biggest, and suchlike (Aubrey, 1997: p21). Parents and care-givers need to be equipped and educated regarding their childrens' cognitive development, how to stimulate the child, various symptoms that may need to be recognized, basic developmental steps which need to be reached, as well as programmes and activities which enhance cognitive development.

This is necessary in order to monitor the development of the young child, as well as to provide the best means possible and enhance the child's opportunities, broaden its scope and influence, through challenging the child by means of individual stimulation and enhancement of his/her abilities.

According to Metlina, the, *'Successful mastery of mathematical concepts depends directly on the development of perception'* (Metlina, 1991: p1). According to Seefeldt and Barbour (1998: p456-459), the value of learning, the content behind mathematics, languages and life skills, as well as the ability to become active in any understanding of these concepts and confident in facing a challenge, would require the active involvement of young children, by means of the following four key elements:

i) First-hand experiences

Case and Okamoto (1996) (as in Seefeldt *et al.,* 1998: p455) stated, '*Because mathematical knowledge is a relationship constructed by the mind, direct teaching alone will not build it. Children have to develop or construct it for themselves through their own experiences and reflections on them*'. Although aid and stimulation from the teacher and parents are vitally important in teaching any cognitive concepts, the child needs to experience the concepts being taught in order to truly understand them.

Children cannot learn mathematics by rote, but rather need to develop an understanding of the numbers (Seefeldt *et al.*, 1998: p455 - 456).

Eliason and Jenkins (2008: p191) state that language is the primary concept of understanding – it forms the basis for all other learning and development. '*Language is the instrument of thought, personal expression, and social communication'* (Eliason *et al.*, 2008: p191).

Language cannot be seen in isolation; it is seen as the tool whereby children are able to translate experiences into understanding and create meanings. As experience broadens and also deepens, so language acquires meanings. These meanings result in deeper learning and in further meaning taking place (Hendrick *et al.,* 2007: p270).

Children begin the learning process slowly, and only gradually begin to develop and enhance their thinking through day-to-day dealings and by means of language. Children develop understanding through their exposure to everyday life and through daily experiences. Seefeldt *et al.* (1998: p456), believe the knowledge that is gained through interaction is acquired through the physical world, as well as incidences of reflection within the physical world. This interaction enhances understanding and logical thought.

Dewey's (as in Metlina, 1991: p2) focal point is that children should not be taught knowledge by memorizing lessons and activities, but rather through experiences, and by being challenged, by gaining skills and knowledge which they can incorporate into their daily lives. With advances in technology and the rapid direction of change, the curriculum design and ways of implementing the curriculum need to be analysed critically and effectively.

ii) Interaction with others

The school and its curriculum, as well as the society and cultures of the learners and their families that are a part of the school body all have an apparent link and implicate one another

directly. The social contribution is to make educators aware that education exists in a social context and has an influence on the culture of people. It is important for parents, teachers and care-givers to realise that the school, as well as the learners' culture, both have an equal impact on the learner. The role of the educator should be to prepare learners for the future by providing them with the knowledge and values they will need in order to make wise decisions within their context (Ornstein & Hunkins, 2004: p167).

It is equally important for children to interact with teachers and parents, as it is for them to interact with their peers. In Seefeldt *et al.* (1998: p457), '*When children hold misconceptions, the teacher can often help them come to new insights… or provide them with opportunities to confide, notice and draw conclusions' (Richardson & Salkeld,1995:29).* Parents and teachers need to provide opportunities for children to learn; they need to create a teaching situation where children can develop an understanding of the world around them; where they can develop a way of thinking that will challenge their thought patterns and create new learning opportunities for children.

iii.) The use of language

Language is vital in the learning process. It provides a basis and framework for children to grow and develop. Children are constantly communicating; throughout their day they are talking and responding (Seefeldt *et al.*, 1998: p458). It is of fundamental importance to incorporate educational concepts into the general conversation throughout the day. Simple statements, such as, 'Look at the big, yellow square blocks. Let's build with them and see how tall we can make our tower,' refer to colour, shape and measurement, and the children begin to understand and recognise all the different elements.

According to Seefeld *et al.* (1998: p458), '*The processes of speaking and listening are the first steps in the representation of mathematical ideas through language'.* These authors are of the contention that the use of language helps the child organize his/her thinking and experiences. Children can put into words what has happened, and if they have a question or misunderstanding, through language and communication these problem can be solved.

This aids in their understanding of the abstract world, with the development of problem-solving strategies, and with an understanding of mathematical, literacy and life-skill concepts (Gordon *et al.*, 2008: p471).

iiiv) Reflection

Reflection is a key component in the understanding of all cognitive concepts, as it provides a means for the child to reflect on his/her experiences and develop an understanding of abstract concepts (Seefeld *et al*., 1998: p459). Providing opportunities for the child to experience mathematics, languages and life skills would be ineffectual without the ability to reflect and develop an understanding at a later stage. *'To reason, solve problems, to see mathematical connections, children think about their actions in the world. They need to reflect on the things that they have experienced and to draw abstract patterns and see regularities from these experiences'* (Seefeld *et al*., 1998: p459). Teachers and parents should recall occurrences and instances in a child's life, so as to remind him/her of any learning that has taken place.

Children's language development is one of the most important aspects of learning that takes place in the early years of a child's life. As the child develops the ability to express himself/herself by means of words, as well as to show understanding, are ways whereby communication is made possible. Early intervention should comprise activities such as verbal interactions with people of all ages, story-telling, reading books, singing, playing games, and early stimulation (Eliason *et al.,* 2009: p191).

Language development directly influences academic and social abilities (Hendrick *et al.,* 2007: p271). Therefore a child's language skills and abilities should be recognised and stimulated from a young age, since these skills will positively affect their scholastic abilities and social successes later on in life. The rate of a child's language development, as with any other development, takes place at his/her own pace, and in his/her own particular manner (Eliason *et al.,* 2009: p193).

Early intervention is imperative; parents and care-givers need to be speaking, communicating and encouraging their children from a young age. Teachers need to ensure rich curricular activities and challenging opportunities for children, while valuing enquiry and thoughtfulness (Hendrick *et al.,* 2007: p275; Eliason *et al.,* 2008: p190).

1.2.2 Preliminary exploration of the problem

The principal aim of this study is to gain a comprehensive understanding of the cognitive development of the young child, so as to develop a suitable programme that can be used to enhance the development of young children. This will be done by means of a literature study as well as an empirical investigation.

It is important to have a full understanding of the individual development of children in their early childhood, referring specifically to the development of cognitive concepts. Theories explaining the importance of teaching these concepts to the young child and what early cognitive stimulation entails will be critically reviewed. The development of early mathematics, literacy and life skills, the promotion of these programmes, processes and strategies will all need to be evaluated as a basis for early mathematics, literacy and life skills. This will need to be done in order to create an integrated cognitive approach and programme to promote early learning.

In order to fully understand the effects and results of development and stimulation, the purpose of this study will be to examine the effects of stimulation and development regarding mathematical, language and life-skill concepts in early childhood.

This study will be conducted:

- To develop and evaluate a programme of mathematical skills, language and literacy development, including general knowledge and life-skills stimulation, to enhance the ability of young children in order to provide a better understanding of the cognitive development and abilities of these learners, as well as providing insight into the benefits of and the rate of individual development of the young learners' intelligence,
- To assess the validity of the programme of cognitive development, and
- To establish the reliability of the application of such a programme of cognitive development.

1.2.3 Research question

After interrogating the research problem using the preliminary literature study, it became apparent that the influence of stimulation and the enhancement of cognitive development needs to be examined. Various programmes and activities need to be logically planned in order to aid cognitive development and to enhance children's abilities. Thus, the research question for this study can be formulated as follows:

- *What are the effects of cognitive stimulation (mathematical, language, general knowledge) on the young child, and how can these effects be enhanced?*

The research will provide confirmation on the importance of stimulation in the early childhood years and the long-term effects of this stimulation. Thus educators, primary care-

givers, teachers and parents that are dealt with in this study will become more aware of the importance of early childhood care and the long-term effects and their implications.

Once an understanding of the effectiveness of the development of these cognitive abilities has been gained, further secondary questions will arise, such as:

- "What is the child's ability to learn and develop numeracy and mathematical concepts, literacy and language development, general knowledge and life skills development?"
- "How can the various cognitive concepts be provided for in the early childhood programme? What can teachers and parents do to enhance their children's mathematical, language, life skills and general knowledge ability?"

An understanding of the stimulation and development of cognitive abilities in the young child will provide an understanding of the different developmental levels and methods of learning, as well as the ability of the young child to learn and develop abstract ideas and knowledge. It could further add to the body of knowledge with regard to what should be done by teachers and parents to enhance the young child's development.

1.2.4 Aim of the study

The primary aim of this study will be:

- To develop a programme to enhance cognitive development in order to examine the effects of the stimulation of mathematical, literacy, life skills and general knowledge concepts in young children;
- To evaluate the methods of implementation that will assist in the development of the cognitive concepts;
- To indicate how such concepts can be provided for in the early childhood centre.

1.3 DEFINITIONS AND EXPLANATION OF IMPORTANT CONCEPTS

It is necessary that the concepts occurring frequently in this dissertation be defined before commencing with the literature study. These principal concepts are:

1.3.1 Early childhood

According to Gordon *et al.* (2008: p8), early childhood refers to children from birth to eight years old. For the purpose of this study, early childhood will refer to children in the age group from conception to five years old.

1.3.2 Stimulation

Stimulation refers to different concepts and exercises that one can do with children, in order to enhance their abilities and understanding. It involves time and effort, and is a long-term and ongoing process. Stimulation is a process of constantly challenging children to think and reason more deeply and to become creative thinkers. (http://extension.oregonstate.edu/catalog/pdf/ec/ec1301-e.pdf, 23/07/08)

During the contact time between researcher and participant, the child will be stimulated cognitively in three aspects, namely literacy, mathematics and life skills. Various exercises will be done with children. These exercises will challenge their way of thinking and broaden their horizons.

1.3.3 Mathematical development

Mathematical concepts are those which need to be developed in order to take part in day-to-day activities. Mathematical concepts are in the world around us, and children need to develop an understanding of these concepts and be able to manipulate and effectively work with them (Metlina, 1991: p1-2).

'It is believed by neuropsychologists that humans are born with "number sense", or an innate ability to perceive, process, and manipulate numbers. It is an intuitive ability to attach meaning to numbers and number relationships, in order to understand the magnitude of numbers, as well as the relativity of numbers, and to use logical reasoning for estimation' (http://s22318.tsbvi.edu/mathproject/ch1.asp, 18/03/2009).

1.3.4 Language development

The development of language concepts is a process that begins very early in life. Humans are constantly communicating with one another and often language development results 'When a person begins to acquire language by learning it as it is spoken and by mimicry'. (http://en.wikipedia.org/wiki/Language_development, 15/03/2009)

As with anything, the child's language development moves from simple to complex. According to the article in http://en.wikipedia.org/wiki/Language_development (15/03/2009), language usually starts off by means of recalling simple words that are commonly said or heard. These words generally have no meaning, but as the child grows older, so the words acquire meanings and connections between these words are formed. Sentences are then formed to create logical meaning; new meanings are associated with words and vocabulary is extended and increased.

1.3.5 Life-skills development

According to http://www.selfgrowth.com/articles/Definition_Life_Skills.html (18/03.2009), life skills can be defined as the 'abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life'. Life skills prepare and equip the child to deal with day-to-day challenges. They educate the child as to how one should act and react; life skills teach morals and values and also represent the psycho-social skills which develop reflective skills such as problem-solving and critical thinking, as well as developing self-awareness and enhancing positive self-esteem and self-actualisation, sociability and they equip children to deal with other people.

1.3.6 Cognitive development

According to Woolfolk (2007: p22), children from the ages of three to eight years old develop a number of cognitive concepts. These include time, speech, reading and reasoning. Piaget has developed a theory that embraces the different stages of cognitive development, which he believes all children develop. Children do however go through the stages at different rates.

1.4 RESEARCH DESIGN AND METHOD

This study employs the quantitative approach to explore the effects of cognitive development in the early childhood. In quantitative research, researchers are aware of the outcomes they are expecting, and strive to remain objectively separated from the subject matter being researched. 'Designing quantitative research involves choosing subjects, data collection techniques (e.g. questionnaires, observations, or interviews), procedures for gathering the data, and procedures for implementing treatments' (McMillan & Schumacher, 2006: p117).

All aspects of the study will be very carefully designed before the data are collected and analysed.

An outline of the literature study, empirical research and the research instruments used to conduct this study will be furnished in this section. Quantitative research involves an analysis of numerical data. The reason for this study being quantitative is because the aim is to determine the relationships between one phenomenon (independent variable) and another (dependant variable) in a population. (McMillan *et al.*, 2006: p117–119; http://www.socialresearch methods.net/tutorial/Abrahams/sbk16.htm)

1.4.1 Literature study

The primary reason for doing a literature study is because it compares any new research with previous research in the same field. It can be used to create awareness of the topic, to shed light on already existing knowledge, on the theoretical paradigms which have already been developed and previously researched. The literature review is educative; it enables us to identify areas of uncertainty, differences and any confusion within the field of study. It also provides for a scientific discussion of the deductions from the literature.

Many sources, including published books, journal articles and electronic sources from the Internet were employed to obtain an in-depth understanding of the nature and meaning of the problem in this study on cognitive development (McMillan, *et al.,* 2006: p75-77).

1.4.2 Empirical research

The effects of the stimulation of cognitive abilities in early childhood can best be described in quantitative terms. Therefore, in order to understand the development and cognitive abilities of young children, it is necessary that questions be posed to provide quantitative descriptions (McMillan *et al.,* 2006: p10).

The research will be performed by means of the 'True Experimental Design', whereby the subjects will be measured before and after the treatment. It is believed that True Experimental Design is 'the preferred method of research'. It provides the highest degree of control over an experiment, enabling the researcher the ability to draw casual inferences with a high degree of confidence'. (http://www.socialresearchmethods net/tutorial/Abrahams/sbk16.htm, 10/10/09)

This is the only design that can effectively determine the cause and effect, as it involves a control group and an experimental group (McMillan *et al.,* 2006: p24).

All subjects who take part in this research will be assigned to either the control group or the experimental group by probability sampling, based on randomisation. All subjects in the population (Early Childhood Centre) have the same chance of being selected. The subjects will be selected by systematic random sampling, where each individual has an equal chance of being selected.

Systematic sampling selects subjects from a population by firstly selecting only one case randomly, by using a random table with each individual representing a number. All subsequent subjects will be selected according to a particular interval.

1.4.3 Research design and methodology

The research design will be a quantitative method of capturing and analysing data. It will be an ongoing process of working with children and gaining a deeper understanding of their development as individuals. The home environment, emotional, physical, social and spiritual development will form part of this investigation, as the child always needs to be seen as a whole, and there is no way of separating the child from the environment.

The literature will be reviewed to identify the cognitive activities which aid stimulation in young children; and the most suitable ones will be included in a battery of tests. The programme will cover all mathematical, language and life-skill concepts suitable to the young learner. In order to determine the validity of the test, 40 subjects will be selected from three Early Childhood Centres and will be assigned to either the experimental or control groups through random selection.

Both groups will undergo an initial test to determine their understanding and knowledge of the mathematical, literacy and life-skill concepts and other skills and abilities. Thereafter, for the next eight weeks, both the experimental and control groups will undergo their normal daily programmes. In addition to this, the experimental group will undergo daily sessions of mathematical stimulation, language development and life skills and their stimulation, whereby cognitive concepts and ideas are understood and developed.

After the eight-week intervention programme, both groups will again undergo a post-test to determine their understanding and knowledge of the cognitive concepts and skills learnt.

The following analysis of the data was employed:

1. Single variable descriptive statistics (mean, standard deviation and frequency distributions) will give insight into the pre-test and post-intervention scores.
2. The reliability of the scores for the pre-tests and post-tests will be determined by item analysis consisting of factor analysis and the calculation of Cronbach's coefficient of alpha (McMillan *et al.,* 2006: p54, p185-186).
3. T-tests will be implemented in order to determine the level of significance in the control and experimental groups, as well as to compare the two groups' mean scores ($p \leq .001$ at 0.1% level of significance).
4. The level of significance of the study will be determined by the p-level or level of probability (McMillan *et al.,* 2006: p292). A critical value at the five-percent level of confidence ($p \geq .05$) is required for significance to be achieved.
5. Analysis of co-variance, using the statistical software package program used by BMDP2007 in addition to the analysis of co-variance, where the treatment was the grouping variant and the pre-test was the co-variant, used to test the level of improvement in the scores as a result of the intervention programme (McMillan *et al.,* 2006: p165).

A number of hypotheses have been postulated which will be dealt with in detail in Chapter 5.

1.4.3.1 Ethical measures

In order to ensure that this research meets the necessary ethically requirements the required ethical clearance will be obtained from UNISA, the relevant Education Department (if necessary) and then parents will be provided with a letter explaining in detail the aims and objectives of the research and the method to be used to achieve these. Full confidentiality will be guaranteed at all times as the wellbeing of the children is of paramount importance.

The process of conducting this research will in no way put the child at risk (Neuman, 2006: p340).

1.4.4 Reliability

'Reliability refers to the consistency of measurement – the extent to which the results are similar over different forms of the same instrument or occasions of data collection'

(McMillan *et al.,* 2006: p183). If the instrument does not show much error, then it is taken to be reliable. If the instrument has a great number of errors, it is seen as being unreliable.

Validity, according to McMillan *et al.* (2006: p188), suggests truthfulness and refers to how the investigation fits into the greater reality of day-to-day occurrences. Reliability is essential for validity to take place, and these two are often seen to complement one another. Reliability and validity can however sometimes conflict with one another (McMillan *et al.,* 2006: p196-197).

There are five types of reality, namely: Stability which refers to the consistency of test scores over a period of time; equivalence which occurs when two or more measures prove a common result in a test at roughly the same time. Equivalence and stability occur when the measures show a common interest over a period of time. Internal Consistency is used to measure a single trait or aspect by means of comparing specific measurements. Agreement on the reliability is the consistency of the ratings and findings of the observation (McMillan *et al.,* 2006: p183; Neuman, 2006: p188-190).

An acceptable range of reliability for most instruments is 0,7 to 0,9. This is normally the permissible range for the Cronbach alpha reliability coefficient (using the split-halves method). (Reliability can be 0,65 for personality tests, 0,8 for achievement tests and 0,5 for exploratory tests) [McMillan *et al.,* 2006: p183].

1.4.5 Method

The following methods will be used to obtain the information required for this study:

i.) Sampling

For the purpose of this study all participants will be selected by means of systematic random sampling, where each individual has an equal chance of being selected. Systematic sampling selects subjects from a population by firstly selecting only one case randomly, by using a random table with each individual representing a number. All subsequent subjects will be selected according to a particular interval (Neuman, 2006: p230).

The participants in this study are children between the ages of two and three-and-a-half years old that attend one of three Early Childhood Centres in Port Elizabeth.

ii) Data collection

Data will be collected by means of post-testing and pre-testing. All participants will be given a pre-test; and under the same conditions, after the period of stimulation, the post-test will take place. Parent interviews and questionnaire forms will also be completed.

1.5 DEMARCATION OF THE STUDY

This study entails a quantitative investigation of the effects of cognitive development in children in their early childhood. It involves a large group of 40 learners between the ages of two and three-and-a-half years old. The research will take place in three Early Childhood Centres in Port Elizabeth. Both boys and girls will be evaluated.

1.6 THE RESEARCH LAYOUT

This study will contain six primary chapters, each consisting of sub-sections and headings which will include an **Introduction**, which covers a basic introductory outline of the work; this will include a clear statement of the problem, the significance of the study, the various aims of the study, the research hypotheses and the limitations of the study. It will also highlight the importance of cognitive development and stimulation in early childhood.

The **Literature Review** will include the framework of mathematical concepts, elements of early cognitive development, including mathematics, literacy and life-skills development, the development of early mathematics, literacy and life-skills, and what each of these entails, various elements of early mathematics, literacy and life-skills. Differences between arithmetic and mathematics, the importance of teaching cognitive concepts to the young child, and the development of the brain will all be reviewed.

The basis for early mathematics, literacy and life-skills, the promotion of cognitive knowledge and strategies will also be discussed. They will be explained and referred to the teacher's role in the stimulation of the child, the importance of parental involvement, possible problem areas between parents and teachers, and suggestions on how to enhance parental involvement in the school or community will also be reviewed.

The **Conceptual framework** will provide a basic outline of influential theories in the history of education. A focus will be placed on those theories which are the foundation and cornerstone of the intervention programme used in this study. The intervention programme will be discussed in detail focusing on the different themes and primary developmental concepts.

The **Research Design and Methodology** chapter will report on a deeper investigation and study of cognitive development in early childhood. This comprises a programme to enhance the cognitive development in the early childhood and the reasons for the approaches taken. This chapter will also include the ethical research approach and the reasons for using this approach, as well as the various instruments used and the reliability and validity of the study.

Reference will be made to the sampling strategies, the demographic details of the group and a data analysis of the study. Close examination through a process of exploration will be conducted using those methods considered most suitable to the development of intelligence in early childhood.

The fourth chapter will include an **Analysis of the data** and findings and a discussion thereof. It will also include a design and description of the study methods used. The sixth chapter will culminate in the **Conclusion** of the study, including various recommendations based on the findings of the study.

1.7 SUMMARY AND CONCLUSION

This chapter has offered a background to the research. It has stated the research problem at hand and described the study's aims and objectives. The research methodology which the researcher plans on using to implement the research has also been stated. The terms that will be used in the following chapters have been clearly defined and the demarcation of the study briefly clarified. Lastly, the study layout has been provided.

Chapter Two will focus on the literature review relevant to the impact of stimulation on cognitive development in early childhood.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 FRAMEWORK BEHIND STUDY

History is a way of recording human achievement and it provides information about relationships between people, events, places and times. According to The South African Oxford Dictionary, history is '*a continuous record of events, a study of the past involving human affairs…*' (Ed. Branford, 1994: p353).

2.1.1 Historical framework

The history of our education helps provide an explanation of where our present education is at. It aids us in determining a broad journey, so that we can note the progress made and challenges that yet need to be faced. All aspects of history need to be considered when developing educational programmes which will impact and affect young children (Gordon *et al.,* 2008: p8).

The history of education aids us in explaining the reasons for the development of our education system - the reasons why it has developed into what it is today, and a strategy to aid development in the future. According to Gordon *et al.,* (2008: p8), '*Drawing upon the knowledge of the past creates an awareness and understanding of changes in education*'. The history of education helps one realise in which direction we are progressing and it also provides one with prospects for the future of education.

Success in the education system would be to know and recognise our strengths and weaknesses, and at the same time to be able to predict future problems and successes from the knowledge gained from past challenges and successes in history. By being provided with the past principles and values of the educational system, educators have a set of guidelines for the improvement of the educational system, as well as thereby being able to assist present educators to define solutions to their problems (Woolfolk, 2007: p8).

2.2. BASIC DEVELOPMENTAL LEVELS

As suggested by Gordon *et al.,* (2008: p100), there are six basic developmental areas that we need to focus on in development regarding young children. The aspects, as suggested by

Gordon *et al.,* (2008: p100), need to be dealt with together, and not in isolation, as the child needs to develop and be seen in totality and as a 'whole.' The areas of development include the following:

i) Physical-motor development

Physical development is imperative as it enhances and promotes the changes in brain structure and function in young children. It is essential to ensure sensory development, through physical activities which aid in the growth and development of the nervous system (De Witt, 2009: p90; Gordon *et al.,* 2008: p435-436; Kostelnik, Soderman & Whiren, 1999: p398).

ii) Social-emotional development

Social–emotional development refers to the child's relationship that he possesses with himself, as well as the way in which he relates to his peers, teachers, parents, and others he may be in contact with. It also refers to the child's self-concept, self-esteem and the ability one has to express oneself on how one may be feeling (De Witt, 2009: p21 & p27; Gordon *et al.,* 2008: p100).

iii) Play development

The importance of play in the education of young children is universally appreciated (Eliason *et al.,* 2008: p25; Gordon *et al.,* 2008: p167; Maree & Ford, 1987: p8). According to Eliason *et al.* (2008:p25), play in the early childhood is reflected by the teacher's knowledge and understanding of play. The environment and curriculum will be a clear representation of the teacher's understanding of play in a developmentally appropriate curriculum.

iv) Cognitive Development

Cognitive development, according to Gordon *et al*. (2008: p457), refers not only to the development of the mind, but also to all areas of the child's growth, including changes in mental structures that occur as children discover and interact with the world around them. After much research in the 1980s, a conclusion was reached by Harris and Cooper (1985; in Cooper & Levine, Ed. Presseisen, 2008), that teaching practices need to be adapted, and more focused on 'concept development, cognitive development, reasoning, thinking, higher-order comprehension skills and advanced subject matter. Cognition is the mental process which is used by children to acquire knowledge, where they exercise skills such as conscious thought and memory (De Witt, 2009: p20; Gordon *et al.,* 2008: p456).

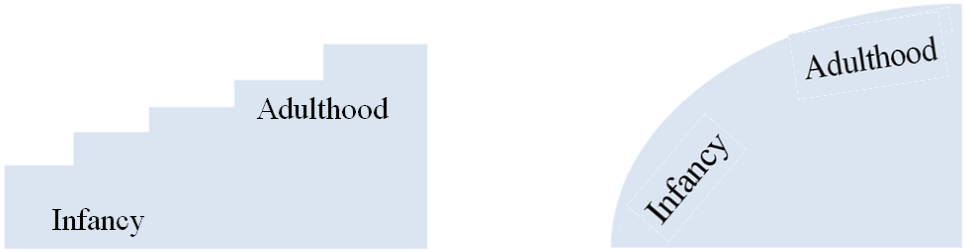
v) Language and speech development

The development of language and speech is imperative to the overall development, as all learning needs to take place with language and communication. The ability for children to understand and speak a language is therefore vital (De Witt, 2009: p98; Gordon *et al,* 2008: p100).

Development takes place in one of two processes, namely continuous development or discontinuous development (Berk, 2006: p7). Continuous development is a process whereby development and growth occur from infancy to adulthood. This takes place by means of gradually adding '*more of the same types of skills that were there to begin with*' (Berk, 2006: p7). It is a smooth, continuous and ongoing process.

Discontinuous development is a process of development and growth which takes place at specific times from infancy to adulthood, by the developing of new ways of understanding and responding to the world (Berk, 2006: p7). According to Berk (2006: p7), '*Children develop rapidly as they step up to a new level of development and then change very little for a while. With each step, the child interprets and responds to the world differently'.*

Figure 2.1 is a clear representation of the differences in development from infancy to adulthood.



a) Continuous Development b) Discontinuous Development

Figure 2.1 Continuous and discontinuous development from infancy to adulthood (Berk, 2006: p7)

2.3 INTELLIGENCE

'Intelligence is the ability to understand and manipulate facts and ideas using language and mathematics' (Spillane, Ed. Presseisen, 2008: p139). Intelligence is an indispensable part of human development which determines individual differences (De Witt, 2009: p147). Sternberg (Ed. Presseisen, 2008: p65) also states that intelligence is a vital aspect of cognitive development, and something that schools should be zoning in on, focusing not only on knowledge to be learned, but also on being able to apply knowledge and skills to real-life situations, and in everyday life (Sternberg, 2008: p65).

Intelligence is not only about having knowledge, but rather about being able to use and utilise the knowledge and intelligence that one gains (Spillane, Ed. Presseisen, 2008: p140). According to Spillane (Ed. Presseisen, 2008: p141), *'A curriculum that teaches for intelligence must provide many opportunities for students to use what they have learned in order to investigate, understand, discuss and comment on significant matters.'*

The education process is not only one of imparting knowledge, but rather one of equipping and enabling young children to use their skills and abilities in life situations (Berk, 2006: p314; Spillane, Ed. Pressiesen, 2008: p140; Sternberg, Ed. Presseisen, 2008: p65; Hendrick, 1986: p308).

Through an intense research study done by Rosenzweig (1966) and Krech (1969), a conclusion was drawn that not only did the environment impact intelligence and abilities, but they found that these changes were consistent with the levels of intelligence developed in the children (Whitmore, 1986: p6). The impact of a stimulating environment has been found to directly affect the growth of the brain in a significant way.

Whitmore (1986: p7), also believes that, *'prior to conception, the health of the mother can directly support or limit the growth of the child. Studies from third world countries have shown that, when severely deprived, it will take three generations of both proper nutrition and stimulation to return the human brain to a normal level of cognitive growth*'. This is an alarming fact, especially in a country like South Africa which has a large number of children living in poverty.

According to Kostelnik *et al.* (2004: p9), *as early childhood educators, we are becoming increasingly aware that in addition to what children learn, we must consider how children*

learn, so that we can best promote the development of these core abilities (Slentz & Krogh, 2001a).

IQ is seen as an important aspect of intelligence, but educators are also aware that there are other characteristics which reveal intelligence, such as: *'perseverance, reasoning ability, motivational level, ingenuity, originality, fluency, good concentration ability, the ability to work with acquired insight, good powers of retention and the ability to generalise'* (De Witt, 2009: p148).

In 1992 Bredekamp and Rosegrant (as quoted in Eliason *et al.,* 2008: p319) suggested that a learning style that is repetitive is necessary for early childhood teaching. This comprises four phases: awareness, exploration, enquiry and utilisation. Awareness is the ability to recognize people, objects and events. This facility is developed from the child's experiences. Exploration is the ability to observe, investigate, discover and create meaning. Enquiry is the ability to refine and create understanding through investigating, examining, comparing and generalising; and Utilisation is the ability to apply prior knowledge to new situations.

According to De Witt (2009: p147), there are different aspects of intelligence by which it can be defined:

- The ability to adapt to the environment in which one finds oneself ;
- One's ability to learn;
- One's ability to think abstractly, working with symbols and problem-solving;
- Holistically, developing an understanding of the child in his/her totality;
- One's verbal and language abilities, memory skills, problem-solving and dealing with the demands of day-to-day experiences.

2.4 COGNITIVE DEVELOPMENT

According to Woolfolk (2007: p37), Robbie Case (1992, 1998) suggests that children develop in phases within specific fields, such as numerical concepts, spatial perception, social tasks, storytelling, reasoning about physical objects, and motor development. As children practise these phases and become more familiar with them, achieving the tasks requires less time and attention.

According to Cunningham and Stanovich (1997) in Dockrell and Messer (Ed. Berman, 2004: p35), *'Vocabulary knowledge is a strong predictor of academic success, and it plays a central role in cognitive development'.*

Brody (Ed. Kyllonen, Roberts & Stankov, 2008: p71) justifies the teaching and learning process by stressing the importance of the development of intelligence, '*What is learned (self-evidently) depends on what is taught. Individuals with the same intelligence may acquire different levels of expertise and knowledge if they are taught in different ways'.*

2. 5 DEVELOPMENT OF THE BRAIN

The brain is an extremely complex and comprehensive part of the human body. Brain cells are formed within the first three weeks after conception, and play an indispensable role in the development of the child, with between 100 and 200 billion neurons or nerve cells still to be developed (De Witt. 2009: p78-79). According to Brierley (1994: p5), the brain has full control over the body and its functions. The brain is made up of many parts which all play a different, yet vital role in the day-to-day functioning of a human being (Brierley, 1994: p6).

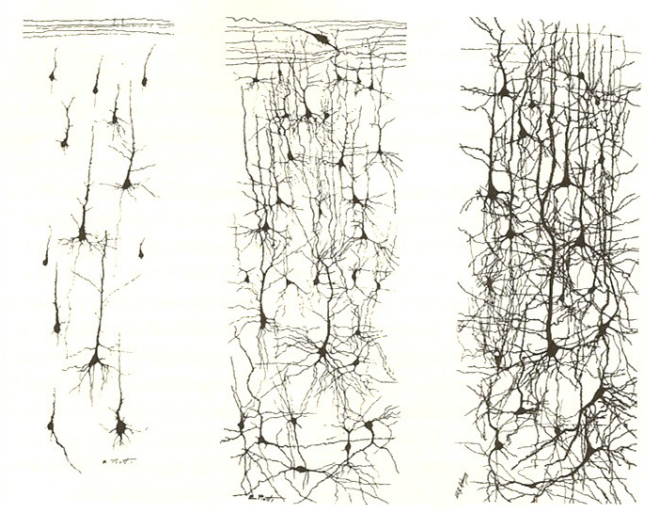
Every sight, sound, touch, smell and thought leaves an imprint on specific neuronal circuits and pathways, altering and transforming the way future sights, sounds, smells and thoughts will be registered. According to (Eliot, 1999: p4) '*Brain hardware is not fixed, but living, dynamic tissue that is constantly updating itself to meet the sensory, motor, emotional, and cognitive demands at hand'.*

The child becomes aware of its environment and surroundings by means of the most complicated system in its body, the nervous system. The child's senses and muscles create awareness and allow it to adjust to its milieu (De Witt. 2009: p77). While genetics plays a great role in the sequence of neural development, the quality and eminence of development is formed by environmental factors (Eliot, 1999: p9). The primary role of the nervous system is to 'control, integrate and co-ordinate' the responses to stimuli, which enhance the child's ability for the acquisition of learning and language (De Witt. 2009: p78, Hendrick, *et al.* 2007: p10-11).

Gordon and Browne (2008: p460) believe that, *'During the first three years of life, an infant's brain creates an estimated 1000 billion synapses. Providing thereby quality*

experiences and relationships which will create lasting effects on how the brain gets wired… Indications are strong that children's brains need to be stimulated for the network of connections to grow and be protected from being discarded.' The fact that during the early stages of a child's life there is such a vast growth in the synapses, which affect the development and advancement of the brain, it is clear that young children need to be invested in so as to protect and enhance the synapses.

According to Eliot (1999: p29), brain-wiring and development evolve and advance in an intricate relationship between nature and nurture.



Newly born 3 months old 2 years' old

Figure 2.2 Representation of cellular growth in the cerebral cortex during the first two years of a child's life **(**Eliot, 1999: p29)

Gordon *et al.* (2008: p460), state that '*Indicators are strong that children's brains need to be stimulated for the network of connections to grow and be protected from being discarded'*. It is clear that dendrites and synapses are formed rapidly during a child's early years (Eliot, 1999: p28).

According to Eliot (1999: p439), past research has shown that on average 40 percent of people's memory skills can be attributed to their genetic formation; 60 percent of a child's memory ability and skills are shaped by experience. Memory improves with practice and through repetition, especially with deliberate efforts to acquire and retain new information.

There are a number of representative characteristics of a three-year-old child; these are related to their cognitive development and include: (Althouse, 1981: p126; http://www.allthedaze.com/pdevelopment.html, 20/06/09; http://www.musckids.com/health_library/growth/threeyo.htm, 18/06/09; http://www.child-development-guide.com/child-development-3years.html, 18/06/09)

* The child likes to experiment with concrete apparatus, often repeating actions;
* The child now focuses on and attends to one aspect of an object – his thinking is centred;
* The child is unable to complete a process from start to finish, and then retrace his steps to the starting point;
* The child's reasoning is transductive. He will use his reasoning to make sense of the world around him;
* The child now begins to gain understanding regarding position, order, sequence and simple classification;
* The child can verbally compare two or more objects;
* The child can finish basic puzzles;
* The child is able to copy a circle;
* The child can recognise and name basic shapes and colours;
* The child can use personal pronouns and plurals correctly;
* The child is able to take part in simple conversations, with the ability to describe present and past experiences;
* The child is able to speak more than one language if he repeatedly hears more than one language spoken around him as he grows up;
* The child tends to talk to himself when playing;
* The child enjoys listening to and making music;
* The child can count up to ten or more by simple repetition.

Table 2.1 Parts of the brain

(Berk, 2007: p219; Brierley, 1994: p6; De Witt, 2009: p81-84; Woolfolk, 2007: p24-25; http://serendip.brynmawr.edu/bb/kinser/Structure1.html, 29/06/09)

	Part of the Brain	Function
RIGHT HEMISPHERE	Corpus Callosum	Inter-hemispheric connexion
	Thalamus	Central 'switchboard' of sensations
	Visual Cortex	Sight
	Cerebellum	Equilibrium
	Reticular Activating system	Sleep, wakefulness, alertness
	Pituitary Gland	Hormonal equilibrium
	Amygdals	Regulation of instinctive behaviour
	Cerebral Cortex	Outer layer of the brain. 3mm thick
	Hypothalamus	Instinctive behaviour: thirst, hunger, aggression, sex, fear
	Hippocampus	Concerned in memory
LEFT HEMISPHERE	Frontal Lobe	Decision-making
	Broca's Area	Motor speech
	Olfactory Bulb	Smell and taste
	Temporal Lobe	Memory in language
	Auditory Cortex	Hearing
	Wernicke's Area	Understanding speech
	Spinal Cord	Transmission of inputs and outputs
	Cerebellum	Equilibrium
	Occipital Lobe	Sight
	Parietal Lobe	Seems to control relationship between body and mind

It is clear that the brain is an indispensable part of the human body – one that affects and influences all other parts of the body.

2.6 GIFTEDNESS

Giftedness refers to children who may be '*exceptional, superior, brilliant, geniuses, talented, keen-witted and a quick learner*' (De Witt, 2009: p145). There is a group of children that is very often overlooked in the school situation (Woolfolk, 2007: p148). Gifted children have special needs – they thrive in a classroom situation that is enriched; one that does not look down on the extremely talented child. A study done by Tomlinson-Keasey in 1990 (in Woolfolk, 2007: p149) states that more than one-half of all gifted children do not achieve in school at a level equal to their ability.

Every opportunity needs to be taken to encourage the understanding of gifted children, as well as to equip educators and care-givers to enhance the development of each child individually, irrespective of their level of intellect or their abilities. Giftedness forms a great part of cognitive development – one that can no longer be overlooked and ignored.

According to Slater and Bremner (in De Witt, 2009: p145), giftedness is generally a term used to describe a person with high cognitive abilities, as seen through verbal abilities, memory, problem-solving skills, and the daily demands of life. Kokot (In Landsberg, Kruger & Nel, 2005: p470) gives his interpretation of giftedness from a South African perspective. He believes that '*giftedness is biologically rooted in the child and develops as an expression of a system of interrelated influences within the child's inner and outer environment'*.

Accordingly, giftedness can be explained in terms of an interrelated system. Children may be born with the genetic potential for giftedness in one or more fields in the neurological structures, but it is necessary to nurture this potential to full fruition in order to create the best opportunities for the child.

The following are characteristics of giftedness, as mentioned by Landsberg, Kruger and Nel (2005: p472-473):

- **There is early use of advanced vocabulary;**

Many gifted children begin with language development, by communicating and using words before they are 12 months old.

- **Keen observation and curiosity;**

A potentially gifted child could ask questions and show intrigue around topics that would not normally interest young children.

- **Retention of an above-average amount of information;**

Gifted children have a great memory and are able to recall past events and experiences with great detail.

- **Periods of intense concentration;**

A potentially gifted young child can sit and listen inventively to instructions, a story or any conversation without getting distracted or bored.

- **Ability to understand complex concepts, perceive relationships and think abstractly;**

Young children are able to show understanding by observing and noting concepts. These children can think abstractly and conceptualize situations and relationships in the world around them.

- **A broad and changing spectrum of interests;**

Gifted children often show an extreme interest in a subject, and then an extreme interest in another subject a little while later.

- **Strong critical thinking skills and self-criticism;**

Gifted children evaluate themselves and others critically. They notice inconsistencies when people say something and do another thing, and often tend to get disappointed and let down when people do not do as they say. Gifted children are also very critical of themselves.

2.7 EARLY MATHEMATICS

Numeracy and numbers are all around us; every day, teachers and care-givers have the opportunity to enhance and encourage each child's mathematics abilities, so as thereby to enhance the young child's cognitive skills and development. *'Children's early mathematical experiences play an enormous role in the development of their understanding of mathematics, and serve as a foundation for their cognitive development*' (Tudge *et al.,* in Perret-Clermont, 2004: p21). Mathematics plays a great part in cognitive development, and an understanding of mathematics is an indispensable foundation for the teaching of concepts.

According to De Witt (2009: p184), concepts form the foundation for reasoning, interpretation and thinking; these are the groundwork of a learner's understanding of maths and science.

In an article written by Swets and Zeitlinger (2002: p252), early numeracy is defined as '*the acquisition of mathematical knowledge and skills* which *can be viewed as a developmental process that starts long before the beginning of formal mathematics education in the primary school.* In the years prior to formal schooling in Grade 1, children are exposed to simple mathematics concepts, especially those that are interested in numbers and facts about numbers. They develop understanding regarding shapes, colours, patterns, counting in sequence, groups, and comparing objects (De Witt, 2009: p184).

Saracho and Spodek (Ed. Saracho, O & Spodek, B. 2008 : p viii), stated that children '*build considerable informal knowledge of mathematics before entering school and can extend their knowledge if provided with appropriate experiences at all ages'.*

Swets et al. (2002: p250) have categorized this type of learning as, '*informal mathematical concepts,'* and believe they are developed and enhanced over a period of time, based on children's experiences with numbers, in school as well as in their day-to-day experiences. Saracho and Spodek believe that mathematics not only includes numbers, but also geometry, measurement, algebra and patterns (2008: p1).

In early childhood, teachers and parents should enhance the development of these mathematical notions by creating learning situations through spontaneously occurring situations which seem unintentional, yet are planned and systematic educational activities (Swets *et al.,* 2002: p250).

