METACOGNITIVE STRATEGIES AND ACADEMIC PERFORMANCE AMONG CHILDREN WITH LEARNING PROBLEMS

By

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I dedicate this thesis to my inspirational parents and grandparents whose example of hard work and dedication taught me to persist and to realise my dreams. I wish to express my sincere gratitude to my parents with whose continued support it was possible to complete this work.

And in my prayers I thank my God.

> *"The fear of the Lord is the beginning of wisdom; all who follow his precepts have good understanding. To him belongs eternal praise." - Psalm 111:10.*

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ABSTRACT

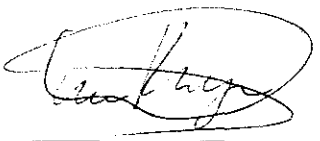
The present study examines the relationship between metacognitive strategy instruction and academic performance among children with learning problems. The metacognitive strategy instruction was based on a metalearning model. Thirty nine pupils with learning problems from grades 4 and 5 participated in the study. Academic performance data on curriculum based history tests and data from the self-report Metacognitive Learning Process Questionnaire (MLPQ) were collected. Baseline pretest data from History Test 1 indicated that pupils attained average percentage scores. Subsequent to training in the use of cognitive and metacognitive strategies pupils produced significantly higher performance scores on History Test 2. No statistically significant differences were found between the pre- and post application of the MLPQ. Increases in the cognitive and metacognitive strategies and test writing abilities sub-tests of the MLPQ were indicated. The results clearly indicated that training in metacognitive strategies coincided with an increase in academic performance. The broader implications and limitations of the study are discussed.

UITTREKSEL

Die huidige studie ondersoek die verband tussen metakognitiewe strategie opleiding en akademiese prestasie onder kinders met leerprobleme. Die metakognitiewe strategie opleiding was gebaseer op 'n metaleer model. Nege en dertig leerlinge met leerprobleme uit grade 4 en 5 het deelgeneem aan die studie. Akademiese prestasie data van kurrikulum gebaseerde geskiedenis toetse en data van die Metakognitiewe Leer Proses Vraelys (MLPV) was versamel. Basislyn voortoets data, verkry van geskiedenis toets 1, het getoon dat leerlinge gemiddelde prestasie punte behaal het. Na afloop van opleiding in die gebruik van kognitiewe en metakognitiewe strategieë het leerlinge 'n statisties betekenisvolle toename in prestasie punte getoon op geskiedenis toets 2. Geen statisties betekenisvolle verskille is gevind in die voor- en na- toepassing van die MLPV nie. 'n Toename in die kognitiewe en metakognitiewe strategieë- en toets skryf vermoëns sub-toetse van die MLPV is gevind. Die resultate wys duidelik dat opleiding in metakognitiewe strategieë toeval met 'n toename in akademiese prestasie. The wyer implikasies en tekortkominge van die studie word bespreek.

DECLARATION

This is to declare that this dissertation represents my own work both in conception and in execution.



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CHAPTER ONE

1. INTRODUCTION

1.1 MOTIVATION FOR THE STUDY

The researcher's involvement with school children on an individual and group basis has led to the observation that children who are taught metacognitive skills seem to perform better when evaluated on certain learning tasks. Observation also showed that children of average intelligence appear to learn some metacognitive skills as they are exposed to an environment that encourages the use of metacognitive skills. Further observation of children, specifically those with learning problems or those performing poorly, has brought to light that these children, unlike those without problems, do not spontaneously develop metacognitive skills.

In response to the problems that children experience and needs identified in the school, it seems beneficial to explore whether teaching children, and specifically those with learning problems, metacognitive skills will improve performance and enhance their chances of completing school and reducing the stress associated with poor performance and academic failure. It is with this in mind that this thesis explores metacognition as a factor in academic performance.

1.2 EXPLORATION OF PREVIOUS RESEARCH RELATED TO THE PROBLEM

Research on metacognition and academic performance or achievement of children with learning problems seems to indicate that this is a relatively new field of study (Geary, Klosterman & Adrales, 1990:439; Short, 1992:230; Vosniadou, 1996:98; Wong, 1987:191). There seems to be a gap in research exploring specifically the relationship between metacognition and academic performance or achievement of children with learning problems in South Africa. There are articles available, on the relationship between metacognition and other variables, which will be discussed.

In considering some kind of experimental intervention the researcher reflected on the theoretical value of using a metacognitive framework. Does metacognitive theory, specifically, contribute to the improvement of academic performance? Braten (1992:13-17) suggests that theories that can offer direction as well as insight into the processes of self-regulated learning and problem-solving are very useful in education and metacognitive theory has proved useful in this respect. He states that metacognitive theory is deeply rooted in the basic tenets of Vygotsky's theory of cognitive development. Metacognitive theory highlights concerns such as: conscious control over learning; learning without awareness; transfer of rule learning; relation of age and expertise to various aspects of planning; monitoring and error correcting; general rules for problem solving vs. content specific knowledge, and mechanisms of change. Braten mentions areas

in which further research is needed; which include the specific factors responsible for positive effects when complex metacognitive training packages are implemented; task variables (difficulty); the relationship between metacognition and motivation, and the transitional character of metacognition.