According to Brooks-Gunn (Ed. Chase-Lansdale, Kiernan, Friedman. 2004: p295), all children have the potential to develop mathematical concepts, and the amount of development that occurs before formal teaching varies from child to child. In an article written by Dockett and Perry (2007: p871), it states that through thorough research, it has been recognised that young children are capable of learning mathematics, as well as of developing a deep understanding of mathematical concepts, and in turn relating them to their current life situation.

Swets et al. (2002: p250) believe that there are three major views on mathematical concepts in early childhood which can be distinguished. They include the following:

i) Logical mathematical foundations

The concept of logical-mathematical foundations was greatly influenced by Piaget. He believed that the development of number concepts and early mathematical skills that can be envisaged as the amalgamation of the logical operations of number conservation, classification and seriation (Woolfolk, 2007: p26-28). '*A child who has acquired these logical operations, has a true understanding of what numbers are, and is ready to start to do mathematical operations with them in a meaningful way* (Swets *et al.,* 2002: p251).

In an article written by Swets *et al,* (2002: p251), Piaget (1965) notes his belief in the development of logical operations. He believes that the development of these operations is a direct reflection on the child's contact and relations with the concrete materials in his/her environment. Piaget believes that the development of mathematics concepts can be attributed to one experiencing the number, interacting with mathematical concepts and for mathematical concepts to be constant in their environment and surroundings, so that mathematics becomes a regular part of a child's daily life.

In Swets *et al.* (2002: p251), Piaget also states that teaching a child to count by rote is not of vital importance – it will in no way aid in his/her development and understanding of numerical concepts.

Although rote counting is important, and may provide us with a familiarity on number names and the sequence of numbers, it does not provide us with an understanding of numbers, number concepts and abstract ideas. Piaget (1952) blatantly stated that *'Counting has no operational value'* (Swets *et al.,* 2002: p251).

ii.) Children's counting skills

In contrast to Piaget's previous statement, the importance of developing children's counting skills is also stressed as an indispensable part of the development of mathematical concepts. This contradicts Piaget's logical operations theory. According to those that support this view, counting skills are essential and also aid in the development and understanding of the numbers concept. The repetition of counting by rote reinforces the child's ability to memorise sequences and sounds, even if done without any understanding (Eliason *et al.,* 2008: p325).

According to Swets *et al.* (2002: p251), *'Frequent and varied experiences with counting are considered to be necessary for the development of the concept of numbers, and of the concepts of addition and subtraction'*.

For children to fully gain an understanding of numbers and to have number sense, they need to continually experience numbers in the world around them.

iii) Synthetic approach

The idea of the synthetic approach integrates the ideas of the Logical Mathematical Foundations approach and the Children's Counting Skills approach into one synthetic model. Here, both theories are to be considered vital in the development and understanding of early numeracy, mathematics concepts and abstract notions. Swets *et al.* (2002: p252), state that eight closely knit aspects of numeracy were devised by Van de Rijt (1996).

These eight aspects include the following, and will be dealt with in more detail later on:

* Concepts of comparison
* Classification
* One-on-one correspondence
* Seriation
* The use of number words
* Structured counting
* Resultative counting
* General understanding of numbers

Subsequent to a study performed by Aubrey (1997: p27), it is now recognised that there are four related assumptions regarding early numeracy and the development of mathematical concepts in early childhood. These assumptions include:

* Children develop their own knowledge and understanding of mathematics.
* Mathematics needs to be organised in such a manner as to facilitate the development of mathematical knowledge and an understanding of concepts.

* The topics and starting point for mathematical instruction should be developed according to the children's level of development.

* Mathematical skills need to be taught concurrently with developing understanding and problem-solving skills (Aubrey, 1997: p27). Schoenfeld (1989, 1994, in Woolfolk 2007: p358) did a study where all the learners were given problem sums. The beginner and novice problem solvers began unproductive explanation routes when problem-solving and very often continued on these paths, even though they were not aimed towards a resolution. In comparison, expert problem-solvers move towards solutions by using a range of cognitive processes, such as 'planning, implementing and verifying' and altering their conclusion. These are based on the process of discovery.

According to De Witt (2009: p106), Piaget was originally of the opinion that language development and cognitive development go hand in hand and work simultaneously. He also stated the notion that thinking develops before language does. Vygotsky believed that language development and cognitive development are usually seen in isolation until the child reaches the age of two years, when a sudden spurt in development occurs.

2.8 WHAT EARLY NUMERACY AND MATHEMATICS ENTAIL

Children are exposed to some form of numeracy from birth. The child is constantly exposed to people discussing things from their environment, including shopping, shapes, numbers, ages and sequences. Numeracy is all around us. Although it cannot be assumed that the child has developed an understanding of numbers, merely because he has encountered numbers and counting, the child does acquire mathematical concepts through experiencing the numbers in various context (Swets, *et al.,* 2002: p251-252).

Often parents and families think that because their young child can count to 50 by rote and write the number names they have a deep understanding of mathematics. This is most definitely not the case; before a child truly understands abstract numbers and concepts, he/she needs to have experienced numbers through his/her senses in a concrete format. Only then will the concepts begin to be understood.

According to Lansdown and Walker (1991: p312) during the early stages of a child's life, they '*need to understand words like more, less, several and some; then come bigger, biggest, taller, heavier, between and so on*'.

There are six major aspects of early numeracy teaching and learning that are important in the understanding of mathematics concepts in the early childhood (Wright 2002: p35). These include:

* Children need to have a deep understanding of mathematics, through identifying strategies and a conceptual knowledge of numbers.

* Early childhood teachers and workers need to be provided with an explanatory model and guide to young children's number development.

* The guides and explanatory models can be used by teachers to observe and assess the child's early number knowledge.

* The models and guides can be used across a broad range of schooling systems, stimulation centres and communities.

* Together with learning frameworks, instructional frameworks are also available. The instructional frameworks and learning frameworks go hand in hand to enhance the learning experience.

* Teachers and professionals need to undergo development courses which will enable them to effectively implement the learning and teaching frameworks and gain positive results with the development of children.

In a recent study done by Griffin (2004: p175-176), to note the effects and develop an understanding of number sense, the following guidelines need to be taken into consideration when implementing a mathematics programme for young children. This will enable the child to use his/her existing knowledge, as well as to construct new knowledge on the next level, so as to enhance his/her abilities and thinking.

Each individual child's needs should be met, by means of the following:

* The child's current knowledge should always be noted and taken account of, so that progress and development can be assured.

* Activities should be multi-levelled, so that children with different base knowledge can take part in activities and the programme at hand, with an understanding of the activities, ensuring that all the children will benefit from the exposure to concepts (Griffin, 2004: p 175-176).

2.9 THE DIFFERENCE BETWEEN ARITHMETIC AND MATHEMATICS

2.9.1 Mathematics

Mathematics is, '*The study of the measurement, properties, and relationships of quantities and sets, using numbers and symbols*' (http://www.answers.com/topic/arithmetic.1/10/08). Mathematics evolved from simple concepts, such as counting and measuring. *'It deals with logical reasoning and quantitative calculation'* (http://www.answers.com/topic/arithmetic. 1/10/08).

2.9.2 Arithmetic

Arithmetic is a branch of mathematics. It deals with numbers, operations and computations of numbers. Arithmetic is used in many practical situations, such as buying, selling, counting, statistics and day-to-day occurrences. '*The usual numbers of arithmetic are whole numbers, fractions, decimals, and percentages. The numbers used in arithmetic are negative numbers, rational numbers, and irrational numbers. The rational and irrational numbers together constitute the real numbers'* (http://www.answers.com/topic/arithmetic. 1/10/08).

2.10 THE ELEMENTS OF EARLY NUMERACY

Toddlers sort things. They put them in piles—of the same colour, the same size, the same shape, or with the same use. Young children pour sand and water into containers of different sizes. They pile blocks into tall structures and see them fall and become small parts again. The free exploring and experimentation of a child's first two years help to develop muscle co-ordination and the senses of taste, smell, sight, and hearing—skills and senses that serve as a basis for all their future learning (http://www.project2061.org/publications/earlychild/online/experience/Lind.htm, 1/10/08).

Although young children may not be doing math's sums and equations, they are still developing mathematical concepts and gaining valuable insights into numeracy. From their earliest days children are exposed to numbers, shapes, colours and structures in their daily lives. Teachers and educators thus need to ensure that children are gaining the most insight possible from the world around them.

According to an article written by Sophian (2004: p59), although mathematics instruction for young children should be age-appropriate, in both format and content, it should at the same time prepare the child conceptually for the kinds of mathematics that they will be exposed to in the future.

2.10.1 Counting

There are many ways in which we can include counting in the development of mathematics concepts, so that counting is not merely a memory activity, but rather so that children may develop an understanding of numbers and extend their concept of understanding (Young-Loveridge, 2002: p37). Counting is a very important aspect of mathematics. It is the foundation for all future mathematical knowledge, and it is part of daily life (Clarke, Clarke & Cheeseman, 2006: p83-84; De Witt, 2009: p184; Tudge *et al.,* 2004: p21).

We are surrounded by counting and mathematics every day (Clarke *et al.*, 2006: p84).

If learners merely recite numbers, and learn the names of numbers by rote, they are not gaining anything; and later on in their mathematical careers they will suffer greatly. According to Mc Dermott and Rakagokong (1996: p51), the ability to recite numbers does not mean a child can count. Counting skills are skills which are learned gradually and after a great deal of counting experiences.

Counting involves the following aspects (Mc Dermott *et al.,* 1996: p51):

- The ability to distinguish a selection of objects.
- The ability to connect a number name to a collection of similar objects representing the total number of objects in that collection.
- The ability to know that the last number name used in counting represents the number of that specific arrangement.

There are many stories and poems that refer to numbers and counting. Stories such as, 'The Three Little Pigs', 'Snow White and the Seven Dwarfs', and poems such as, 'One, Two, Three, Four, Five once I caught a fish alive… Six, Seven, Eight, Nine, Ten, then I let it go again'. These can all be used when teaching children the concept of counting.

2.10.2 Classification

Classification is an important aspect in the development of mathematical concepts, and according to Micklo (1995; as in Seefeldt *et al.,* 1998: p469), it deals directly with '*putting together things that are alike or that belong together'*. Classification occurs when one groups together like objects, or objects which belong together. Classification helps the young child to develop the concept of numbers (De Witt, 2009: p186; Eliason *et al.*, 2008: p240, 332).

Throughout the child's first year, infants use their senses to sort and classify their experiences (Gordon *et al.,* 2008: p463).

In order for a child to be able to sort and classify objects by placing them in groups, they first need to be able to observe an object, identify similarities and dissimilarities, and thus compare characteristics (Hendrick *et al.,* 2007: p225). It also implies noting specific attributes and characteristics which are associated with purpose, position, appearance or location (Seefeldt *et al.*, 1998: p469). Children should constantly be encouraged to take note of the similarities between the things they see and with which they interact throughout their day.

Children should also be encouraged to collect things – rocks, shells, marbles, flowers, money and creatures. This should be performed as a fun activity, so as to encourage learning in a fun environment (Gordon *et al.,* 2008:463).

Seefeldt *et al.* (1998: p470), firmly believe that the classification process is segmented into the following stages:

- Sorting into collections without any plan in mind;

Children will begin the sorting process without a plan in mind, but as they 'play' they realise that they are sorting objects, and will continue. There is no reason behind the sorting. It was by chance that the sorting process took place (Seefeldt *et al.*, 1998: p469; Lindberg, 1985: p185).

- Grouping with no apparent plan;

Children have their own idea of grouping, often unable to be seen by the adult, but when explained by the child, there is a deeper understanding of the child's reasoning (Seefeldt *et al.*, 1998: p469).

- Sorting on the basis of some criterion;

Children are often able to sort objects according to one criterion, but often struggle to sort more than one. All the green things or all the round things go together, but not all objects that are green and round necessarily do go together (Gordon *et al.,* 2008: p463; Seefeldt *et al.*, 1998: p469).

- Sorting on the basis of two or more properties;

Once children have mastered the technique of sorting according to one criterion, they are then able to create groupings on the basis of two or more criteria, putting together all the green and round objects together in a group (Eliason *et al.*, 2008: p332; Swedlow, 1985: p185).

- Sorting on the basis of function, use or concept.

Finally, children are able to sort objects or events according to their function, use or concept (Seefeldt *et al.*, 1998:469).

2.10.3 One-to-one correspondence

One-to-one correspondence is an ability that a child develops, which enables them to match an object to a number. One-to-one correspondence is the most important element in the concept of numbers. One-to-one correspondence is a deliberate way of counting, and will only become evident in the child's mathematical ability, once they have developed the concept of this counting technique (Clarke *et al.,* 2006: p94; Eliason, 2008: p325; Gordon *et al.,* 2008: p464; McDermott *et al.,* 1996: p52).

According to Benigno and Ellis (2004: p17), *'Reciting strings of numbers, pointing, and emphasising the final count are likely to reinforce preschoolers' understanding of number sequence, one-to-one correspondence, and cardinality.'*

By developing a link between the number and the number of objects that are being counted, the child begins to develop an understanding of this concept, which later allows children to match the number of objects to number names. One-to-one correspondence would be evident and understood, should a child have five sweets in front of him; he counts them, and as he counts them, he touches each sweet, counts it only once, and can state that there are five sweets in front of him.

Should the child count the sweets, but counts one sweet twice, doesn't count one, skips one out or counts beyond the number of sweets that there actually are, the concept of one-to-one correspondence has most likely not yet been acquired (Eliason *et al.*, 2008: p325, McDermott *et al.,* 1996: p52).

Counters are a great teaching aid to use whilst demonstrating one-to-one correspondence, as they are concrete objects that the learners can feel and touch (Eliason *et al.*, 2008: p325). This is easy for them to comprehend, as the counters are physical, tangible objects in front of them. The number chart is also a very important teaching aid, as it is very multifunctional, and can be used in many activities to reach different outcomes.

Counting pictures is a semi-concrete teaching aid, whereby the learners can count the numbers of a specific type of object. This is also a great teaching aid, for the younger and earlier days of mathematics, as it is still introducing the numbers and number concepts to the learners (Seefeldt *et al.*, 1998:469).

2.10.4 Sequencing and seriation

In Gordon *et al.* (2008: p464), Geist (2001) states that *'Seriation is the ability to put an object or group of objects in a logical series based on a property of those objects.'* This involves being able to identify objects from the biggest to the smallest, tallest to shortest, fattest to thinnest, darkest to lightest, and so on (Clarke *et al.,* 2006: p86; Eliason *et al.*, 2008: p332; Hendrick, 2007: p339). Before a child is able to put objects in a sequence, he first needs to be able to order objects by evaluating them according to some form of contrast and similarity (Althouse*,* 1981: p124).

2.10.5 Geometry

'*Geometry is the area of mathematics that involves shape, size, space, position, direction, and movement, and describes and classifies the physical world in which we live.*' (http://www.ed.gov/pubs/EarlyMath/whatis.html, 2/10/08). The ability for young children to have an understanding of shapes and structures is imperative (Clements & Sarama, 2008: p184; Eliason *et al.*, 2008: p335). A simple exercise such as taking a small box apart and putting it back together again is a monumentous achievement if a young child can do it.

Children need to be exposed to shapes and different dimensions so that their abstract thinking and their understanding of representation may be enhanced. There are so many aspects of geometry and shapes that can be learnt in our daily lives, including angles, shapes, and solids by merely observing the world around us (Gordon *et al.,* 2008: p465).

According to Clements *et al.,* (2004: p187), '*Geometry and patterning are foundational for mathematics learning'*.

2.11 THE PROMOTION OF MATHEMATICAL KNOWLEDGE, PROCESSES AND STRATEGIES

McDermott *et al.* (1996: p2) believe that the development of mathematical concepts comes from a model of teaching and learning that was formed by research, conducted in South Africa. '*This concept is strongly South African in context'* (Mc Dermott *et al.,* 1996: p2). The acronym, EXCELL stands for the five stages of the process for the development of mathematical concepts.

EX stands for Experience. Mc Dermott *et al.* (1996: p2), believe, together with many other theorists, that children need to experience mathematics and numeracy before they can develop any understanding of it. De Witt (2009: p185) states that basic learning experiences which develop mathematical concepts are essential for further mathematical development.

According to Gordon *et al.* (2008: p464), an awareness and understanding of numbers is neither complete nor absolute unless children have direct experiences with materials and objects. When children are exposed to numbers and experiences they adopt the concept and develop an understanding. This process is called 'accommodation', and results from an interaction between the learner and his/her environment (Mc Dermott *et al.,* 1996: p3;

Gordon *et al.,* 2008: p143). Very often children do not adopt the new concept, but rather take it in, and allow for the new concept to fit into their current understanding. This process is called assimilation (Mc Dermott *et al.,* 1996: p3; Gordon *et al.,* 2008: p143).

C stands for Context. This refers to the understanding and learning of mathematics concepts which take place in the context of the child's real world and the various needs he may have. Mathematics which is based on the young child's reality and life-experiences has more meaning for the child than that based on the unknown and the uncommon.

Mathematics needs to be fun and relevant to the child (Mc Dermott *et al.,* 1996: p3; Woolfolk, 2007: p263).

E stands for Environment. Mathematics should encourage intrigue and interest in the child's environment. It should provide learners with a means to explore and discover (Mc Dermott *et al.,* 1996: p3; Gordon *et al.,* 2008: p328). According to Petrill and Wilkerson (2000), in Woolfolk (2007: p121), differences in intelligence are the result of both heredity and environment, so both the child's home and school environment aid in the development and learning of mathematics concepts (Mc Dermott *et al.,* 1996: p3).

The first L in EXCELL represents Language. Mc Dermott *et al.* (1996: p4), believe that *'Language is an essential component in the formulation, as well as the expression of mathematical ideas.'* Children begin using mathematical terms and developing mathematical concepts from a young age, before they even know that they are using mathematical terms.

Expressions such as bigger than, more, shorter, taller are all expressions that enable them to articulate and express their opinions and thoughts. Because of the differences in children's cultures, religions, beliefs, socio-economic status, all children's levels of understanding and development are at a different level. Because of this, some children grasp concepts immediately, while other children struggle with the concept (Mc Dermott *et al.,* 1996: p4; Eliason, *et al.,* 2008: p191).

The final L represents Learning. Cognitive learning is a very important process occurring in the brain. Knowledge is a two-way process, where the learners recognise and identify the features that are significant to their experience and make those features their own (De Witt, 2009: p185; Mc Dermott *et al.,* 1996: p4; Woolfolk, 2007: p206).

Mc Dermott *et al.* (1996: p2-4), believe that all assimilation of new knowledge takes place within the context of the above-mentioned criteria – Experience, Context, Environment, Language and Learning.

2.12 EARLY LITERACY

Early literacy and language development begin with experiencing language through verbal interactions, books, rhyming, activities, storytelling, singing and games (Eliason, *et al.,* 2008: p191). Language is a means of expression, a way in which people can communicate and interact with the world around them (De Witt, 2009: p5). Communication and language are the cornerstones of cognitive learning and development. *'Language is thus the device through which raw experiences are translated into meaningful symbols that can be dealt with coherently and used for both thinking and communicating'* (Eliason, *et al.,*2008: p191).

In an article by De Witt, Lessing and Lenayi (2008), a statement by Al Otaiba and Fuchs (2002) is endorsed, stating that, *'Given the pivotal role reading plays in and out of school and the cumulative long-term cost of literacy, early literacy intervention is critical'.*

As a child's experience intensifies, his/her language obtains meaning and therefore further growth and learning become achievable, also allowing for children to express their feelings and emotions. Language is a fundamental concept for further development and learning (De Witt, 2009: p5; Eliason, *et al.,* 2008: p191). According to Gordon *et al.* (2008: p505), successful readers are able to note an association between the spoken language and the written word, they are aware that language is formed with a number of sounds and symbols, and are thus able to make the connections between the spoken word and the written word. According to Estes (1975), McKenna & Kear (1990) (in Cunningham, 2008: p20), a child's attitude towards reading and language plays a vital role in establishing a love for literacy.

Between 19 months and four years, the child has an intrinsic and natural ability available for language learning, called the Language Acquisition Device. According to Kostelnik, Soderman and Whiren (2004: p315), '*During this period, the environment of the child must be rich in language experience.'* The child should be exposed to as much verbal interaction, communication, reading, reasoning, learning poems and songs and make-believe as possible.

Cunningham (2008: p28) believes that it should be every teacher, administrator, reading specialist and care-giver's role to promote and encourage children to love language, as well as encourage a passion for literature and books, thus creating a life-long reader. According to an article written by Schmitt and Gregory (p1), '*Without intervention on the part of the educational system, the prospect of very real and negative consequences for future success in school and life are what lie in store for these children'.*

Arnold Gesell (1925) was the chief proponent of a theory that compared cognitive maturation to physical maturation. This was called the Maturationist Movement, and it stated that children were ready to read once they had developed certain prerequisite skills and abilities (Gordon *et al.,* 2008: p155; Lilly *et al.,* 2004: p2). The Behaviorist Theory is one that is still used in some school situations today. It is teacher-centred and fast-paced, where children learn through repeating words and sentences that have been constructed by their teachers (Gordon *et al.*, 2007: p138, 174; Lilly *et al.*, 2004: p2).

The Connectionist Theory functions on the cornerstone that literacy knowledge is built on a series of skills and experiences. The alphabet, reading words and fluency are all taught and an emphasis is placed on the mastery of these techniques (Lilly *et al.*, 2004: p3). The Social Constructivist Theory is based on Vygotskian principles, and is largely based on the child's environment from a cultural perspective. The cornerstone of this theory is that parents and care-givers should model language, so that children might acquire knowledge through their experiences with more experienced peers or adults (Gordon *et al.,* 2007: p149, 174; Lilly *et al.*, 2004: p3).

The Critical Theory encourages developing a deep understanding of each child, their environment and home situation, supporting a multi-cultural approach to teaching. It addresses issues of social justice, poverty, malnutrition, non-violence and helps children to become creative and critical thinkers and readers (Higgs & Smith, 2006: p66; Lilly *et al.* 2004: p4).

Emergent literacy involves the formation of literacy concepts through informal experiences, where skills, knowledge and attitudes are developmental indications to conventional forms of reading and writing (Berk, 2006: p300-301; Gordon *et al.*, 2008: p506). Emergent literacy forms the building blocks for future learning, reading and writing. It is developed from birth, through interactions with people, participation with adults and peers and through both non-intentional and intentional stimulation (Lilly *et al.*, 2004: p4).

Some of the important characteristics of language, according to De Witt (2009: p100), include:

- **Language is a means of communication**

In order for children to communicate with other humans in the world around them, there needs to be a common ground and understanding of words, symbols and expressions, in order to make verbal or non-verbal communication possible. Verbal interaction and communication take place through language (De Witt, 2009: p100; Hoff, 2005: p254; Lilly *et al.,* 2004: p126).

- **Language is a means of socialisation**

Language is the cornerstone of communication and interaction. It is also important for maintaining and sustaining interpersonal relationships and communicating morals, values, attitudes and beliefs through sensitivity, understanding and clear communication (De Witt, 2009: p100; Lilly *et al.,* 2004: p124).

- **Language as a means of exploration**

Children explore and gain insight by asking questions, by examination and through discovery. This expands their insight and knowledge (De Witt, 2009: p49, p100).

- **Language is a medium of thought**

We think and reason in our minds through language. Without vocabulary and words we would not be able to form cognitive thought patterns (De Witt, 2009: p100).

- **Language is a medium of learning**

Language is a means of learning and gaining understanding, not only through verbal explanations, but also by gaining access to culture, daily occurrences and learning possibilities (Lilly *et al.,* 2004: p124). Engelbrecht *et al.* (in De Witt, 2009: p5), believe that *'Many learning problems are a result of the child's language problems: the child is taught through the medium of language, he must understand, processes and memorise information through language, and he must also give answers in his language'.*

- **Language as a medium of expression**

Language is the way whereby children are able to express themselves, their feelings, thoughts, ideas and beliefs (De Witt, 2009: p100).

- **Language is culture-bound**

Each culture has its own, preferred ways of communicating, its language preferences, pronunciation, and dialects (De Witt, 2009: p100; Lilly *et al.,* 2004: p128).

2.13 THE DEVELOPMENT OF EARLY LANGUAGE

Reading is defined by Ruddell and Ruddell (1995) as, '*The use of one's language to decode and comprehend text'* (Eliason *et al.*, 2008: p191). Eliason also states that the foundation of literacy is language development. Children need to have a deep understanding of language before they are able to read and write. According to Bishop (2002; as in Carr 2006: p18), some children's cognitive development is of a normal standard, while their language development is delayed.

De Witt (2009: p106) states that information is received through reception, or communicated through expression, by means of language. Children need to be able to communicate in sentences, have a vast vocabulary, clear pronunciation, have an understanding for words, be able to use proper sentence structure, syntax or grammar, and be able to express themselves, their needs, wants and desires (Eliason *et al.*, 2008: p191-192; Gordon *et al.,* 2008: p100).

Matlin (in De Witt 2009: p106), states that there are four components of language that need to be understood and mastered for one to be able to communicate meaningfully. They include:

i.) Phonology

Phonology refers specifically to the basic sounds that are used to make up a language. Each language has a specific set of phonological rules and norms, which determine how the phonemes will be combined in order to create meaning in a language (De Witt, 2009: p106; Hoff*,* 2007: p238; Lilly *et al.,* 2004: p17, McGuinness, 2005: p23). Phonology also refers to the ability to hear and discriminate between sounds, as well as the articulation of sounds in speech (De Witt, 2009: p106).

ii.) Morphology

A morpheme is the smallest component of sound which has significance and importance. Sound units are combined together to create words that have meaning (De Witt, 2009: p107; http://www.wisegeek.com/what-is-morphology.htm; 30/06/09).

iii.) Syntax

Syntax refers to the grammatical set of rules and regulations that exist in a language. It refers to the way in which words are arranged in sentences. Firstly, understandable words need to be constructed from sounds; then words are placed in a particular order to make a sentence that conveys meaning. Then complete sentence structure and overall composition is done according to the child's understanding of syntax (De Witt, 2009: p107; Eliason *et al.*, 2008: p193; Lilly *et al.,* 2004: p20, McGuinness, 2005: p329).

iv.) Semantics

Semantics refers to the meanings of words, which have been connected through language. Abilities such as understanding vocabulary, phrases, the ability to define and to categorise, the identification of synonyms, antonyms, absurdities and ambiguities, all play an important role in semantics. This aspect of language is indispensable in ensuring that thought processes are possible. Semantics is vital in ensuring that speech is meaningful and purposeful (De Witt, 2009: p107; Eliason *et al.*, 2008: p193; Lilly *et al.,* p20).

According to Vander Zanden (in De Witt 2009: p108), *'The level of the child's developmental process is determined by his vocabulary. Not only is the scope of his vocabulary involved here, but also his ability to use language as an instrument of thought'*.

2.14 THE DIFFERENCE BETWEEN LANGUAGE AND LITERACY

All areas of the curriculum should encompass language and literacy as essential aspects of development.

2.14.1 Language

Language should be seen as a mechanism of thought, personal expression and social communication (Eliason *et al.*, 2008: p191). '*Language acquisition is not only important for*

oral communication, it is also the first step in becoming literate' (Lilly *et al.,* 2004: p16). Children's knowledge of language patterns and their ability to structure sentences effectively and know semantics and the meanings of words enable them to effectively interpret the written language as they begin to read. Language is the cornerstone of literacy. A child needs to have an understanding of language before being are able to read and write effectively and with comprehension (Lilly, *et al.,* 2004: p16-17; De Witt, 2009: p99; Eliason *et al.*, 2008: p191-192).

2.14.2 Literacy

Children's early experiences with language through stimulation and day-to-day interactions play a part in enhancing their literacy ability later on in development, influencing their reading and writing abilities (De Witt, 2009: p183).

Gambrell and Mazzoni (in Eliason *et al.,* 2008: p189), state that, '*Outstanding primary-level literacy classrooms are characterized by intense, sustained literacy experiences and are filled with high-quality reading, writing, and skills instruction.'* Literacy, according to Eliason *et al.* (2008: p205), encompasses learning to read, write and think. These concepts are critical to the development of the child in school and everyday life. Literacy involves the child developing an understanding and knowledge of sounds, letters, words and sentences (Eliason *et al.*, 2004: p205).

2.15 ELEMENTS OF EARLY LANGUAGE AND LITERACY DEVELOPMENT

Language is a slow and in-depth process, which the child is expected to master (De Witt, 2009: p101). There are various theories that exist as to how children acquire knowledge of languages, but according to De Witt (2009: p101), language is developed and learned through trial and error, and by repetition of what has been heard. Over time children will learn sentence composition, correct sentence structure and grammar. There are various facets of language and literacy which develop progressively. These include:

- Vocabulary (expressive and receptive language)
- Oral language (speech and listening)
- Reading

- Writing

2.15.1 Vocabulary

Vocabulary is the *'development of stored information about the meanings and pronunciation of words necessary for communication'* (Barone, Mallette and Hong Xu, 2005: p208).

According to Barone *et al.* (2005: p208), there are four types of vocabulary. They include:

- Listening vocabulary refers to the knowledge of words, which ensures that children are able to understand what they are hearing. This is usually more advanced than the speaking vocabulary (De Witt, 2009: p99).
- Speaking vocabulary is the knowledge of words when used in speaking.
- Reading vocabulary refers to the words needed to understand what one is reading.
- Writing vocabulary is the knowledge of words used when writing.

Verbal or expressive language is the language that is spoken vocally. According to Gormly and Brodzinsky (in De Witt 2009: p99), these are those words that are used vigorously by the young child when speaking. Non-verbal or receptive language is similar to the listening vocabulary, as it refers to the words that the child understands but does not actively use in speech (Berk, 2007: p248; Hoff, 2007: p348, McGuinness, 2005: p280).

2.15.2 Oral language (speech and listening)

Oral language consists of two elements, namely speech and listening. Speech refers to the ability of a young child to express himself effectively in an audible manner. Listening is an indispensable aspect of communication, as language and interaction would not be possible without listening (De Witt, 2009: p99; Hoff, 2007: p160).

According to Jordaan and Jordaan (1989, in De Witt 2009: p99), there are three skills that need to be mastered in order to effectively be able to understand other people's linguistic messages, as well as produce understandable linguistic messages of one's own. These include:

- The child needs to be able to relate speech sounds with their respective meanings,

- Associating words with the symbols,
- Mastering the rules of the language structure, so as to create a level of understanding.

2.15.3 Reading

When learning about reading, young children's reading not only refers to the written language, but to books, print and illustrations (Barone *et al.*, 2005: p9). Emergent reading occurs in the early years of development; it refers to concepts such as colour, shape and sound. According to Eliason *et al.* (2008: p216), children need to have numerous reading experiences, which sharpen their visual and aural perceptions, before they are able to develop a reading facility. It is important that when children begin the reading process, that they first develop an understanding of reading, why we read, and what we read (Berk, 2006: p300; Hoff, 2007: p454).

When starting to read, children are unaware that each page follows on from the previous one. They merely observe the illustrations on each page. After a while, they will begin to realise that the book carries a story line, and that each page follows on from the previous one (Barone *et al.*, 2005: p9). According to Barone *et al.* (2005: p9), '*As young children develop, they begin to read a book by using book language'*.

According to Raines and Canady (1990: p5, in Eliason, *et al.,* 2008: p216), the reading process is no longer considered as *a 'word-by-word decoding process designed to unlock the meaning embedded in the print.'* They state, however, that comprehensive literacy teachers view reading as a process *'of constructing meaning from interacting with the print, relating the information on what one already knows, and teaching specific skills'*.

Once children have developed an understanding of the alphabet and letter sounds, they are able to gradually begin the reading process in a more in-depth way. According to Barone *et al.* (2005: p11), there are three dominant reading behaviours which are portrayed by beginning readers. Firstly, they begin by reading aloud, by hearing the words out loud it helps them decipher and de-code the words. Secondly, children often use their finger as a pointer at the words they are reading. Thirdly, children begin by reading word by word, and often have no understanding and meaning of what is being read, they are merely de-coding the words.

2.15.4 Writing

Since Clay (1975) and Read (1975) completed their research in the 1970s, we have come to understand the importance of children's writing from a young age. They helped teachers and parents to understand the development of writing in young children, emphasising the importance of scribbles and early writing (Gordon *et al.,* 2008: p511; Barone *et al.,* 2005: p33). Research done by Labbo (1996), Rowe (1994) and Dyson (1992), has shown the importance of the social context in the writing situation (Barone *et al.,* 2005: p33).

Scribbling is the first form of writing that emerges in the young child (Gordon *et al.,* 2008: p511). These scribbles progress through a series of developments, beginning at uncontrolled scribbles, which refer to random marks on the paper. Figure 2.2 is a clear representation of uncontrolled scribbling. This representation of scribbling clearly shows that there is no 'order' to the picture. By looking at the picture we would not be able to recognize the image as a green frog. The figures below show a comprehensible illustration of the stages of writing that children go through, starting at scribbling, moving on to writing with meaning and purpose. Children have an idea in mind when scribbling and they can often name the scribble, although this frequently changes each time the child is questioned (Barone *et al.,* 2005: p33-37).

Figure 2.3 Uncontrolled scribbling, A green frog

(Barone *et al.,* 2005: p27)

Following uncontrolled scribbling is controlled scribbling, where the child is able to show objects in a more systematic manner. Figure 2.2 is a representation of a green goblin. Children's images at this stage gradually become more noticeable and recognisable. Distinctions are also able to me made between their drawing scribbles which are larger, and

their writing scribbles, which are smaller. Figures 2.3 and 2.4 are representations of a child's desire to write.

They are a child's representations of letters, gradually developing. Once children have left the scribbling phase and are using letter strings for writing, they often learn how to write their names. Figure 2.4 is a representation of the Eiffel Tower with the letters PRS which stand for Paris (Barone *et al.*, 2005: p33-37).

Figure 2.4 Controlled scribbling, a green goblin

(Barone *et al.,* 2005: p34)

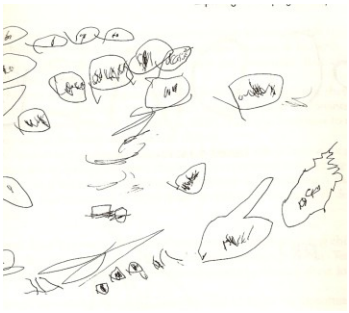


Figure 2.5 Controlled scribbling and writing with circles

(Barone *et al.,* 2005: p35)

Figure 2.6 A letter string

(Barone *et al.,* 2005: p36)

Figure 2.7 The Eiffel Tower, and a child's representation of PARIS, written as PRS (Barone *et al.,* 2005: p36).

2.16 CREATING A LITERACY-RICH ENVIRONMENT

Environments which are believed to be literacy-rich environments are those that enhance and emphasise the language learning experience and allow for development and awareness. According to Mc Gee *et al.* (2008: p149-175), there is a series of guidelines which aids in the enhancement of literacy-rich environments and classrooms. These include the following:

2.16.1 The physical arrangement of the classroom

The layout and arrangement of a classroom is important as regards the atmosphere and ambience of the room; it also sets a level of expectation. The amount of literacy visible in the classroom will set the scene, and will be a guide as to how much literacy will be taught in the classroom, and the importance thereof. Classrooms that are cluttered, untidy and seem old and tired don't tend to encourage and motivate young learners, but rather discourage and de-motivate them (Gordon *et al.,* 2008: p328).

Children love bright colours, which are attractive and inviting. The arrangement of the work area is also important, whether children will be doing group work, working individually, or in teams. All such play a part in the child's literacy expectations (Mc Gee *et al.,* 2008: p149-155).

According to Mc Gee *et al.* (2008: p155), in literacy-rich classrooms a library centre, writing centre and computer centre are important, and play a significant role in enhancing the child's literacy abilities.

2.16.2 Materials

According to Roskos and Neuman (in Mc Gee *et al.,* 2008: p159), in each classroom there needs to be an abundance of materials which are diverse, wide-ranging, authentic, accessible and located in areas where they will be utilised. The materials in a classroom should grab the young child's attention; they should intrigue them and keep their interest. Materials should be age-specific, and should meet the child's developmental level, the areas of interest and the instructional needs (Lilly *et al.,* 2004: p84-85; Mc Gee *et al.,* 2008: p159).

The various elements of early literacy need to be accounted for. So provision needs to be made for the child's literature and the materials needed for early writing. According to Chomsky (1972, in Mc Gee *et al.,* 2008: p160), the child's language development is directly proportional to the child's experience with literature. According to a study done by Morrow (1992, in Mc Gee *et al.,* 2008: p160), children that are exposed to good quality, and varied literature tend to have a higher level of reading achievement.

2.16.3 Daily schedule and routine literacy activities

The daily schedule, and the amount of time each day that the children are exposed to literacy greatly influences the child's literacy development. Time for reading, writing and allowing children to become creative and experience literacy is crucial. Children need to understand the importance of literacy and should also regard this time as precious. Literacy activities can take place in three, equally important structures, namely small groups, whole-class interaction or one-to-one (Mc Gee *et al.,* 2008: p162-166).

2.16.4 Continuous assessment

Assessment is critical in determining each individual child's abilities. All children learn and develop in their own way and at their own pace. Teachers and parents assess children, in order to find out the child's level of development, the way in which the child learns, various skills and behaviours and whether the educational goals are being met (Mc Gee *et al.,* 2008: p167).

According to Hills (1993) and others, (in Gordon, *et al.,* 2007: p246), the purpose of assessing children is primarily for:

- Planning education (DAP) and communicating with the parents;
- Identifying children with special needs;

- Program evaluation and accountability.

Monitoring a child's development and learning is also an important aspect of assessment in early childhood.

2.16.5 Culturally sensitive and integrated curriculum

The curriculum consists of a programme for learning, related to the disciplines of '*language arts and literature,* including reading, writing, spelling, *social studies, science, mathematics, art, music, health and physical education'* (Mc Gee *et al.,* 2008: p168). The curriculum needs to be integrated, working together for overall achievement. Units of education and teaching are pre-arranged around a broad theme that incorporates learning concepts across the curriculum (Mc Gee *et al.,* 2008: p169-171).

2.16.6 Developmentally appropriate curriculum

The programme that is being used for any child needs to be appropriate to the child's level of development, abilities and needs. The ways in which focus areas, such as literacy, mathematics and life skills develop also need to be considered (Gordon *et al.,* 2008: p333-336; Mc Gee *et al.,* 2008: p172-173).

According to Mc Gee *et al.* (2008: p173), there are three critical roles of teachers, in helping children achieve challenging goals:

- Teachers need to be knowledgeable about the range and variety of development;
- Teachers need to be able to assess individual children, and establish their position in the range of development;
- Teachers need to be able to devise goals and prepare instruction that will help children reach their goals.

2.17 LIFE-SKILLS DEVELOPMENT

Teaching children the value of life may seem too much to comprehend, but through a broken-down approach and step-by-step programme, one is able to educate them in terms of the basic attitudes and values of life (Hendrick *et al.,* 2007: p166). Life skills and concepts aid in the overall development of the young child. Concepts of being and belonging, as well as

encouraging enquiry and intrigue, questioning, social interaction, self-esteem and self-worth, all play an important role in the development of the child in totality.

Each child needs to be seen as an individual, with specific needs and abilities. It is imperative that all children be catered for and that each child be seen as a whole. Life skills and basic concepts are important in the cognitive development of children. This aspect of cognitive development plays a significant role in the development of the child in totality.

Children have a desire to learn and gain knowledge and abilities; this zest often increases as the child matures. It is imperative to preserve the child's desire to learn by providing learning situations, fostering curiosity and allowing for inquisitiveness in young children (Eliason *et al.*, 2004: p41).

A developmentally appropriate practice is one that is suitable for young children. It ensures the provision of a curriculum and environment that are right for the developmental needs of children, characterized by their age, gender, personalities, abilities, likes and dislikes (Hendrick *et al.,* 2007: p9). Gordon *et al.* (2008: p50-51), state that a Developmentally Appropriate Practice (DAP) is one that is based on young children's development, after observing their interests, abilities and needs.

Education is then provided for in an activity-based learning environment which is learner-centred, teacher-directed and facilitated; it promotes academic preparation and is focused on skills and abilities' development.

Some essential aspects of development in early childhood include the following which need to be developed and encouraged in early childhood, in order to assist in enhancing life skills:

- **Experiences**

Because early childhood education forms such a strong foundation for future learning, the need for experiencing and understanding is paramount. Children learn through experiencing; they need to use their senses and gain insight by means of touch, taste, sight, smell and sound (De Witt, 2009: p122; Gordon *et al.,* 2008: p567). Concepts need to be taught using different methods of explanation. Repetition is the key to enhancing deep understanding and insight (Eliason *et al.*, 2004: 41-42). According to Eliason *et al.,* (2004: p42), children need experiences that encourage them to manipulate, explore, use their senses, build, create, discover, construct, take apart, question and understand the world that they live in.

Experiences allow for a child to interpret, understand, conceptualise and categorise through active, engaged and involved learning.

- **Choices and decisions**

An important aspect of development and 'growing up' involves the ability to make decisions through critical thinking and analysis. By allowing children to make a limited amount of decisions, it engages them in the learning process, as well as giving them responsibility and accountability. According to Elliason *et al.* (2004: p42), Glasser (1997) suggests that teachers should not place too much emphasis on the students, but rather on the curriculum. Glasser proposes that at least one block period should be set aside each day in which children can choose how they want to spend their time.

According to Hendrick *et al.* (2007: p244), encouraging children to make their own decisions fosters creativity. Creativity needs to be engineered from within a child, rather than the child be told what they need to do and when. By the child being able to make his/her own decisions the teacher is not only empowering the child, but also allowing for the child's creativity and personality to shine through.

- **Curiosity and questioning or enquiry**

Children are inquisitive beings, they thrive on gaining knowledge and understanding of how things work and gaining insight into the unknown. Most people are born with a curiosity to learn, explore and understand the world (De Witt, 2009: p113; Eliason *et al.*, 2004: p43). Teachers, care-givers and carers can enhance and encourage children's curiosity by encouraging them to answer any questions which the children may have. Exploring their surroundings can also be useful in raising their curiosity and intrigue (De Witt, 2009: p115).

Through exploration and enquiry the attention span of a child increases (Gordon *et al.,* 2008: p462). There should be many concrete, tactile, sensory experiences which children can encounter and use to make sense of their world (Gordon *et al*., 2008: p462). Adults should always encourage children to think creatively and concretely about any challenges they may encounter, supporting children when their ideas fail, encouraging them to pursue the challenge and enhance their critical thinking (Eliason *et al.*, 2004: p43).

- **Modelling**

Modelling is an aspect of teaching and learning which is vital, as it enables the teacher to model concepts that are yet to be understood, as well as the correct use of language (De Witt, 2009: p218; Gordon *et al.,* 2008: p139; Woolfolk, 2007: p233). Teachers not only model knowledge that is to be taught to the learners, but also model good skills, attitudes and values which the learners observe and adopt (Gordon *et al.,* 2008: p196; Eliason *et al.*, 2004: p45). Often children are able to understand concepts and ideas more effectively once having had the concept demonstrated to them (Gordon *et al.,* 2008: p139; Eliason *et al*, 2004: p45).

- **Rich socio-cultural heritage**

According to New (1999 in Eliason *et al.,* 2004: p45), *'Cultural habits and traditions in homes and communities serve as contexts for children's development; they also provide content as well as opportunities for learning.'* The way in which young children learn and what they learn will depend on their environment, their culture and their life-experiences. Each family and culture has its specific traditions, norms, beliefs and ways of doing things. These all need to be considered when dealing with young children.

Diversities need to be seen as a positive attribute in children, as they can teach and educate others in terms of their own heritage (Eliason *et al.*, 2004: p45; Gordon *et al.,* 2008: p462).

- **Interaction with others**

Through interaction, children learn from one another. This enhances their affective and cognitive perceptions and abilities. Oral and listening abilities are enhanced through interaction; children learn to become sensitive to one another, they learn basic life skills, and they learn what is acceptable and what is not. This is an important aspect of development for the young child in his/her totality (Eliason *et al.*, 2004: p45; De Witt, 2009: p227-228).

2.18 THE IMPORTANCE OF TEACHING CONCEPTS TO THE YOUNG CHILD

Aubrey (1997: p29) believes that '*Teaching which focuses on fine-grained analysis of the way teaching and learning interact will contribute to the development of teachers' and children's understanding.*' Teaching is not merely a process of reciting knowledge, but is

rather an interactive process which enhances the child's understanding and so aid in his/her development (De Witt, 2009: p212).

The learning of concepts forms the structure and foundation of knowledge. It equips children, enabling them to organise and categorise any information. During early childhood, children are constantly acquiring fundamental concepts and learning fundamental process skills. Haydon (2006: p6) believes that education, both at home and in the school situation, should be seen as a route to the spiritual, moral, social, cultural, physical and mental development of the child, and it therefore influences the wellbeing of the individual.

Concepts are the cornerstone required in the gaining of knowledge and understanding (Gordon *et al*., 2008: p192, Woolfolk, 2007: p286-287; http://www.project2061.org/publications/earlychild/online/experience/lind.htm, 01/ 10/08).

2.18.1 The child's cognitive development

Children begin the process of learning from a very young age, and move from one stage of cognitive development to the next, where they are constantly being stimulated by their environment and the happenings therein (De Witt, 2009: p159 & p277; Gordon *et al.,* 2008: p456). Cognitive development, according to Maxim (1992: p91), *'refers to the changes in mental structures that occur as children explore the world around them'*.

Developing and encompassing an understanding of children's thought patterns, their understanding and reflections are essential aspects of teaching and educating (Gordon, *et al.,* 2008: p456). Although each child is born with his/her own capacity and intelligence, the circumstances and situations into which one is born plays, a vital role in the child's development and advancement as human beings (Eliason *et al.*, 2004: p45).

A teacher needs to have an understanding of the children in the class, and needs to be aware of their thinking patterns. The process of cognitive development, according to Piaget, is exceptionally interesting, and one that creates a way of understanding and clarifying the world into which they have been born.

2.18.2 Language and cognitive development

The relationship that exists between language and cognition is important, as language is our means for understanding the child's thinking patterns and thoughts. *'Cognition and language*

generally become more interdependent when development progresses' (Gordon *et al.,* 2008: p457).

2.19 LACK OF STIMULATION

According to a web address dedicated to the wellbeing of young children (http://www.childwelfare.gov/pubs/focus/earlybrain/earlybraina.cfm: 07/07/08), there are major negative effects that result from a lack of stimulation in young children. According to Perry (1998: http://www.childtrauma.org/ctamaterials/biolo_relativity.asp, 10/7/08), at the age of three, the brain has reached 90 percent of its adult size and the child's emotional, behavioural, cognitive and social foundation is in place for the rest of the individual's life (Perry, 1998: http://www.childtrauma.org/ctamaterials/biolo_relativity.asp, 10/7/08).

According to Starkey and Klein (Ed. Saracho & Spodek, 2008: p270), if sufficient cognitive enrichment is not provided during the early years, a gap in the child's knowledge and ability to cope with life takes root. A detrimental result of a lack of stimulation is when the neuronal pathways whither and die. This has devastating effects on young children, as they may not be able to achieve any further development and growth (http://www.childwelfare.gov/pubs/focus/earlybrain/ earlybraina.cfm: 07/07/08; De Witt. 2009: p78-79; Brierley, 1994: p6).

The lack of stimulation in the child can negatively affect the child physically, permanently disabling the child and detrimentally affecting his/her progress and growth. Children need to be exposed to learning situations repeatedly in order to ensure and build the brain circuitry which will enable the young child to develop (Gordon *et al.,* 2008: p460).

The following type of drastic, global neglect can have detrimental effects on the child. The extreme neglect of stimulation can cause the neuronal pathways, whose primary objective is to provide for learning, to narrow and eventually disintegrate, causing permanent dysfunction (http://www.childtrauma.org/ctamaterials/neuros~1.asp, 14/06/09). Intelligence is both a result of genetic activity, and of stimulation. Even in children with high genetic cognitive abilities, a lack of stimulation can be severely detrimental to their development, resulting in a permanent cognitive disadvantage (http://www.childtrauma.org/ctamaterials/neuros ~1.asp, 14/06/09, http://www.childtrauma.org/ctamaterials/brain_II.asp, 14/06/09).

Figure 2.7 is a representation of two children, both aged three, one of whom was stimulated from childbirth, and the other, who was not. According to Perry (http://www.childtrauma.org/ctamaterials/neuros~1.asp, 14/07/09), the images illustrate the negative impact of the developing brain. The image from the CT scan on the left is one of a healthy three-year-old child, with an average head size. The image on the right is that of a three-year-old child suffering from severe sensory deprivation and neglect.

The physical size and development of the cortex is abnormally small http://www.childtrauma.org/ctamaterials /neuros~1.asp, 14/07/09).

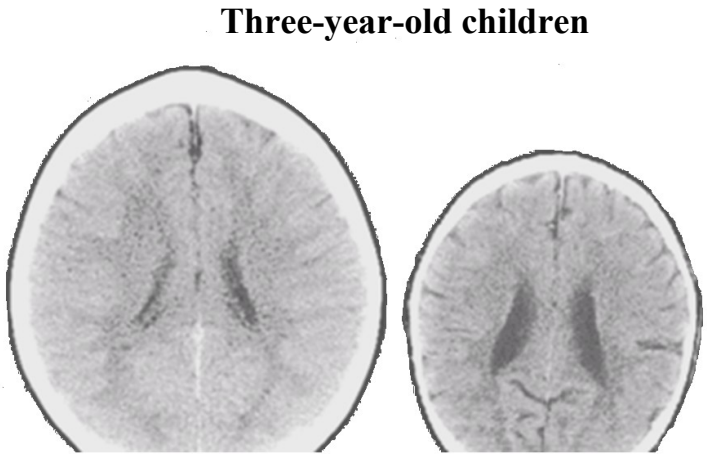


Figure 2.8 A comparison between two three-year-old children, one of whom was stimulated, and one that was not. Taken from (http://www.childwelfare.gov/pubs/focus/earlybrain/earlybraina.cfm: 07/07/08)

2.20 THE TEACHERS' ROLE IN STIMULATION

The role of the teacher is of great importance in the stimulation and development of the child in totality (De Witt, 2009: p211; Gordon *et al.,* 2008: p192). Teaching and learning are very unique and exclusive tasks that need to be adapted year in and year out, according to children, circumstances, and other external factors, in order to make a significant difference and impact on the children's development and learning (Eliason *et al.*, 2004: p19; Ornstein *et al.*, 2004: p23).

The approaches that individual children take, their reactions and perspectives are different from one another; the ways in which they learn are different, and the entire ethos in the classroom is experienced differently from child to child. These all need to be accounted for. Leinhardt (2001: p334), believes that teaching '*is specific with respect to task, time, place, participants, and content, and that different subjects vary in those specifics'*.

According to Seefeldt *et al.* (1998: p479), the role of the teacher is to organize and position the child's environment and conditions of learning to enable the child to develop formal knowledge. Vygotsky (in Hendrick *et al.* 2007: p314), believes that the teacher's role is to be a sensitive observer and guide. By doing this, the teacher needs to be aware of the child's abilities and current developmental level, as well as the future potential development and learning that are going to take place, and how to conceptualise this learning in order to create a real learning experience for the child (Hendrick *et al.,* 2007: p314).

Early childhood education is primarily aiding the movement from the lower mental functions to the higher mental abilities. This educational activity needs to be facilitated by the teacher, by providing leading activities (Hendrick *et al.,* 2007: p314). Haydon (2006: p6) states that education should be viewed as a '*route to equality of opportunity for all, a healthy and just democracy, and productive economy, and sustainable development*.'

According to the 'Policy for Early Childhood Development Centres' in the Western Cape, an ECD Centre (Early Childhood Development Centre) is any '*building or premises maintained or used for the care of children'* (2003: p2). Early Childhood Development Centres include playgroups, crèches, aftercare centres, pre-schools and nursery schools (ECD Centre Policy Document, 2003: p2).

The National Curriculum Statement gives a clear and detailed outline of what the Council of Education Ministers desire to see happening in modern South African classrooms regarding teaching and learning. This however refers to the formal schooling situation, from Grade 1. The National Curriculum Statement (2002: p9) envisages teachers who are "*qualified, competent, dedicated and caring and who will be able to fulfil the various roles outlined in the Norms and Standards for Educators'* (Government Gazette No 20844, 2002: p9). Teachers are envisaged as '*mediators of learning, interpreters and designers of learning programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors and learning area/phase specialists*' (NCS, 2002: p9).

With regards to the envisaged learner in the modern classroom, the curriculum aims to develop the maximum potential of each learner, encouraging and ensuring effective and active citizens of South Africa (Ornstein *et al.,* 2004: p24). It also aims to create lifelong learners who are confident and independent, literate, numerate and multi-skilled, who are also compassionate and respect their environment (NCS, 2002: p8). This is such wonderful news, that it should be the cornerstone of the leaders in this country to develop future leaders which are educated and equipped to make a difference in this nation.

By stimulation and development from an early age, one can aid in the developmental level of children, and effectively make a difference for them in the future (De Witt, 2009: p211; Gordon *et al.,* 2008: p192).

The National Curriculum Statement (2002) builds on the vision and values of the Constitution and Curriculum 2005. These fundamental values of the Constitution include the following (NCS, 2002: p7):

- Social Justice and Equity;
- Democracy;
- Non-racism and non-sexism;
- Ubuntu (human dignity);
- An open society;
- Accountability (responsibility);
- Respect;
- The rule of law;
- Reconciliation.

The curriculum can play a vital role in creating awareness of the relationship between human rights, a healthy environment, social justice and inclusivity. In particular, the curriculum attempts to be sensitive to issues of poverty, inequality, race, gender, age, disability, and HIV/AIDS (NCS, 2002: p8).

IQMS is an Integrated Quality Management System that consists of three programmes which are aimed at enhancing and monitoring performance in the South African Education system. According to http://www.elrc.co.za/UploadedDocuments/IQMS%20Training%20Manual.doc (10/06/09), the three programmes which work in an inter-related manner with each other include:

- **Developmental appraisal**

This exists to appraise individual educators in a transparent manner with a view to determining their areas of strength and weakness, as well as to draw up programmes for individual development.

- **Performance measurement**

The purpose of performance measurement is to evaluate the individual educators and teachers for salary progression, grade progression, affirmation of appointments and rewards with incentives.

- **Whole School Evaluation**

This is to evaluate the overall effectiveness of a school, as well as the teaching and learning that take place in the school.

For many years teachers in South African Schools have had no accountability processes in place, and so scholars' unsatisfactory results have increased dramatically. IQMS exists to benefit the school and the day-to-day effectiveness of efficient education (Cele, 2008: p35; Howard, 2005: p4). The IQMS aids educators, teachers, schools and district offices to receive support and aid should they have any needs, since they believe that the teacher is fundamental in the procedure of educating and stimulating young children, and therefore a performance-based teacher assessment and evaluation system is critical in improving the teaching and learning process.

The cornerstone of the IQMS programme is '*The performance of educators is the foundation for achieving the goal of increased learner achievement. Evaluation of programmes and practices is essential to any ongoing effort to improve any profession. Evaluation is not apart from, but is a part of the educational process'.* IQMS also exists to support and to promote accountability, so that the weight of educating not only lies on the shoulders of the teacher, but that they have accountability processes in place.

The monitoring of the institution or school's overall effectiveness is also an important facet of the IQMS, as well as the evaluation and assessment of the educator's performance and successes (Hayward, 2006: p4).

In doing this, it is vital that the IQMS ensures fairness, as well as seeking to maximise transparency, so that the schools do not put on a show of teaching, but that their day-to-day

lessons and processes are of a high standard. There needs to be a spirit of excellence and professionalism, as well as consistency in the schools (Hayward, 2006: p4).

According to Lindberg *et al.,* (1985: p190), there are three primary roles of the teacher:

i.) 'Create a climate conducive to investigation';

The attitude of the teacher towards the child and his/her abilities is one of great importance. The teacher needs to be continually observing and to be taking note of what the child is experiencing (Gordon *et al.,* 2008: p193). The teacher needs to be aware of the developmental level of the child regarding his/her cognitive understanding and abilities, as well as make provision and gain access to more resources and stimuli to keep the child entertained and enthralled (De Witt, 2009: p220).

ii.) 'Observe cognitive comprehension in children's play'

It is very important for the teacher to observe the child during play and general day-to-day activities, in order to see how he/she deals with problem-solving. Teachers and parents should never interfere immediately after seeing a child struggling to complete a task (Lindberg *et al.,* 1985: p190). Children need to try, try and try again. There needs to be some form of a fight and determination for children to attempt new tasks. After a while, when the teacher can see that the child has struggled and is now becoming frustrated, the teacher can then aid, support and advise.

The teacher should never tell the child what to do, but merely provide the child with suggestions, and allow the child to make all the final decisions. It is imperative to support the child emotionally; he/she needs to feel safe and secure. Praising the child, giving him/her responsibilities and helping the child realise his/her strengths will all aid in the development of independence (De Witt, 2009: p215).

iii.) 'Ask questions to heighten a child's awareness'

Very often when children complete a task, they are unaware of how they actually completed the task, what steps they took to achieve the success, and in the same way, often children that complete a task unsuccessfully are unaware why they are not succeeding. The role of the teacher in such an instance is of great importance, as it is the teacher's strategic questioning that will aid the child in understanding any concepts and principles (Lindberg *et al.,* 1985: p190). It is the role of the teacher to ask the child how the task had been completed. Why did

you do it that way? What made you think that would work? Did they have any advice for their peers? And what had they tried prior to the success? (De Witt, 2009: p218)

2.21 THE IMPORTANCE OF PARENTAL INVOLVEMENT

Parents have specific rights and responsibilities in terms of directing, caring for and educating their children. They are also mediators and legal guardians who act on behalf of their children. In an article written by De Witt (2007: p2), it was stated that, from previous research, it has become clear that *'the participation and involvement of the caregiver contributes to the quality of the implementation*' of the intervention. The role that parents play in their child's development is enormous and has great implications on the child in his/her totality, including the cognitive, physical, emotional, social and spiritual development (De Witt, 2009: p106).

According to Eliason *et al.,* (2004: p49), it is the teacher's as well as the parents' responsibility to provide learning opportunities for children. Parents need to become involved in their children's schooling, forming partnerships with teachers and educators. According to Vygotsky (in De Witt, 2009: p106), adults and care-givers play a major role in the learning of each child. Adults aid the child in constructing meaning and understanding, which in turn assist in the process of discovery.

As part of parents' duties, they are required to take care of and sustain their children by maintaining their physical, emotional, cognitive and social wellbeing. For this, meticulous care and support need to be implemented. The basic provision of their physical and emotional needs in the form of protection, nourishment, physical set-up, education and security is necessary (Carr, 2006: p4; Meier *et al.,* 2007: p143).

Finn (1998) in Eliason *et al.,* has devised four parental interactions which he believes have influence on the child's achievements:

- The child's time needs to be structured and monitored. The child cannot merely be left in front of the television all day. They need to have boundaries and set times for activities, while also allowing time for freedom, exploration and discovery.

- The child needs to be assisted with his/her homework. Children need guidance and support. They need to be assured that they are on the right track, and also appreciate their parents' input and direction.
- It is important that parents discuss school matters with their child. These include communication about activities at school, what the children are learning, friends and basic day-to-day happenings.
- A fundamental foundation of cognitive development and academic success is the child developing a love and desire for reading. Reading in the home should be seen as a fun activity that children and parents both enjoy.

As indicated in Abraham Maslow's Hierarchy of Needs (Figure 2.8), physical survival needs are basic necessities in development and wellbeing, as well as forming the foundation of human needs (http://www.pateo.com/images/maslowmaster4ts.gif, 10/8/08). Without that basic foundation, further development and encouragement would not be possible and the need for safety and security could not be met. Should this need for safety and security not be met, the child will not be able to have a sense of belonging and acceptance. They will therefore have a low level of self–esteem and sense of worth, with their need for self–actualization not being adequately met (http://www.pateo.com/images/maslowmaster4ts.gif, 10/8/08).

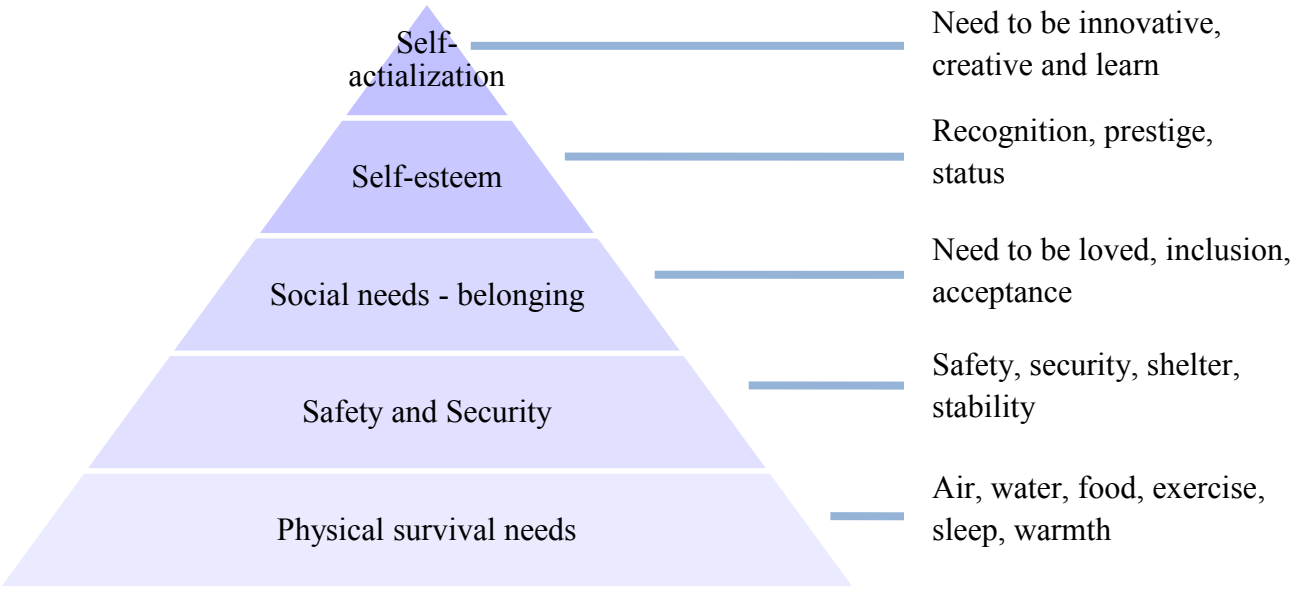


Figure 2.9 Maslow's hierarchy of needs (http://www.pateo.com/images/maslowmaster4ts.gif, 10/8/08;

http://www.ruralhealth.utas.edu.au/comm-lead/images/Maslows-needs-Pyramid.jpg, 24/06/09;

http://www.omafra.gov.on.ca/english/rural/facts/96-001f1.gif, 24/06/09)

In South Africa, some form of education is compulsory from the age of 7 to 15 years (http://www.southafrica.info/about/education/education.htm, 11/6/09). This is however not sufficient and will not provide the best opportunities for future leaders should they only begin their learning careers at the age of seven. The effects of parental involvement in South Africa, together with classroom education have been recognized not only to have a positive influence on the child, but also to be a necessity (http://www.southafrica.info/about/education/education.htm, 11/06/09).

According to Meier *et al.,* (2007: p143), parental involvement in the School Governing Body is imperative as various issues that affect children are brought to the light. Parents need to be seen as active partners in education. They do not merely pay school fees, but need to interact and to be a part of the school process. Investment in early childhood development from the parents needs to commence at birth and to be incorporated with health care, nutrition and attention to both the cognitive and the social aspects of child development.

This will enable the children to deal with the transition into Grade 1 and beyond (Meier *et al.,* 2007: p143).

According to the Department of Education (1997: p2) in Meier *et al.,* (2007: p143), with the implementation of Outcomes-based Education taking place in our schools, a greater level of parental involvement and participation is required in order to develop a productive education system, as parents and teachers are expected to share the responsibility of their children's education. An increasing level of parental involvement is closely linked to greater academic achievement, as well as implementing positive perceptions on parenting skills.

This includes maintaining a good relationship between the child and the parent, ensuring emotional security for the child, as well as a strong connection of trust (Eliason *et al.,* 2008: p54; Gordon *et al.,* 2008: p322).

Eliason, *et al*. (2000), together with Epstein, have devised a list of benefits for the parental involvement with children (2008: p54), benefits of parental involvement for parents (2008: p54) and the benefits of parental involvement for teachers (2008: p55).

Recommendations and ways in which parents can be actively involved in the education process, as well as the benefits of parental involvement will be dealt with in Chapter 6.

2.22 PROBLEM AREAS BETWEEN PARENTS AND TEACHERS

Although a strong working relationship between parents and teachers is envisaged; very often it is not quite as easily implemented. Often parents and teachers have uninformed misperceptions about one another, and these more often than not tend to hinder the development of a harmonious parent-teacher relationships (Kostelnik, *et al*. 1999: p240). As teachers are dealing with little lives and their futures, the role they play is not merely a job, but an ongoing continual process that not only involves the child's cognitive, but also his emotional, social, physical and spiritual development (McAfee *et al.,* 2007: p36).

Teachers need to remember not to be over-critical and to give solutions to every problem the child may face. Rather, they should be a support for the parents and offer advice when asked, as very often the circumstances are far beyond the teacher's control and understanding (Eliason *et al.,* 2007: p55). Educators also experience many problems in facilitating parental involvement and continually feel that they need to 'walk on egg-shells' around the parents of the learners (Gordon *et al.,* 2008: p306). In some cases, parents are unwilling to implement any advice and recommendations made by teachers, as they feel that they know better. This may cause teachers to feel undermined and ridiculed (Stretch, 2008: p10-11).

As a result of South Africa being such a diverse country with many cultures, races and ways of doing things, teachers need to be aware of each individual child's family set-up and subsequent ways of life. Teachers need to be sensitive towards the decisions that parents implement and not have judgmental attitudes as a result of their culture.

Poverty is a serious factor that affects families in South Africa, especially in a single-parent family. Often in single-parent families there is little time to get involved in the school as the parent's primary focus is on earning a sustainable income to support their family. *'Parents can feel burdened by their parenting and work roles and may feel they do not have time to get*

involved in their child's school activities' (Eliason *et al.,* 2007: p55; Meier *et al.*, 2007: p144).

Through implementing previous research, it has now become clear that parents often experience problems with the school system and structure, and as a result they develop negative attitudes towards teachers and may feel unwelcome in the school. Some parents feel there is not enough opportunity for them to get involved, and may feel that because of this they are unwanted. Many parents feel they are uninformed about happenings in and around the school, which is made worse by the poor communication between parents and teachers.

This communication gap causes negative and challenging situations. Often parents seem unwilling to help children with their homework and activities they are given to complete at home, since they feel that it is the teacher's duty to educate the child.

2.23 SUGGESTIONS ON HOW TO ENHANCE PARENTAL INVOLVEMENT IN THE SCHOOL OR COMMUNITY

Parents need to not only keep in contact with children and their school education, but also to focus on good relationships at home (Mindes, 2007: p47). Parents need to be involved in their child's life from the early years, continually having the child's best interests at heart. Parents constantly need to be encouraging their children, being consistent and loving, yet firm at the same time. It is vital for parents to be involved in the classroom activities, as well as the school programme, governing body and even school resources (Gordon *et al*., 2008: p307). According to Singh, in Meier & Marais (2007: p148), *'Parents, especially those from impoverished environments need to be empowered if they are to make a meaningful contribution to the education of their children*'. Parents need to be given the tools and shown what to do to stimulate their children. They need to be educated as to what can be done to provide their child with the best means possible. There are different exercises they can do that will aid in their child's development (Meier *et al.,* 2007: p148).

The role of a parent is not merely to provide the child with physical means such as food, clothing and an education – but rather the role that parents play in a child's overall development is enormous and irreplaceable.

There are various strategies that can be put into place, to encourage parental involvement:

- Parents need to be informed of the happenings at the school, the progress and development of their child, as well as to be involved with continuous assessment (Meier *et al.,* 2007: p149). Parents could get involved in transporting to and from outings, as well as providing the other parents with a layout of the themes for the term, and parents can research the theme, get books out the library for their children, discuss the topic and reinforce what was learnt at school.
- In this way parents are aware of what is being taught at school, and at the same time allowing their child to pass on knowledge and any interesting facts they have learnt at school. Teachers can inform the parents about various activities taking place that create opportunities for the involvement of the parents (Meier *et al.,* 2007: p149).
- Teachers need to make the parents feel needed and wanted in the school environment. Teachers should notify the parents on the importance of their involvement in the development process. This will enable parents to understand that their role is of the utmost importance, and the teacher and parents need to work hand in hand (Eliason *et al.,* 2007: p55).
- Teachers need to understand the circumstances of the children in their class. They need to be aware than in many cases both parents work, and it would be unreasonable to expect projects to be done in one day, resources to be brought to school immediately and to find instant gratification. The school should not place extra stress and tension on the home situation and other relationships (Morrison, 1998: p474).
- It is imperative that teachers and parents be given the opportunity to work together and to discuss important issues. Time needs to be given for parent-teacher interaction where both parties express their thoughts and worries regarding their child's social, physical, cognitive and emotional development (Morrison, 1998: p474).
- It is imperative for both the teacher and the parent to remember never to run down or undermine the other in front of the child. Teachers desperately need parental support and vice versa (Eliason *et al.,* 2007: p55).
- Teachers need to remember to always be professional and friendly to parents, grandparents and family members. All parents need to be treated fairly and no prejudice should be evident (Meier *et al,* 2007: p149).
- There needs to be a great level of respect between teachers and parents. Personal opinions need to be respected and appreciated, and no undermining and discouraging should be allowed. Teachers need to respect parents and their views. Parents must

know that their opinions are appreciated, and must be aware that teachers are available for any concerns or anxieties they may be feeling (Eliason *et al.,* 2007: p56).

- It is imperative for teachers to know each parent well. Teachers should refer to parents on a first-name basis, and develop an interest in their lives, while at the same time remaining professional. Parents should not merely be known as 'Sarah's mother', but rather as 'Jenna' or Mrs Vosloo. Each person has a name, and as a sign of respect teachers should refer to parents by their name (Eliason *et al.,* 2007: p56; Morrison, 1998: p474).
- Make the school vision and mission statement clear to all parents, so that they are aware of school ambitions and goals. Get the parents on-board, so as to take part in the implementation of the school's mission statement (Meier *et al,* 2007: p149).
- Clear lines of communication between the school and parents are imperative (Eliason *et al.,* 2007: p57).

According to Eliason *et al* (2007: p55), teachers should follow the same set of guidelines when interacting with parents, as they would when interacting with children. These guidelines include: '*Be positive, supportive, interested, caring, objective, friendly and warm. Work hard, using a variety of techniques to motivate, teach, build and strengthen'*.

2.24 CONCLUDING REMARKS

The need for early childhood development and intervention has proven to be of great importance and one that plays a fundamental role in the total development of the child. The child needs to be seen in his/her totality, focusing on the cognitive, physical, emotional, spiritual and social development (De Witt, 2009; Eliason *et al.,* 2008; Gordon et al., 2008; Seefeldt *et al.,* 1998; Sternberg, 2008).

Cognitive development consists primarily of the following three aspects:

- Mathematics
- Literacy
- Life skills

Each of the above aspects has been dealt with in detail regarding effective and valuable elements of stimulation which influence development. Literacy, mathematics and life skills should not be seen in isolation. And thus when educating, an integrated approach needs to be taken focusing on the combined elements of each aspect.

Parental involvement plays a role in child development. Various parenting strategies, techniques and beliefs all directly or indirectly influence the child's growth and development.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The theoretical framework or compilation of interconnected notions and theories serves to direct the research, in order to determine the relationships and concepts to be measured. According to McMillan *et al.* (2006: p424), concept analysis involves '*clarifying the meaning of a concept by describing its essential meaning, different meanings, and appropriate use*'. This helps us understand education, the ways people educate and the thinking behind the theories, illuminating personal opinions and ensuring that the study remains unbiased.

3.2 CONCEPTUAL METHOD

McMillan (2006: p131) states that there are three major aspects of development; these consist of minor sub-sections. Figure 3.1 is a clear representation of the interrelated aspects of development.

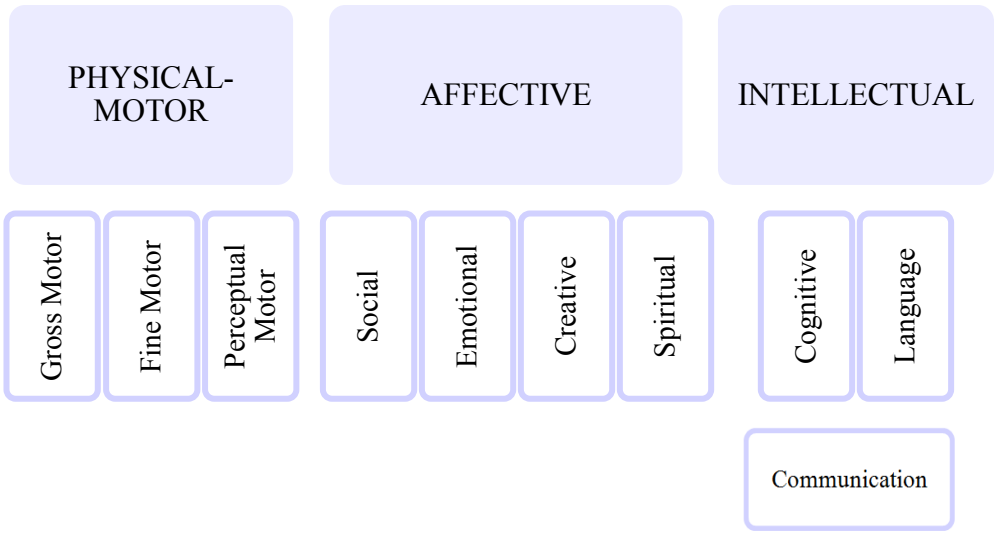


Figure 3.1 The developmental areas which capture the concept of the child in his/her totality

(Gordon *et al.,* 2008: p131)

Gordon *et al.,* (2008: p131) explain the major processes of development which parallel the above-mentioned developmental areas. They include:

- Biological processes which describe the changes in one's body;
- Cognitive processes which describe the changes in thought, intelligence and language;

- Socio-emotional processes, which intimate any transformations in the individual's relationships with other individuals, emotions and personality.

3.3 THEORIES AND MODELS

According to Warner and Sower (2005, as in Meier *et al.,* 2007: p24), there are key theories to teaching and learning in early childhood. Theories which will be observed include the Psychodynamic or Psychosocial theory, consisting of work by Sigmund Freud and Erik Erikson, the Behaviorist theory, including the works of educationists, such as Skinner and Bandura, the Cognitive theory, which includes theories by Piaget. The Sociocultural theory, including the works of Vygotsky, the Ecological theory, Multiple-intelligences theory by Gardner, the Maturation theory which includes the work of Gestell and the Humanistic theory (Gordon *et al.,* 2008: p133-157; Meier *et al.,* 2007: p24-25); www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm, 19/9/09).

3.3.1 The Psychodynamic theory

The Psychodynamic theory consists of work by Sigmund Freud and Erik Erikson's theory of human development. Psychodynamic theory focuses on personality development and emotional problems, internal drives and unconscious issues, which influence and alter human thinking, behaviour and the challenges which children face (Berk, 2006: p18; Berk, 2007: p15; Gordon *et al.,* 2008: p134; Meier *et al.,* 2007: p24).

Sigmund Freud was a medical doctor and was interested in the irrational side of human behaviour. He was particularly interested in the personality of humans and factors that influence personality development, such as relationships (Gordon *et al.,* 2008: p134). According to De Witt (2009: p23), Freud believed that '*emotions derive from social relationships.'* Erik Erikson further developed and refined Freud's theory, having a huge impact and influence on the theory of early childhood development (Gordon *et al.,* 2008: p134).

Erikson's theory of human development states that life is a series of stages through which each person passes, and with each stage growing and expanding on the previous stage, continuing throughout life. Erikson proposes eight stages of psychosocial development with each stage representing a critical aspect of growth (Gordon *et al.,* 2008: p135; Woolfolk, 2007: p67). Woolfolk (2007: p67) describes psychosocial theory as the '*relation of the*

individual's emotional needs to the social environment.' According to De Witt (2009: p24), Gordon *et al.,* (2008: p135-137) and Woolfolk (2007: p67), the stages of Erikson's theory are as follows:

Stage 1: Trust vs Mistrust
This usually occurs from birth to 24 months

By providing constant care and love, parents aid in the development of trust relationships in young children.

Stage 2: Autonomy vs Doubt
Two-to-three years old

The child learns to manage and have power over impulses and both motor and mental skills. Parents should encourage curiosity, inquisitive behaviour and persuade the child to explore the environment. Physical skills, such as crawling, walking, bodily control are developed.

Stage 3: Initiative vs Guilt
Three-to-six years old
Parents should set boundaries and have order. Children need and thrive on discipline and structure.

Stage 4: Competence vs Inferiority
Six-to-12 years old
Here the child learns to deal with demands placed on him to learn new skills.

Stage 5: Search for identity vs Role confusion
Adolescence

Stage 6: Intimacy vs Isolation
Young adulthood

Stage 7: Generativity vs Stagnation
Grown-ups

Stage 8: Integrity vs Despair
Old age

Erikson's eight stages of development assist parents in providing guidelines for the roles that adults should play in the lives of young children. He encourages play and emphasises the importance of the adult as an emotional base for the child (Gordon *et al.,* 2008: p137).

3.3.2 Behaviorist theory

The Behaviorist theory includes the works of educationists such as Skinner and Bandura, and the theory describes both learning and development (Gordon *et al.,* 2008: p138). According to Woolfolk (2007: p206), behavioral learning theories are '*explanations of learning that focus on external events as the cause of changes in observable behaviors'*. Gordon *et al.* (2008: p138) state that the cornerstone of Behaviorism is that each child is born with a 'clean slate' on which they will expand and grow. According to Berk (2006: p19), in behaviorism the focus of learning is on stimuli and responses.

Skinner developed a doctrine which states that a person can be compared with a vessel that needs to be filled by carefully designed experiences. The environment controls all experiences and all learned behaviour (Gordon *et al.,* 2008: p139).

Bandura has developed another type of learning theory called social learning, which refers to the socialisation of the young child (Berk, 2006: p20; Gordon *et al.,* 2008: p139). This theory observes the ways whereby the environment influences how children learn and then they implement what has been learnt in their peer groups specifically. According to De Witt (2009: p30 & p230), a principal way for children to obtain new prototypes of social behaviour is through observational learning, where children learn vast amounts of new social reactions simply by observing the actions of other people in their environment.

These responses are then stored in their memory in the form of mental images.

There are three primary types of learning which occur in the theory of behaviorism, namely classical conditioning, operant conditioning and observational learning or modelling.

i.) Classical conditioning

This theory, discovered by Ivan Pavlov in the 1920s focuses on the acquisition of involuntary emotional or physiological reactions, such as fear, muscle tension, salivation, sweating, which are all automatic responses to stimuli (Woolfolk, 2007: p208). Shaffer and Kipp (2007, in De Witt, 2009: p53) describe classical conditioning as '*a conditioned reflex.'* Classical conditioning trains humans to respond involuntarily to stimuli, through association (Gordon *et al.,* 2008: p139).

ii.) Operant conditioning

In operant conditioning, a connection is produced between two incidences, where the subject learns that if he does something he can acquire a particular outcome (De Witt, 2009: p53). Woolfolk describes operant conditioning as '*learning in which voluntary behaviour is strengthened or weakened by consequences or antecedents*'. Should the subject act in a specific manner, he will either receive a reward or be punished. This behaviour is reinforced through rewards, where the subject will learn that should they desire a specific result, a specific action needs to first take place (De Witt, 2009: p53).

iii.) Observational learning or modelling

According to Gordon *et al.,* (2008: p141), modelling is '*a special kind of observational learning; children learn from a teacher how to use materials and how to behave in group settings'.*

3.3.3 Constructivist theory

In contrast to the behaviourist theory which encourages learning in a stimulus-response manner with learning by association, the Constructivist theory is based on the ideas of Dewey, Piaget and Maria Montessori. Although the notions of these theorists vary greatly, each expresses a comparable framework to learning and development (Gordon *et al.,* 2008: p146).

Hunt (1969) believed that the theorists are '*consistent in their belief that learning and development occur when young children interact with the environment and people around*

them' (www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm, 19/9/09). Constructivist theory views children as being active participants in the learning process through interaction and participation (Ornstein *et al.,* 2004: p117), where through learned adaptation, what the children learn or adapt to is directly influenced by the people, materials and situations with which they come into contact (Gordon *et al.,* 2007: p147).

3.3.3.1 Dewey

Dewey firmly believed that education was not merely the passing on of knowledge about specific historic events or the biology of a plant, but rather the learning of skills and knowledge that children could incorporate into their daily lives through the integration of education and life, and so developing integrity (Gordon *et al.,* 2008: p22).

3.3.3.2 Piaget

Jean Piaget, after close interaction and dealings with many children, stated that people progress through four stages which occur in sequence. Piaget believed that only when a child reaches the age of 15, and has progressed into the 4th and final stage of development, will the child be able to reason like an adult (Berk, 2006: p21; Berk, 2007: p233; Carr, 2006: p14; Gordon *et al.,* 2008: p143; Hendrick, 1986: p303).

Generally, there are ages that are assigned to the stages. This is not definite, as children grow and develop at different paces, but it serves as a good guideline (Ornstein *et al.,* 2004: p109). The four stages of cognitive development, as stated by Piaget are in accordance with the brain's major developments in growth. The brain is constantly growing throughout childhood, and even sometimes into early adulthood (Berk, 2006: p21; Gordon *et al.,* 2008: p143; Ornstein *et al.,* 2004: p109; Seefeldt *et al.,* 1998: p453; Woolfolk, 2007: p28).

The four stages of cognitive development are: the sensorimotor, the preoperational, the concrete operational and formal operational stage. Piaget stated that there are periods where a person may show various characteristics from more than one stage in different situations (Formanek & Gurain, 1981: p5; Gordon *et al*., 2008: p143).