In consideration of the topic, the researcher contemplated the idea of teaching metacognitive strategies to primary school children. Would they be able to master and apply these strategies? In answer to the question, starting at preschool level, Snyman and Viljoen (1992:170-1) argue that children at this age are particularly receptive learners and that those responsible for their education/development should exploit this stage optimally by facilitating the development of metacognition and they go on to discuss various suitable strategies. There seems to be an apparent absence and lack of spontaneous development of metacognition at this age. No statistically reliable longitudinal studies have proved the necessity of early metacognitive development for later learning success, but that there is sufficient indication of the importance of metacognition to warrant further research. The research of Snyman and Viljoen (1992:170-1) indicates that there are positive grounds for teaching metacognitive strategies to young children.

In considering the method of intervention, Viljoen's (1993:115-124) statement that children with learning problems seldom take metacognitive strategies into account in the planning and execution of learning, is noted. They need to be specifically

instructed by a competent teacher on *how* to apply a variety of cognitive strategies to solve a particular learning task.

In discussion with teachers the researcher discovered a need from the side of the teachers to understand the etiology and nature of the learning problems of the children they have to deal within their classrooms every day. Viljoen (1993:115-124) states that the ability to identify and development of metacognitive skills can contribute to better understanding of individual differences in learning as well as give insight into why some children are underachievers. Metacognition is, it seems, a little known and under utilised concept in the field of teaching.

Viljoen (1993:116) mentions that differing definitions of metacognition and ways of measurement seem to be a weak point in research on metacognition, making comparison of research difficult. It seems a worthwhile pursuit to explore the nature of metacognition and the place thereof in the learning process. Viljoen (1993:116) states that further research into the manifestations of socio-cultural variables in the metacognitive skills of learners is needed, especially factors such as literacy, socio-economic status and the availability of role models.

The question can be asked; are there studies that have shown the usefulness of metacognition? Researchers such as Hugo (1993) and Chan (1991) state the usefulness of metacognition.

Hugo (1993:56-63) asserts that metacognition can be taught and that students should therefore be instructed to be able to choose applicable metacognitive strategies when reading with an aim to study (metacognitive skills focussing on a specific domain, namely reading). The presupposition is that teaching metacognitive reading strategies will result in improved comprehension while reading. This presupposition seems to be based on the idea that cognitive processes occur automatically and unknowingly, which seems to have a developmental-maturational theory as underpinning. Metacognitive processes however require conscious monitoring and controlling which supports the idea that metacognition does not therefore develop spontaneously to a useful level and *that additional teaching of metacognition to improve reading comprehension is* necessary. Hugo's research has shown an improvement in reading when metacognitive strategies are employed (Hugo, 1993:56-63).

Chan (1991:4-10) examines understanding of children's learning from a metacognitive perspective and the contribution this understanding can make in providing for the needs of students with learning difficulties. The difficulties many students experience in their school learning are related to their non-strategic approach to learning and inappropriate causal attributions for successes and failures in school tasks (lack of metacognitive skills). Chan (1991:5) also reports that students with inferior metacognitive skills were more likely to have lower levels of word attack skills, and subsequently poorer comprehension.

The researcher had a specific group of children, attending a remedial school, in mind for the study. Chan and Spedding (1991:8-12) report that while much remedial work has been done in the area of word identification (phonic skills and blending), the results of the programmes have been inconsistent, because no account has been taken of the metacognitive abilities behind these skills. Discussion revealed this to be the case at the mentioned remedial school. The pupil also needs to be assisted in acquiring the necessary cognitive and metacognitive processing skills at the word level and to change a strategy if it is ineffective.

In summary, research indicates that metacognition (as academic strategy) does not spontaneously develop to an effective level to contribute effectively to academic success, especially in children with learning problems. Further more, teaching children specific metacognitive skills in specific learning areas has a positive effect on their performance. Metacognition as a theoretical basis seems to hold promises for positive development in the area of learning problems. Based on these findings it therefore seems worthwhile to continue with the present study.

1.3 STATEMENT OF THE PROBLEM

The question then is: If a child, especially the child with learning problems or one that performs poorly, is taught metacognitive strategies/skills, will he be able to acquire these skills and to implement them so as to improve his learning

capabilities and will this result in improved academic performance?

This multiple faceted examination will aim to increase the understanding of the learning process and cognitive, as well as metacognitive skills these children employ when studying. This knowledge can be used to evaluate the usefulness of teaching metacognitive skills to children with learning problems.

1.4 AIMS OF THE STUDY

The primary aim of the study will be to examine and describe the relationship between metacognitive strategy instruction and academic performance of children with learning problems.

The specific objectives are:

1.4.1 to determine the academic performance levels of children with learning problems *before* the experimental intervention.

1.4.2 to determine the academic performance levels of children with learning problems *after* the experimental intervention.

1.4.3 to find out whether academic performance before and after the intervention is associated with the variables of age, and sex.

1.4.4 to ascertain which of the skills taught, children with learning problems actually used and to what extent.

1.4.5 To determine the difference in academic performance *between the four groups* of the sample before and after the experimental intervention.