A child in this age group of early childhood would be in the pre-operational stage of cognitive development, where the child is usually between the ages of 2 to 7 years. They

begin to talk by applying the knowledge gained over the past two years. The child begins to use symbols to represent objects, but generally has difficulty conceptualising and understanding the concept of time.

The child also has a very egocentric viewpoint, where he feels that others see everything from his viewpoint. His thinking patterns are influenced by fantasy (Berk, 2006: p252; Gordon *et al*., 2008: p143; Hendrick, 1986: p305; Ornstein *et al.,* 2004: p109; Seefeldt, *et al.,* 1998: p453).

- **Characteristics of the stages of Piaget's theory**

According to Berk (2006: p 21 & p222-250), Seefeldt *et al.* (1998: p 453-454), Gordon *et al.,* (2008: p145), Hendrick (1986: p304-306), Ornstein *et al.* (2004: p109) and Woolfolk (2007: p29-36) the following are characteristic of the stages in Piaget's theory:

i.) The sensorimotor stage

- The child is usually between the ages of 0 – 2 years.
- The child starts to learn about himself, his surroundings and various motor and reflex actions are performed for a specific reason and with a goal in mind.
- The child begins to imitate those around him/her, remembers things and faces and starts to develop thought patterns.
- The child will begin to understand that although objects or people are not within his reach, they still exist.
- These children start to develop mathematical concepts by noticing that some objects are small, while others are large.
- They play with blocks or with movable objects like cars and trains, thus familiarising themselves with the concepts of shape and movement.

Piaget believes that mathematical understanding begins when children develop object permanence – when a child realises that an object exists, although he cannot see the whole object or even part of the object, the object is still there (Berk, 2006: p21; Seefeldt *et al.*, 1998: p454).

ii.) Pre-operational

- The child is usually between the ages of 2 – 7 years.
- The child begins to talk by applying knowledge he/she has gained over the past two years.
- The child begins to use symbols to represent objects. Pre-concepts are developed.
- The child has difficulty conceptualising and understanding the concept of time.
- Children are able to influence and manoeuvre symbols or representations of the world around them.
- The child has a very egocentric viewpoint, where he feels that others see everything from his viewpoint. His thinking patterns are influenced by fantasy.
- Children learn to conserve, which aids in their mathematical understanding later on in life. According to Seefeldt *et al.* (1998: p454), conservation comprises three levels:
    * When a child is able to understand and reason that the shape or form of an object changes according to the arrangement, shape or container that the object is in.
    * Children understand that although the arrangement of the matter may alter the amount of matter remains constant.
    * Children are able to preserve qualities, volume and mass.

iii.) Concrete operational

- The child is usually between the ages of 7 – 11 years.
- The child now begins to think abstractly and starts to develop the understanding and viewpoint of another child or person. They continue to expand their mathematical thought processes.
- The child needs to be able to manipulate and solve concrete problems. Children, at this stage, are operational in their thinking, and often need objects to handle and manipulate while they are thinking.
- This child is able to classify and sequence objects.
- The child is now able to reverse problems that he/she is faced with.

Here, children are able to sequence and classify objects according to class, numbers, colours, and more, with understanding. Children at the age of about 11 are also able to reverse thought, complete calculations and develop logical ideas of numbers, weight, area and time (Berk, 2006: p21; Gordon *et al,* 2007: p145; Seefeldt *et al,* 1998: p454; Woolfolk, 2007: p34).

iv) Formal operational

- The child is usually between the ages of 11 – adulthood.
- This child no longer requires problems to be concretely displayed.
- The child can think logically and abstractly.
- The child is aware of the world around him/her and problems he/she may be facing.
- The child becomes more scientific in his/her thinking patterns and thoughts.
- This is the ultimate level of cognitive development.

These children are able to deal with problems concerning time, distance, probability and geometry. They are able to use conceptual thinking, and can relate different concepts using abstract thinking and problem-solving (Berk, 2006: p21; Seefeldt *et al,* 1998: p454; Woolfolk, 2009: p35).

3.3.3.3 Montessori

Maria Montessori was the founder of the Montessori method of teaching and learning and she aided in the revival of education in the early childhood stage. From as early as 1965, Montessori has had incredible outcomes and great feedback, working with poor and mentally disabled children (Meier *et al.,* 2007: p22). The Montessori approach takes on and encourages the individual to be free and creative in his/her choices of materials and activities (Gordon *et al.,* 2008: p18-19; Meier *et al.,* 2007: p22).

The child is not expected to be able to achieve any task or to master any skill, should his/her development not allow for this. The work and tasks are adapted for each child so that he/she is allowed freedom and not pressurised to develop, but can rather develop at his/her own pace (Gordon *et al.,* 2008: p18-19). Basic life-lessons and practical experiences are dealt with in a Montessori school which educates the child on how to deal with real situations and teach them good values and principles.

The learning and teaching technique focused on in the Montessori classroom is that of stimulating the child's senses through various materials and resources (Gordon *et al.,* 2008: p19). Children work at their own pace and are encouraged to develop and grow as individuals. '*It stresses the importance of adapting the child's learning environment to his or her developmental level, and of the role of physical activity in absorbing academic concepts and practical skills*' (http://en.wikipedia.org/wiki/Montessori, 10/10/09).

Children are given the freedom to decide for themselves which materials they will use. Independent and responsible, self-correcting attitudes are encouraged in a warm and loving, peaceful environment. Children need to be creative in their choice of materials. Practical life tasks and activities are learned, such as the cleaning of hands, clothes and tables, doing specific tasks, such as lacing or doing up buttons and zipping.

All objects and equipment in a Montessori classroom are child-centred, as they are the perfect size for children. This encourages independence in the child (Gordon *et al.,* 2008: p422-423).

The role of the teacher is to observe the children as they learn through experience. Instruction on how to use materials is generally given by teachers, but children still decide for themselves on the materials which they will use and what their outcome will be after choosing these materials (Gordon *et al.,* 2008: p423).

3.3.4 Sociocultural theory

The sociocultural theory is one which foresees children as a fundamental aspect of development – children in the learning environment are very important and are seen in their totality (Berk, 2006: p20 & p25; Berk, 2007: p234-235; Gordon *et al.,* 2008: p149; Meier *et al.,* 2007: p24). Teachers, families and parents play an essential role in the development of young children's language abilities through observation and parents' scaffolding the learning with guidance and support (Gordon *et al.,* 2008: p149; Meier *et al.,* 2007: p24).

According to De Witt (2009: p55), social or observational learning may be described as *'a synthesis of the most important elements of the different types of learning'*.

Vygotsky's work is called sociocultural because it focuses on the deep connection between culture and development, specifically targeting the interpersonal connection between the

child and other people. According to Gordon *et al.* (2008: p149), Vygotsky believed that the child is planted in a specific family and culture of his society and community, which results in much of a child's development being defined according to his/her culture.

Sociocultural theory also focuses on how children's values, attitudes, skills, traditions and beliefs are passed on from one generation to the next (Berk, 2006: p259; Gordon *et al.,* 2008: p149; De Witt, 2009: p55). Vygotsky believed that adults and people in the child's surroundings have the authority to aid and refine children's language knowledge, by preparing their external environment (Meier *et al.,* 2007: p24).

According to De Witt (2009: p55), Vygotsky's theory is not merely a theory of learning, but also one of teaching and instruction. Children rely greatly on the adults in their milieu to extend knowledge and thus facilitate understanding.

3.3.5 Ecological theory

The ecological theory is one which, like the Sociocultural theory, is based on the assumption that development is significantly influenced by external forces outside of the child, and in their environment (Berk, 2006: p26). Physical factors, such as climate, space, home, school and the social environment, including family, culture and the larger society all play a large role in the development of the young child (Gordon *et al.,* 2008: p152).

Bronfenbrenner designed a general theory of human development which includes an amalgamation of environment and person (Gordon *et al.,* 2008: p152). The model describes four systems which impact and influence human development. The four circles in the centre represent the four primary areas of influence in the young child's life, namely: family, school, peers and religious setting. The mesosystem, microsystem, exosystem, macrosystem, and chronosystem are all intertwined and have great influence on one another (Berk, 2006: p27-29; Gordon *et al.,* 2008: p152; Woolfolk, 2007: p72-73).

According to Gordon *et al.* (2008: p152), the values of the community (exosystem) and the influence of the social conditions (macrosystem) can, in turn, be influenced by the individual family or programme (microsystem).

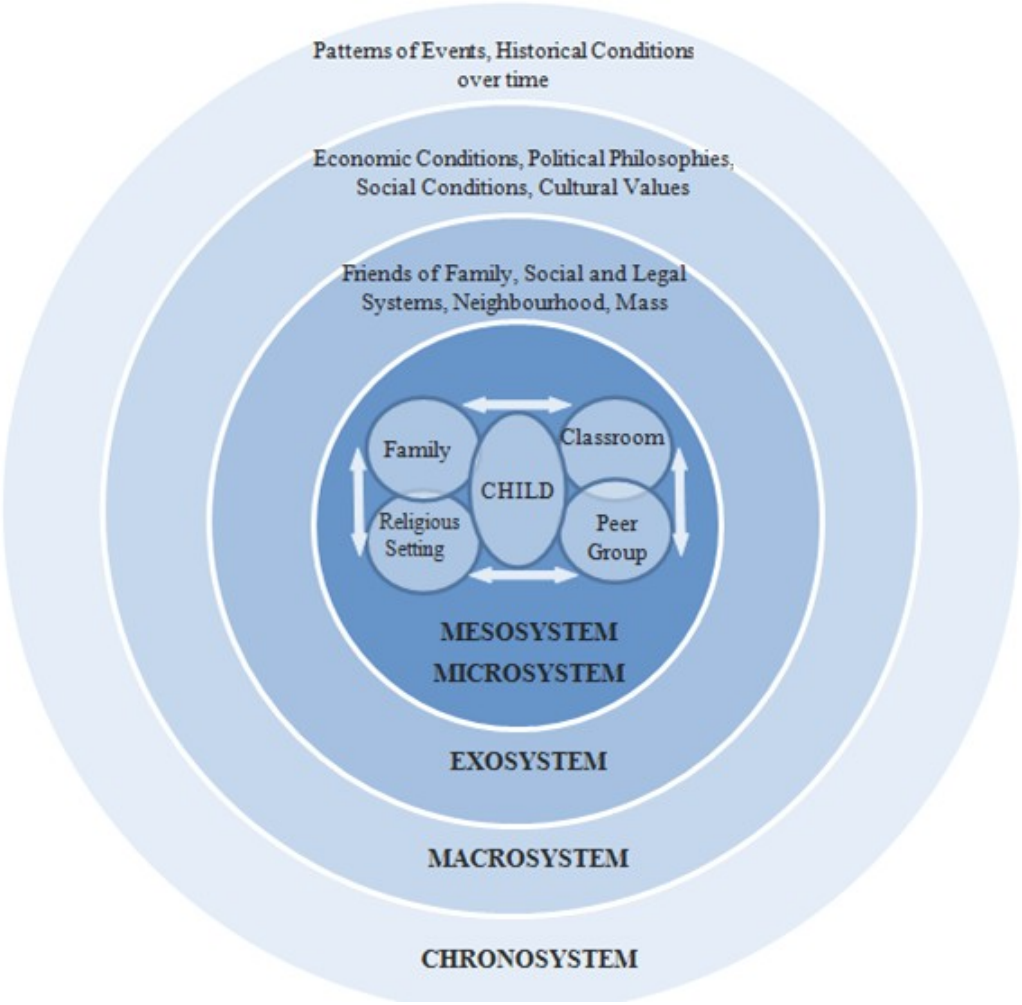


Figure 3.2 The Ecological theory shows the different factors which influence the child's development
(Berk, 2006: p28; Gordon *et al.,* 2008: p152; Woolfolk, 2007: p73)

3.3.6 Multiple-intelligences theory

Howard Gardner's theory of Multiple-intelligences was greatly influenced by the works of Piaget and Bruner. The theory exists to *'distinguish whether intelligence is a single, broad ability (as measured by an IQ test) or is a set of specific abilities (more than one intelligence)* (Gordon *et al.,* 2008: p153). Gardner emphasises that there is reliable confirmation and verification from brain-based research and from the study of genius, that there are a minimum of eight basic different intelligences (Gordon *et al.,* 2008: p153).

Intelligence is developed as the ability to solve problems or to create a product in the particular cultural setting. So the child's area of development depends largely on their external environment and context (Gordon *et al.,* 2008: p154; Woolfolk, 2007: p114).

The eight areas of intelligence, as stated by Gardner, include (De Witt, 2009: p14 & p148; Gordon *et al.,* 2008: p154; Woolfolk, 2007: p114):

1. Musical intelligence
2. Bodily-kinesthetic intelligence
3. Logical-mathematical intelligence
4. Linguistic intelligence
5. Spatial intelligence
6. Interpersonal intelligence
7. Intrapersonal intelligence
8. Naturalist intelligence

3.3.7 Maturation theory

The Maturationist theory was primarily devised by Arnold Gessell. Gessell was concerned with the ways in which children grow and mature from a medical point of view, and viewed it as an imperative and crucial aspect of development (Gordon *et al.,* 2008: p30). According to Gordon, *et al.,* (2008: p30) maturation may be defined as the '*process of physical and mental growth that is determined by heredity*,' and Woolfolk (2007: p22) defines maturation as '*genetically programmed, naturally occurring changes over time.'*

According to Hunt (1969), http://www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm 19/9/09), maturationists believe that a child's development is a biological process which occurs automatically; it is conventional, and consists of a series of sequential stages which occur in due course. The cornerstone of this theory considers a child to be healthy, their development in totality will take place when the child is biologically ready to develop and grow (www.ncrel.org/sdrs/areas/issues/students/earlycld/ea 7lk18.htm, (19/9/09).

The parents' role in stimulating and aiding the cognitive development and ensuring that the child is school-ready include teaching the foundational concepts for future learning by

equipping the child to recite the alphabet and to be able to count by rote (www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm (19/9/09).

3.3.8 The Humanistic theory

The humanistic theory is one which exists to explain what motivates people (Gordon *et al.,* 2008: p156). It is a theory which is centred on people's goals, ambitions, desires, needs, successes and the urges which motivate and drive people (Gordon *et al.,* 2008: p156, Ornstein *et al.,* 2004: p124).

3.3.9 The Environmentalist theory

According to www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm (19/9/09), the environmentalist theory is one which stresses the importance of the child's milieu and environment, and how it shapes and affects the child's learning and behaviour patterns.

3.4 THEORIES, METHODS AND MODELS USED IN THIS STUDY

The theories, methods and models used in this study are based upon those by John Dewey. The following section examines the development of the research tool, as well as the work done by Dewey.

3.4.1 John Dewey

The primary cornerstone of John Dewey's view of education was that a greater amount of effort and emphasis should be placed on enhancing and strengthening the child's intellect and mental understanding, and stimulating and challenging the problem-solving and critical-thinking skills so that learners develop and learn to stand for their own opinions and views on issues (Gordon *et al.,* 2008: p22; Meier *et al.,* 2007: p26). This view of education is Dewey's focal point which prevents children from learning and gaining knowledge by memorising lessons and activities, but rather through experiences, and being challenged with concrete experiences in a child-oriented and child-involved situation (Pellegrini, Symons & Hoch, 2004: p7; Meier *et al.,* 2007: p23,25).

Read and Paterson (1980, in Gordon *et al.,* 2008: p24), state Dewey believed that *'real objects and real situations within the child's own social setting'* should be used.

According to Gordon *et al.* (2008: p22-23), Dewey believed that schools should focus on the nature and uniqueness of each child, with education becoming an integrated aspect of life, training and equipping young children. Creating an interest and awareness of the child's world, through co-operative living, encouraging experimentation and group work under adult supervision and intervention plays an imperative part in the teaching process (Woolfolk, 2007: p385).

An important document (Gordon *et al.,* 2008: p22) written by Dewey titled, *My Pedagogic Creed* (1897) states five primary aspects of his theory.

1. '*I believe that only true education comes through the stimulation of the child's powers by the demands of the social situations in which he finds himself.'* This ensures that children learn to manage themselves in groups, to make and share friendships, to solve problems, and to cooperate.

2. *'The child's own instinct and powers furnish the material and give the starting point for all education.'* We need to create a place that is child-centred, a place that values the skills and interests of each child and each group.

3. *I believe that education is a process of living and not a preparation for future living'* Prepare children for what is to come by enriching and interpreting the present to them. Find educational implications in everyday experiences.

4. *'I believe that... the school like should grow gradually out of the home life... It is the business of the school to deepen and extend the child's sense of the values bound up in his home life.'* This sets the rationale for relationships between teachers and parents. Values established and created in the home should be enhanced by teaching in the schools.

5. *'I believe, finally, that the teacher is engaged not simply in the training of individuals, but in the formation of a proper social life. I believe that every teacher should realise the dignity of his calling.'* This says that the work teachers do is important and valuable. They teach more than academic content, they must also teach how to live.

Dewey's overall outlook on teaching and the emphasis he placed on the importance of the individual child is vital in the development of young children. According to Gordon *et al.* (2008: p23), as Dewey began to implement this method of teaching and learning, not only were children's social skills developed, but they also started acquiring skills such as reading, science and mathematics.

The role that the teacher plays is indispensable, as it provides continual support, participation and encouragement (Woolfolk, 2007: p417).

3.4.2 The model used for the purposes of this research

According to Gordon *et al.* (2008: p22), Dewey believed in the innate goodness of young children and views children as valuable and an integral aspect of human life, with childhood being an important phase. The focus that is placed on the child and his/her development in totality is imperative, and is also the focus in this study.

The intervention programme used in this study was devised in accordance with the constructivist theory, which focuses on the learning and development of the young child in the context of his/her environment, and stresses the importance of young children being active participants in the learning process (Gordon *et al.,* 2008: p24).

The eight-week intervention programme was divided into three parts, namely literacy, mathematics and life-skills (Figure 3.3). These concepts are to be dealt with simultaneously, and for the purpose of this study, must have equal levels of importance and significance. Each concept has its own sub-concepts which were dealt with in detail in Chapter Two.

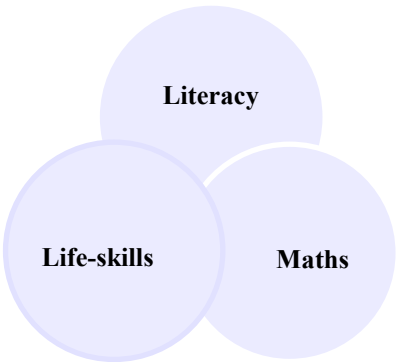


Figure 3.3 Primary concepts dealt with in this study, namely literacy, life skills and mathematics.

Mathematics

Counting

One-to-one correspondence

Classifying

Sequencing

Geometry

Literacy

Vocabulary

Speech

Listening

Reading

Writing

Life skills

Visual-motor

Foreground/Background

Discrimination

Sensory awareness

A day-by-day planning which focuses on literacy, mathematics and life skills was devised as a guide to be used to stimulate and educate the experimental group in the study. Weekly themes were followed, which created a sense of formality and structure.

All interaction with the participants of the study was child-centred and developmentally based. The primary aim was to educate and equip young children by means of applying and enabling participants to understand the concepts of mathematics, literacy and life skills.

The themes which were followed include:

Week 1: Me

Week 2: Family and friends

Week 3: Homes and weather

Week 4: Animals

Week 5: Transport

Week 6: Health

Week 7: Feelings
Week 8: Revision week

Basic life skills were enhanced each week, focusing on different aspects of the child and the concepts to be developed:

Week 1: Heritage
Week 2: Interaction
Week 3: Modelling behaviour
Week 4: Enquiry
Week 5: Experiences
Week 6: Decisions
Week 7: Personality
Week 8: Revision week

Table 3.1 Programmes for the implementation and stimulation of mathematics concepts

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Week 1: **ME** HERIGATE	COUNTING 1. Rhyme -1, 2, 3, 4, 5, once I caught a fish alive (concrete actions, semi-concrete pict.) 2.Count body parts (conc.)	GEOMETRY 1.Look at shapes (concrete) 2.Create house with shapes (concrete)	ONE-TO-ONE CORRES. 1.Count the number of objects in the rooms (concrete and semi-concrete)	SEQUENCING 1.Sequence a child's day (with flash cards)	CLASSIFYING 1.Classify pictures of likes and dislikes
Week 2: **FAMILY & FRIENDS**	COUNTING Rhymes with numbers	GEOMETRY Copy my picture of	ONE-TO-ONE CORRES. Count family members,	SEQUENCING According to height, age,	CLASSIFYING Classify males/female

INTERCTN		images built with shapes.	pictures of friends, etc (semi-concrete)	colours, etc	s, and kids/parents
Week 3: **HOMES & WEATHER** MODELL-ING	COUNTING Look at weather outside, sing Mr sun	GEOMETRY Build own house from shapes (not copy)	ONE-TO-ONE CORRES. Count while building blocks (as if building a house)	SEQUENCING Old-fashioned homes to modern homes	CLASSIFYING Different seasons and weather
Week 4: **ANIMALS** ENQUIRY	COUNTING Rhyme and count animals (concrete)	GEOMETRY Use 3D shapes to create space for animals to live in	ONE-TO-ONE CORRES. Semi-concrete – pass me … cows in farmyard, etc	SEQUENCING Sort big – small, etc	CLASSIFYING Sort different animals into groups
Week 5: **TRANS-PORT** EXPERIEN-CES	COUNTING Count transport in pictures (semi-concrete)	GEOMETRY Look at modes of transport – add in shapes (ie. Wheels (circle), etc	ONE-TO-ONE CORRES. Count modes of transport in the picture	SEQUENCING Sequence big – small, small – big, etc	CLASSIFYING Sort according to air/land/sea, function and image
Week 6: **HEALTH** DECISIONS	COUNTING 1.Heads, Shoulders, Knees and Toes Rhyme	GEOMETRY Shape recognition, colours	ONE-TO-ONE CORRES. 1.Count people in picture – match good	SEQUENCING 1.Order SEQUENCING stories	CLASSIFYING 1.Classify semi-concrete pictures

			hygiene to bad hygiene		according to healthy food and junk food
Week 7: **FEELINGS** PERSON-ALTY	COUNTING 1. Listen to story about emotions	GEOMETRY 1. Complete other half of a picture. Complete it – visual closure	ONE-TO-ONE CORRES. 1.Count the happy people, sad people, etc	SEQUENCING 1.Sequencing stories	CLASSIFYING 1.Classify pictures of good/bad feelings
Week 8: REVISION	In the 8th week, I focused on any revision that needed to be made, focusing on concepts which children struggled with.				

Table 3.2 Programmes for the implementing of stimulation of literacy concepts

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Week 1: **ME** HERITAGE	VOCAB 1.Rhyme 2.Parts of the body	SPEECH 1.Speak about self & home environment 2.Family	LISTENING 1. Teacher tells a story with a picture. They must note the mistakes in the story (by looking at the picture)	READING 1.Show a picture, child describes what is happening in the picture (also vocab & speech)	WRITING 1.Draw a picture of self
Week 2: **FAMILY&**	VOCAB Look at cue	SPEECH Talk about	LISTENING Tell story of	READING Read pictures	WRITING Draw picture

FRIENDS INTERACT	cards of family members – name members and sort who goes where	who lives in their homes. Discuss family	a little girl's family – ask questions after. comprehensi on	and say what is happening in each picture	of family
Week 3: **HOMES & WEATHER** MODELL-ING	VOCAB Where we live, types of homes, my home	SPEECH Animals homes	LISTENING Listen to sounds on computer – discriminate between sounds.	READING Read pictures of weather – what they think it means	WRITING Copy my picture of a home – draw same
Week 4: **ANIMALS** ENQUIRY	VOCAB Naming animals by looking at picture	SPEECH Talking about animals at home, in the book, etc	LISTENING Listen to story of animals, answer questions as we go along	READING Look at picture, tell me what is happening in the picture	WRITING Draw a picture of favorite animal
Week 5: **TRANS-PORT** EXPERIEN-CES	VOCAB Look at pictures and discuss different modes of	SPEECH Name the modes of transport used in SA and world	LISTENING Listen to different forms of transport and discriminate	READING Read and match pictures together	WRITING Draw wheels on the forms of transport

	transport used in SA and around the world				
Week 6: **HEALTH** DECISIONS	VOCAB Cue cards, and match to healthy food from shopping basket. Name objects	SPEECH Discuss what food is seen in picture of supermarket – discuss favorite foods, etc	LISTENING Listen to explanation of a hygiene picture – match to picture	READING Read pictures of hygiene and health. Discuss	WRITING Complete a picture of fruit
Week 7: **FEELINGS** PERSON-ALITY	VOCAB Discuss emotions on cue cards	SPEECH What makes you feel like this? When do we feel sad? Happy? etc	LISTENING Listen to story of girl with emotions	READING Match pictures of emotions to the reason why one would feel that way. (boy hitting = sad face)	WRITING Copy happy face (dot-to-dot)
Week 8: RECAP	In the 8th week, I focused on any revision that needed to be made, focusing on concepts which children struggled with.				

T**able 3.3** Programmes for the implementing of stimulation of life-skills concepts

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Week 1: **ME** HERITAGE	VISUAL MOTOR 1.Dot-to-dot of bodies 2. Point to parts on picture, and on own body.	FORE/BAC GROUND 1. Picture of house & yard – discuss what is seen. 2. Relate to their home environment	DISCRIM-INATE 1.Note differences between pictures of objects around the house	SENSORY AWARE-NESS 1. Look at pictures after sequenced, have concrete objects (ie blanket/cereal bowl, etc – match picture to object).	DISCRIM-INATE 1. Discriminate between likes and dislikes.
Week 2: **FAMILY& FRIENDS** INTERACT	VISUAL MOTOR 1.Dot-to-dot 2. Match same emotions to one another. 3.Discuss emotions	FORE/BAC K GROUND 1.Match belongings to family members	DISCRIMINAT 1.Discrim-inate between feelings (happy, sad, etc)	SENSORY AWARE-NESS 1.Recognize sounds of family members and friends	DISCRIM-INATE 1. Discriminate between good and bad behavior.
Week 3: **HOMES & WEATHR** MODELING	VISUAL MOTOR 1. Give children a picture of	FORE/BAC K GROUND Recognize and circle weather	DISCRIM-INATE 1. Match up the leaves	SENSORY AWARE-NESS 1. Distinguish	DISCRIM-INATE 1.Discrim-inate between

	homes to discuss. 2.Dot the page with Koki's (creating rain/snow)	types and symbols in picture	that are the same as the ones in the column. And match to concrete.	which clothing is worn when the weather is hot, and when the weather is cool.	weather symbols
Week 4: **ANIMALS** ENQUIRY	VISUAL MOTOR 1. Make a porcupine out of play dough – stick tooth picks in as quills.	FORE/BACK GROUND 1. Circle all the animals in the picture.	DISCRIM-INATE 1. Circle objects which we can hear.	SENSORY AWARE-NESS 1. Look at picture of animal. What sound does it make? (choose from recorded list) What does it feel like? (choose from concrete materials)	DISCRIM-INATE 1.Discrim-inate between animals which fly, walk, swim
Week 5: **TRANS-PORT** EXPER-IENCE	VISUAL MOTOR 1. Follow the dots on the line.	FOREBACK GROUND 1. Circle all the forms of transport in the picture.	DISCRIM-INATE 1.Colour in the correct one	SENSORY AWARE-NESS 1. Listen to sounds, does this sounds like traffic? Match sound	DISCRIM-INATE 1. Match the cut outs onto the parts of the pictures.

				heard to picture. (train/bus/motorbike/horse/etc)	
Week 6: HEALTH DECISIONS	VISUAL MOTOR 1.Choose healthy food out of a shopping basket	FOREBACK GROUND 1. Recognize healthy food in a supermarket picture. Circle healthy food.	DISCRIM-INATE 1. Discriminate between good hygiene and bad hygiene.	SENSORY AWARE-NESS 1.Distinguish between smells – healthy or unhealthy smells	DISCRIM-INATE 1.Memory game of healthy behaviour
Week 7: **FEELINGS** PERSONAL	VISUAL MOTOR 1.Recognize emotions, complete the picture	FORE/BAC K GROUND 1. Recognize emotions in the picture.	DISCRIMINAT 1.Match actions to feelings	SENSORY AWARE-NESS 1.Play memory game with pictures of emotions	DISCRIM-INATE 1.Discrim-inate between feelings, match to actions
Week 8: RECAP	In the 8th week, I focused on any revision that needed to be made, focusing on concepts with which children had struggled.				

3.5 HYPOTHESES

The primary aim of this study was:

- To develop a programme to enhance cognitive development in order to examine the effects of stimulation of mathematical, literacy, life skills and general knowledge concepts in young children;
- To evaluate the methods of implementation that aid development of the cognitive concepts.

Hypothesis 1: Intervention

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of intervention, comparing control and experimental groups:

H_0: There is no significant difference between the overall cognitive development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the overall cognitive development of the subjects in the control and experimental groups.

Hypothesis 2: Literacy

The null hypothesis (H_0) and alternative hypothesis (H_1) for the significance of implementation of literacy concepts, comparing control and experimental groups:

H_0: There is no significant difference between the literacy development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the literacy development of the subjects in the control and experimental groups.

Hypothesis 3: Mathematics

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of mathematics concepts, comparing control and experimental groups:

H_0: There is no significant difference between the mathematics development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the mathematics development of the subjects in the control and experimental groups.

Hypothesis 4: Life skills

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of life-skills concepts, comparing control and experimental groups:

H_0: There is no significant difference between the life-skills development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the life-skills development of the subjects in the control and experimental groups.

A hypothesis that states the programme that has been developed according to the work of Dewey and the constructivist theory is one which will provide positive results and will prove to have had a large impact on the cognitive development of young children and to have aided in their stimulation over the eight-week intervention process.

Dewey's work is well-recognized worldwide and is the cornerstone of the intervention programme used in this study.

3.6 CONCLUSION

This chapter has dealt with the theory behind the development of the research tool by referring to various previous models, theories, methods and concepts of early childhood development. The finished research tool in the form of an eight-week intervention programme has been fully discussed.

CHAPTER 4
METHODOLOGY AND PROCEDURE

4.1 INTRODUCTION

The purpose of this study is to develop and field-test an instrument which provides a means of cognitive stimulation for early childhood children, through mathematics, literacy and life skills. This chapter describes the methods that will be used to develop an early childhood cognitive stimulation and development programme, including methods for exploring the validity and reliability of the study.

The literature was reviewed to establish the existing curricular approaches used in early childhood education. Furthermore, ethical issues to be considered in order to conduct the research in a sound and professional capacity are stipulated.

From the review, it is clear that young children's cognitive development is permanently enhanced by means of stimulation. The three major aspects of cognitive development include mathematics, literacy and life skills which are all equally important, and need to be enhanced simultaneously and by means of integration (De Witt, 2009; Eliason *et al.,* 2008; Gordon *et al*., 2008; Seefeldt *et al.,* 1998; Sternberg, 2008).

The child's environment and family situation have proven to be of great importance and have a huge influence in the child's development (De Witt, 2009; Eliason *et al.*, 2004; Gordon *et al;* Hendrick *et al;* Meier *et al.,* 2007).

This section encompasses a complete description of the research design of the methods and procedures employed in this study, the aim of which was to note the effects of cognitive stimulation (mathematical, literacy, life skills) on the young child, and the programmes used for intervention. Selection methods for the participants, measures to ensure trustworthiness, ethical issues, data collection and analysis, and the limitations of the study are included in this chapter.

4.2 THE RESEARCH PROBLEM

Various programmes and activities need to be logically planned in order to aid cognitive development and enhance children's cognitive abilities. Thus, the research question for this study can be formulated as follows:

- *What are the effects of cognitive stimulation (mathematical, literacy and life skills on the young child, and how can they be enhanced?*

The principal aim of this study is to gain a comprehensive understanding of the cognitive development of the young child, so as to develop a suitable programme that can be used to stimulate their development. This will be done by means of a literature study, as well as an empirical investigation.

This study will be conducted in order to:

- Develop and evaluate a programme of mathematical skills, language and literacy development and general knowledge, as well as life-skills stimulation, to enhance the ability of young children in order to provide a better understanding of the cognitive development and abilities of these learners, as well as providing insight into the benefits of and the rate of individual development of the young learners' cognitive abilities;
- Assess the validity of the programme of cognitive development; and
- Establish the reliability of the application of the programme of cognitive development.

4.3 THE AIM OF THE RESEARCH

This study aims to provide scientific knowledge of the impact of early intervention in children's cognitive development through stimulation.

The aim of the empirical study is:

- To develop a programme to enhance cognitive development in order to examine the effects of stimulation of mathematical, literacy and life-skills concepts in young children;

- To evaluate the methods of implementation which aid development of the cognitive concepts;
- To indicate how the concepts can be provided for in early childhood centres.

McMillan *et al.,* (2006: p22) define research design as a comprehensive plan for creating empirical evidence which will be used to answer the research questions, aims and objectives. For the purpose of this research, this study uses a quantitative, experimental research design.

4.3.1 The nature of quantitative research

A quantitative research method will be used. The quantitative approach is value-free and focuses on variables, while measuring objective facts rather than social and cultural contexts. According to McMillan *et al.,* (2006: p23), quantitative fields of study '*adopt a positivist philosophy that emphasizes objectivity and the quantification of phenomena'.*

Objectivity is maximized as a result of data being in the form of numbers, statistics, structure and control, and the information is then transferred into a computer-readable format (Neuman, 2006: p41). Once the data have been collected, the analysis of the data commences. This stage typically involves manipulating the data or numbers using computer software to create charts, tables, graphs and statistics (Neuman, 2006: p14).

Once the researcher has all the information graphically represented, an interpretation of the data is necessary. By looking at the analyzed data and with background knowledge on the research topic, the original research question can be answered and insight can thereby be arrived at (Neuman, 2006: p14).

In an experimental research design, the researcher has, in some manner, control over some subjects and is able to manipulate their experiences (McMillan *et al.,* 2006: p23). The researcher is then able to investigate cause-and-effect relationships by making comparisons between the control and experimental groups through statistical analysis (McMillan *et al.,* 2006: p24).

4.4 THE RESEARCH DESIGN

'*The quality of action research depends on the reflexive sensitivity of the researchers, whose data collection, analysis and interpretations will all be mediated by their sense of self and identity'* (Somekh, 2006: p14). The study will be conducted by means of a true experimental

design, whereby the subjects will be measured before and after the treatment. This is the only design that can effectively determine the cause-and-effect procedure as it involves a control group and an experimental group (McMillan *et al.,* 2006: p24).

4.4.1 The research method

This research method involves data collection, sampling method, the researcher as the instrument, ethical issues, and a suitable method to ensure trustworthiness and data analysis.

The research design which will be implemented is a quantitative method of capturing and analysing data. Quantitative research is based on logical positivism, where one single reality is measured (Neuman, 2006: p13). Previous data were thoroughly researched and literature was consulted so that procedures would be able to follow a step-by-step plan.

The quantitative approach will also create a means to establish a relationship between the measured variables and thus explain the cause of this change (McMillan *et al.*, 2006: p24).

All subjects that will participate in this research will be assigned to either the control group (independent variable) or the experimental group (dependent variable) by probability sampling, based on randomisation (Neuman, 2006: p251). All subjects in the population (Early Childhood Centres) have the same probability of being selected. Pre-tests and post-tests will be done with both the control and experimental groups, and thorough intervention and stimulation need to take place with the experimental group.

A questionnaire will be used to provide valuable subject history and parental objectives. Questionnaires ensure anonymity, and are economical (McMillan *et al.,* 2006: p194).

Correlational research determines and analyses the relationships between variables (McMillan *et al.,* 2006: p25). Using this method, certain predictions may be made on the basis of these relationships. It is however important to note that this design will not necessarily determine cause and effect. As this study intends to determine the relationship and effects of early intervention and stimulation in the cognitive development of young children, statistical analysis of the mathematical, literacy and life-skills development of young children will be conducted.

The home environment, emotional, physical, social and spiritual development will form part of this investigation, as the child always needs to be seen in his/her totality and as a whole, and there is no way of separating the child from the environment.

4.4.2 Data collection

The data collection period will consist of a week of pre-testing (T1: Appendix E), which will take place prior to the commencement of the intervention programme, an eight-week intervention programme, and a final week of post-testing (T2: Appendix F) after the intervention period. Questionnaires will be sent out to the subject's teachers and parents or care-givers.

The questionnaires will enable the researcher to gain background information from each family, as well as to provide a large amount of information in a short period of time (Koshy, 2005: p87).

4.4.3 Sampling methods

A population refers to '*a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalise the results of the research*' (McMillan *et al.*, 2006: p119).

In many cases the population is so large and unreachable that it cannot be used in its entirety due to the inability of the researcher to control the group. In the case of this research, a useful division of the population was used. The research population of this study can be defined as: selected children between the ages of two and three-and-a-half years old, attending middle class early childhood centres in the Port Elizabeth region.

A group of the population from whom the data have been collected is called a sample group (McMillan *et al.,* 2006: p119).

Neuman (2006: p227) explains random sampling as being one that truly represents the population, and allows for the researcher to statistically compute and analyse the relationship between the sample and the population. Systematic random sampling takes place when the researcher calculates the sampling interval. The interval then becomes the quasi-random selection method.

The sampling interval suggests how to select the elements from a sampling frame starting from a randomly selected element. The sampling frame needs to be arranged randomly for systematic random sampling to take place effectively (McMillan *et al.,* 2006: p121; Neuman, 2006: p230).

The systematic random sampling method was relevant and appropriate for this study that had a specific task to accomplish. The population was not arranged according to any systematic pattern; the list is arranged randomly, which ensures that there were no possible weaknesses in the selection of participants (McMillan *et al.*, 2006: p121).

The study explored the effects of stimulation on cognitive development in children ranging from two to three-and-a-half years.

4.4.4 Ethical measures

According to Koshy (2005: p83), it is imperative to carry out ethical guidelines during research projects. All information gathered will be coded to ensure the anonymity of the subjects involved in the study. According to Neuman (2006: p139), anonymity ensures that the participants remain nameless and their identity is thus protected from being disclosed. All information gathered will remain confidential with the identity of the subjects only known to the researcher.

All the subjects will be required to sign an informed consent form (Appendix C), agreeing to participate in the study (Neuman, 2006: p135). Ethical requirements will be fulfilled for the purpose of this study.

4.4.5 Informed consent

Attaining informed consent implies that the researcher ensures that the participants will be treated with anonymity and confidentiality at all times. The intended use of all information gained and acquired during the investigation, the various actions and events that will be followed during the execution of the investigation, any possible advantages, disadvantages or dangers to which participants may be exposed, will all be provided to the participants prior to the investigation (McMillan *et al.*, 2006: p334).

Further, it is emphasized that precise and absolute information is to be provided to all subjects so that they are fully aware of the steps of completion in the investigation, and they are therefore able to make an informed and critically analyzed decision regarding their participation in the study (Mouton, 2001: p244; Neuman, 2006: p135).

Written informed consent will be obtained from the participant's parents and the principals of the three early childhood centres (Appendix C) after they have received a letter explaining the intentions and programme for the research project (Appendix A: Letter to Principles, Appendix B: Study Information Letter). No participant will be allowed to participate in the

study without having completed and returned a consent form, which needs to be signed by a parent or guardian.

All names will be removed to protect the participant's identity and the schools at which this research will be implemented. The informed consent form for all participants, teachers, parents and principals will ensure the anonymity of the children in the classrooms, using pseudonyms to classify the participating schools, teachers and children throughout the study and in all succeeding periodicals and presentations thereof.

4.4.6 Confidentiality and privacy

According to the Oxford Dictionary (Ed. Branford: p602), privacy refers to *'freedom from disturbance or public attention'.* In the case of research it refers to anything that is normally not intended for others to observe or analyze (McMillan *et al.,* 2006: p334). Confidentiality is a prolongation and extension of privacy. Privacy refers to a contract between people that limits others from accessing private information (McMillan *et al.,* 2006: p335).

As a result of the above, the names of participants who were analyzed during the eight-week intervention programme are not given in the study. That is, the researcher has kept details of early childhood participants confidential.

4.4.7 Participants in the study

For the purpose of this study all participants will be selected by means of systematic random sampling, where each individual has an equal chance of being selected (Neuman, 2006: p230). The participants in this study will be children between the ages of two and three-and-a-half years old that attend one of three Early Childhood Centres across Port Elizabeth. Forty (40) children between the ages of two and three-and-a-half will be selected to participate in the study; both males and females were included.

The participants will be classified, by means of systematic random sampling into two main categories:

- Control Group (20 participants)
- Experimental Group (20 participants)

4.4.8 Processing the results

When analysing data it is imperative that data should be organised in a clear and concise manner. According to McMillan *et al.* (2006: p417), quantitative data are summarised using simple descriptive statistics, such as the mean, frequencies, mode, range and graphs.

4.4.9 Procedure of the research project

In the initial phase of this research study, before direct interaction with children, the researcher will contact the early childhood centre principals and consult with them regarding their approaches to teaching, their motivation to make a difference, and their current teaching beliefs and practices. Various aspects of the practice will be discussed with the principals, including class schedules, room arrangements, materials used in the classroom, and the curriculum currently being implemented.

This will be done in order to gain a perspective on the children's abilities, as well as a guideline of the input that both the experimental and the control groups will receive during the class teaching.

The researcher will provide insight into the day-to-day happenings of each early childhood centre, and the procedures of this research project will be explained to the principal in detail. The expectations of the early childhood centre will be discussed; the eight-week intervention programme which is to be implemented will be discussed, as well as the centre's expectations of the research, the project and the intervention programme.

Data will be collected by means of pre-testing and post-testing. All 40 participants involved will be given a pre-test which is to be performed under the same conditions for all participants. Pre-tests and post-tests are to be implemented in a one-on-one format. The duration of the pre-test will be roughly 10 minutes per subject, over a five-day period. The experimental group (20 participants) will then undergo a process of eight weeks of cognitive development and stimulation intervention.

Questionnaire forms will be completed by all parents (McMillan *et al.,* 2006: p194; Neuman, 2006: p292).

During the eight-week intervention programme, a series of concepts and abilities will be stimulated. Together with their daily routines, the experimental group subjects will have an

additional stimulation session, one-on-one with the researcher for a period of roughly ten minutes per day. In this contact session, literacy, mathematics and life-skills concepts (dealt with in Chapter 2) will be focused on.

Integration is a key component in the programme, and literacy, mathematics and life skills will be taught as an amalgamation of all these cognitive concepts.

The post-test (T2) will be completed by both the experimental and the control groups after the eight-week intervention process. The questionnaires sent out to all participants' parents (Appendix D) will provide the parents' views on early intervention and the importance thereof, as well as the parents' views on the importance of parental involvement with stimulation and developmental programmes.

4.4.10 Validity and reliability

The results of the subjective and objective evaluations on the 40 subjects will be assessed and observed. Although these scores may appear to be similar, each child's level of development is different and specific for each individual. The manner of learning and attaining knowledge is different from child to child. Reliability and validity are essential in scientific research, as they '*help to ensure that our measures are objective'* (Pellegrini *et al.*, 2004: p140).

4.4.10.1 Validity

Instrument validity refers to the consistency of measurements and results on different occasions (McMillan *et al.,* 2006: p130). Validity usually refers to the reliability and truthfulness of the measure (Pellegrini *et al.*, 2004: p140). The pre-tests and the post-tests are the same, so no deviation will take place in the instrument used to assess the learners. The researcher will test all the subjects, at a similar time of day, which ensures a fair standard of assessment. The two aspects focused on consist of content validity and face validity.

Face validity ensures that the concepts tested all follow a developmental pattern and structure – for example that if a child cannot count from 1-5, he/she would therefore not be able to count from 6-10.

Content validity ensures that after a thorough investigation of the literature regarding the cognitive concepts, including the sub-sections of mathematics, literacy and life skills, that all the aspects of the sub-sections are taken into account in the study. Tests devised and

programmes implemented for the intervention are all based on the theory discussed in the conceptual framework.

i.) Internal validity

Internal validity is the degree to which conclusions and assumptions about the cause-and-effect relationships arising from an experiment are accurate and correct. There are many types of threats which could affect the internal validity of a research design. (McMillan *et al.,* 2006: p134, 260). According to Polgar and Thomas (http://www.qmu.ac.uk/psych/RTrek/study_notes/web/sn3.htm, 18/03/09), 'Internal validity concerns the soundness of an investigation'.

Possible threats, which may affect the internal validity of this trial include the following:

- History

The history refers to various possible incidents that could occur outside or inside the context of the study. These incidents are out of the researcher's control, and they can influence the results of the study (McMillan *et al.,* 2006: p136, p261).

There is a possibility that incidents outside of the researchers control can occur. The effectiveness of the intervention programme relies heavily on the children's school attendance. Children in the experimental group that are not at school on a regular basis may tend to have less effective results than those that are at school more consistently.

- Instrumentation

Instrumentation refers to a visible change in the results. This is because of changes in the instrument itself, or changes in the person who is implementing the research (Neuman, 2006: p262; McMillan *et al.,* 2006: p262).

Instrumentation refers to a visible change in the results (Neuman, 2006: p262; McMillan *et al.,* 2006: p262). The instrument used for the pre-tests and the post-tests will remain constant. The same scoring sheet will be used for all children and the person implementing the research will also remain constant throughout the research process, so no deviation will take place.

- Subject attrition

Often there is a difference noted should the number of subjects present for the pre-test be different from that of the post-test (McMillan *et al.,* 2006: p138). Only subjects present for both the pre-test and the post-test will be submitted and analysed.

- Maturation

Maturation refers to changes in the individual subject that take place between the pre-test and the post-test. Children are constantly changing and growing. From one month to the next, they also become more mature. Factors such as the time of day, the weather, the child's health and even their moods all affect their results in the tests (McMillan *et al.,* 2006: p138-139, 261; Neuman, 2006: p261).

Maturation refers to changes in the individual subjects between their pre-test and their post-test scores. Because all children are constantly changing and growing, the fact that children may develop would be a common occurrence in all the children, and one which cannot be prevented. Every precaution will be taken to ensure that factors, such as the time of day, the weather, the child's health will be considered when implementing the research.

ii.) External validity

- Population external validity

Population external validity is the extent to which the results can be generalised to all other people, not only people with similar characteristics. The results of a study should only be generalised should the population have similar characteristics to those of the subject group. These characteristics include features such as age, race, sex, ability (McMillan *et al.,* 2006: p141; http://www.gifted.uconn.edu/siegle/research/Samples/externalvalidity.html, 10/11/09). All children in both experimental and control groups are between the ages of two and three-and-a-half years. They attend one of three early childhood centres in Port Elizabeth, and come from a similar socio-economic sector.

The racial breakdown of the participants includes one Indian child, one coloured and 38 white children. There are 23 males and 17 females in the experimental and control groups. 38 of the 40 children speak English at home, while the remaining two participants speak Afrikaans.

4.4.10.2 Reliability

Reliability refers to the consistency of the uniformity in an experiment. It suggests that the same thing can be reproduced by different researchers under similar conditions and reach the same results (McMillan *et al.,* 2006: p130, p188 & p198; http://www.socialresearchmethods.net/kb/reliable.php, 3/11/09). In order to determine whether the tests would be reliable when administered at different times, the group of 40 subjects from three early childhood centres will be tested over a period of five days.

4.4.11 The questionnaire

According to McMillan *et al.* (2006: p194), a questionnaire is the most widely used method to obtain information. The questionnaire was developed according to a step-by-step plan in McMillan *et al.* (2006: p194), whereby the following steps need to be followed:

- Establish justification
- Define the objectives
- Write the items
- Review items
- Construct the general format of the questionnaire
- Conduct a pilot test
- Revise the questionnaire and responses

Insight into the steps of cognitive development, various strategies which are able to enhance development and concept understanding, as well as understanding each individual's development are all important. The parent or caregiver's understanding of their child's level of development is also important. The purpose of the questionnaire was to gain an understanding of the importance that parents or care-givers place on the cognitive development of their child.

A questionnaire (Appendix D) will be distributed to each participant's parent or caregiver that had returned a consent form agreeing to the terms of the study (Appendix C). Each subject is given clear instructions on completing the questionnaire.

The questionnaire provides insight into the parents' feelings regarding their responsibilities in regard to the cognitive development of the young child, and the responsibilities of the

children's teachers. Insight will be provided to gain a greater sense of understanding on how parents rate their child's development, the necessary stages of development, the amount of importance they place on cognitive development, activities that they would use to aid and enhance cognitive development, and factors they believe play a role in this development.

4.5 DATA ANALYSIS

Once the pre-tests and post-tests have been implemented, and the data have been collected, this data needs to be formatted in a way that is meaningful prior to drawing conclusions and implementing the appropriate action (Koshy, 2005: p109). According to McMillan *et al.,* (2006: p417), '*quantitative data are summarized using simple descriptive statistics (eg. frequencies, mean, mode, range) and graphs*'. The aim of data analysis is for the researcher to determine whether they provide the needed information, in order to achieve the goals and aims of the study (Koshy, 2005: p109).

A number of hypotheses have been postulated which will be dealt with in detail in Chapter 5.

As the aim of this study is to develop a programme that can be used to enhance cognitive development in order to examine the effects of stimulation of mathematical, literacy and life-skills concepts in young children, to evaluate the methods of implementation that aid development of the cognitive concepts, and to indicate how the concepts can be provided for in the early childhood centre, descriptive statistical procedures are utilised to investigate the relationship between early childhood intervention and cognitive development.

The following tests were employed to test the hypotheses:

1. Single variable statistics (mean, standard deviation and coefficients of variance), frequency histograms and one independent variable regression were used to give greater insight into the pre-test and post-intervention scores. The reliability of the scores for the pre-tests and the post-tests was determined by the item-analysis-factor analysis and the calculation of Cronbach's Coefficient of alpha (McMillan *et al.,* 2006: p54, p185-186).
2. T-tests were implemented in order to determine the level of significance in the control and experimental groups, as well as to compare the two groups' mean scores ($p \geq .001$ at 0.1% level of significance).

3. The level of significance of the study was determined by the p-level or level of probability (McMillan *et al.,* 2006: p292). A critical value at the five-percent level of confidence ($p \geq .05$) was required for significance.
4. Analysis of co-variance, using the statistical software package program used by BMDP2007 in addition to the analysis of co-variance, where the treatment was the grouping variant and the pre-test was the co-variant, used to test the level of improvement in the scores as a result of the intervention programme (McMillan *et al.,* 2006: p165).
5. The item-analysis-factor analysis and the calculation of Cronbach's coefficient of alpha were used to test the reliability of the pre-test and post-intervention test scores (McMillan *et al.,* 2006: p185-186).

4.6 THE LIMITATIONS OF THE STUDY

The study was limited to the selected children aged between two and three-and-a-half years from the three selected early childhood centres in the middle class socio-economic status group of Port Elizabeth. Other centres and age-groups were not explored. Further, the length of the dissertation had a constraining and limited time frame which resulted in speeding up the research process so that the due date of the dissertation could be met.

4.7 CONCLUSIONS

To test the ability of understanding and the development of mathematical, literacy and life-skills concepts of children in their early childhood a programme has been designed and will be implemented, which focuses on the primary cognitive concepts. A test will be conducted on a Group of 40 subjects. Twenty of these subjects will be worked with for a further eight weeks, during which time the primary cognitive concepts are to be taught, according to the child's level of understanding. After the eight-week study, the same test will be carried out on all the original 40 subjects.

The effects of the children which were stimulated and those that were not stimulated will be assessed. The effectiveness of the intervention programme will also be tested, and the results of success or failure noted.

In this chapter an overview had been given on the research methodology used for this study. In the following chapter, a more in-depth description will be given of the plan for analysing the collected data, as well as the research results obtained from the analysis.

CHAPTER 5
DATA ANALYSIS AND FINDINGS

5.1 INTRODUCTION

This chapter presents the results of a study conducted to gain a comprehensive understanding of the effects of cognitive stimulation (mathematics, literacy and life skills) on the development of the young child, in order to develop a suitable programme that can be used to enhance the development of young children. This was done by means of a literature study, as well as an empirical investigation.

The secondary aims of this study were to:

- Develop and evaluate a programme of mathematical skills, language and literacy development and general knowledge and life-skills stimulation; to enhance the ability of young children in order to provide a better understanding of the cognitive development and abilities of these learners, as well as providing insight into the benefits of and the rate of individual development of the young learners' cognitive abilities,
- Assess the validity of the programme of cognitive development; and
- Establish the reliability of the application of the programme of cognitive development.

The following analysis of the data was employed:

1. Single variable descriptive statistics (mean, standard deviation and frequency distributions) give insight into the pre and post-intervention scores.
2. The reliability of the scores for the pre-test and post-test procedures were determined by item analysis consisting of factor analysis and the calculation of Cronbach's coefficient of alpha (McMillan *et al.,* 2006: p54, p185-186).
3. T-tests were carried out in order to determine the level of significance in the control and experimental groups, as well as to compare the two groups' mean scores ($p \leq .001$ at 0.1% level of significance).

4. The level of significance of the study was determined by the p-level or level of probability (McMillan *et al.,* 2006: p292). A critical value at the five-percent level of confidence ($p \geq .05$) was required for significance.
5. The level of improvement in the scores as a result of the intervention programme were tested by using the statistical software package program (BMDP2007). In testing the analysis of co-variance, the treatment was the grouping variant and the pre-test was the co-variant (McMillan *et al.,* 2006: p165).

The concept of significance, both statistical (based on p-value) and practical (either Cohen's d or Cramérs V) mention that where it is reported that p = .000, it does not mean that p is equal to zero, but on account of rounding, that p is less than 0.0005 (SOURCE). When significance is mentioned, it refers to both statistical significance and practical significance.

5.2 SAMPLE DISTRIBUTION

Literature was reviewed to identify the importance of early childhood intervention, as well as to gain an understanding of the major theoretical advances in the history of education. According to McAfee and Leong (2007: p36), there are various facets of a child's development, namely the physical, emotional, social, cognitive, normative and spiritual. The cognitive aspect of development was the focal point of this study, emphasising the importance of literacy, mathematics and life skills.

For the purpose of this study all participants were selected by means of systematic random sampling, where each individual had an equal chance of being selected (Neuman, 2006: p230). Children had to be between the ages of two years (24 months) and three-and-a-half years (42 months) old, and to attend one of three Early Childhood Centres in Port Elizabeth.

5.2.1 Age of subjects

The subjects' included in this study ranged from two years old (24 months) to three-and-a-half years old (42 months). Table 5.1 represents the age distribution of the 40 subjects (in months). The greatest number of subjects in one age group is five subjects (13%) at 37 months old.

Table 5.1 Distribution of ages (in months) of subjects

24 months	3	8%
25 months	1	3%
26 months	4	10%
27 months	3	8%
28 months	3	8%
29 months	1	3%
30 months	2	5%
31 months	3	8%
32 months	0	0%
33 months	2	5%
34 months	2	5%
35 months	1	3%
36 months	0	0%
37 months	5	13%
38 months	2	5%
39 months	4	10%
40 months	1	3%
41 months	0	0%
42 months	3	8%
Total	**40**	**100%**

5.2.2 Gender distribution of subjects

Male and female subjects were used in this study. All subjects were chosen by means of systematic random sampling, where gender did not play a role in determining the selection of subjects. Table 5.2 represents a total of 17 females (43%) and 23 males (57%) that took part in this study.

Table 5.2 Distribution of male and female subjects

Female	17	43%
Male	23	57%
Total	**40**	**100%**

5.2.3 Subject's home language distribution

The children selected to take part in this study only represented two home languages, namely Afrikaans and English. Table 5.3 represents a total of 2 (5%) of the subjects' home language was Afrikaans, while the remaining 38 subjects (95%) speak English at home.

Table 5.3 Distribution of subjects' home languages

Afrikaans	2	5%
English	38	95%
Total	**40**	**100%**

5.2.4 Subjects' race distribution

Of the subjects randomly selected to take part in this study, race was not a factor in determining the subjects' involvement. Table 5.4 depicts the three races represented in this study, namely Coloured subjects (3%), Indian subjects (3%) and White subjects (94%).

Table 5.4 Distribution of subjects' racial orientation

Coloured	1	3%
Indian	1	3%
White	38	94%
Total	**40**	**100%**

5.2.5 Control and experimental groups

Originally 40 subjects were selected to take part in the study; both males and females were included. The participants were classified by means of systematic random sampling into two main categories:

- Control group (20 participants)
- experimental Group (20 participants)

The control group will undergo the pre-test and the post-test procedures. The subjects will continue with their daily programme at the Early Childhood Centre. The experimental group will undergo the pre-test, and will then take part in an eight-week intervention programme. After the eight-week intervention programme, they will undergo the post-test. Once the study began, one of the subjects in the experimental group did not attend school for five weeks, as she was on a family holiday. As a result of this, the subject was placed in the control group.

Figure 5.1 is a representation of the 40 subjects consisting of 21 subjects (52%) in the control group and 19 subjects (48%) in the experimental group.

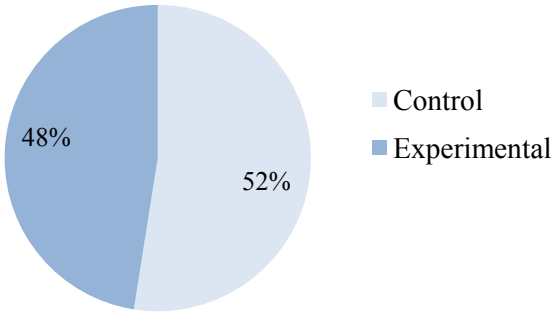


Figure 5.1 Representation of subjects in the control and experimental groups

5.3 DEMOGRAPHIC DIFFERENCES BETWEEN THE CONTROL AND EXPERIMENTAL GROUPS

The demographics of the control group were compared with those of the experimental group in order to determine the significance of the differences observed in this study. Where $p \geq .05$ we deem the study to be statistically significant and the null hypothesis is not rejected at the 5% level of significance.

The null hypothesis (H_0) and alternative hypothesis (H_1) for the significance of the demographic distribution differences between the control and experimental groups were as follows:

H_0 : There is no significant difference between the demographic distribution of the subjects in the control and experimental groups.

H_1: There is a significant difference between the demographic distribution of the subjects in the control and experimental groups.

5.3.1 Differences between control and experimental groups

The subjects included in this study ranged from two years old (24 months) to three-and-a-half years (42 months). In order to compare the age distribution in the control and experimental groups, a chi² test was done at the 0.05 (5%) significance level, as well as independent *t*-tests.

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of the difference in age distribution of subjects in control and experimental groups were as follows:

H_0: There was no significant difference between age distribution of subjects in the control and experimental groups.

H_1: There was a significant difference in the age distribution of subjects in the control and experimental groups.

Table 5.5 gives a clear indication that there was no significant difference in the age distribution of the control and experimental groups [chi² (d.f. = 2, n = 40) = 3.89; p = 0.143]. p level $\geq$ .143, which is greater than 0.05; thus the null hypothesis was not rejected at the 5% level of significance.

Table 5.5 Representation of ages (in months) of subjects in control and experimental groups

	Age							
	24-29 months		**30-34 months**		**35-42 months**		**Total**	
Control	10	47.6%	2	9.5%	9	42.9%	21	100.0%
Experimental	5	26.3%	7	36.8%	7	36.8%	19	100.0%
Total	15	37.5%	9	22.5%	16	40.0%	40	100.0%
(chi² (d.f. = 2, n = 40) = 3.89; p = .143)								

Figure 5.2 provides a comparison between the ages of subjects (in months) in the control and experimental groups. The age distribution within the two groups shows that there is no significant difference between the ages of the two groups, so the results of the study have not been influenced by the age distribution differences between the control and experimental groups.

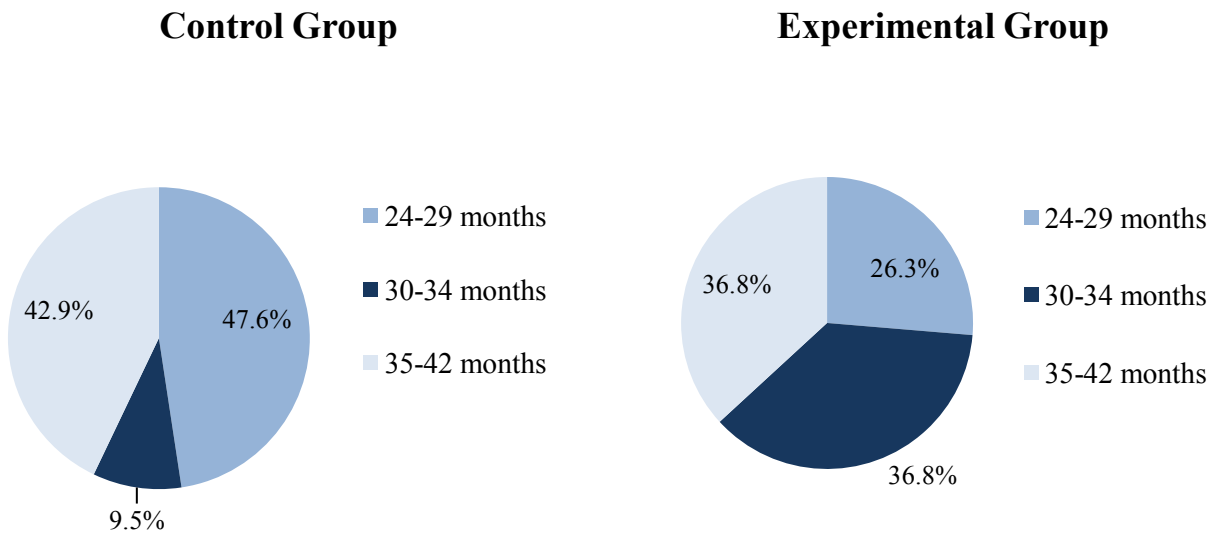


Figure 5.2 Representation of the ages of subjects in control and experimental groups

An independent *t*-test was also conducted to determine whether there was a significant difference between the average age of the subjects in the control group and the average age of the subjects in the experimental group.

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of the difference in age distribution of subjects in control and experimental groups were as follows:

H_0 : There is no significant difference between the average age of subjects in the control and experimental groups.

H_1 : There is a significant difference between the average age of subjects in the control and experimental groups.

Table 5.6 gives a clear indication that there were no significant differences between the average age of students in the control and experimental groups (t-test (38) = -0.24, p = 0.808). Where p ≥ 0 .05, we deem the study to be statistically significant and the null hypothesis is not rejected at the 5% level of significance. In the case of this study, p = 0.808, resulting in stronger evidence to suggest that there is no significant difference in the average ages of subjects in control and experimental groups; thus the null hypothesis is not rejected at the 5% level of significance.

Table 5.6 Ages of subjects in control and experimental groups

	Age		
	All	**Control**	**Experimental**
Number	40	21	19
Mean	32.50	32.29	32.74
Standard Deviation	5.76	6.27	5.30
Minimum	24.00	24.00	24.00
Quartile 1	27.00	27.00	29.00
Median	32.00	30.00	33.00
Quartile 3	37.25	37.00	37.50
Maximum	42.00	42.00	40.00
(t-Test (38) = -0.24, p = 0.808)			

5.3.1.1 Difference in gender distribution of the control and experimental subjects

The subjects' included in this study were males and females between the ages of two years old (24 months) and three-and-a-half years (42 months). In order to compare the gender distribution in the control and experimental groups, a chi² test was performed.

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of gender distribution of subjects in Control and Experimental Groups were as follows:

H_0 : There is no significant difference between the gender distribution of subjects in the control and experimental groups.

H_1 : There is a significant difference between the gender distribution of the subjects in the control and experimental groups.

In Table 5.7, p = 0.967 which gives a clear indication that there is no significant difference in the gender distribution of the control and experimental groups (chi² (d.f. = 1, n = 40) = 0.00; p = 0.967). There is strong evidence to suggest that there was no significant difference in the gender distribution of subjects in control and experimental groups; thus the null hypothesis is not rejected at the 5% level of significance and the study is deemed as being statistically significant.

Table 5.7 Representation of gender of subjects in control and experimental groups

	Gender					
	Female		**Male**		**Total**	
Control	9	42.9%	12	57.1%	21	100.0%
Experimental	8	42.1%	11	57.9%	19	100.0%
Total	17	42.5%	23	57.5%	40	100.0%
(chi² (d.f. = 1, n = 40) = 0.00; p = 0.967)						

Figure 5.3 provides a comparison between the gender distribution in the control and experimental groups. The gender distribution within the two groups shows that there was no significant difference; so the results of the study have not been influenced by gender distribution in the control and experimental groups.

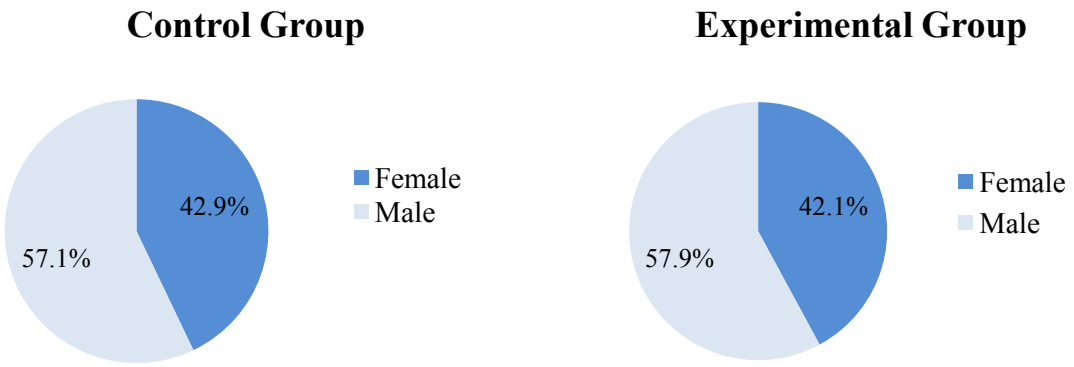


Figure 5.3 Representation of the gender distribution in control and experimental groups

5.3.1.2 Differences in home language distribution in the control and experimental subjects

The subjects included in this study represented only two (2) home language options, namely English and Afrikaans. In order to compare the language distribution in the control and experimental groups, a chi² test was done.

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of home language distribution of subjects in Control and Experimental Groups were as follows:

H_0 : There is no significant difference between the subjects' home language distribution in the control and experimental groups.

H_1 : There is a significant difference between the subjects' home language distribution in the control and experimental groups.

Table 5.8 indicates the two languages represented by the control and experimental groups, as well as the number and percentage of subjects which represent each home language.

Table 5.8, p = 0.897 gives a clear indication that there was no significant difference in the subjects' home language distribution between the control and experimental groups (chi² (d.f. = 1, n = 40) = 0.02; p = 0.897), p=0.897. This is significantly greater than 0.05. The null hypothesis is therefore not rejected at the 5% level of significance and the study is deemed as being statistically significant.

Table 5.8 Representation of subjects' home languages in the control and experimental groups

	Home Language					
	Afrikaans		English		Total	
Control	1	4.8%	20	95.2%	21	100.0%
Experimental	1	5.3%	18	94.7%	19	100.0%
Total	2	5.0%	38	95.0%	40	100.0%
(chi^2 (d.f. = 1, n = 40) = 0.02; p = 0.897)						

Figure 5.4 provides a comparison between the distribution of home languages in the control and experimental groups. The home language distribution within the two groups shows that there was no significant difference; so the results of the study have not been influenced by home language distribution in either the control or the experimental groups.

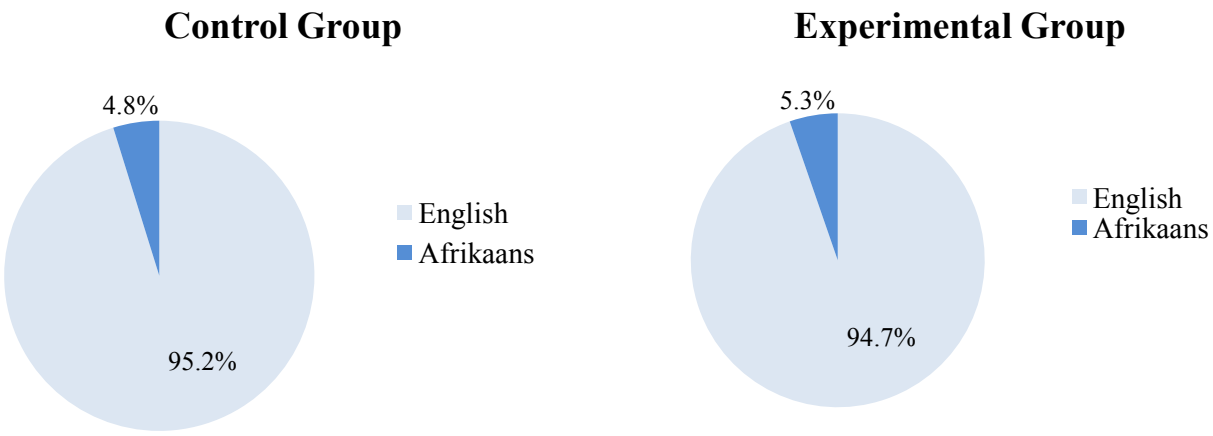


Figure 5.4 Representation of home language distribution in control and experimental groups

5.3.1.3 Differences in race distribution of the control and experimental subjects

The subjects included in this study represented three racial orientations, namely Coloured, Indian and White. In order to compare the racial orientation of subjects in the control and experimental groups, a chi^2 test was done.

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of distribution of racial orientation of subjects in Control and Experimental Groups were as follows:

H_0 : There was no significant difference between the subjects' race distribution in the control and experimental groups.

H_1 : There was a significant difference between the subjects' race distribution in the control and experimental groups.

Table 5.9 gives a clear indication that there was no significant difference in the racial orientation of the control and experimental groups, as p= 0.795, which is substantially greater than 0.05, resulting in the null hypothesis not being rejected at the 5% level of significance and the study is seen as being statistically significant (chi² (d.f. = 2, n = 40) = 0.46; p = 0.795).

Table 5.9 Representation of subjects' racial orientation in control and experimental groups

	Race							
	Coloured		**Indian**		**White**		**Total**	
Control	0	0.0%	0	0.0%	21	100.0%	21	100.0%
Experimental	1	5.3%	1	5.3%	17	89.5%	19	100.0%
Total	1	2.5%	1	2.5%	38	95.0%	40	100.0%
(chi² (d.f. = 2, n = 40) = 0.46; p = 0.795)								

Figure 5.5 provides a comparison between the distribution of racial orientation in the control and experimental groups.

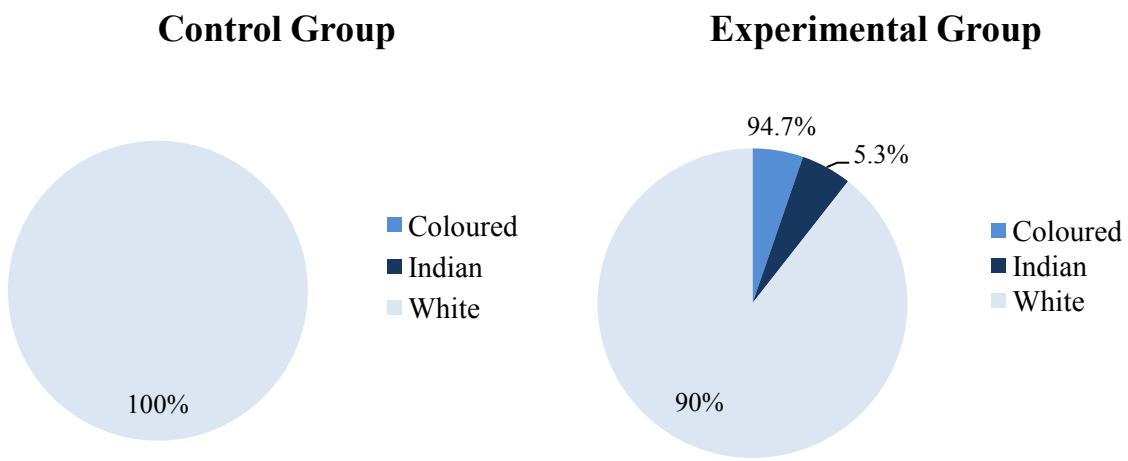


Figure 5.5 Representation of subjects' racial orientation in control and experimental groups

The results in the notation of sample distribution in control and experimental groups were:

H_0 : There is no significant difference between the sample distribution of subjects in the control and experimental groups; therefore the null hypothesis is true at the 5% level of significance.

H_1 : There is a significant difference between the sample distribution of the subjects in the control and experimental groups; therefore the alternate hypothesis is not true at the 5% level of significance.

5.3.2 Reliability

Reliability refers to the consistency in the uniformity of an experiment. It suggests that the same thing can be reproduced by different researchers under similar conditions and gain the same results (McMillan *et al.,* 2006: p130, 188, 198). If the instrument does not show much error, then it is reliable. If the instrument has a considerable amount of error, it is seen as being unreliable.

The instrument used to assess the subjects' intellectual development focused on three primary aspects, namely literacy, mathematics and life skills, with each aspect consisting of sub-sections. The internal reliability and consistency of this instrument was tested using Cronbach's alpha coefficient. The post-test showed high reliability levels, all ranging between 0.74 and 0.96, while the pre-test scores ranged from 0.39 to 0.88.

Table 5.10 is a representation of the reliability of the scores derived from the instrument used in this study. Literacy scored an overall consistent reliability, with an alpha of 0.65 in the pre-test and 0.88 in the post-test. Mathematics scored an overall reliability in the pre-test with an alpha of 0.74, and 0.93 in the post-test.

Life skills scored an overall reliability in the pre-test with an alpha of 0.81, except sensory awareness (factor 4), for which alpha was 0.39. It is likely that this factor elicited a lower alpha value because of the small number of items (three) on the scale. Life skills showed high internal reliability in the post-test with an overall alpha value of 0.94.

Overall, a consistent reliability was achieved, with an alpha of 0.92 in the pre-test and 0.96 in the post-test. This is deemed as being a desirable result, proving the reliability of the instrument. It is clear that the results in the post-test prove better consistency than the results in the pre-test.

Table 5.10 Reliability statistics for pre-test and post-test scores

	Cronbach's alpha	
	Pre-test	**Post-test**
TOTAL	**0.92**	**0.96**
LITERACY	**0.65**	**0.88**
Vocabulary	0.69	0.82
Speech	0.66	0.88
Listening	0.77	0.91
Writing	0.60	0.79
MATHEMATICS	**0.74**	**0.93**
Counting	0.88	0.91
One-to-one correspondence	0.76	0.96
Classifying	0.55	0.87
Sequencing	0.49	0.90
Geometry	0.67	0.74
LIFE SKILLS	**0.81**	**0.94**
Visual Motor	0.65	0.91
Foreground/Background	0.68	0.88
Discrimination	0.77	0.92
Sensory Awareness	0.39	0.81

Figure 5.6 is a graphical representation of the total alpha scores in each aspect of the instrument used to test reliability, namely literacy, mathematics and life skills in the pre-test and post-test procedures.

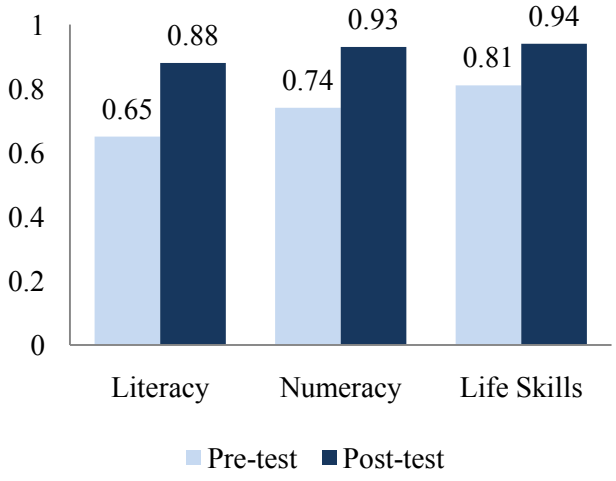


Figure 5.6 Total alpha scores of the instrument used, representing internal reliability

The minimum score obtained in the pre-test was 0.39 (life skills - sensory awareness) and the maximum score was 0.88 (mathematics - counting). The minimum score obtained in the post-test was 0.74 (mathematics-geometry) and the maximum 0.96 (mathematics – one-to-one correspondence). The results in the post-test were more consistent.

Table 5.11 Minimum and maximum scores of alpha in pre-test and post-test

	Pre-test	Post-test
Min	0.39	0.74
Max	0.88	0.96

5.4 FREQUENCY DISTRIBUTIONS FOR PRE-TEST AND POST-TEST SCORES

A frequency distribution represents the number of scores in each of the several ranges of values (http://davidmlane.com/hyperstat/A26308.html, 22/10/09). Frequency distributions were calculated on all results from pre-tests and post-tests performed on all 40 subjects. The frequency distribution of scores for the control group and experimental groups during the pre-test and post-test scores are represented in Table 5.12, Table 5.13, Table 5.14 and Table 5.15.

Scores' range in categories presented were as follows:

[1.0, 1.8) Starting at 1.0 until (but not including) 1.8

[1.8, 2.6) From (and including) 1.8 until (but not including) 2.6

[2.6, 3.4] From (and including) 2.6 until (and including) 3.4

(3.4, 4.2] From (and not including) 3.4, until (and including) 4.2

(4.2, 5] From (and not including) 4.2, until and including) 5

5.4.1 CONTROL GROUP

The control group consisted of 21 subjects from three Early Childhood Centres. The control (group completed the pre-test; thereafter they were subjected to their regular daily routine at the Early Childhood Centre. After the intervention process was complete with the experimental group, the control and experimental group completed the post-test.

5.4.1.1 Pre-test frequency distribution

The frequencies of scores of the control group during their pre-test were determined and are presented in Table 5.12.

Table 5.12 Frequency distribution in control group during the pre-test, showing literacy, mathematics and life skills

CONTROL GROUP	[1.0, 1.8)		[1.8, 2.6)		[2.6, 3.4]		(3.4, 4.2]		(4.2, 5]		Mean	S.D.
Total PRE-TEST	**14**	**67%**	**6**	**29%**	**1**	**5%**	**0**	**0%**	**0**	**0%**	**1.69**	**0.43**
LITERACY	**10**	**48%**	**7**	**33%**	**4**	**19%**	**0**	**0%**	**0**	**0%**	**2.00**	**0.57**
Vocabulary	6	29%	7	33%	8	38%	0	0%	0	0%	2.26	0.82
Speech	5	24%	9	43%	2	10%	5	24%	0	0%	2.50	0.92
Listening	10	48%	4	19%	6	29%	1	5%	0	0%	2.07	0.91
Reading	15	71%	0	0%	6	29%	0	0%	0	0%	1.57	0.93
Writing	13	62%	5	24%	2	10%	0	0%	1	5%	1.62	1.02
MATHEMATICS	**16**	**76%**	**4**	**19%**	**1**	**5%**	**0**	**0%**	**0**	**0%**	**1.50**	**0.46**
Counting	16	76%	1	5%	3	14%	1	5%	0	0%	1.81	0.79
One-to-one Correspondence	16	76%	3	14%	1	5%	1	5%	0	0%	1.48	0.73
Classifying	19	90%	2	10%	0	0%	0	0%	0	0%	1.10	0.30
Sequencing	20	95%	0	0%	1	5%	0	0%	0	0%	1.13	0.45
Geometry	11	52%	6	29%	3	14%	0	0%	1	5%	1.98	0.89
LIFE SKILLS	**18**	**86%**	**2**	**10%**	**1**	**5%**	**0**	**0%**	**0**	**0%**	**1.56**	**0.40**
Visual-Motor	5	24%	12	57%	4	19%	0	0%	0	0%	1.95	0.61
Fore/Background	17	81%	3	14%	0	0%	1	5%	0	0%	1.54	0.69
Discrimination	18	86%	3	14%	0	0%	0	0%	0	0%	1.33	0.43
Sensory Awareness	19	90%	1	5%	1	5%	0	0%	0	0%	1.41	0.54

The range [1.0, 1.8) was the most frequent range of scores overall. 48% of the scores were in the range [1.0, 1.8) for literacy, while 76% of the mathematics scores were in the range [1.0, 1.8), and 86% of the life skills scores were also in the range [1.0, 1.8).

The most common score range in the pre-test for each concept in literacy, mathematics and life skills in the control group are represented in Table 5.13.

Table 5.13 Most common score range in control group's pre-test

	Range	Percentage
LITERACY	**[1.0, 1.8)**	**48%**
Vocabulary	[2.6, 3.4]	38%
Speech	[1.8, 2.6)	43%
Listening	[1.0, 1.8)	48%
Reading	[1.0, 1.8)	71%
Writing	[1.0, 1.8)	62%
MATHEMATICS	**[1.0, 1.8)**	**76%**
Counting	[1.0, 1.8)	76%
One-to-one Correspondence	[1.0, 1.8)	76%
Classifying	[1.0, 1.8)	90%
Sequencing	[1.0, 1.8)	95%
Geometry	[1.0, 1.8)	52%
LIFE SKILLS	**[1.0, 1.8)**	**86%**
Visual-Motor	[1.8, 2.6)	57%
Fore/Background	[1.0, 1.8)	81%
Discrimination	[1.0, 1.8)	86%
Sensory Awareness	[1.0, 1.8)	90%

It is interesting to note that each case of mathematics scored the highest frequency distribution in the range [1.0, 1.8). In four out of the five concepts, namely counting (76%), one-to-one correspondence (76%), classifying (90%) and sequencing (95%), more than ¾ (75%) of the mean scores were in this range. In literacy, three out of the four concepts, namely visual-motor (57%), foreground and background (81%) and discrimination (86%), more than 80% of the mean scores were in the range [1.0, 1.8).

Figure 5.7 represents the total frequency distribution (%) of scores for the control group in the pre-test. It is evident that the most common result scored was in the range: [1.0, 1.8), comprising 67% of all scores for the pre-test in the control group.

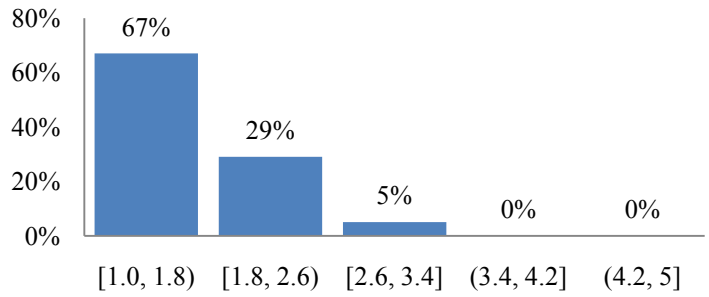


Figure 5.7 Total frequency distribution in control group during the pre-test

The total mean scores of literacy, mathematics and life skills are represented in Figure 5.8, with literacy representing the highest mean score of 2.0 and mathematics representing the lowest mean score of 1.50.