1.5 HYPOTHESES

The hypotheses considered for this research are:

1.5.1 Children with learning problems who are taught metacognitive strategies and study skills will not show greater achievement after the experimental intervention.

1.5.2 There will be no relationship between academic performance and the variables age and sex either before or after the experimental intervention.

1.5.3 Different metacognitive strategies do not yield different performance scores.

1.5.4 There will be no difference in academic performance between the four groups of the sample both before and after the experimental intervention.

1.6 DEFINITION OF TERMS

1.6.1 Metacognitive strategies

In this study, the concept of metacognitive strategies shall be defined as: t h e behaviour that displays the selection, monitoring and control of the thought processes through which knowledge is acquired and structured.

1.6.2 Academic performance

In the present study academic performance shall mean the quantitative score achieved on specific content tests designed for the purpose of the research.

1.6.3 Children with learning problems

The present study defines operationally, the phrase "children with learning problems" as; those children placed in the remedial school due to their poor performance compared with their age and ability levels in one or more learning area where learning experiences appropriate for their age and ability were presented. These children display a severe discrepancy between achievement and intellectual ability in one or more of the following areas: oral and written expression, listening and reading comprehension, basic reading skills, and mathematical calculation and reasoning, as well as visual-perceptual-motor integration delays. The children involved in this study can be classified as children with learning problems which specifically include children with learning disabilities.

1.7 METHODOLOGY

1.7.1 Literature study

An in depth literature study will be done focussing on current research on metacognition as it relates to learning, achievement/performance and children with learning problems.

1.7.2 Sample

The study sample (±N=40) will consist of selected children with learning problems from a local remedial school. Sample design will be discussed in chapter 3.

1.7.3 Method for collection of data

In order to achieve the set objectives the following methodology will be utilised: The subject focus of this study will be on the application of metacognitive skills in social science subjects. Unlike a lot of the research done (Elliot, 1993:1; Hugo, 1993:56; Powell & Makin, 1994:579; Tobias, 1995:399;), that has concentrated broadly on mathematics and reading, a social science subject will be used. History will be used as a subject representing the social sciences.

Methodology that will be used, to pursue each objective of study, will be briefly presented:

Objective 1.4.1

A history lesson will be presented by the teacher and monitored by the researcher. Thereafter the pupils will be given one week to study for a test, on the history lesson, to determine their performance levels *before* any experimental intervention.

Objective 1.4.2

A similar history lesson will be presented by the teacher and monitored by the researcher. Thereafter the pupils will be given one week to study for a test, on the history lesson, to determine their performance levels *after* the experimental intervention.

Objective 1.4.3

Statistical analysis will be performed to determine the relationship between performance scores and of the variables; age and sex.

Objective 1.4.4

A questionnaire will be completed by the pupils to determine which metacognitive skills/strategies were employed and to what extent. This needs to be done in order to determine which metacognitive skills are utilised by the children and to determine their learning process.

Objective 1.4.5

Statistical analysis will be performed to determine the difference between the four groups of the sample both before and after the experimental intervention.

1.7.4 Method of data analysis

Data analysis needs to be flexible to allow the use of a wide variety of analytical tools. The statistics to be used will be discussed in chapter three.

1.8 PLAN OF STUDY

This study will be organised as follows:

1.8.1 Chapter 1

This chapter consists of a motivation for investigation in this field, statement of the problem, aims and objectives of the study, methodology and a plan for the organization of the whole scientific report.

1.8.2 Chapter 2

Chapter two will provide a theoretical background to the study. This background will consider and discuss the nature of and the factors involved in metacognition and learning performance or achievement.

1.8.3 Chapter 3

This chapter will detail the research design and methodology of the study. The design and method of investigation will be discussed in detail, including, hypotheses, the selection of samples, the implementation of fieldwork, collection of data, measuring instruments implemented and a plan for organising and analysis of data.

1.8.4 Chapter 4

Chapter four will focus on the results of the empirical investigation, analysis and interpretation of data. The hypotheses formulated in chapter one will be tested in this section and findings will be discussed.

1.8.5 Chapter 5

This chapter concludes the research report by discussing the limitations of the study, by making recommendations for improved development and implementation of the teaching of metacognitive skills to children with learning problems and suggesting topics for future research.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 INTRODUCTION

In the rapidly changing environment of South Africa, both parents and educators recognise the importance of preparing children to become self-sufficient, independent learners who will be able to fend for themselves and contribute as productive adults in our society. The aim of schooling still seems to be to educate our children to the best of our abilities. In this process it is the responsibility of the teacher to facilitate positive growth. However, it can be said that education is still focussed on teaching basic skills such as reading, writing, arithmetic and presenting curriculum contents to students. In today's work environment, basic skills that were appropriate 20 years ago are no longer sufficient to equip children for the world beyond school. In our accelerating information age children will need skills that will give them control over their lives and their learning. They will need knowledge, but more importantly they will need the capacity to gain new knowledge. When life presents situations that cannot be solved by learned responses, metacognitive behaviour is brought into play. Metacognitive skills are needed when habitual responses are not successful. Guidance in recognizing and practice in applying metacognitive strategies will help students successfully solve problems throughout their lives.

It can generally be said that past theories of learning tended to focus on simpler forms of learning. These theories were successful in generating many improvements in the teaching of basic skills. Today there is a greater emphasis on the process of learning, on investigation and problem solving, on reading for meaning, on the use of reasoning in writing, on study skills and on developing autonomous ways of learning (Fisher, 1990:vii).

Research over the past two decades in psychology in general, and educational psychology in particular, have progressively focussed on the role that metacognition plays in the learning process. Despite the definition and theoretical explanation used, the goal of learning psychology has traditionally been to formulate general laws of learning valid for all humans. In early research it was found that people differ in respect to learning effectiveness, even when external conditions were held constant. These findings led to further research in an attempt to explain why these differences occur. In the early 1950s the focus shifted to research into individual differences. Differences in the learner's prior knowledge, in available cognitive processes and in learning and memory strategies, were used to explain inter- and intra-individual performance variation in learning. More researchers started to focus on theories of cognition, metacognition and memory (Weinert & Kluwe, 1987:2).

Before moving onto metacognition it is necessary to explain the concept and process of learning and where metacognitive strategies fit into this process. Slabbert (1993:38) states that many still believe that learning is the receiving and

storing of information or content, to be reproduced at the appropriate time. He asserts that learning is a constructive process where the learner constructs meaning for himself through competencies employed for this purpose. When teachers teach preconstructed meanings, these meanings are conveyed to children to accept and in the process, it restrains them from constructing their own meaning. They experience no need to develop, own, or employ any competencies to construct meaning. Children are often handed content summaries done by the teacher to "simplify" their learning task. This denies them the opportunity to interact meaningfully with the content and they are often expected to regurgitate meaningless information. It seems that traditionally metacognitive strategies do not form an active part of the learning process and teachers are not teaching metacognitive skills. Learners must be helped to assume increasing responsibility for planning and regulating their learning. It is difficult for learners to become self-directed when learning is planned and monitored by someone else.

According to Bondy (1987:8), Bransford (1979) declares that more emphasis is placed on what children know rather than their ability to realise gaps in their current knowledge and ineffective learning. Learning outcomes are more highly valued than learning processes. Bondy (1987:8) further notes that Schallert and Kleiman (1979) and Baker (1979) say that teachers who maintain strict control of student learning may discourage the development of metacognitive skills. Learners have difficulty becoming self-directed when their learning is directed and monitored by others. Similarly, when teachers and instructional programmes

monitor students' comprehension, they may inhibit the development of self-checking skills (part of metacognitive strategies).

The researcher wishes to embrace the view of learning defined as the mastering of competencies through which content is obtained. How content is taught is more important than the actual content itself. The focus is on the process, rather than on the content, which should serve as a means by which competencies are acquired.

An age-old sentiment is often echoed by students today when they ask, "Why do I have to know this boring work, I will never use it one day..." Parent and educator alike frequently answer that it will make you clever and help you solve problems. Children's disbelief and inability to comprehend this idea often indicate that these children are not consciously aware of the underlying competencies they acquire in the process of giving meaning to the contents they are exposed to at school. These competencies can be regarded as a set of generic skills that can be applied in a variety of learning situations. Cognitive and metacognitive strategies and skills are the competencies that facilitate the process of giving meaning to content.

The researcher believes that not only are these competencies the ways and methods used to give meaning to content, but also valuable strategies that are "learned" which enable the learner to grow in the skill and art of learning. These competencies are both the means and the end of the learning process. It is for this reason that this study examines the relationship between metacognitive

strategies and academic performance among children who experience learning problems. In essence this study looks at metalearning and specifically at metacognitive strategies in achieving effective learning as indicated by academic performance.

In the rest of this chapter the process of metalearning is expounded on, the nature of metacognition as a concept is explored, and some questions, problems and issues surrounding the concept are examined. The relevance of metacognitive theory and research to the field of learning and learning problems is considered, which includes: self-regulation, effective learning and learning problems; other regulation, specific research on the relationship between metacognition and academic performance; and reading as a special issue in this research.

2.2 THE PROCESS OF METALEARNING

The researcher has often noticed the haphazard and disorganised way in which children with learning problems attempt to start, execute and complete a learning task. Their efforts rarely seem to include stages such as effective planning, careful execution and monitoring of the results of their learning process. The aim of this research is to explore whether a child with learning problems can be taught the knowledge and use of metacognitive strategies. These metacognitive strategies, however, cannot be implemented in a disjointed fashion, but rather need to form part of a process that can be described as the metalearning process.

According to Slabbert (1993:39) metalearning is the activity of a learner who is aware of his learning process and who can intentionally plan, execute and evaluate his learning. Metalearning implies the learner has conscious control over learning. First, a learner has to plan his learning. When this is done, he should represent or picture the learning task which will show understanding of what is expected. Then the learner will be able to select the learning strategy to execute the learning task. Although executing is not really a metalearning strategy, it is of vital importance that the learner should execute the learning strategy planned as a starting point.

Monitoring is the most important component of metalearning strategy and entails continuous control over each step in the learning process by activities such as self-management, self-questioning, anticipation, elaboration and verification. It is the learning process which is the focus during monitoring. The quality of the product is assessed and questions such as the following are asked: What is the quality of my learning task outcome? Did I achieve the requirements? How does my product differ from the others? What did I learn from this? How will I be able to use the new knowledge I have obtained?