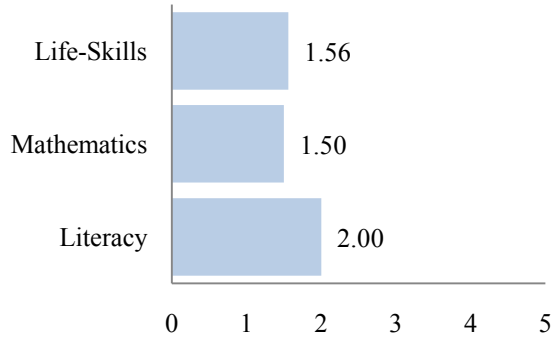


Figure 5.8 Representation of total mean score for life skills, mathematics and literacy in the control group during the pre-test

A comparison can be made between the frequency distribution of scores in the three aspects of intellectual development, namely literacy, mathematics and life skills. The frequency distribution of scores for the control group in the pre-test is represented in Figure 5.9.

It is clear that the greatest percentage of low scores in the control group was life skills, with 86% of the total amount of life skills' scores in the [1.0, 1.8) range. 76% of the total amount of mathematics scores, and 48% of literacy scores were in the same range, [1.0, 1.8). In literacy, mathematics and life skills, 0% of scores were in the range (3.4, 4.2] or (4.2, 5].

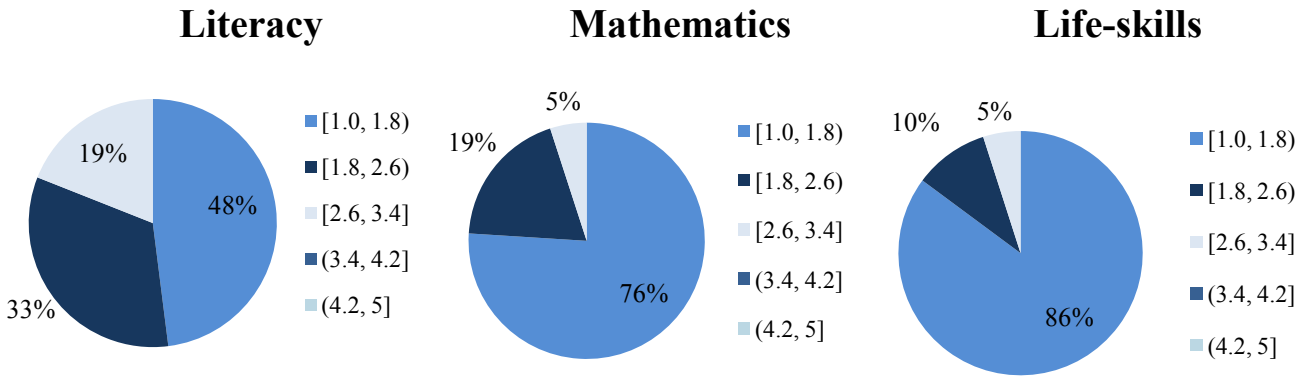


Figure 5.9 Comparison of distribution of scores for literacy, mathematics and life skills n the pre-test

The mean scores of each aspect of intellectual development (literacy, mathematics, life skills) in the control group during the pre-test are represented in Figure 5.10.

The literacy concepts which the control group found most challenging were reading (1.57) and writing (1.62), while speech (2.50) was a strong point.

In mathematics, geometry (1.98) and counting (1.81) were the strongest concepts, while classifying (1.1) and sequencing (1.13) showed poor results.

The most challenging life-skills concept was discrimination (1.33), while visual-motor (1.95) was the strongest life-skills concept.

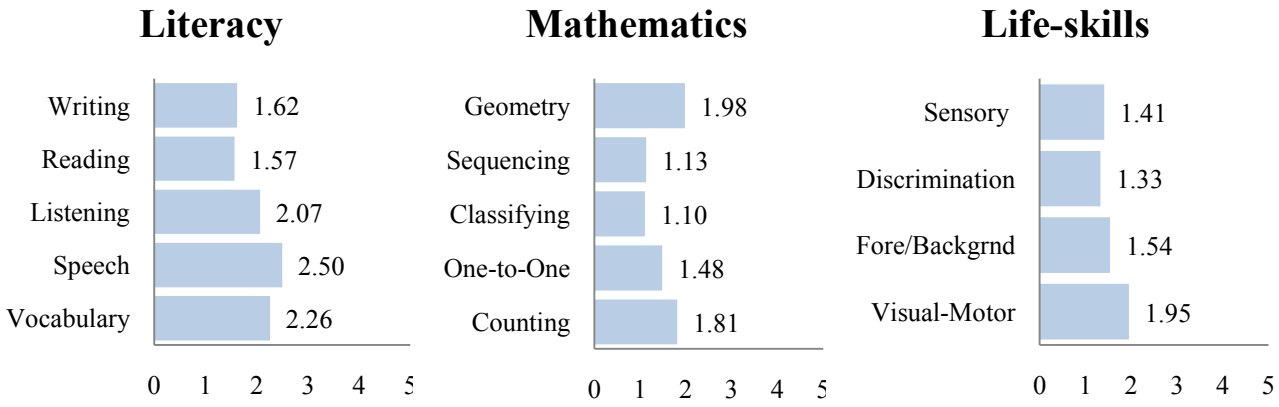


Figure 5.10 Mean scores of aspects of intellectual development in Control Group during the Pre-test.

5.4.1.2 Post-test frequency distribution

The frequencies of scores were determined and are represented in Table 5.14. Table 5.14 represents the scores of the Control Group during their Post-test.

Table 5.14 Frequency distribution in control group during the post-test, showing literacy, mathematics and life skills

CONTROL GROUP	[1.0, 1.8)		[1.8, 2.6)		[2.6, 3.4]		(3.4, 4.2]		(4.2, 5]		Mean	S.D.
Total Post Test	3	14%	12	57%	3	14%	3	14%	0	0%	2.37	0.70
LITERACY	**1**	**5%**	**8**	**38%**	**8**	**38%**	**4**	**19%**	**0**	**0%**	**2.72**	**0.73**
Vocabulary	1	5%	0	0%	9	43%	8	38%	3	14%	3.59	0.85
Speech	2	10%	10	48%	4	19%	3	14%	2	10%	2.76	0.89
Listening	3	14%	5	24%	8	38%	4	19%	1	5%	2.75	0.94
Reading	7	33%	0	0%	14	67%	0	0%	0	0%	2.33	0.97
Writing	8	38%	7	33%	2	10%	3	14%	1	5%	2.14	1.24
MATHEMATICS	**9**	**43%**	**10**	**48%**	**1**	**5%**	**1**	**5%**	**0**	**0%**	**1.99**	**0.65**
Counting	6	29%	6	29%	4	19%	2	10%	3	14%	2.63	1.09
One-to-one Correspondence	13	62%	4	19%	1	5%	2	10%	1	5%	1.81	1.17
Classifying	15	71%	3	14%	3	14%	0	0%	0	0%	1.43	0.75
Sequencing	20	95%	0	0%	1	5%	0	0%	0	0%	1.25	0.49
Geometry	2	10%	5	24%	10	48%	3	14%	1	5%	2.83	0.86
LIFE SKILLS	**6**	**29%**	**8**	**38%**	**4**	**19%**	**1**	**5%**	**2**	**10%**	**2.41**	**0.95**
Visual-Motor	5	24%	9	43%	5	24%	1	5%	1	5%	2.18	0.89
Foreground/Background	11	52%	4	19%	2	10%	1	5%	3	14%	2.30	1.18
Discrimination	5	24%	7	33%	3	14%	2	10%	4	19%	2.69	1.31
Sensory Awareness	8	38%	6	29%	4	19%	1	5%	2	10%	2.46	1.09

The most common score range in the post-test for each concept in literacy, mathematics and life skills in the control group are represented in Table 5.15. The range [1.8, 2.6) was the most frequent range of scores overall with 57% of the total scores. The ranges [1.0, 1.8), [2.6,

3.4] and (3.4, 4.2] all represented 14% of the total frequency distribution. 0% of the total post-test scores were above 4.2.

Table 5.15 Most common score range in control groups post-test

	Range	Percentage
LITERACY	**[1.8, 2.6); [2.6, 3.4]**	**38%**
Vocabulary	[2.6, 3.4]	38%
Speech	[1.8, 2.6)	48%
Listening	[2.6, 3.4]	38%
Reading	[2.6, 3.4]	67%
Writing	[1.0, 1.8)	38%
MATHEMATICS	**[1.0, 1.8)**	**48%**
Counting	[1.0, 1.8) [1.8, 2.6)	29%
One-to-one Correspondence	[1.0, 1.8)	62%
Classifying	[1.0, 1.8)	71%
Sequencing	[1.0, 1.8)	95%
Geometry	[2.6, 3.4]	48%
LIFE SKILLS	**[1.0, 1.8)**	**38%**
Visual-Motor	[1.8, 2.6)	43%
Fore/Background	[1.0, 1.8)	52%
Discrimination	[1.8, 2.6]	33%
Sensory Awareness	[1.0, 1.8)	38%

It is interesting to note that in the post-test, four out of the five concepts of mathematics, namely counting (29%), one-to-one correspondence (62%), classifying (71%) and sequencing (95%) scored their highest frequency distribution in the range [1.0, 1.8). Geometry (48%) was the only concept where the majority of the scores were in the range [2.6, 3.4].

Figure 5.11 represents the total frequency distribution (%) of scores for the control group in the post-test. It is evident that the most common result scored was in the range: [1.8, 2.6), comprising 57% of all scores for the post-test in the control group.

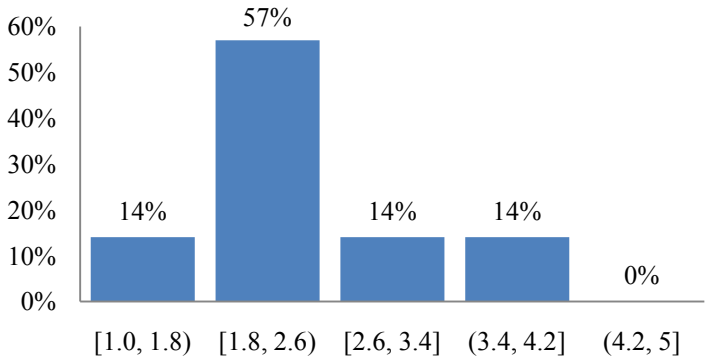


Figure 5.11 Total frequency distribution in control group during the post-test

The total mean scores in literacy, mathematics and life skills are represented in Figure 5.12, with literacy representing the highest mean score of 2.72 and mathematics representing the lowest mean score of 1.99.

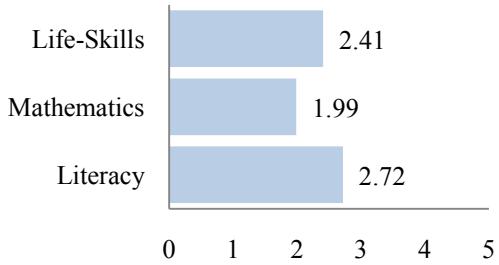


Figure 5.12 Representation of total mean score for life skills, mathematics and literacy in the control group during the post-test

A comparison can be made between the frequency distribution of scores in the three aspects of intellectual development, namely literacy, mathematics and life skills. The frequency distribution of scores for the control group in the post-test is represented in Figure 5.13.

It is clear that the greatest percentage of low scores in the control group was mathematics, with 43% of the total amount of mathematics scores ranging from [1.0. 1.8). 5% of the total amount of literacy scores, and 29% of life skills scores were in the same range, [1.0, 1.8).

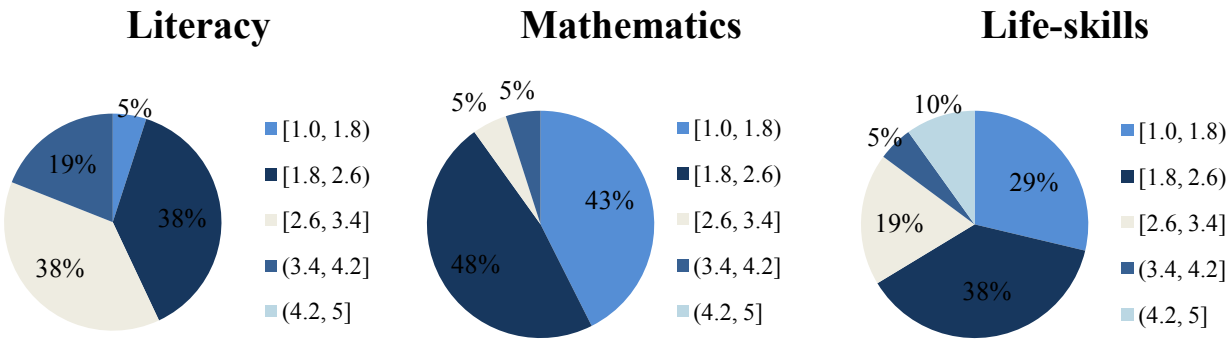


Figure 5.13 Comparison of distribution of scores for literacy, mathematics and life skills in the post-test

The mean scores of each aspect of intellectual development (literacy, mathematics, life skills) in the control group during the post-test are represented in Figure 5.14.

The literacy concepts which the control group found to be most challenging were writing (2.33) and writing (2.14), while vocabulary (3.59) was a strong point.

In mathematics, geometry (2.83) and counting (2.63) were the strongest concepts, while sequencing (1.23) and classifying (1.43) showed poor mean scores.

The most challenging life skills concept was visual motor (2.18), while discrimination (2.69) was the strongest life skills concept.

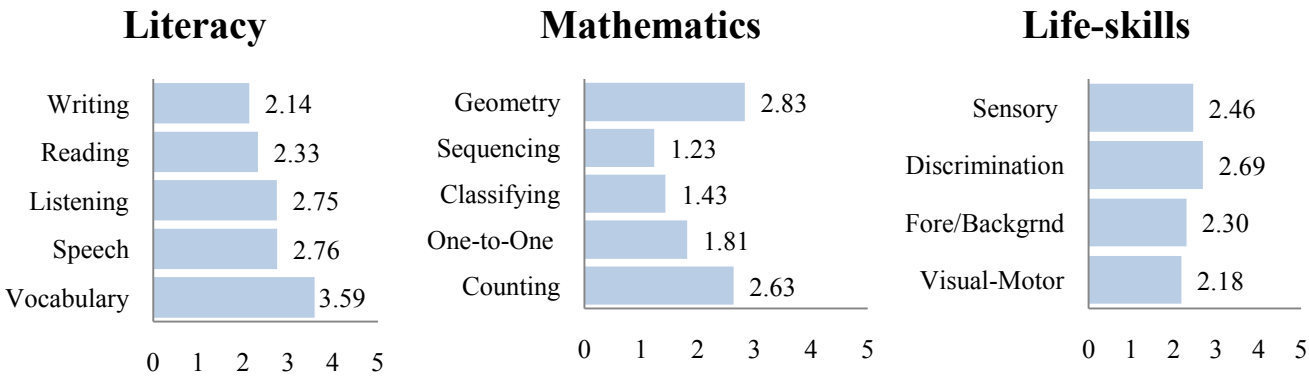


Figure 5.14 Mean scores of aspects of intellectual development in the control group during the post-test.

5.4.2 THE EXPERIMENTAL GROUP

The experimental group consisted of 19 subjects from the three Early Childhood Centres. The Experimental Group completed the pre-test, thereafter they were subjected to an intervention programme, where they were intellectually stimulated on a daily (weekday) basis in conjunction with their regular daily routine at the Early Childhood Centre. After the intervention process had been done, the post-test was completed.

5.4.2.1 Pre-test frequency distribution

The frequencies of pre-test scores for the experimental group were determined and are represented in Table 5.16.

Table 5.16 Frequency distribution in experimental group during the pre-test, showing literacy, mathematics and life skills

EXPERIMENTAL GROUP	[1.0, 1.8)		[1.8, 2.6)		[2.6, 3.4]		(3.4, 4.2]		(4.2, 5]		Mean	S.D.
Total Pre-test	**7**	**37%**	**4**	**21%**	**8**	**42%**	**0**	**0%**	**0**	**0%**	**2.19**	**0.70**
LITERACY	**4**	**21%**	**6**	**32%**	**7**	**37%**	**2**	**11%**	**0**	**0%**	**2.46**	**0.74**
Vocabulary	1	5%	4	21%	11	58%	3	16%	0	0%	2.83	0.73
Speech	4	21%	5	26%	3	16%	7	37%	0	0%	2.79	0.93
Listening	5	26%	7	37%	6	32%	1	5%	0	0%	2.16	0.83
Reading	8	42%	0	0%	10	53%	0	0%	1	5%	2.26	1.19
Writing	9	47%	3	16%	3	16%	1	5%	3	16%	2.26	1.52
MATHEMATICS	**9**	**47%**	**5**	**26%**	**5**	**26%**	**0**	**0%**	**0**	**0%**	**1.95**	**0.68**
Counting	6	32%	3	16%	3	16%	5	26%	2	11%	2.72	1.11
One-to-one Correspondence	9	47%	4	21%	3	16%	3	16%	0	0%	2.03	0.99
Classifying	15	79%	3	16%	0	0%	1	5%	0	0%	1.32	0.75
Sequencing	15	79%	4	21%	0	0%	0	0%	0	0%	1.53	0.52
Geometry	7	37%	6	32%	3	16%	3	16%	0	0%	2.16	0.97
LIFE SKILLS	**6**	**32%**	**7**	**37%**	**5**	**26%**	**1**	**5%**	**0**	**0%**	**2.17**	**0.82**
Visual-Motor	6	32%	5	26%	7	37%	1	5%	0	0%	2.20	0.86
Foreground/Background	8	42%	4	21%	1	5%	4	21%	2	11%	2.37	1.23
Discrimination	5	26%	8	42%	1	5%	4	21%	1	5%	2.37	1.15
Sensory Awareness	12	63%	6	32%	1	5%	0	0%	0	0%	1.74	0.62

The most common score obtained was [2.6, 3.4], with 42% of the scores. 37% of the scores appeared in the range [1.0, 1.8); 21% of the total scores ranged between [1.8, 2.6) and 0% of the total pre-test scores were above 3.4.

The most common score range in the pre-test for each concept in literacy, mathematics and life skills in the experimental group are represented in Table 5.17.

Table 5.17 Most common score range in the experimental group's pre-test

	Range	**Percentage**
LITERACY	**[2.6, 3.4]**	**37%**
Vocabulary	[2.6, 3.4]	58%
Speech	(3.4, 4.2]	37%
Listening	[1.8, 2.6)	37%
Reading	[2.6, 3.4]	53%
Writing	[1.0, 1.8)	47%
MATHEMATICS	**[1.0, 1.8)**	**47%**
Counting	[1.0, 1.8)	32%
One-to-one Correspondence	[1.0, 1.8)	47%
Classifying	[1.0, 1.8)	79%
Sequencing	[1.0, 1.8)	79%
Geometry	[1.0, 1.8)	37%
LIFE SKILLS	[1.8, 2.6)	**37%**
Visual-Motor	[2.6, 3.4]	37%
Fore/Background	[1.0, 1.8)	42%
Discrimination	[1.8, 2.6]	42%
Sensory Awareness	[1.0, 1.8)	63%

It is interesting to note that, as in the pre-test of the control group, the pre-test of the experimental group also showed that each concept in mathematics scored its highest frequency distribution in the range [1.0, 1.8). In literacy, two (2) out of the five (5) concepts, namely reading (53%) and vocabulary (58%) scored more than 50% frequency in the range [2.6, 3.4].

Figure 5.15 represents the total frequency distribution (%) of scores for the experimental group in the pre-test. It is evident that the most common result scored was [2.6, 3.4], comprising 42% of all the scores for the pre-test in the experimental group. 37% of the scores appeared in the range [1.0, 1.8), while 21% of the scores were in the range [1.8, 2.6).

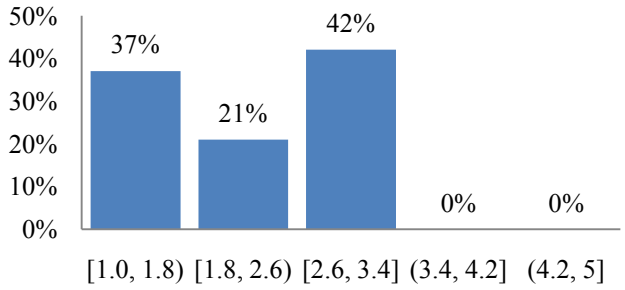


Figure 5.15 Total frequency distribution in the experimental group during the pre-test

The total mean scores of literacy, mathematics and life skills are represented in Figure 5.16, with literacy representing the highest mean score of 2.46 and mathematics representing the lowest mean score of 1.95.

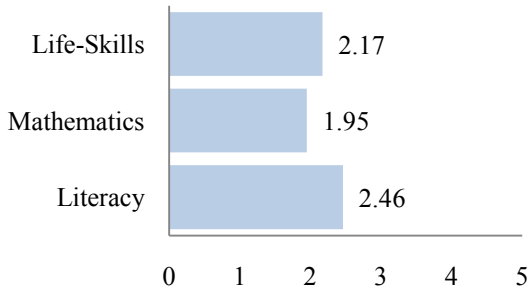


Figure 5.16 Representation of total mean score for life skills, mathematics and literacy in the experimental group during the pre-test

A comparison can be made between the frequency distribution of scores in the three aspects of intellectual development, namely literacy, mathematics and life skills. The frequency distribution of scores for the experimental group in the pre-test is represented in Figure 5.17.

It is clear that the greatest percentage of low scores in the experimental group was mathematics, with 47% of the total amount of mathematics scores being in the range [1.0. 1.8). 32% of the total amount of life-skills scores, and 21% of literacy scores were in the

same range, [1.0, 1.8). In mathematics and life skills 0% of scores were in the range (3.4, 4.2] or (4.2, 5], whereas in literacy, 11% of the scores were in the range (3.4, 4.2].

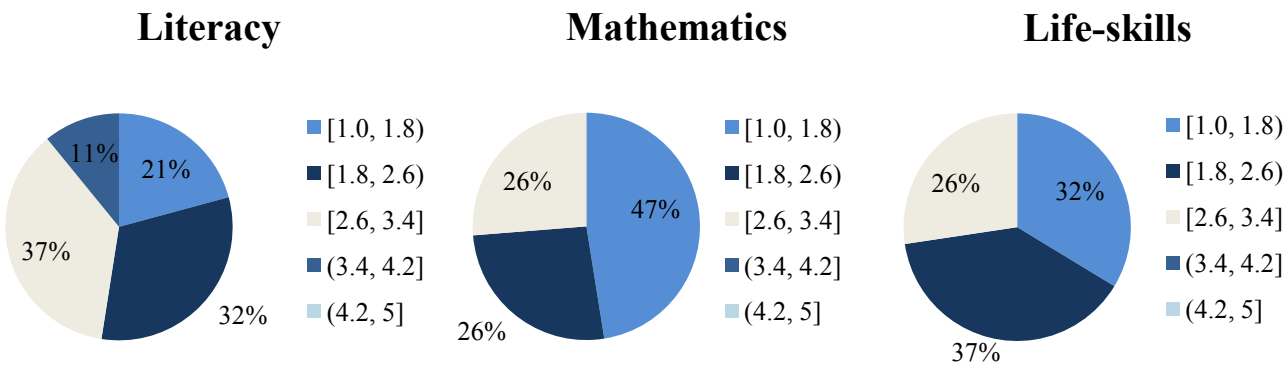


Figure 5.17 Comparison of distribution of scores for literacy, mathematics and life skills in the pre-test

The mean scores of each aspect of intellectual development (literacy, mathematics, life-skills) in the experimental group during the pre-test are represented in Figure 5.18.

The literacy concepts which the experimental group found to be most challenging were listening (2.16), reading (2.26) and writing (2.26), while speech (2.70) and vocabulary (2.8) were marginally stronger.

In mathematics, geometry (2.61) and counting (2.72) were the strongest concepts, while classifying (1.32) and sequencing (1.53) showed poor results. The most challenging life-skills concept was discrimination (1.33), while visual-motor (1.95) was the strongest life-skills concept.

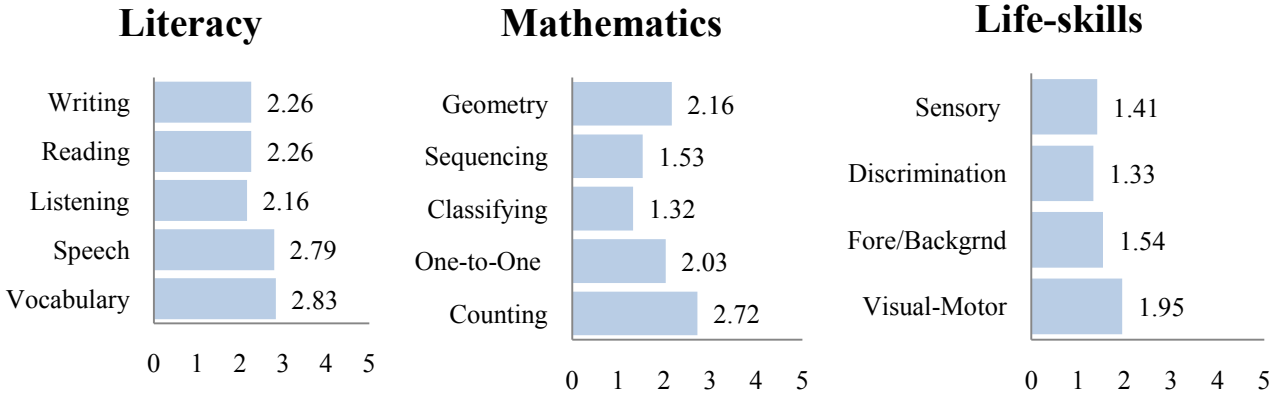


Figure 5.18 Mean scores of aspects of intellectual development in Experimental Group during the pre-test.

5.4.2.2 Post-test frequency distribution

The frequency distributions of scores for the experimental group during the post-test were determined and are represented in Table 5.18.

Table 5.18 Frequency distribution in the experimental group during post-test, showing literacy, mathematics and life skills

EXPERIMENTAL GROUP	[1.0, 1.8)		[1.8, 2.6)		[2.6, 3.4]		(3.4, 4.2]		(4.2, 5]		Mean	S.D.
Total Post Test	0	0%	0	0%	1	5%	3	16%	15	79%	4.55	0.49
LITERACY	**0**	**0%**	**0**	**0%**	**2**	**11%**	**4**	**21%**	**13**	**68%**	**4.45**	**0.56**
Vocabulary	0	0%	0	0%	0	0%	1	5%	18	95%	4.92	0.21
Speech	0	0%	1	5%	0	0%	4	21%	14	74%	4.63	0.66
Listening	0	0%	0	0%	1	5%	0	0%	18	95%	4.85	0.55
Reading	3	16%	0	0%	1	5%	0	0%	15	79%	4.26	1.52
Writing	0	0%	3	16%	6	32%	6	32%	4	21%	3.58	1.02
MATHEMATICS	**0**	**0%**	**1**	**5%**	**0**	**0%**	**2**	**11%**	**16**	**84%**	**4.53**	**0.57**
Counting	0	0%	1	5%	0	0%	3	16%	15	79%	4.46	0.64
One-to-one Correspondence	0	0%	1	5%	1	5%	1	5%	16	84%	4.68	0.77
Classifying	0	0%	0	0%	3	16%	0	0%	16	84%	4.68	0.75
Sequencing	1	5%	0	0%	3	16%	1	5%	14	74%	4.12	1.02
Geometry	0	0%	0	0%	0	0%	4	21%	15	79%	4.71	0.42
LIFE SKILLS	**0**	**0%**	**0**	**0%**	**0**	**0%**	**3**	**16%**	**16**	**84%**	**4.67**	**0.50**
Visual-Motor	0	0%	0	0%	0	0%	7	37%	12	63%	4.60	0.52
Foreground/Background	2	11%	0	0%	1	5%	0	0%	16	84%	4.37	1.08
Discrimination	0	0%	0	0%	0	0%	0	0%	19	100%	4.92	0.19
Sensory Awareness	0	0%	0	0%	0	0%	3	16%	16	84%	4.79	0.50

The most common score range obtained in the post-test was (4.2, 5], with 79% of the scores. The ranges [1.0, 1.8) and [1.8, 2.6) obtained 0% of the total frequency distribution, 5% of the scores were distributed in the range from 2.6 to 3.4, [2.6, 3.4] and 16% of the distribution of scores was represented in the range from 3.4 up to, and including 4.2, (3.4, 4.2].

The most common score range in the pre-test for each concept in literacy, mathematics and life-skills in the experimental group are represented in Table 5.19.

Table 5.19 Most common score range in experimental group's pre-test

	Range	**Percentage**
LITERACY	**(4.2, 5]**	**68%**
Vocabulary	(4.2, 5]	95%
Speech	(4.2, 5]	74%
Listening	(4.2, 5]	95%
Reading	(4.2, 5]	79%
Writing	(3.4, 4.2]	32%
MATHEMATICS	**(4.2, 5]**	**84%**
Counting	(4.2, 5]	79%
One-to-one Correspondence	(4.2, 5]	84%
Classifying	(4.2, 5]	84%
Sequencing	(4.2, 5]	74%
Geometry	(4.2, 5]	79%
LIFE SKILLS	**(4.2, 5]**	**84%**
Visual-Motor	(4.2, 5]	63%
Fore/Background	(4.2, 5]	84%
Discrimination	(4.2, 5]	100%
Sensory Awareness	(4.2, 5]	84%

It is interesting to note that in each primary aspect of cognitive development, namely literacy (68%), mathematics (84%) and life skills (84%), in the post-test more than 65% of the total mean scores were in the range (4.2, 5].

Although the most common frequency range in the experimental group's pre-test mathematics score was [1.0, 1.8), the most common score range in mathematics in the post-test is now (4.2, 5], with a total of 84% frequency in the same range.

Figure 5.19 represents the total frequency distribution (%) of scores for the experimental group in the post-test. It is evident that the most common result scored was from (4.2, 5], comprising 79% of all scores for the post-test in the experimental group.

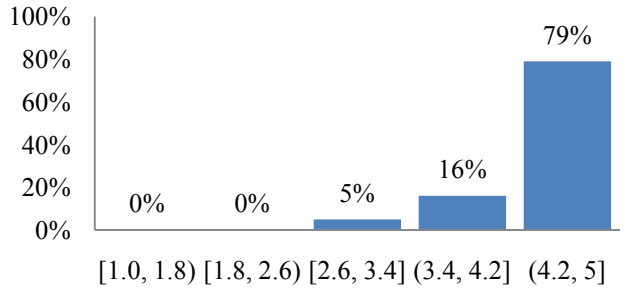


Figure 5.19 Total frequency distribution in the experimental group during the post-test

The total mean scores in literacy, mathematics and life skills are represented in Figure 5.20 with life skills representing the highest mean score of 4.67 and literacy representing the lowest mean score of 4.45.

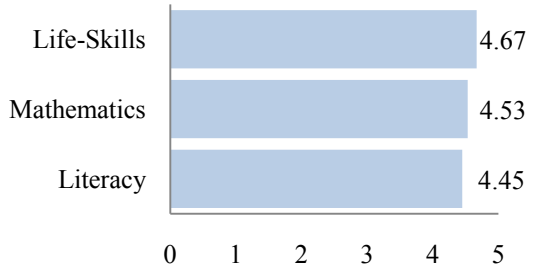


Figure 5.20 Representation of total mean score for life skills, mathematics and literacy in the experimental group during the post-test

A comparison can be made between the frequency distribution of scores in the three aspects of intellectual development, namely literacy, mathematics and life skills. The frequency distribution of scores for the control group in the post-test is represented in Figure 5.21.

It is clear that the greatest percentage of high scores in the experimental group was mathematics (84%) and life skills (84%), where the total amount of mathematics and life skills' scores ranged from 4.2 up to, and including 5 (4.2, 5]. 68% of the total amount of literacy scores were in the same range, (4.2, 5].

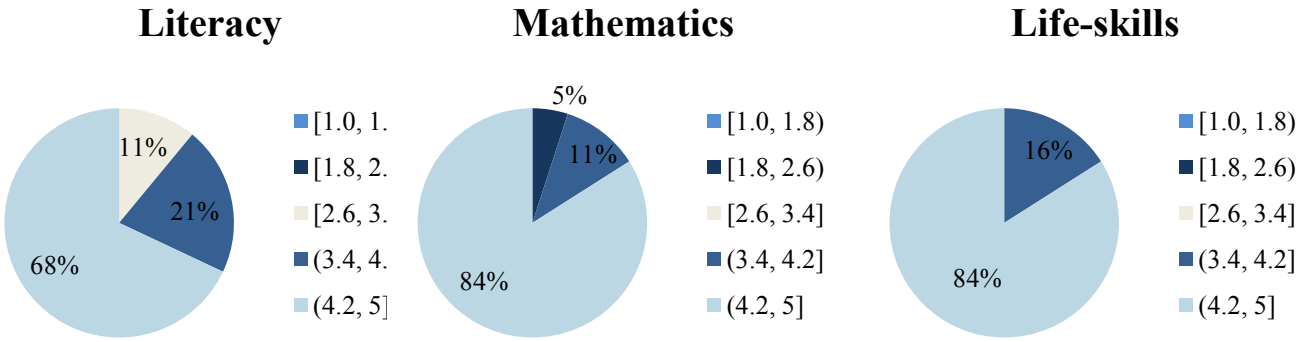


Figure 5.21 Comparison of distribution of scores for literacy, mathematics and life skills in the post-test

The mean scores of each aspect of intellectual development (literacy, mathematics, life skills) in the experimental group during the post-test are represented in Figure 5.22.

The literacy concept which the experimental group found most challenging was writing (3.58), while vocabulary (4.92) was a strong point.

In mathematics, geometry (4.71) was the strongest concept, while sequencing (4.12) had the lowest mean score.

The most challenging life-skills concept was foreground/background (4.37), while discrimination (4.92) was the strongest life-skills concept.

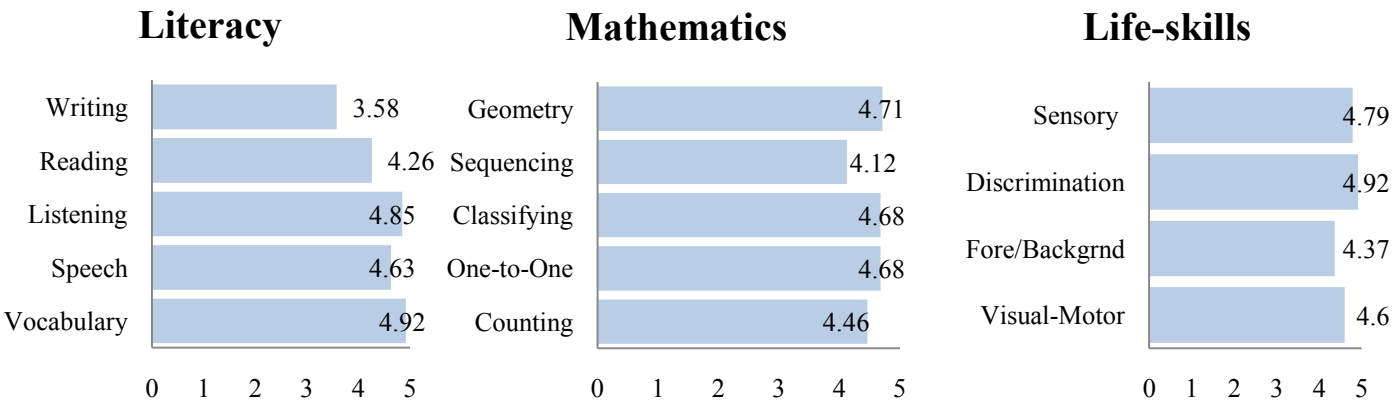


Figure 5.22 Mean scores in intellectual development in the experimental group during the post-test

5.4.3 Difference in frequency distributions

The frequencies of scores in the difference between the pre-test and post-test scores of the control group were determined and are represented in Table 5.20. The difference in scores was calculated by subtracting the results of the pre-test scores from those of the post-test.
The greatest total difference resulting was a 76% increase in frequency distribution in the range (0,1). There was an increase in the range [1,2) for 24% of the control group sample. This is represented graphically in Figure 5.23.

Table 5.20 Frequency distribution difference in control group, showing literacy, mathematics and life skills

CONTROL GROUP	[-4, 0)		[0, 0]		(0, 1)		[1, 2)		[2, 4]		Mean	S.D.
Total Difference	0	0%	0	0%	16	76%	5	24%	0	0%	0.69	0.47
LITERACY	**1**	**5%**	**0**	**0%**	**14**	**67%**	**6**	**29%**	**0**	**0%**	**0.71**	**0.43**
Vocabulary	0	0%	2	10%	4	19%	12	57%	3	14%	1.33	0.81
Speech	4	19%	5	24%	8	38%	4	19%	0	0%	0.26	0.66
Listening	1	5%	2	10%	11	52%	6	29%	1	5%	0.69	0.87
Reading	0	0%	13	62%	0	0%	0	0%	8	38%	0.76	1.00
Writing	0	0%	12	57%	0	0%	8	38%	1	5%	0.52	0.75
MATHEMATICS	**0**	**0%**	**2**	**10%**	**16**	**76%**	**3**	**14%**	**0**	**0%**	**0.50**	**0.44**
Counting	0	0%	3	14%	12	57%	3	14%	3	14%	0.83	0.76
One-to-one Correspondence	2	10%	11	52%	5	24%	2	10%	1	5%	0.33	0.76
Classifying	0	0%	16	76%	0	0%	3	14%	2	10%	0.33	0.66
Sequencing	0	0%	17	81%	4	19%	0	0%	0	0%	0.13	0.27
Geometry	0	0%	3	14%	9	43%	7	33%	2	10%	0.86	0.67
LIFE SKILLS	**0**	**0%**	**0**	**0%**	**14**	**67%**	**4**	**19%**	**3**	**14%**	**0.85**	**0.85**
Visual-Motor	1	5%	14	67%	4	19%	2	10%	0	0%	0.23	0.56
Foreground/Background	1	5%	8	38%	6	29%	3	14%	3	14%	0.76	1.06
Discrimination	0	0%	4	19%	7	33%	3	14%	7	33%	1.36	1.37
Sensory Awareness	0	0%	5	24%	10	48%	2	10%	4	19%	1.05	1.18

The difference in the frequencies of scores in the pre-test and the post-test of the experimental group were determined and are represented in Table 5.21. The difference in frequency distributions is measured by subtracting the results of the pre-test from those of the post-test.

The greatest total difference resulting was a 74% increase in frequency distribution in the range [2,4]. There was an increase of 26% in the range [1,2). This is represented graphically in Figure 5.24.

Table 5.21 Frequency distribution difference in experimental group, showing literacy, mathematics and life skills

EXPERIMENTAL GROUP	[-4, 0)		[0, 0]		(0, 1)		[1, 2)		[2, 4]		Mean	S.D.
Total Difference	**0**	**0%**	**0**	**0%**	**0**	**0%**	**5**	**26%**	**14**	**74%**	**2.36**	**0.49**
LITERACY	**0**	**0%**	**0**	**0%**	**0**	**0%**	**9**	**47%**	**10**	**53%**	**1.99**	**0.51**
Vocabulary	0	0%	0	0%	0	0%	6	32%	13	68%	2.08	0.62
Speech	0	0%	0	0%	0	0%	11	58%	8	42%	1.84	0.83
Listening	0	0%	0	0%	2	11%	0	0%	17	89%	2.69	1.01
Reading	1	5%	4	21%	0	0%	0	0%	14	74%	2.00	1.76
Writing	0	0%	3	16%	0	0%	8	42%	8	42%	1.32	0.82
MATHEMATICS	**0**	**0%**	**0**	**0%**	**0**	**0%**	**3**	**16%**	**16**	**84%**	**2.58**	**0.61**
Counting	0	0%	0	0%	3	16%	9	47%	7	37%	1.74	1.00
One-to-one Correspondence	0	0%	0	0%	1	5%	4	21%	14	74%	2.66	1.11
Classifying	0	0%	0	0%	0	0%	1	5%	18	95%	3.37	0.96
Sequencing	0	0%	1	5%	0	0%	1	5%	17	89%	2.60	0.94
Geometry	0	0%	0	0%	0	0%	4	21%	15	79%	2.55	1.01
LIFE SKILLS	**0**	**0%**	**0**	**0%**	**0**	**0%**	**4**	**21%**	**15**	**79%**	**2.50**	**0.61**
Visual-Motor	0	0%	0	0%	0	0%	2	11%	17	89%	2.40	0.63
Foreground/Background	0	0%	2	11%	2	11%	5	26%	10	53%	2.00	1.24
Discrimination	0	0%	1	5%	0	0%	4	21%	14	74%	2.55	1.14
Sensory Awareness	0	0%	0	0%	0	0%	0	0%	19	100%	3.05	0.56

There was a noteworthy difference in scores between the pre-test and the post-test. Figures 5.23 and Figure 5.24 show a graphical representation of the total differences in frequency distribution (%) in the control group and the experimental group.