In the process of metalearning, metacognitive strategies are employed to accomplish a learning task. If quality learning is obtained through metalearning, then teaching for metalearning will reach the requirement of quality teaching for all. In order to achieve the aim of effective metalearning, metacognitive strategies need to be employed.

2.3 DEFINING METACOGNITION AS A CONCEPT

2.3.1 WHAT IS METACOGNITION?

Although Flavell (1987) defined metacognition as "knowledge concerning one's own cognitive processes and products or anything related to them," there is currently some debate as to how exactly metacognition should be defined. Metacognition as a concept has grown and developed over the past two decades opening up new avenues for research. This literature review will show the dynamic nature of the term metacognition, and how it continually seems to change and grow. Defining this concept has however remained a contentious subject and researchers have not reached consensus about what exactly the term covers and what not. The basic premise seems to be that metacognition refers loosely to one's knowledge and control of one's own cognitive system. Over the years it seems to have retained its 'fuzzy' label which contributes to the confusion and difficulty in comparing research in this field. Researchers continuously define and redefine metacognition, adding to, subtracting from and modifying the concept.

The question remains, what is metacognition? Some object to simple knowledge (such as knowledge of which strategy to use for a particular problem, or knowledge of strategies to remember something) being labelled metacognition. This term has been used to refer to everything from knowledge of strategies, executive control of strategies, and self-monitoring of activity to such things as checking solutions to equations, listing possible strategies for solving a problem,

detection of errors within a reading passage, knowledge of sources of motivation, and self-correction of errors (Bondy, 1987:7). While this process is common when new constructs appear, and generates considerable enthusiasm, it is necessary to arrive at a fairly clear conceptual definition of what metacognition is, or risk having everything labelled as metacognition, in which case the construct loses its meaning.

In an attempt to define metacognition, one soon realises that the concept, as it was originally defined by Flavell (1987:21) in the early 1970's, is not devoid of roots. Metacognition seems to be used as a blanket concept that loosely incorporates a family of sub-concepts. According to Brown (1987:65) the historical roots of metacognition can be traced through four separate strands of enquiry: firstly, verbal reports as cognitive processes and the validity of verbal reports as data, secondly, executive control within an information processing framework, thirdly, self-regulation, metaprocedural reorganization, and consciousness and who has it, reflected abstraction from the Piagetian school of developmental psychology, and lastly the transference from other-regulation to self-regulation, inspired by Vygotsky's theory of development. Even though the term has remained 'fuzzy' in definition many argue that metacognitive concepts lie at the root of the learning process.

Two primary problems in defining and applying the term are: it is often difficult to distinguish between what is meta and what is cognitive; and there are many different historical roots from which this area of inquiry developed. Adding to the confusion is the proliferation of sub-concepts or terms used including:

metamemory- knowledge about and regulation of memory states and processes. An example of this would be students knowing that they will recall information better on a test if they study in the same room as where they will be tested using mnemonics to help them remember information. Metacomprehension - used to describe monitoring of one's comprehension, also referred to as self-monitoring for comprehension. An example of this would be someone realizing that he does not fully understanding something he is reading. Meta-attention - controlling and regulating one's attention. An example of this is selectively ignoring task-irrelevant stimuli, and focussing attention on relevant stimuli. This could also be broadened to include knowing when one's attention has wandered from the task, and using strategies to keep one's attention on task, such as talking out loud to oneself or structuring the environment to be conducive to attending to the desired stimuli (turning off music while studying, perhaps). The confusion has mainly resulted from the use of a single term for a multifaceted problem.

Viljoen (1993) summarizes the development of this fluid concept. In Viljoen (1993:116) Paris and Winograd (1989) highlight that the original definitions of Brown (1978) and Flavell (1978) make use of prototype examples to define the concept. The definition of metacognition is done in open-ended terms and researchers mostly value thoughts and learning as important in the process.

Katz and Hartman-Maeir (1997:54) suggest that cognition can be divided into two major elements: cognitive skills and metacognitive skills. They name the sub components of each of these, for example, cognitive skills consist of attention,

memory, visual spatial perception, categorization skills; and metacognitive skills are comprised of self-awareness and executive functions.

Flavell (1987:21), in his original research, defined the term metacognition as knowledge and cognition about cognitive objects. He further subdivided metacognitive knowledge into three categories: Knowledge of person variables; knowledge of task variables and knowledge of strategy variables. Individually and collectively these three variables illuminate the structure of metacognition as it was originally defined:

Knowledge of ***person variables*** encompasses everything one believes about oneself and other people as cognitive processors. It also includes knowledge of a subject area and belief in one's ability to deal with this area. There are three sub-categories of person variables: Firstly, intra-individual knowledge is the individual's knowledge about his own cognitive abilities such as knowing that it is easy to memorise verbal material and that spatial tasks are more difficult. Secondly, inter-individual knowledge refers to comparison between, rather than within, persons. An example would be: judging that one is able to recall a list of digits more readily compared to one's friends and younger children. Thirdly, universal knowledge refers to general knowledge most people acquire about cognition; such as the fact that most people's short term memory is fallible and of limited capacity. This knowledge is acquired in the process of maturational development and is used by most individuals in managing their lives (Flavell, 1987:22).

The second subcategory, ***task variable,*** is the individual's knowledge he gains from experience that different tasks demand different kinds of processing. It is the knowledge we have about the nature of the task and how this determines how the task must be approached. An example is the difference between memorising a short poem and memorising a page from a telephone directory. You might learn through experience that memorising pages from a telephone directory is much more difficult than memorising a passage from your favourite poem. In order to learn the pages from the telephone book it would be necessary to proceed slowly and carefully, whereas learning a favourite passage requires much less effort and repetition. As we mature and develop as learners we supposedly learn through encountering different kinds of information, that each kind requires a different kind of processing. We also learn that different kinds of tasks place different kinds of information-processing demands on us. We learn about the implications of various task demands for self-processing. Some, such as learning complex mathematical formulas, demand more, whereas memorising a telephone number requires less effort (Flavell, 1987:22).

The third subcategory is knowledge of ***strategy variables***. Strategy variables are those cognitive strategies or procedures used for getting from one point to the next in order to achieve various goals. It thus refers to the repertoire of strategies we have available as well as the ability to choose the appropriate strategy to deal with a task. It is this strategy component of Flavell's definition that seems to contribute to the confusion about what can be defined as metacognition and what not. The matter is complicated when the same cognitive functions are used for

different goals and in this process labelled as metacognitive functions. Flavell (1987:23) suggested that one can distinguish between cognitive strategies and metacognitive strategies. A cognitive strategy is one designed simply to get the individual to some cognitive goal or sub-goal e.g. a cognitive strategy for getting the sum of a list of numbers would be to add them up. The goal is to find the sum and in order to do so the numbers are added. In the same situation, a metacognitive strategy might be to add the numbers a second time to be sure the answer is right. The purpose of the second or even third addition is different from that of the first. The purpose is no longer to reach the goal (cognitive strategy), but rather to feel absolutely confident that it has been reached (metacognitive strategy). Likewise Bondy (1987:7) states that a child who summarises a chapter just read, exercises cognitive skills. When the child constructs a summary as a means of obtaining feedback on his understanding of the material, he engages in metacognition. The difference between cognition and metacognition is a difference in self-awareness and control. Another example would be reading a passage slowly in order to learn the content (cognitive strategy) as opposed to skimming a passage in order to get an idea of how difficult or easy it would be to learn the content (metacognitive strategy). Cognitive and metacognitive functions are differentiated by the different goals set out by the learner. In the course of development one learns about cognitive strategies for making cognitive progress and about metacognitive strategies for monitoring the cognitive process. It is at this stage of Flavell's framework that he mentions the monitoring aspect of metacognitive knowledge. Finally, he emphasises that person, task, and strategy

variables always interact, and that intuitions about their interaction are also acquired (Flavell, 1987:23).

Flavell (1987:24) discusses another related concept, namely metacognitive experiences, that forms part of his metacognitive framework. Metacognitive experiences are conscious experiences that are cognitive and affective in nature. A metacognitive experience can be any kind of affective or cognitive conscious experience. One is having a metacognitive experience whenever one has the feeling that something is hard to perceive, comprehend or remember, or solve; If there is the feeling that one is far from the cognitive goal; or if one has the sense that the material is getting easier or more difficult than it was a moment ago. If a person realises that he does not understand something which he has just read or he realises that he knows a great deal about a subject, this person is metacognitively evaluating his knowledge. Metacognitive experiences play a very important role in every day cognitive life. As one grows older one learns how to interpret and respond appropriately to these experiences. The converse implication is that young children may have such conscious experiences, but may not know how to interpret them very well; children simply may not know what these experiences mean and imply (Flavell, 1987:24)

Another source of confusion concerning the wide spread use of the term metacognition is that, within the modern psychological literature, it has been used to refer to two distinct areas of research: *knowledge about cognition* and

regulation of cognition. These two areas are indeed closely related but do however have readily distinguishable historical roots.

Knowledge about cognition refers to the stable, statable, often fallible information that human thinkers acquire through learning and have about their own cognitive processes. Piaget (Seifert & Hoffnung, 1987:68) stated that the reflected abstraction required of knowledge about one's own cognitive process demands formal operational thought which is rarely found in the very young child or novices.

In Flavell's (1987:21) definition of metacognition he focusses mainly on the knowledge component of the concept. The three sub-categories of knowledge he uses, namely person, task and strategy variables, seem to be the focus of his definition.

Viljoen (1993:117) discusses the types of *metacognitive knowledge* we have that can be divided into:

- procedural - the person who summarises, knows *how* to identify main ideas;
- declarative - selection of main ideas; and
- conditional knowledge - *when* and *why* certain strategies are used to summarize.

Viljoen (1993:117) states that Paris and Winograd (1989) maintain that metacognition can be seen as shared *knowledge;* knowledge acquired through verbal explanation, teaching strategies and indirect methods. Shared knowledge is observable, verifiable and measurable and is directional for cognitive activities.