Figure 5.23 represents the total frequency distribution difference (%) of scores in the control group; while Figure 5.24 represents the total frequency distribution difference (%) of scores in the experimental group.

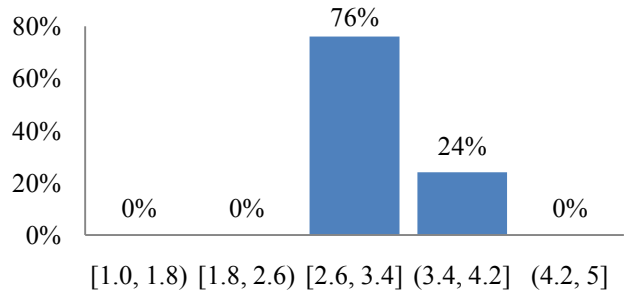


Figure 5.23 Frequency distribution of differences between pre-test and post-test total scores in the control group

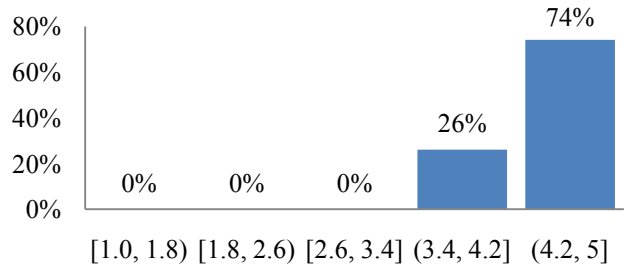


Figure 5.24 Frequency distribution of differences between pre- test and post-test total scores in the experimental group

It is interesting to note that in the experimental group, the majority (74%) of the different scores were in the range (4.2, 5], an improvement of between 4.2 and 5.0 units, whereas in the control group there were no scores in this range.

The total mean differences in scores in literacy, mathematics and life skills are represented in Figure 5.25. Comparing the difference in improvement between the control and the experimental groups

In the control group the greatest difference in mean scores between pre-test and post-test was a 0.85 increase in life skills. There was a 0.50 increase in mathematics' mean score and 0.71 increase in literacy's mean score.

In the experimental group the greatest difference in mean scores between pre-test and post-test was a 2.58 increase in mathematics, while life skills showed an increase in the mean score of life skills by 2.50 and 1.99 in literacy. The differences in the experimental group are significantly more than those in the control group.

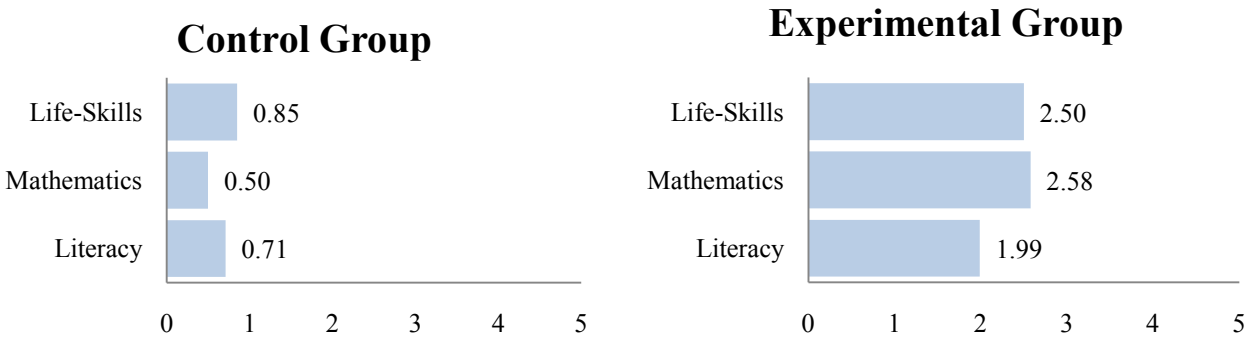


Figure 5.25 Representation of total mean score for life skills, mathematics and literacy in the control and experimental groups

The mean difference in the scores of each aspect of intellectual development (literacy, mathematics, life skills) in the control and experimental groups are represented in Figures 5.26, 5.27 and 5.28.

Figures 5.26, 5.27 and 5.28 are a clear representation that the differences in results from the pre-test to the post-test in the control and experimental groups are significantly more in the experimental group.

Figure 5.26 represents the mean differences in literacy, comparing the increase in the control group with that in the experimental group. The mean difference in scores in the control group ranges greatly between the pre-test and the post-test scores, from 0.26 (Speech) to 1.33 (Vocabulary). The mean difference in scores in the experimental group ranges from 1.32 (Writing) to 2.69 (Listening). It is clear that the differences between Pre-test and Post-test in the experimental group are significantly more than they are for those in the control group.

The writing score (1.32) in the experimental group compared with that of the control group (0.52) shows a difference of 0.8 between the two groups.

The reading score (2.00) in the experimental group compared with that of the control group (0.76) shows a difference of 1.24 between the two groups.

The listening score (2.69) in the experimental group, compared with that of the control group (0.60) shows a difference of 2.09 between the two groups.

The speech score (1.84) in the experimental group compared with that of the control group (0.26) shows a difference of 1.58 between the two groups.

The vocabulary score (2.08) in the experimental group compared with that of the control group (1.33) reports a difference of 0.75 between the two groups.

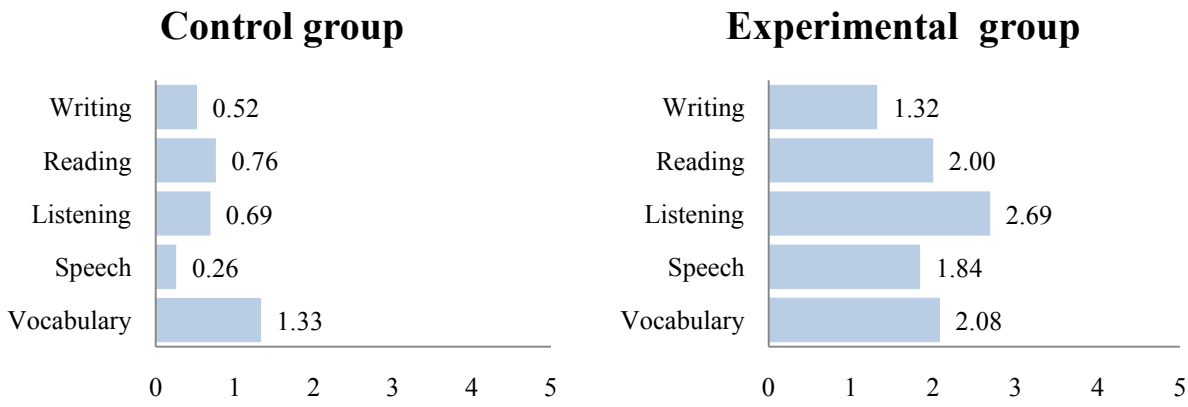


Figure 5.26 Literacy mean score differences in the control and experimental groups

Figure 5.27 presents the mean differences in mathematics, comparing the increase in the control group with that of the experimental group. The mean difference in scores in the control group ranges between the pre-test and the post-test scores, from 0.13 (sequencing) to 0.86 (geometry). The greatest difference in mean scores in the experimental group ranges from 1.74 (counting) to 3.37 (classifying).

The difference between pre-test and post-test is much greater in the experimental group.

The geometry score (2.55) in the experimental group compared to that of the control group (0.86) shows a difference of 1.69 between the two groups.

The sequencing score (2.60) in the experimental group compared with that of the control group (0.13) shows a difference of 2.47 between the two groups.

The classifying score (3.37) in the experimental group compared with that of the control group (0.33) reports a difference of 3.04 between the two groups.

The one-to-one correspondence score (2.66) in the experimental group compared with that of the control group (0.33) shows a difference of 2.33 between the two groups.

The counting score (1.74) in the experimental group compared with that of the control group (0.83) shows a difference of 0.91 between the two groups.

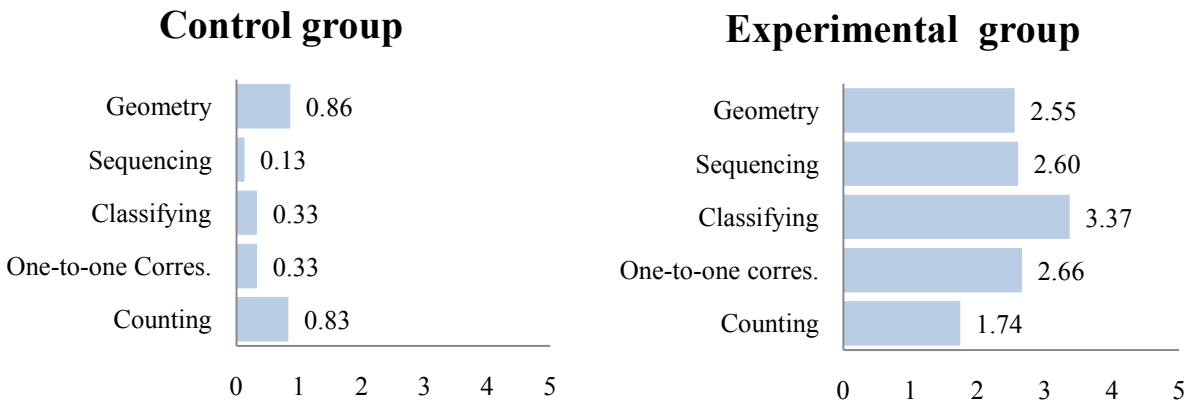


Figure 5.27 Mathematics mean score differences between the control and experimental groups

Figure 5.28 presents the mean differences in life skills, comparing the increase in the experimental group to that of the control group.

The mean difference in scores in the control group between the pre-test and the post-test ranges from 0.23 (visual motor) to 1.36 (discrimination), while the mean difference in scores in the experimental group ranges from 2.00 (foreground and background) to 3.05 (sensory awareness). It is clear that the difference in scores between the pre-test and the post-test is much greater in the experimental group.

The sensory awareness score (3.05) in the experimental group compared with that of the control group (1.05) shows a difference of 2.0 between the two groups.

The discrimination score (2.55) in the experimental group compared with that of the control group (1.36) shows a difference of 1.19 between the two groups.

The foreground and background score (2.00) in the experimental group compared with that of the control group (0.76) shows a difference of 1.24 between the two groups.

The visual motor score (2.4) in the experimental group compared with that of the control group (0.23) shows a difference of 2.17 between the two groups.

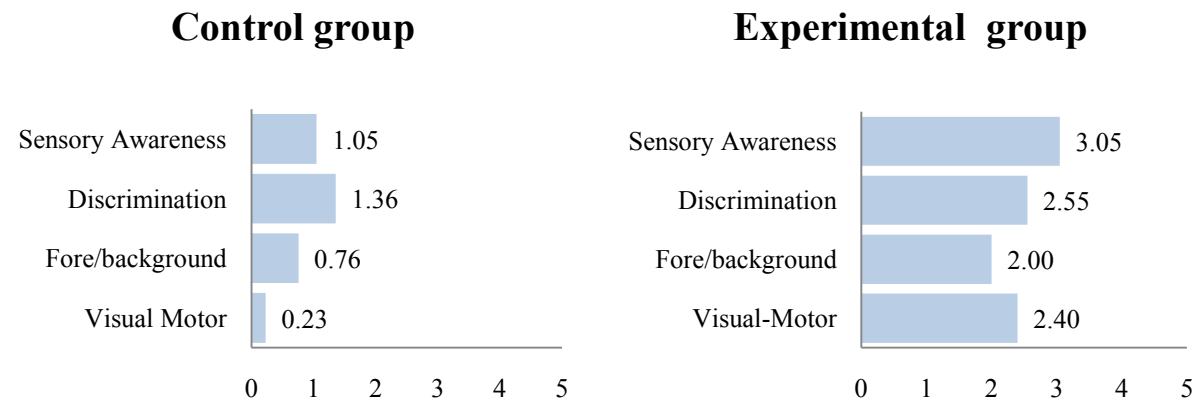


Figure 5.28 Life skills mean score differences between control and experimental groups

5.5 DESCRIPTIVE AND INFERENTIAL STATISTICS

Single variable statistics, including the mean scores and standard deviations, are represented in Table 5.22. These statistics can be used to provide greater insight into the pre-test and post-test intervention scores of the control and experimental groups, as well as a comparison of the difference in results between the pre-test and the post-test scores in the control and experimental groups.

The mean score, according to McMillan *et al.* (2006: p158), is the arithmetic average of a set of scores in a specific criterion. Every score is used to determine the mean score, by adding the scores, then dividing the total by the number of scores.

In the control group the total mean score during the post-test (2.37) was more than that of the pre-test (1.69). The difference in total means was 0.69. The greatest difference in means between the pre-test (1.56) and the post-test (2.41) of the control group was in life skills, with a difference of 0.85. There was an increase of 0.50 in mathematics and 0.71 in languages.

In the experimental group the total mean score during the post-test (4.55) was substantially more than that of the pre-test (2.19). The difference in total means was 2.36. The greatest difference in means between the pre-test (1.95) and the post-test (4.53) of the control group was in mathematics with a difference of 2.58. There was an increase of 2.50 in life skills and 1.99 in languages.

Table 5.22 Comparison of control group and experimental groups' scores

	CONTROL	Mean	Standard Deviation	Min.	Quartile 1	Median	Quartile 3	Max.
PRE-TEST	**TOTAL**	1.69	0.43	1.03	1.45	1.47	1.98	2.78
	Language	2.00	0.57	1.10	1.56	1.84	2.36	3.36
	Mathematics	1.50	0.46	1.00	1.10	1.43	1.77	2.83
	Life-Skills	1.56	0.40	1.00	1.37	1.47	1.69	2.82
POST- TEST	**TOTAL**	2.37	0.70	1.04	1.86	2.38	2.62	3.89
	Language	2.72	0.73	1.00	2.22	2.76	3.04	4.02
	Mathematics	1.99	0.65	1.00	1.53	1.97	2.40	3.67
	Life-Skills	2.41	0.95	1.13	1.63	2.15	3.00	4.65
DIFFERENCE	**TOTAL**	0.69	0.47	0.01	0.37	0.59	0.72	1.82
	Language	0.71	0.43	-0.10	0.42	0.70	1.02	1.40
	Mathematics	0.50	0.44	0.00	0.17	0.33	0.73	1.73
	Life-Skills	0.85	0.85	0.13	0.29	0.46	1.04	2.98
	EXPERIMENTAL	**Mean**	**Standard Deviation**	**Min.**	**Quartile 1**	**Median**	**Quartile 3**	**Max.**
PRE-TEST	**TOTAL**	2.19	0.70	1.03	1.65	2.17	2.80	3.33
	Language	2.46	0.74	1.10	1.95	2.40	3.01	3.60
	Mathematics	1.95	0.68	1.00	1.35	1.87	2.60	2.97
	Life-Skills	2.17	0.82	1.00	1.39	2.22	2.68	3.42
POST-TEST	**TOTAL**	4.55	0.49	3.11	4.45	4.74	4.85	5.00
	Language	4.45	0.56	3.34	4.20	4.60	4.80	5.00
	Mathematics	4.53	0.57	2.57	4.42	4.77	4.80	5.00
	Life-Skills	4.67	0.50	3.41	4.67	4.83	5.00	5.00
DIFFERENCE	**TOTAL**	2.36	0.49	1.55	2.00	2.37	2.64	3.46
	Language	1.99	0.51	1.26	1.61	2.00	2.27	3.14
	Mathematics	2.58	0.61	1.50	2.20	2.50	2.85	3.87
	Life-Skills	2.50	0.61	1.42	2.25	2.53	2.83	4.00

Figure 5.29 is a clear representation of the difference between mean scores in the pre-test and the post-test scores of the control and experimental groups.

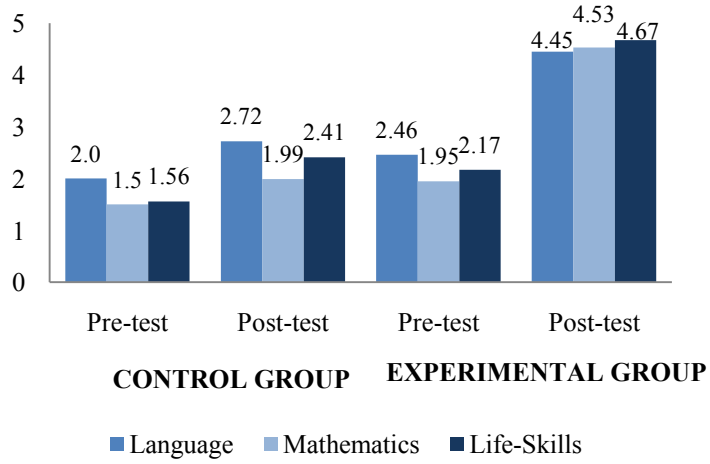


Figure 5.29 Mean scores of control and experimental groups in pre-test and post-test

The difference in mean scores between the control group and the experimental group is represented in Figure 5.30. A substantial increase in mean scores of the experimental group between the pre-test and the post-test is evident.

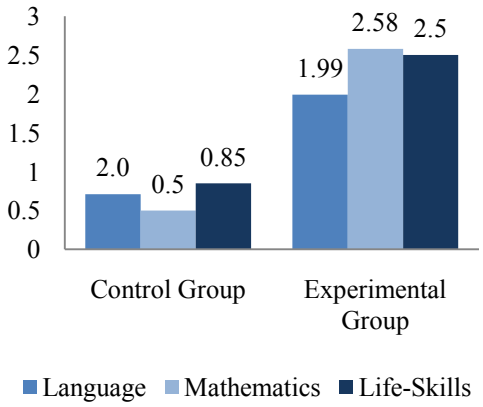


Figure 5.30 Mean pre-test and post-test difference in scores for control and experimental groups

Standard deviation is an indicator of the degree of variation in the scores (McMillan *et al.* (2006: p163; http://www.toolingu.com/definition-800220-35806-mean.html, 20/10/09). The standard deviation is calculated by determining the distance between each score and the

mean, and then determining the average distance of the scores from the mean (McMillan *et al.,* 2006: p163).

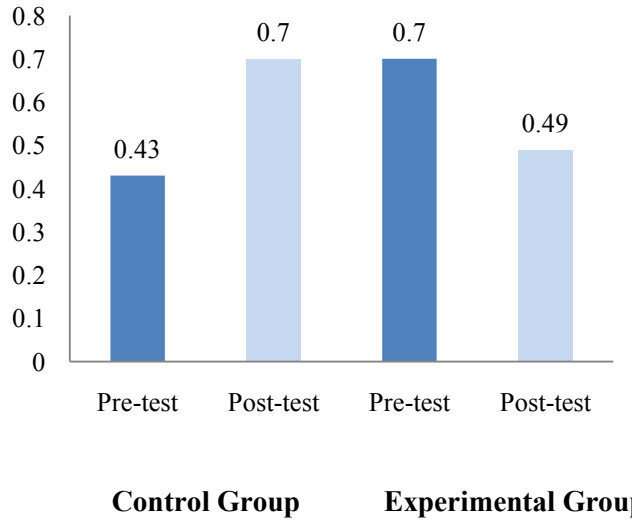


Figure 5.31 Standard deviation in scores from control and experimental groups

In the control group the total standard deviation of the pre-test is 0.43, while the standard deviation of the post-test is 0.70. The difference in total standard deviation between the pre-test and the post-test of the control group is 0.47. The greatest difference in standard deviation was in the area of life skills where the deviation for the pre-test (0.40) was substantially less than that of the post-test (0.95) resulting in a difference of 0.85.

The difference between the mathematics and the language scores was 0.44 and 0.43 respectively.

In the experimental group the total standard deviation of the pre-test is 0.70, while the standard deviation of the post-test is 0.49. The difference in total standard deviation between the pre-test and the post-test of the experimental group is 0.49. The difference in standard deviation from the pre-test to the post-test represented the greatest differences in mathematics (0.61) and life skills (0.61), while there was a difference of 0.51 in language.

Average minimum and maximum scores for each concept (literacy, mathematics and life skills) are represented in Table 5.22. The minimum scores for the control (2.0) and the experimental Groups (1.03), as well as the maximum scores for the control (2.78) and experimental (3.2) groups are similar in the pre-test. There is, however a noticeable

difference in the minimum post-test scores of the control group (1.04) compared with the minimum score of the experimental group (3.33). The maximum score in the control group during the post-test is 3.89, while the experimental group's maximum average score is 5.

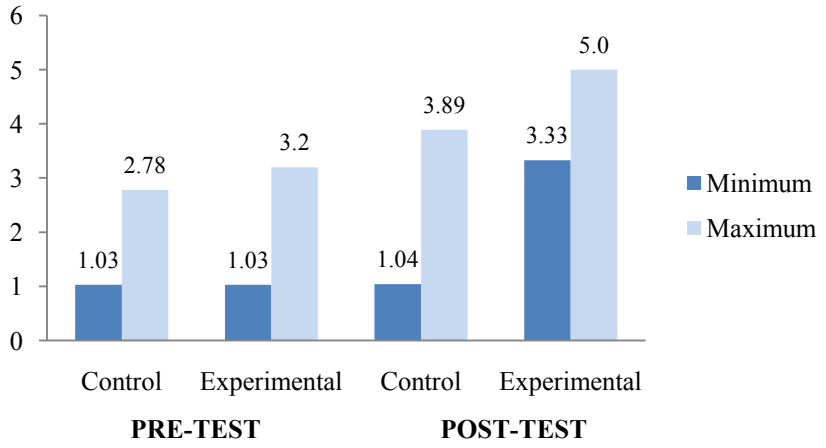


Figure 5.32 Minimum and maximum scores in the control and experimental groups

Table 5.23 provides a clear representation of the results of tests performed on the statistics of this study.

Table 5.23 Descriptive and inferential statistics for differences between control and experimental difference scores

	Total	**Literacy Total**	Vocabulary	Speech	Listening	Reading	Writing	**Mathematics Total**	Counting	One-to-one Correspondence	Classifying	Sequencing	Geometry	**Life-Skills Total**	Visual-Motor	Fore/Background	Discrimination	Sensory Awareness
Mean																		
Experimental	**2.36**	**1.99**	2.08	1.84	2.69	2.00	1.32	**2.58**	1.74	2.66	3.37	2.60	2.55	**2.50**	2.40	2.00	2.55	3.05
Control	**0.69**	**0.71**	1.33	0.26	0.69	0.76	0.52	**0.50**	0.83	0.33	0.33	0.13	0.86	**0.85**	0.23	0.76	1.36	1.05
Exp - Cont	**1.63**	**1.19**	0.80	1.00	1.80	1.00	1.00	**2.03**	0.67	1.75	3.00	2.00	1.50	**1.96**	2.00	1.33	1.25	2.00
t-statistic	**11.04**	**8.55**	3.26	6.66	6.78	2.77	3.19	**12.45**	3.27	7.80	11.80	11.54	6.29	**6.97**	11.59	3.41	2.98	6.73
p-value	**.000**	**.000**	.002	.000	.000	.009	.003	**.000**	.002	.000	.000	.000	.000	**.000**	.000	.002	.005	.000
Cohen's d	**3.49**	**2.71**	1.03	2.11	2.15	0.88	1.01	**3.94**	1.04	2.47	3.74	3.66	1.99	**2.21**	3.67	1.08	0.94	2.13

5.5.1 Difference (Experimental – Control)

The difference between the control group's mean total score and that of the experimental group is 1.67. This is calculated by subtracting the mean total score of the control group from the total mean score of the experimental group.

There was a significant difference between the control group and the experimental group's individual categories of literacy, mathematics and life skills. Figure 5.33 gives a clear representation that the most significant difference was noted in the mathematics results, with a difference of 2.09. The difference in life skills results was a mean score of 1.65 and the difference in literacy results was a mean score of 1.27.

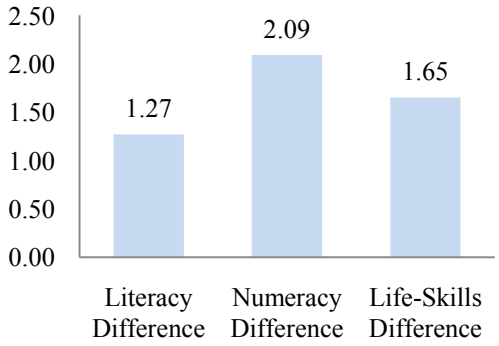


Figure 5.33 Comparison of experimental minus control group differences for literacy, mathematics and life skills mean scores

The aspect of literacy which represented the greatest difference in results between the control and experimental groups was listening (2.01), and the aspect which represented the smallest difference was vocabulary (0.75).

The aspect of mathematics which presented the greatest difference in results between the control and experimental groups was classifying (3.04), and the aspect which presented the smallest difference was geometry (1.70).

The aspect of life skills which presented the greatest difference in results between the control and experimental groups was visual-motor (2.17); and the aspect which presented the smallest difference was discrimination (1.20).

Overall, the aspect which presented the greatest difference in results between the control and experimental groups was mathematics - classifying (3.04), and the aspect which represented the smallest difference overall was literacy – vocabulary (0.75).

5.5.2 T-test statistic

T-tests for independent groups were conducted to determine the level of statistical significance of the difference between the control and experimental group mean scores. In Figure 5.2.3, t-statistic scores are presented, focusing on literacy (8.55), mathematics (12.45) and life skills (6.97), as well as the mean scores for each aspect thereof.

In order to test the significance of the study, the t-test statistic, as well as the corresponding degrees of freedom needed to be represented, in order to determine the significant level of the results. The degrees of freedom as a statistical concept is calculated by adding the sample size of the control group to that of the experimental group, and then subtracting 2 from the total. In this case the degrees of freedom (*df)* is 38.

Hypothesis 1: Intervention

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of intervention, comparing control and experimental Groups:

H_0: There is no significant difference between the overall cognitive development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the overall cognitive development of the subjects in the control and experimental groups.

A total t-statistic of 11.04 with 38 *df*, is significant at $p \leq .001$ (0.1% level). This suggests that the study is considerably significant, and that the results will be evident in 99.9% of the cases. The null hypothesis is rejected at the 0.1% level of significance.

Hypothesis 2: Literacy

The null hypothesis (H_0) and alternative hypothesis (H_1) for the significance of implementation of literacy concepts, comparing control and experimental groups:

H_0: There is no significant difference between the literacy development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the literacy development of the subjects in the control and the experimental groups.

The total t-statistic for literacy is 8.55 with 38 *df*, and is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99.9% of the cases. The null hypothesis is rejected at the 0.1% level of significance.

The smallest t-value for literacy was for a reading with a t-statistic of 2.77 and 38 *df*. It is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99% of the cases.

The largest t-value for literacy was for listening with a t-statistic of 6.78, and 38 *df*. It is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99.9% of the cases.

Hypothesis 3: Mathematics

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of mathematics concepts, comparing control and experimental groups:

H_0: There is no significant difference between the mathematics development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the mathematics development of the subjects in the control and experimental groups.

The total t-statistic for mathematics is 12.45 with 38 *df*, and is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99.9% of the cases. The null hypothesis is rejected at the 0.1% level of significance.

The smallest t-value for mathematics was for counting with a t-statistic of 3.27, and 38 *df*. It is significant where $p \leq .01$ (1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99% of the cases. The null hypothesis is rejected at the 0.1% level of significance.

The largest t-value for mathematics was for listening with a t-statistic of 11.80, and 38 *df*. It is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99.9% of the cases.

Hypothesis 4: Life skills

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of Life skills concepts, comparing control and experimental groups:

H_0: There is no significant difference between the life skills development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the life-skills development of the subjects in the control and experimental groups.

The total t-statistic for life-skills is 6.97 with 38 *df*, and is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant and that the

results will be evident in 99.9% of the cases. The null hypothesis is rejected at the 0.1% level of significance.

The smallest t-value for life skills was for discrimination with a t-statistic of 2.98, and 38 *df*. It is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant, and that the same results will be evident in 99% of the cases.

The largest t-value for life skills was for visual-motor with a t-statistic of 11.59, and 38 *df*. It is significant where $p \leq .001$ (0.1% level of significance). This suggests that the study is considerably significant and that the same results will be evident in 99.9% of the cases.

5.5.3 P-value

In Figure 5.23, p-value scores for all aspects of literacy, mathematics and life skills are presented.

Hypothesis 1: Intervention

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of intervention, comparing control and experimental groups:

H_0: There is no significant difference between the overall cognitive development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the overall cognitive development of the subjects in the control and experimental groups.

Table 5.23 gives a clear indication that the total p-value was 0.000. Where $p \geq .05$ we deem the study to be statistically significant. In the case of this study, p (0.000) is significantly smaller than 0.05, resulting in strong evidence to suggest that the null hypothesis is rejected at the 5% level of significance. Therefore, there is evidence to suggest that there is a significant difference between the cognitive development of the subjects in the control and experimental groups at the 5% level of significance.

Hypothesis 2: Literacy

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of literacy concepts, comparing control and experimental groups:

H_0: There is no significant difference between the literacy development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the literacy development of the subjects in the control and experimental groups.

Table 5.18 gives a clear indication that the total p-value for literacy was 0.000, where $p \geq .05$ we deem the study to be statistically significant. In the case of this study, p (.000) is significantly smaller than 0.05, resulting in strong evidence to suggest that the null hypothesis is rejected at the 5% level of significance. Therefore, there is evidence to suggest that there is a significant difference between the literacy development of the subjects in the control and experimental groups at the 5% level of significance.

The greatest p-value for literacy is 0.009, should the significance level have been 0.01 (1% level), a type-1 error would still not have been committed; there would still be significance at the 1% level.

Hypothesis 3: Mathematics

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of mathematics concepts, comparing control and experimental groups:

H_0: There is no significant difference between the mathematics development of the subjects in the control and experimental groups.

H_1: There is a significant difference between the mathematics development of the subjects in the control and experimental groups.

Table 5.23 gives a clear indication that the total p-value for mathematics was 0.000, Where p $\geq$ .05 we deem the study to be statistically significant. In the case of this study, p (0.000) is significantly smaller than 0.05, resulting in strong evidence to suggest that the null hypothesis is rejected at the 5% level of significance. Therefore, there is evidence to suggest that there is a significant difference between the mathematics development of the subjects in the control and experimental groups at the 5% level of significance.

The greatest p-value for mathematics is 0.002. Should the significance level have been 0.01 (1% level), a type-1 error would still not have been committed, Therefore there would still be significance at 1% level.

Hypothesis 4: Life skills

The null hypothesis (H_0) and alternative hypothesis (H_1) for significance of implementation of Life skills concepts, comparing control and experimental groups:

H_0 : There is no significant difference between the life-skills development of the subjects in the control and experimental groups.

H_1 : There is a significant difference between the life-skills development of the subjects in the control and experimental groups.

Table 5.23 gives a clear indication that the total p-value for life skills was 0.000. Where p $\geq$ 0.05 we deem the study to have been statistically significant. In the case of this study, p (0.000) is significantly smaller than 0.05, resulting in strong evidence to suggest that the null hypothesis is rejected at the 5% level of significance. Therefore, there is evidence to suggest that there is a significant difference between the life-skills development of the subjects in the control and experimental groups at the 5% level of significance.

The greatest p-value for mathematics is 0.005, should the significance level have been 0.01 (1% level), a type-1 error would still not have been committed; there would still be significance at 1% level.

As a result of Hypotheses 1, 2 and 3 and 4 being rejected, it is clear that there is in fact a significant difference between the mean scores in literacy, mathematics and life skills, comparing the control group with the experimental group. The experimental group took part in the eight-week intervention programme, and as a result their total mean scores in the post-test were significantly higher than those of the control group.

5.5.4 Cohen's d statistic

Cohen's d statistic is defined as a scale which represents the standardised difference between two means. In the case of this study, the two means compared are those of the control group and of the experimental group (http://power.education.uconn.edu/glossary.htm, 30/11/09; http://www.sportsci.org/resource/stats/effectmag.html, 30/11/09).

Table 5.24 is a representation of the means, and the description of the difference between the two means.

Table 5.24 A description of Cohen's correlations (http://www.sportsci.org/resource/stats/effectmag.html, 30/11/09)

Correlation Coefficient	Descriptor
0.0-0.1	trivial, very small, insubstantial, tiny, practically zero
0.1-0.3	small, low, minor
0.3-0.5	moderate, medium
0.5-0.7	large, high, major
0.7-0.9	very large, very high, huge
0.9-1	nearly, practically, or almost: perfect, distinct, infinite

The Cohen's d score presented in Table 5.23 represents a total score of cognitive development (literacy, mathematics and life skills) to equal 3.49. This score depicts a large practical significance, as presented in Table 5.19, resulting in the comparison between the

control and experimental group's overall score to be significantly large. The difference is distinct and the results are infinite.

The Cohen's total d score for literacy is 2.71. This score is significantly higher than the scores presented in Table 5.24, resulting in the comparison between the control and experimental group's literacy score to be significantly large. The difference is distinct and the results are infinite.

The Cohen's total d score for mathematics 3.94. This score is significantly higher than the scores presented in Table 5.24, resulting in the comparison between the control and experimental group's mathematics score to be significantly large. The difference is distinct and the results are infinite.

The Cohen's total d score for life skills is 2.21. This score is significantly higher than the scores presented in Table 5.24, resulting in the comparison between the control and experimental group's life-skills score to be significantly large. The difference is distinct and the results are infinite.

The smallest Cohen's d score was for literacy – writing is 1.01. This score is slightly greater than the scores presented in Table 5.24, resulting in the comparison between the control and experimental group's literacy - writing score to be significantly large. The difference is distinct and the results are infinite.

5.5.5 Analysis of co-variance

Analysis of co-variance, using the statistical software package programme BMDP2007 in addition to the analysis of co-variance, where the treatment was the grouping variant and the pre-test was done with the co-variant, with the assumption that the two groups (control and experimental) represent parallel slopes of improvement. The level of improvement in the scores of the experimental group was phenomenal, while the control group's level of improvement was minimal.

As a result the slopes were not parallel, and the test could not be employed.

5.6 SUMMARY

The aim of data analysis is for the researcher to determine whether the data provide the needed information, in order to achieve the goal and aims of the study (Koshy, 2005: p109). The initial phases of the study addressed the sample distribution of all subjects taking part in the study, as well as a comparison of the biographical details between the subjects in the control and experimental groups.

Single variable descriptive statistics (mean, standard deviation and frequency distributions) give insight into the pre-test and post-intervention scores. To assess the internal consistency and the reliability of the scores for the pre-test and post-tests, alpha coefficients for each were computed. Statistical analyses were conducted to assess the criteria and construct validity.

The internal reliability of the instrument was evaluated via Cronbach's alpha, using both control and experimental group's pre-test and post-test scores. Concluding remarks will be discussed in Chapter 6.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

Children begin the process of learning from a very young age, and move from one stage of cognitive development to the next, where they are constantly being stimulated by their environment and the happenings therein (Chapter 2.18.1: p56). *'Education is the most powerful weapon which you can use to change the world'* (Nelson Mandela, http://www.allgreat_quotes.com/graduation_quotes.shtml, 9/11/09). Learning is an ongoing lesson in life, one with which we need to be equipping young children.

The principal aim of this study was to gain a comprehensive understanding of the cognitive development of the young child, by developing a suitable programme that could be used to enhance the cognitive development of young children. The results of this study, in conjunction with others cited in previous chapters, suggest that the influence that quality cognitive intervention has on the development of young children is extensive.

Chapter 6 deals with an overview of the investigation, the findings and recommendations on the effects of cognitive stimulation in the development of mathematics, literacy and life-skills concepts in early childhood.

6.2 SUMMARY OF THE RESULTS

An eight-week programme was developed in order to examine the effects of early intervention on cognitive development. Cognitive development was enhanced by means of stimulation in mathematics, literacy and life-skills concepts.

From the findings discussed in Chapter 5, it has become clear that the effects of early intervention and stimulation of cognitive concepts are greatly beneficial to the young child. The results provide encouraging evidence on the viability of stimulation and the development of cognitive concepts in the early years.

From Table 5.22 (p149) it becomes clear that subjects who received the intervention programme (experimental group) consistently outperformed those who did not receive additional intervention (the control group).

6.2.1 Demographics of the subjects

Irrespective of race, gender, age and language, early intervention and stimulation of cognitive concepts will have a positive effect on children's understanding and the comprehension of concepts. This study did not set out to compare the results between the demographic groups, but rather to recognise that the effects of cognitive intervention and stimulation are greatly beneficial to the young child's cognitive development, irrespective of race, gender, age or language.

6.2.2 Reliability of instruments

Another aim of this investigation was to evaluate the methods of implementation which aid the development of the cognitive concepts. The eight-week intervention programme that was designed for this study proved to be reliable and effective. In Table 5.10 (p123) the reliability statistics for the pre-test and post-test scores are recorded. The results of subjects in the respective groups displayed scores which were consistent with one another. The increase of results in the experimental group in the course of the post-test was to be found in each subject, while the results of the control group remained similar to those of the pre-test.

As a result of the substantial difference in results of the experimental group's pre-test and post-test scores (Table 5.21: p143), it can be deduced that not only does intervention have great effects on cognitive development, but that the method of implementation designed for the purposes of this study was effective in developing and enhancing cognitive concepts.

6.2.3 Effects of early cognitive intervention

Brody (Ed. Kyllonen, Roberts & Stankov, 2008: p71) justifies the teaching and learning process by stressing the importance of the development of intelligence, '*What is learned (self-evidently) depends on what is taught. Individuals with the same intelligence may acquire different levels of expertise and knowledge if they are taught in different ways'.*

In Table 5.22 (p149), it is clear that there was a significant difference between the scores of the control group and the experimental group's individual categories of literacy, mathematics and life skills.

T-tests for independent groups were conducted to determine the level of statistical significance of the difference between the control and experimental group's mean score. T-statistics are represented in Table 5.23 (p153), where a total t-statistic of 11.04 with 38 *df*, is significant at $p \leq .001$ (0.1% level).

This suggests that the study is highly significant, and that the results will be evident in 99.9% of the cases. The null hypothesis is rejected at the 0.1% level of significance. Therefore, there is a significant difference between the overall cognitive development of the subjects in the control and experimental groups.

In Table 5.23 (p153) it is clear that there is in fact a significant difference between the mean scores on literacy, mathematics and life skills, when comparing the control group with the experimental group. The experimental group took part in the eight-week intervention programme, and as a result their total mean scores in the post-test were significantly higher than those of the control group.

Figure 5.26 (p146) represents the differences in mean scores between the control group and the experimental group. Each concept of literacy was compared (writing, reading, listening, speech and vocabulary), and a significant increase in mean scores in each concept was clearly evident.

Figure 5.27 (p147) represents the differences in mean scores between the control group and the experimental group. Each concept of mathematics was compared (geometry, sequencing, classifying, one-to-one correspondence and counting), and a significant increase in mean scores in each concept was clearly evident.

Figure 5.28 (p148) represents the differences in mean scores between the control group and the experimental Group. Each concept of life skills was compared (sensory awareness, discrimination, foreground/background and visual motor skills), and a significant increase in mean scores in each concept was clearly evident.

Cohen's d statistic represented a similar result, where the comparison between the results of the two groups is infinite. Table 5.23 (p153) shows that the difference in results is extremely large, again stressing the positive effects of early intervention. It is clear that the effects of early intervention and cognitive stimulation have positive effects on the development of young children.

It is clear from the results of this study that there is a great need for early intervention which caters for each child uniquely and in his/her totality. Parents play a significant role in the development of mathematics, literacy and life-skills concepts during early childhood, and as a result, parents need to be trained and equipped regarding the role they can play and the importance thereof, allowing parents to create the best possible learning environments for their children.

In Chapter 2 (2.21: p62) the importance of parental involvement was discussed, emphasizing that the child's achievements and successes are greatly influenced by parental input and interaction.

6.3 CONCLUSIONS

In 99.9% of the cases of early cognitive intervention, the results are positive (Table 5.23: p153). This is an outstanding result, encouraging the development of intervention programmes for cognitive concepts from an early age. Early intervention will enable young children to gain an understanding of cognitive concepts from an early age. This will possibly prevent future barriers to learning resulting in a smaller number of children in schools struggling with foundational concepts.

It is assumed that with a decrease in the number of learners struggling with foundational concepts, the need for specialists such as Occupational Therapists and Remedial Therapists will become substantially less.

Parents, teachers, social workers, therapists, extended family and siblings all play a vital role in the upbringing of children in today's society. These stakeholders all form part of an

important hierarchy and the children's emotional, social, physical and intellectual advances will always need to be attended to (Chapter 2.21: pg62).

6.4 RECOMMENDATIONS

6.4.1 Intervention programme

Cognitive development programmes should be readily available to parents and early childhood educators. Ideally, a programme should be devised which caters for young children's cognitive development, in the different stages of their growth.

A step-by-step plan could be devised which focuses on the various developmental levels (Chapter 2.2: p18-19), an understanding of how children learn (Chapter 2.4 and 2.5), as well as the various aspects of cognitive development, namely mathematics (Chapter 2.8-2.11), literacy (Chapter 2.12-2.16) and life skills (Chapter 2.17), with their various sub-sections.

This programme, as well as an indication of manners in which concept development can be provided for in the classroom, should be explained to parents and care-givers. It is clear that the concepts discussed in Chapter 2 need to be provided for in Early Childhood Centres, as concept development has clearly proved to be crucial in the intervention programmes discussed in this study.