The *second cluster of activities*, distinguished from the knowledge component of the definition dubbed as metacognitive in developmental literature, consists of the activities used to *regulate* and oversee learning. These processes include planning activities (predicting outcomes, scheduling strategies, and various forms of vicarious trial and error, etc.). Before attempting a problem, monitoring activities (monitoring, testing, revising, and rescheduling one's strategies for learning) during learning; and checking outcomes (evaluating the outcome of any strategic actions against criteria of efficiency and effectiveness). It has been assumed that these activities are relatively unstable, not necessarily statable, and relatively age independent (i.e., task and situation dependent). It seems that all active learning involves self-regulation and though these activities are not always statable they are used by adults and children to varying degrees. And even when these activities are not statable; knowing how to do something does not necessarily mean that the activities can be brought to the level of conscious awareness and reported to others (and can the learning disabled child report on his own thoughts?).

In subsequent definitions of metacognition this *control* or *regulation component* is more often added. For example, Viljoen (1993:116) states that Braun (1984) included a knowledge *and* control component in his definition.

Viljoen (1993:117) includes this *control component* when he states that metacognition is important in the classroom; it is critical in situations where children have to master content and to develop comprehension of own thinking during the learning situation. This consciousness of own mistakes in learning and thinking and the correction thereof is part of metacognition.

The idea that we as humans have conscious access to our own thought processes and that we are able to control our thoughts is one that has developed over time.

Hugo (1993:57) states that metacognition stems from the terrain of cognition, in other words, from the study of thinking. She describes metacognition as the cognitive activities which are present when a person thinks about his thinking and regulates this thinking. The difference between cognition and metacognition is the self-awareness *and* control a person has over his thinking.

Hugo (1993:58) states that Du Toit (1990) asserts that cognitive processes occur automatically and unknowingly. Metacognitive processes however, require conscious monitoring and controlling. According to Hugo (1993:58) Haller, Child and Walberg (1988) state that the term metacognition is widely used to refer to a person's awareness of his own cognitive processes.

Central to the controversy surrounding the definition of metacognition and its use in research is this issue of conscious access to cognition. In this research participants will be asked to comment on their own thought processes. The aim is to gather information through a process of verbal reports in order to understand the processes children go through when they study. However, problems associated with data gathered as verbal reports are anticipated. According to Brown (1987:72) these problems are well illustrated in developmental psychology. First, there is the obvious problem of asking children to reliably inform on the content of their own conscious thought processes. Craig (1989:250) states that Piaget, for example, has pointed out, children are likely to distort and modify their observations of their thought processes as they see their observations of the world around them. It is referred to as a problem of externalising mental events. What a child says he or she has done or will do is not necessarily related to his or her performance which makes reliance on verbal responses risky. This relationship between what a child says he knows and what he does is not clear. Children may also endorse items they interpret to be desirable, regardless of whether they actually engage in the cognitive activity; different children may interpret items in different ways, making it difficult to compare responses; children may engage in metacognitive activities that are not assessed in self-reports, thus, our understanding of metacognitive processes is limited to activities represented on a self-report inventory. This raises issues such as; are we as humans capable of reflecting and commenting on our own thought processes, how can the accuracy of what we report be validated, what is the relationship between what we say we did and our actual performance, are young children aware of their

cognition and metacognition, are they accurate and unbiased observers of their own cognition and metacognition, and can they report their observations accurately, etc. Many questions are raised in the process of trying to capture and define the phantom-like concepts we label as cognition and metacognition.

According to Brown (1987:69) the concepts of multiple and reflective access are key issues in the field of metacognition and in developmental psychology. It refers to the essential human ability to step back and consider one's own cognitive operations as objects of thought and to reflect on one's own thinking. Original interest was aroused by the persistent finding of a production deficiency in young children's learning which is a classic problem of access. Children who know perfectly well how to use a strategy or have the relevant prior knowledge, often fail to access it on appropriate occasions. One of the primary problems with young learners is that they tend to acquire information that is "welded" to the form and context in which it was acquired. Reflective access was also pinpointed as a problem for the young and particularly the retarded learner. On the basis of the relative absence of these qualities in slow learners, multiple and reflective access has been diagnosed as underlying mechanisms of intelligent behaviour which impact on the ability to learn and perform effectively (Brown, 1987:69).

One must also distinguish between the many forms of context that the child is asked to comment on. Many forms of knowledge about cognitive things can be assumed to be stable, others are transient and are elicited only in certain

situations. Stable forms of knowledge are the kind of information learners may possess about themselves as learners and about the learning context. Practised learners come to know a great deal about the learning situations. They know certain stable characteristics about themselves as learners; they know the demands of certain classes of problems, and they are aware of the necessity of tailoring their learning activities so that they will be finely in tune with specific criterial tasks (Brown, 1987:73). As discussed before, Flavell classified the types of knowledge as person, task and strategy variables. Learners possess naive theories of what it takes to learn certain types of materials, in order to meet certain criterial task demands. They also know a lot about their repertoire of available strategies needed to accomplish certain ends. It has been well documented that young children are less informed about stable characteristics of learning. This lack of stable, statable, knowledge is due to children's relative lack of experience in learning situations that occur repeatedly in school; it reflects their novice status as deliberate learners (Brown, 1987:73).