6.4.2 Parental involvement

As discussed in Chapter 2 (2.21), parental involvement in the education process is of paramount importance. Feedback from the questionnaires raised the issue that many parents are ignorant of the fact that their involvement is so important, and are unaware of possible ways to get involved in the child's cognitive development process.

Awareness needs to be raised regarding the importance of parental involvement and interest, as well as equipping parents on their child's developmental levels and expectations. Very often the parents' role in stimulation is not seen as important, but research shows that there is a clear long-lasting benefit from parental involvement in the education system (Eliason, *et al.,* 2004: p49).

i.) Benefits of parental involvement for children

- Their reading ability increases
- Children have a much more positive attitude towards school and education
- Children have a higher rate of class attendance
- Their homework habits are healthy
- Good home-school communication
- Children see their parents as an important part of the education system

ii.) Benefits of parental involvement for parents

- Parents that are involved are more willing to help children with homework and extra activities
- Parents have a more positive attitude towards school activities
- Parents tend to appreciate teachers and their efforts more, and show more support and encouragement towards teachers
- Parents are more familiar with the curriculum
- Parents also have more confidence in their parenting abilities
- Parents have a deeper understanding of their child, their child's development and their expectations of the child.

iii.) Benefits of parental involvement for teachers

- Teachers appreciate parental involvement
- Teachers gain respect for parents and develop a deeper understanding of the child
- Teachers feel more respected by parents
- A more harmonious environment for all can be created.

6.5 RECOMMENDATIONS FOR FURTHER STUDIES

Kay (2005), Tolbert and Theobald (2006, in De Witt, 2008: p1), state that in order for there to be a sustainable, long-term beneficial outcome in children's development, intervention is imperative, including programmes that enhance child development from the early stages, as well as ensuring that intervention and stimulation are maintained for as long as possible, since children are constantly developing and maturing.

This study indicates the immediate development of cognitive growth and understanding of concepts after young children undergo an eight-week intervention programme. There is a clear comparison between the subjects which underwent the intervention programme and those that did not. Results were clear after the intervention process that positive development had taken place in the experimental group.

Early intervention enables young children to gain an understanding of the cognitive concepts from an early age. We can assume that the immediate effects of intervention and concept development form the foundations for future learning.

The field of early childhood intervention strategies provides a great opportunity for further investigation. Although studies have shown that there is a great need for early intervention, a strategic plan and design for early childhood stimulation would be of great benefit for Early Childhood Development Centres, as referred to in Chapter 2 (2.20: p59).

Like the NCS (Chapter 2.20: p59), which suggests guidelines and standards for formal teaching strategies, so an intervention strategy and plan should be implemented in Early Childhood Centres across South Africa. The development and implementation of this programme would be of great benefit to education in South Africa.

6.6 LIMITATIONS OF THE STUDY

The study was limited to children aged between two (24 months) and three-and-a-half years (42 months). The subjects were selected from three Early Childhood Centres in the middle-class socio-economic status group of Port Elizabeth (Chapter 4.6: p108). Although the study presented rich quantitative data, the participants were not numerous enough to generalise the findings to other contexts (i.e. other ages). Nonetheless, this investigative study presents an important perspective on the development of cognitive concepts in the early childhood.

6.7 CLOSING REMARKS

The early years of a child's life are years of rapid development and change (Chapter 2.21: p62). Each child is born with infinite potential and possibilities, and as individuals of the

human race, it is our duty to help these children grow and flourish, and by so doing, we stoke the power within that truly makes us powerful. In order for children to flourish, the development and enhancing of their maximum capabilities and potentials, as well as making the most of their period of existence are of the utmost importance (http://jmm.aaa.net.au/articles/4564.htm, 1/11/09).

Nelson Mandela, in his Inaugural Speech in 1994 suggested the following proclamation (Marianne Williamson, http://jmm.aaa. net.au/articles/4564.htm, 1/11/09):

"Our deepest fear is not that we are inadequate. Our deepest fear is that we are powerful beyond measure. It is our light, not our darkness, that most frightens us. We ask ourselves, who am I to be brilliant, gorgeous, talented, and fabulous? Actually, who are you not to be? You are a child of God. Your playing small doesn't serve the world. There's nothing enlightened about shrinking so that other people won't feel insecure around you. We are all meant to shine, as children do. We are born to make manifest the glory of God that is within us. It's not just in some of us; it's in everyone. And as we let our own light shine, we unconsciously give other people permission to do the same. As we are liberated from our own fears, our presence automatically liberates others."

REFERENCE LIST

1. Althouse, R., 1981. *The Young Child – Learning with Understanding.* New York: Teachers College Press

2. Aubrey, C. 1997. Children's early learning of numbers in school and out. In Thompson, I (Ed.). Teaching and learning early numbers (p20-32). Philadelphia: Open University Press

3. Barone, D., Mallette, M. & Hong Xu, S. 2005. Teaching Early Literacy: Development, Assessment and Instruction. New York: Guildford Press

4. Benigno, J. & Ellis, S. 2004. Two is greater than three: effects of older siblings on parental support of preschoolers' counting in middle-income families. Early Childhood Research Quarterly. Volume 19. (p4-20)

5. Berk, L. 2006. *Child Development*. Seventh Edition. Boston: Allyn and Bacon.

6. Berk, L. 2007. *Development through the lifespan*. Fourth Edition. Boston: Allyn and Bacon

7. Branford (Ed.). 1994. Privacy. *The South African Pocket Oxford Dictionary.* Seventh Edition (p602)

8. Brierley, J. 1994. *Give me a child until he is 7: Brain Studies and Early Childhood Education.* Second Edition. Washington, DC: Famler Press

9. Brody, N. 2008. Does Education Influence Intelligence? In Kyllonen, P., Roberts, R. & Stankov, L. (Eds). Extending *intelligence: enhancement and new constructs* (p85-93). New York: Lawrence Erlbaum Associates

10. Brooks-Gunn, J. 2004. Intervention and policy as change agents for young children. In Friedman, R., Chase-Lansdale, P. & Kiernan, K. (Eds). *Human development across lives and generations: the potential for change* (p293-343). New York: Cambridge University Press

11. Carr, A. 2006. *The handbook of child and adolescent clinical psychology: a contextual approach*. Second Edition. New York: Routledge Publishers

12. Cele, V. 2008. The Management of the Implementation of Quality Assurance Policies: The Case of Integrated Quality Management Systems (IQMS) in secondary schools in KwaZulu-Natal.

13. Clarke, B., Clarke, D. & Cheeseman, J. 2006. The Mathematical Knowledge and Understanding Young Children Bring to School. *Mathematics Education Research Journal.* Volume 18, No. 1. (p78-102)

14. Cooper, E., Levine, D. 2008. Teaching for Intelligence: Parameters for Change. In Presseisen (Ed.). Teaching for intelligence (p186-193). California: Corwin Press

15. Cunningham, D. 2008. Literacy Environment Quality in Preschool and Children's Attitudes towards Reading and Writing. *Literacy Teaching and Learning.* Volume 12, No. 2. (p19-36)

16. Department of Education. 2002. *The Revised National Curriculum Statement Grades R-9 (Schools).* Pretoria: Department of Education

17. De Witt, M. 2007. Emergent literacy: why should we be concerned? *Early Child Development and Care.* First Article. (p1-10)

18. De Witt, M. 2008. The implementation of Community-based care: a case study. *Early Learning Development and Care.* (p1-14)

19. De Witt, M. 2009. The young child in context: a thematic approach : perspectives from educational psychology and sociopedagogics. Pretoria: Van Schaik.

20. De Witt, M. & Booysen, M. (1995). *Focusing on the Small Child: insights from Psychology of Education.* First Edition. Pretoria: Acacia.

21. De Witt, M., Lessing, A. & Lenayi, L. 2008. An investigation into the state of early literacy of preschool learners. *Journal for Language Teaching.* Volume 42/2. (p1-10)

22. Department of Education. 2002. *The Revised National Curriculum Statement Grades R-9 (Schools).* Pretoria: Department of Education

23. Directorate: Planning & Environment. 2003. *Policy for Early Childhood Development Centres (ECD Centres).* City of Cape Town, South Africa.

24. Dockett, S. & Perry, B. 2007. Early Childhood Mathematics Education Research: What is Needed Now? *Mathematics: Essential Research, Essential Practice.* Volume 2. (p870-874)

25. Dockrell, J., Messer, D., 2004. Lexical acquisition in the early school years. In Berman (Ed.) Language Development across Childhood and Adolescence. (p35-52) Philadelphia: John Benjamins Publishers

26. Eliason, C. 2008. *A practical guide to early childhood curriculum*. Eighth Edition. New Jersey: Pearson Merrill/Prentice Hall

27. Eliot, L. 1999. *What's going on in there?:How the brain and mind develop in the first five years of life*. New York: Bantam Books.

28. Formanek, R, Gurain, A. 1981. *Charting Intellectual development*: A practical guide to Piagetian tasks. Second Edition. Springfield: Thomas Publishers

29. Gordon, A., & Browne, K. 2008. *Beginnings and beyond: Foundations in Early Childhood Education.* Seventh Edition. New York: Thomson Delmar Learning

30. Griffin, S. 2004. Building number sense with Number Words: a mathematics programme for young children. *Early Childhood Research Quarterly.* Volume 19. (p173-180)

31. Haydon, G. 2006. *Values in education*. New York: Continuum Publishers

32. Hayward, R. 2006. Quality Schools (Part II) Editorial. *Management Today*

33. Hendrick, J. 1986. Total learning: curriculum for the young child. Second Edition. Columbus: Merrill Publishing Company

34. Hendrick, J., Weissman, P. 2007. Total learning: developmental curriculum for the young child. Seventh Edition. New Jersey: Pearson Merril

35. Higgs, P. & Smith, J. 2006. Rethinking our World. Second Edition. Kenwyn: Juta

36. Hoff, E. 2005. *Language Development.* Third edition. Australia: Wadsworth Thomson Learning

37. Koshy, V. 2005. *Action research for improving practice: a practical guide*. London: P. Chapman Publishers

38. Kostelnik, M., Soderman, A., & Whiren, A. 1999. *Developmentally Appropriate Programs in Early Childhood Education.* Second Edition. New Jersey: Merrill

39. Kostelnik, M., Soderman, A. & Whiren, A. 2004. *Developmentally Appropriate Curriculum: Best practices in Early Childhood Education.* (Third Edition). New Jersey: Prentice Hall

40. Landsberg, E., Kruger, D. & Nel, N. 2005. *Addressing Barriers to learning: a South African Perspective*. (First Edition). Pretoria: Van Schaik

41. Lansdown, R., Walker, M. 1991. *Your Child's Development: From birth through adolescence: a complete guide for Parents.* (First American Edition). New York: Knopf Publishers

42. Leinhardt, G. 2001. Instructional explanations: A commonplace for teaching and location for contrasts (in Richardson, V. [Ed.], *Handbook of research on teaching.* 4th edition. Washington: American Educational Research Association)

43. Liebeck, P. 1984. *How children learn Mathematics: A guide for Parents and Teachers.* England: Penguin Books

44. Lilly, E., & Green, C. 2004. *Developing partnerships with families through children's literature*. New Jersey: Pearson Merrill/Prentice Hall

45. Lindberg, L. & Swedlow, R. 1985. *Young Children: Exploring and Learning.* First Edition. Boston: Allyn and Bacon

46. Maree, D. & Ford, M. 1987. *Bridging with a Smile.* South Africa*:* Smile Education Systems

47. Maxim, G. 1992. *The Very Young: Guiding children from Infancy through the early years.* Fourth Edition. New York: Macmillan Publishing Company

48. Mc Dermott & Rakgokong. 1996. *EXCELL in Teaching Mathematics.* Pretoria: Kagiso Publishers

49. McAfee, O., Leong, D. (2007) Assessing and guiding young children's development and learning. Fourth Edition. Boston: Pearson Allyn & Bacon

50. McGee, L., & Richgels, D. 2008. *Literacy's beginnings: supporting young readers and writers*. Fifth Edition. Boston: Allyn and Bacon Publishers

51. McGuinness, D. 2005. *Language development and learning to read : the scientific study of how language development affects reading skill*. Cambridge: MIT Press Publishers

52. McMillan, J., Schumacher, S. 2006. Research in education: evidence-based inquiry. Boston: Pearson

53. Meier, C. & Marais, P. 2007, *Education management in early childhood development*. Pretoria: Van Schaik

54. Metlina, L. 1991. *Mathematics in Preschool: An Aid for the Preschool educator.* Virginia: National Council of Teachers of Mathematics

55. Mindes, G. 2007. *Assessing young children*. Third Edition. New Jersey: Pearson Merrill/Prentice Hall

56. Morrison, G.S. 1998. *Early Childhood Education Today.* Seventh Edition. New Jersey: Macmillan Publishing Company

57. Mouton, J. 2001. *How to succeed in your master's and doctoral studies: a South African guide and resource book*. Pretoria: Van Schaik Publishers

58. Neuman, W. 2006. *Social research methods: qualitative and quantitative approaches*. Sixth Edition. London: Allyn and Bacon

59. Ornstein, A. & Hunkins, F. 2004. *Curriculum – foundations, principles, and issues*. Fourth Edition. Boston: Allyn & Bacon

60. Pellegrini, A., Symons, J., & Hoch, J. 2004. *Observing children in their natural worlds: a methodological primer*. Second Edition. New Jersey: L. Erlbaum Associates

61. Sarama, J. & Clements, D. 2008. Mathematics in Early Childhood. In Saracho, O. & Spodek, B. (Eds). Contemporary perspectives on Mathematics in Early Childhood Education. (p67-94). Charlotte: Information Age Publishers

62. Schmitt, M. & Gregory, A. The Impact of an Early Literacy Intervention: Where Are the Children Now? Literacy Teaching and Learning. Volume 10, No. 1. (p1-20)

63. Seefeldt, C. & Barbour, N. 1998. *Early Childhood Education: an introduction.* Fourth Edition. New York: Merril Publishers

64. Soderman, A., Farrell, P. 2008. Creating literacy-rich preschools and kindergartens. Boston: Allyn & Bacon

65. Sophian, C. 2004. Mathematics for the future, developing a Head-Start curriculum to support mathematics learning. Early Childhood Research Quarterly. Volume 19. (p59-81)

66. Somekh, B. 2006. *Action research: a methodology for change and development*. Maidenhead: Open University Press.

67. Spillane, R. 2008. Teaching for Intelligence: The Intellectual Life of Schools. In Presseisen (Ed.). Teaching for intelligence (p139-141). California: Corwin Press

68. Spodek, B., Saracho, O. & Davis, M. 1991. *Foundations of Early Childhood Education: teaching three-, four- and five-year-old children.* Second Edition. Boston: Allyn & Bacon

69. Starkey, P. & Klein, A. 2008. Sociocultural Influences on Young Children's Mathematical Knowledge (In Saracho, O. & Spodek, B. (Ed.). Contemporary perspectives on mathematics in early childhood education. Charlotte: Information Age Publishers

70. Sternberg, R. 2008. Schools Should Nurture Wisdom. In Presseisen (Ed.). Teaching for intelligence (p61-88). California: Corwin Press

71. Stretch, L. 2008. Investigating the Impact of Stimulation in Mathematical Concepts in the Early Childhood, Unpublished Manuscript

72. Swets & Zeitlinger. 2002. *Development of Early Numeracy in 5 to 7 Year Old children: a comparison between Flanders and the Netherlands.* Volume 8. Educational Research and Evaluation

73. Tudge, R., Doucet, F. (2004). Early mathematical experiences: observing young Black and White children's everyday activities. *Early Childhood Research Quarterly.* Volume 19. (p21-39)

74. Whitmore, J. 1986. Intellectual Giftedness in young children: Recognition and Development. New York: Haworth Press

75. Woolfolk, A. 2007. *Educational Psychology.* 10th Edition. Boston: Allyn & Bacon

76. Wright, R.J. 2002. *Assessing young children's arithmetical strategies and knowledge: Providing learning opportunities for teachers.* Volume 27. No 3 September. School of Education, Southern Cross University

77. Young-Loveridge, J. 2008. Development of Children's Mathematical Thinking in Early School Years. In Saracho, O., Spodek, B. (Ed.). Contemporary perspectives on mathematics in early childhood education. Charlotte: Information Age Publishers

78. *A Scale of Magnitudes for Effect Statistics.* Retrieved 30/11/09 from World Wide Web: http://www.sportsci.org/resource/stats/effectmag.html

79. Abrahams, D. *Introduction to Research Design.* Retrieved 10/10/09 from World Wide Web: http://www.socialresearchmethods.net/tutorial/Abrahams/sbk16.htm

80. *Analysis and Statement of the Problem.* Retrieved 16/05/09 from World Wide Web: http://www.idrc.ca/en/ev-56596-201-1-DO_TOPIC.html

81. *Arithmetic.* Retrieved 1/10/08 from World Wide Web: http://www.answers.com/topic/arithmetic

82. Arpin, M. 2002. *Child Development.* Retrieved 20/06/09 from the World Wide Web: http://www.all thedaze.com/development3.html

83. Bailey, C. 2006. *Providing Early Stimulation*. (p1-2). Retrieved 23/07/08 from the World Wide Web: http://extension.oregonstate.edu/catalog/pdf/ec/ec1301-e.pdf

84. *Brain Structures and their Functions.* Retrieved 29/06/09 from World Wide Web: http://serendip.brynmawr.edu/bb/kinser/Structure1.html

85. Child Welfare Information. 2001. *Understanding the Effects of Maltreatment on Early Brain Development.* Retrieved 07/07/08 from World Wide Web: http://www.childwelfare.gov/pubs/focus/earlybrain/earlybraina.cfm

86. *Cognitive Child Development Three Years: Intellectual Development of Your Three-Year-Old Child.* Retrieved from World Wide Web: http://www.child-development-guide.com/cognitive-child-development-three-years.html

87. *Early Childhood: Where Learning Begins - Mathematics: What is Mathematics?* 1999. Retrieved 2/10/08 from World Wide Web: http://www.ed.gov/pubs/EarlyMath/whatis.html

88. *Education in South Africa.* 2006. Retrieved 07/07/08 from World Wide Web: http://www.southafrica.info/about/education/education.htm

89. *External Validity.* Retrieved 10/11/09 from World Wide Web: http://www.gifted.uconn.edu/siegle/research/Samples/externalvalidity.html

90. *Glossary: Cohen's d.* Retrieved 30/11/09 from World Wide Web: http://power.education.uconn.edu/glossary.htm

91. *Growth and Development: The Growing Child: 3-Year-Olds.* Retrieved 18/06/09 from World Wide Web: http://www.musckids.com/health_library/growth/threeyo.htm

92. *Integrated Quality Management Systems (IQMS) For School-Based Educators.* Retrieved 10/06/09 from World Wide Web: http://www.elrc.co.za/UploadedDocuments/IQMS%20Training%20Manual.doc

93. *Language Development.* Retrieved 15/03/2009 from World Wide Web: http://en.wikipedia.org/wiki/Language_development

94. Lie, K. *Validity & Reliability in Quantitative Research.* Retrieved 18/03/09 from World Wide Web: http://www.qmu.ac.uk/psych/RTrek/study_notes/web/sn3.htm

95. Lind, K. 1999. *Dialogue on Early Childhood Science, Mathematics, and Technology Education.* Retrieved 01/10/08 from World Wide Web: http://www.project2061.org/publications/earlychild/online/experience/Lind.htm

96. *Maslow's Hierarchy of Needs*. Retrieved 10/8/08 from World Wide Web: http://www.pateo.com/images/maslowmaster4ts.gif

97. *Maslow's Hierarchy of Needs*. Retrieved 24/06/09 from World Wide Web: http://www.omafra.gov.on.ca/english/rural/facts/96-001f1.gif

98. *Maslow's Hierarchy of Needs*. Retrieved 24/06/09 from World Wide Web: http://www.ruralhealth.utas.edu.au/comm-lead/images/Maslows-needs-Pyramid.jpg

99. McGuigan, B. *What is Morphology?* Retrieved 30/06/09 from World Wide Web: http://www.wisegeek.com/what-is-morphology.htm

100. *Montessori Method.* Retrieved 10/10/09 from World Wide Web: http://en.wikipedia.org/wiki/Montessori

101. Perry, B. & Pollard, R. 1997. *Altered brain development following global neglect in early childhood.* Retrieved 14/06/09 from World Wide Web: http://www.childtrauma.org/ctamaterials/neuros~1.asp

102. Perry, B. 1998. *Biological Relativity: Time and the Developing Child.* Retrieved 10/7/08 from World Wide Web: http://www.childtrauma.org/ctamaterials/biolo_relativity.asp

103. Perry, B. 2002. *Brain Structure and Function II: Special Topics Informing Work with Maltreated Children.* Volume 2, No. 2. Retrieved 14/06/09 from World Wide Web: http://www.childtrauma.org/ctamaterials/brain_II.asp

104. *Quotes.* Retrieved 5/11/09 from World Wide Web: http://www.allgreatquotes.com/graduation_quotes.shtml

105. *Reliability.*2006. Retrieved 3/11.09 from World Wide Web: http://www.socialresearchmethods.net/kb/reliable.php

106. Schneider, B. 2006. *Definition: Life-Skills.* Retrieved 18/03.2009 from World Wide Web: http://www.selfgrowth.com/articles/Definition_Life_Skills.html

107. *Teaching Mathematical Concepts: Number Sense*. 2006. Retrieved 18/03/2009 from the World Wide Web: http://s22318.tsbvi.edu/mathproject/ch1.asp

108. *The Healing Light Institute of Spirituality.* Retrieved 1/11/09 from World Wide Web: http://jmm.aaa.net.au/articles/4564.htm

109. *Theories of Child Development and Learning.* Retrieved 19/9/09 from World Wide Web: www.ncrel.org/sdrs/areas/issues/students/earlycld/ea7lk18.htm

LIST OF APPENDICES

APPENDIX A

LETTER TO PRINCIPAL

Dear Principal,

I am currently completing my Master's, specializing in Psychology of Education (UNISA). As part of my research, I have decided to investigate the impact of stimulation of intellectual development in the early childhood. I feel it is important to have a whole understanding of each child, and the development of children in their early childhood, especially regarding the development of numeracy, literacy and life-skills concepts.

I will be examining theories that have been written, explaining their views on the importance of teaching intellectual concepts to the young child, and what early stimulation entails. I will then be exploring a basis for early numeracy, literacy and life skills, creating my own integrated approach and a programme to promote early development…

The primary aim of this study is:

- To develop a programme to enhance intellectual development in order to examine the effects of stimulation of mathematics, literacy, life skills and general knowledge concepts in young children,
- To evaluate the methods of implementation that aid development of the intellectual concepts,
- To indicate how the concepts can be provided in the Early Childhood Centre.

I will be focusing on the following concepts, which I view as being imperative:

Mathematics:

* Counting
* One-to-one Correspondence
* Classification
* Sequencing and Seriation
* Geometry

Literacy:

* Vocabulary
* Speech
* Listening
* Reading
* Writing

Life Skills

* Visual-Motor
* Discrimination
* Foreground/background
* Sensory Awareness

(By means of educating on heritage, through interaction, modelling behaviour, enquiry, experiences and decision-making)

Would you be interested in allowing me to undertake my research in your school with the children ranging from two to three-and-a-half years old?

I look forward to hearing from you.

Thank you,

Lauren Stretch (084 554 9688)

APPENDIX B

STUDY INFORMATION LETTER

Dear Parent/Care-giver of participant,

This letter serves to inform you about the study that will be conducted at your child's Early Childhood Centre. The study is entitled: **Intellectual development in the Early Childhood.** This study conforms to all the standards of a Master's study as set out by the University of South Africa (UNISA).

The participants in this study are children between the ages of two and four years old that attend one of three Early Childhood Centres across Port Elizabeth. Forty (40) children between the ages of 2 and 4 were selected to participate in the study; both males and females were included.

The testing will consist of:

- A week of pre-testing, which will take place prior to the commencement of the intervention programme,
- An eight-week intervention programme,
- A final week of post-testing after intervention period.

The primary aim of this study will be:

- To develop a programme to enhance intellectual development in order to examine the effects of stimulation of mathematics, literacy, life skills and general knowledge concepts in young children,
- To evaluate the methods of implementation that aid the development of the intellectual concepts,
- To indicate how these concepts can be provided for in the early Childhood Centre.

At no stage during the course of the study will any participants be placed at risk. Each participant's name will be coded and only the codes will be used during the data analysis stage of the study in order to maintain a high level of confidentiality. The identity of participants will not be made public.

Thank you for your willingness to participate.

Yours sincerely,

Lauren Stretch

APPENDIX C

INFORMED CONSENT FORM

Title of research topic	The effects of cognitive stimulation in the development of mathematics, literacy and life-skills concepts in early childhood
Principal Investigator	Lauren Stretch
Address	16 Melville Road Mill Park Port Elizabeth
Contact telephone number	0845549688

DECLARATION BY PARTICIPANT:

I, the participant was invited to participate in the above-mentioned research project that is being undertaken by the Department of Education at UNISA.

Signed: _____

2. The following aspects are included in my research assignment:

2.1 Aim:

- To develop a programme to enhance intellectual development in order to examine the effects of stimulation of mathematic, literacy, life skills and general knowledge concepts in young children,
- To evaluate the methods of implementation that aid development of the intellectual concepts,
- To indicate how the concepts can be provided for in the early Childhood Centre.

2.2 Procedures

I will research this topic adequately; I will then visit Early Childhood schools and centres in Port Elizabeth and implement a 10-week programme with children ranging from two to three-and-a-half years. I will work directly with children daily, stimulating intellectual development (literacy, numeracy, life skills). I will also send questionnaires out to parents and teachers and gain insight on their views of intellectual development.

2.3 Risks:

A problem that may be encountered could be that some of the interviewed parents and teachers may answer questions in the light of what they feel should be done, and not necessarily what they do to encourage effective stimulation. Children that are habitually absent from school may not receive the same level of stimulation which could, in turn, affect their results.

2.4 Possible benefits:

Possible benefits of this research will be to gain a better understanding of the effects of stimulation on intellectual development, as well as the effects of the programme developed to aid the young child's advancement.

2.5 Confidentiality:

The identity of no participant will be revealed in any discussion in my results.

APPENDIX D

QUESTIONNAIRE FOR SUBJECT'S PARENTS/CARE-GIVERS

The effects of cognitive stimulation in the development of mathematics, literacy and life-skills concepts in early childhood

<table>
<tr><th colspan="2">Background information</th></tr>
<tr><td>1. Are you:

○ Teacher?
○ Parent?
○ Teacher and Parent?</td><td>4. What is your home language?

○ English
○ Afrikaans
○ Xhosa
○ Other, please specify
_____</td></tr>
<tr><td>2. What is your race?

○ White
○ Black
○ Coloured
○ Asian
○ Other, please specify
_____</td><td>5. How many years parenting experience do you have? (Including this year)

○ 0 - 1
○ 2 – 4
○ 4 – 8
○ 9 – 15
○ 16 – 20
○ Over 20</td></tr>
<tr><td>3. What is your gender?

○ Female
○ Male</td><td></td></tr>
</table>

THANK YOU FOR YOUR ASSISTANCE

1. What do you feel are **parents'** responsibilities with regard to their child's learning and development?

_____
_____
_____
_____

2. What do you feel are **teachers'** primary responsibilities with regards to education and learning?

_____
_____
_____
_____
_____

3. Who do you feel is the **child's primary educator** – physically, cognitively, emotionally, spiritually and socially?

_____

Give reasons for your response:

_____
_____
_____

4. Do you feel there is a need for early intervention and stimulation for young children?

Yes ☐ No ☐

_____
_____

Give reasons for your response:

_____
_____
_____

5. Rate the percentage of the **importance** you place on stimulating your child cognitively

_____%

6. At what age do you feel it is necessary to begin cognitive stimulation? Why?

_____

_____

7. Indicate by placing an X in the appropriate block which you feel is the teacher's responsibility, the parents' responsibility or that of both the teacher and the parent. Please be honest, and let this be a true reflection of what you think.

	TEACHER	**PARENT**	**BOTH**
PHYSICAL			
Run	☐	☐	☐
Skip	☐	☐	☐
Hop	☐	☐	☐
Ride Bicycle	☐	☐	☐
Posture	☐	☐	☐
Balance	☐	☐	☐
COGNITIVE			
Stimulates memory	☐	☐	☐
Mathematic skills	☐	☐	☐
Reasoning	☐	☐	☐
Discern between right/wrong	☐	☐	☐
Visual perception	☐	☐	☐
Auditory Perception	☐	☐	☐
Creativity in storytelling	☐	☐	☐
Vocabulary	☐	☐	☐
Pronunciation	☐	☐	☐

Tenses	☐	☐	☐
SOCIAL AND EMOTIONAL			
Encourage child	☐	☐	☐
Challenge child to experiment	☐	☐	☐
Understand others emotions	☐	☐	☐
Express feelings	☐	☐	☐
Verbalise fears	☐	☐	☐
Follow rules	☐	☐	☐
Passion for books	☐	☐	☐
Play	☐	☐	☐
Teach on religion	☐	☐	☐

8. What factors do you believe play a role in a child's cognitive (intellectual) abilities? (i.e. Genetics, environment, teachers, and suchlike). Why?

Lauren Stretch

lauren@kickworship.co.za

Master's (Psychology of Education)

APPENDIX E

PRE TEST ASSESSMENT FORM

Mathematics:

Pre-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
COUNTING															
no. 1-5															
no.6-10															
no. 11-15															
5…6,7,8,9															
2…3,4,5,6															
4…5,6,7,8															
TOTAL															
ONE-TO-ONE															
Concrete															
Semi-concrete															
Pass me…															
How many?															
TOTAL															
CLASSIFYING															
Properties															
Functions															
TOTAL															
SEQUENCING															
Story – cooking															
Size (cars)															
Shapes															
TOTAL															
GEOMETRY															
Recognition															
Matching															
Copy Picture															
Building															
TOTAL															

Language:

Pre-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VOCABULARY															
Rhyme															
Name Body parts															
Answer q's															
things at the beach															
name what see															
Animal names															
TOTAL															
SPEECH															
answer q's															
clarity of speech															
sentence structure															
pronunciation															
TOTAL															
LISTENING															
note mistakes															
instrcutions - 1															
instructions- 2															
instrcutions - 3															
animal sounds - match															
TOTAL															
READING															
Read picture															
TOTAL															
WRITING															
Draw pic of self															
Copy picture															
TOTAL															

Life-Skills:

Pre-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VISUAL-MOTOR															
Matching															
copy what i draw															
dot-to-dot															
matching same															
spot difference															
follow the line															
TOTAL															
FORE/BACNGRND															
spot cups in picture															
discuss what seen															
missing puzzle pieces															
TOTAL															
DISCRIMINATION															
note differences															
feelings															
match same objects															
sounds															
TOTAL															
SENSORY AWAR.															
circle what hear															
clothing - which day															
feelings															
TOTAL															

APPENDIX F

POST TEST ASSESSMENT FORM

Mathematics:

Post-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
COUNTING															
no. 1-5															
no.6-10															
no. 11-15															
5…6,7,8,9															
2…3,4,5,6															
4…5,6,7,8															
TOTAL															
ONE-TO-ONE															
Concrete															
Semi-concrete															
Pass me…															
How many?															
TOTAL															
CLASSIFYING															
Properties															
Functions															
TOTAL															
SEQUENCING															
Story – cooking															
Size (cars)															
Shapes															
TOTAL															
GEOMETRY															
Recognition															
Matching															
Copy Picture															
Building															
TOTAL															

Language:

Post-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VOCABULARY															
Rhyme															
Name Body parts															
Answer q's															
things at the beach															
name what see															
Animal names															
TOTAL															
SPEECH															
answer q's															
clarity of speech															
sentence structure															
pronunciation															
TOTAL															
LISTENING															
note mistakes															
instrcutions - 1															
instructions- 2															
instrcutions - 3															
animal sounds - match															
TOTAL															
READING															
Read picture															
TOTAL															
WRITING															
Draw pic of self															
Copy picture															
TOTAL															

Life-Skills:

Post-Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VISUAL-MOTOR															
Matching															
copy what i draw															
dot-to-dot															
matching same															
spot difference															
follow the line															
TOTAL															
FORE/BACNGRND															
spot cups in picture															
discuss what seen															
missing puzzle pieces															
TOTAL															
DISCRIMINATION															
note differences															
feelings															
match same objects															
sounds															
TOTAL															
SENSORY AWAR.															
circle what hear															
clothing - which day															
feelings															
TOTAL															

APPENDIX G

MATHEMATICS SCORING SCALE

COUNTING

1. **No 1-5**

1= cannot count from 1 to 5, did not attempt counting
3= counts from 1 to 5, but with errors
5= can count from 1 to 5 with ease

2. **No 6-10**

1= cannot count from 6 to 10, did not attempt counting
3= counts from 6 to 10, but with errors
5= can count from 6 to 10 with ease

3. **No 11-15**

1= cannot count from 11 to 15, did not attempt counting
3= counts from 11 to 15, but with errors
5= can count from 11 to 15 with ease

4. **5... 6,7,8,9**

1= cannot carry on counting from 5, did not attempt counting on
3= attempts counting on from 5, but with errors
5= can count on from 5 with ease

5. **2...3,4,5,6**

1= cannot carry on counting from 2, did not attempt counting on
3= attempts counting on from 2, but with errors
5= can count on from 2 with ease

6. **4...5,6,7,8**

1= cannot carry on counting from 4, did not attempt counting on
3= attempts counting on from 4, but with errors
5= can count on from 4 with ease

ONE-TO-ONE CORRESPONDENCE

1. **Concrete**

1= cannot count concrete objects, did not attempt counting
3= counts concrete objects, but with errors
5= can count concrete objects with ease

2 Semi-Concrete

1= cannot count semi-concrete objects, did not attempt counting
3= counts semi-concrete objects, but with errors
5= can count semi-concrete objects with ease

3. Pass me....

1= cannot count and pass concrete objects, did not attempt counting
3= counts and passes concrete objects, but with errors
5= can count and pass concrete objects with ease

4. How many?

1 = cannot count how many concrete objects, did not attempt counting
2 = counts how many concrete objects, but with errors
3 = can count how many concrete objects with ease

CLASSIFYING

1. According to properties

1= cannot classify objects according to properties, did not attempt classifying
3= classifies objects according to properties, but with errors
5= can classify objects according to properties, with ease

2. According to functions

1= cannot classify objects according to functions, did not attempt classifying
3= classifies objects according to functions, but with errors
5= can classify objects according to functions, with ease

SEQUENCING

1. According to story

1= cannot sequence story, did not attempt sequencing
3= sequences story, but with errors
5= can sequence story with ease

2. According to size

1= cannot sequence according to size, did not attempt sequencing
3= sequences according to size, but with errors
5= can sequence according to size with ease

3. According to shapes

1= cannot sequence shapes, did not attempt sequencing
3= sequences shapes, but with errors
5= can sequence shapes with ease

GEOMETRY

1. **Recognition**

1= cannot recognize shapes, did not attempt recognizing
3= recognizes shapes, but with errors
5= can recognize shapes with ease

2. **Matching**

1= cannot match shapes, did not attempt to match
3= matches shapes, but with errors
5= can match shapes with ease

3. **Copy Picture**

1= cannot copy picture, did not attempt copying
3= copies picture, but with errors
5= can copy picture with ease

4. **Building blocks**

1= cannot build with blocks, did not attempt building
3= builds with blocks, but with errors
5= can build with blocks with ease

APPENDIX H
LITERACY SCORING SCALE

VOCABULARY

1. **Rhyme**

1= cannot say a rhyme, did not attempt
3= can rhyme, but with errors
5= can rhyme with ease

2. **Name body parts**

1= cannot name body parts, did not attempt
3= names body parts, but with errors
5= can name body parts with ease

3. **Name things at the beach**

1= cannot name things at the beach, did not attempt
3= names things at the beach, but with errors
5= can name things at the beach with ease

4. **Name what they can see**

1= cannot name what is seen, did not attempt
3= names what is seen, but with errors
5= can name what is seen with ease

5. **Animal names**

1= does not know animal names, did not attempt
3= names animals, but with errors
5= names animals with ease

SPEECH

1. **Answer questions**

1= cannot answer questions, did not attempt
3= answers questions, but with errors
5= can answer questions with ease

2. **Clarity of speech**

1= muffled speech, cannot understand
3= partially understand what is being said
5= can understand with ease

3. **Sentence Structure**

1= poor sentence structure
3= average sentence structure
5= good sentence structure

4. **Pronunciation**

1= poor pronunciation
3= average pronunciation
5= good pronunciation

LISTENING

1. **Notes mistakes**

1= cannot note a mistake when listening to a story
3= notes some mistakes when listening to a story
5= notes mistakes with ease

2. **Listens to instructions (1)**

1= cannot listen to instructions
3= attempts to listen to instructions
5= listens to instructions with ease

3. **Listens to instructions (2)**

1= cannot listen to instructions
3= attempts to listen to instructions
5= listens to instructions with ease

4. **Listens to instructions (3)**

1= cannot listen to instructions
3= attempts to listen to instructions
5= listens to instructions with ease

5. **Listens to and identifies animal sounds**

1= cannot identify sound
3= attempts to identify the sound
5= identifies sounds with ease

READING

1. **Read and interpret a picture**

1= cannot read and interpret a picture, did not attempt
3= attempts to read and interpret, but with errors
5= can read and interpret pictures with ease

WRITING

1. **Draw a picture of self**

1= cannot draw a picture of self, did not attempt
3= attempts to draw picture of self, not very recognizable
5= draws picture of self with ease

2. Draw a picture of self

1= cannot copy a picture, did not attempt

3= attempts to copy a picture, not very recognizable

5= copy picture with ease

APPENDIX I
LIFE-SKILLS SCORING SCALE

VISUAL MOTOR

1. **Matching**

1= cannot match like concepts, did not attempt
3= can match, but with errors
5= can match concepts with ease

2. **Copy what I draw**

1= cannot copy what I draw, did not attempt
3= can copy, but with errors
5= can copy with ease

3. **Dot-to-Dot**

1= cannot do dot-to-dot, did not attempt
3= can do dot-to-dot, but with errors
5= can do dot-to-dot with ease

4. **Matching same**

1= cannot match the same, did not attempt
3= can match the same, but with errors
5= can match the same with ease

5. **Spot the difference**

1= cannot spot the difference, did not attempt
3= can spot the difference, but with errors
5= can spot the difference with ease

6. **Follow the line**

1= cannot follow the line, did not attempt
3= can follow the line, but with errors
5= can follow the line with ease

FOREGROUND/BACKGROUND

1. **Spot objects in a picture**

1= cannot spot objects in a picture, did not attempt
3= can spot objects in a picture, but with errors
5= can spot objects in a picture with ease

2. **Discuss what is seen in a picture**

1= cannot discuss what is seen, did not attempt
3= can discuss what is seen, but with errors
5= can discuss what is seen with ease

3. **Fit in missing puzzle pieces**

1= cannot fit in the missing puzzle pieces, did not attempt
3= can fit in the missing puzzle pieces, but with errors
5= can fit in the missing puzzle pieces with ease

DISCRIMINATION

1. **Note differences**

1= cannot note differences, did not attempt
3= can note differences, but with errors
5= can note differences with ease

2. **Express feelings**

1= cannot express feelings, did not attempt
3= can express feelings, but with errors
5= can express feelings with ease

3. **Match similar objects**

1= cannot match similar objects, did not attempt
3= can match similar objects, but with errors
5= can match similar objects with ease

4. **Recognize sounds**

1= cannot recognize sounds, did not attempt
3= can recognize sounds, but with errors
5= can recognize sounds with ease

SENSORY AWARENESS

1. **Circle the objects which are audible**

1= cannot note audible objects, did not attempt
3= can note audible objects, but with errors
5= can note audible objects with ease

1. **Clothing – summer/winter, day/night**

1= cannot recognize clothing types, did not attempt
3= can recognize clothing types, but with errors
5= can recognize clothing types with ease

1. **Recognize feelings**

1= cannot recognize feelings, did not attempt
3= can recognize feelings, but with errors
5= can recognize feelings with ease

APPENDIX J
LANGUAGE QUALITY ASSURANCE CERTIFICATE

Language Quality Assurance Practitioners

Mrs KA Goldstone

Dr PJS Goldstone

14 Erasmus Drive
Summerstrand
Port Elizabeth
6001
South Africa

Tel/ Fax: +27 41 583 2882

Cell: +27 73 008 8558

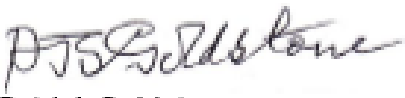
Email: kate@pemail.co.za

pat@pemail.co.za

16 November 2009

TO WHOM IT MAY CONCERN

We hereby certify that we have language edited the MEd thesis prepared by Ms L Stretch entitled *THE EFFECTS OF COGNITIVE STIMULATION IN THE DEVELOPMENT OF MATHEMATICS, LITERACY AND LIFE-SKILLS CONCEPTS IN THE EARLY CHILDHOOD* and that we are satisfied that, provided the changes we have made are effected to the text, the language is of an acceptable standard, fit for publication.



Kate Goldstone
BA (Rhodes)
SATI No: 1000168
UPE Language Practitioner (1975-2004)
NMMU Language Practitioner (2005)

Patrick Goldstone
BSc (Stell)
DEd (UPE)