In this research project statable forms of knowledge will be tapped by using a questionnaire in order to acquire retrospective information. The option of utilising verbal reports, where knowledge is assessed during the actual performance of a task, was rejected. Brown (1987:70) highlights the idea that young children are judged to be incapable of the split mental focus that is required for simultaneously solving problems and commenting on the process. A more common and problematic procedure is to ask children to describe how they would behave in certain hypothetical situations. It must be stated that although metacognition is

executive and regulatory, it is arguable that it needs to be conscious or purposeful - it is possible and even likely that at least some metacognition is automatized and below conscious awareness.

There are many reasons to explain the lack of a close correspondence between what one knows and what one does and future research could concentrate on the specific circumstances under which one would predict a positive or a negative relationship between verbal reports and performances. Brown (1987:76) reports that in studies where learners were asked to verbalise or think out loud they were significantly slower than the control group where they had to state a rule or a reason for an action. It was found that when subjects were forced to think out loud it induced more deliberate planning. Verbal reports can often have negative effects on the learning process. This situation occurs when the requirement for overt verbalisation competes for central processing capacity with the processes that must be reported and verbal reports of information that are not generally available to consciousness is a disruptive procedure.

According to Brown (1987:77) Ericsson and Simon (1980) point out, that asking people to describe the general processes they might use in imaginary situations, is the least favourable circumstance for producing verbal reports that are closely linked to the cognitive processes under discussion. Studies where children are asked to predict how they will perform in tasks or describe how they fared are also imperfect. Tentative evidence suggests that children are better able to identify the items they recall, than to predict in advance how well they will do. Questions

cannot be addressed, or answered adequately, unless researchers are precise about the type of verbalisations, the type of cognitive process, and the theoretical rationale for expecting a positive, negative and neutral relation between verbalisation and cognitive process (Brown, 1987:77).

In summary, the issue of conscious access to cognition and the verbal report thereof contributes to the confusion and controversy surrounding the definition of metacognition. In practical terms, access to and verbal reports of cognition by especially young children and those with learning problems place limitations on the validity of information gathered. The use of retrospective reporting is indicated as the most appropriate method of data gathering in this research, however it is acknowledged that some metacognition is automatised and below consciousness and that not being able to verbalise this knowledge does not indicate a lack thereof. Also, the conditions must be specified exactly under which children's reflective access to their own cognitions are observed. Questions need to be answered such as: under what conditions is it reasonable to ask for verbal reports, do specific restrictions on adults' verbalisations, under varying circumstances, apply to children, or do young learners experience particular difficulties, for example, in imagining possible actions in situations as yet unexperienced. Do children have particular problems talking about general rules rather than specific activities?

In short, in defining metacognition it is accepted that children do have conscious access to cognition and that verbal reports as data are associated with certain

limitations especially where the younger and learning disabled child is concerned. Future research involving the systematic evaluation of the function of verbal reports in specific learning situations is indicated.

In addition to accepting that children have conscious access to cognition, some authors focus on control strategies in their definitions. For example, according to Bondy (1987:7) Brown and DeLoache (1978) identified the basic *skills* of metacognition and defined them. These basic skills of metacognition include *predicting* the consequences of an action or event, *checking* the result of one's own actions (did it work?), *monitoring* one's ongoing activity (how am I doing?), *reality testing* (does this make sense?) and a variety of other behaviours for *coordinating* and *controlling* deliberate attempts to learn and solve problems.

Hugo (1993:58) further states that Sternberg (1985) says that metacognition is "higher order control processing...used in executing , planning and decision making." According to Hugo (1993:58) Mancall (1986) believes that metacognition encompasses all the thinking a person does to evaluate his own cognitive processes and to plan for the appropriate use of these processes to meet the demands of a situation.

Bondy (1987:7) states that one may exert conscious control over the cognitive processes involved in remembering, attending, comprehending and using language; hence the terms metamemory, meta-attention, metacomprehension, and metalinguistic awareness. Cognitive processes emerge early in development.

This sequence fits Vygotsky's view of conceptual development as described by Fisher (1990:136) that is, first knowledge is acquired, and then conscious control of knowledge is gradually developed. Brown and Smiley (1978) according to Bondy (1987:8) pointed out that metacognitive abilities do not appear magically in the development of the child. Rather, these abilities interact with task demands and situations. The significance of this is that even adults may fail to engage in metacognitive processing if faced with a difficult task. Bondy (1987:8) says that metacognitive abilities of self-regulation, self-control and self-direction are critical to success in the future. Such skills promote the independence and discipline needed for life long learning and self-renewal (Bondy, 1987:8).

Although knowledge and regulation of cognition are interdependent and closely related, the two forms of activity have different roots and different attendant problems. The tension generated by the use of the same term, metacognition, for two types of behaviour has complicated research and the comparison of research findings.

In summary, review of literature indicates that Flavell's (1976) original definition of the term metacognition, referring to cognition about cognition or knowledge concerning one's own cognitive processes and products or anything related to them, has remained a dynamic one. Metacognition is sometimes used as a blanket term incorporating various sub-concepts which complicate comparison of research and results. Metacognition is sometimes defined as awareness of cognitive skills only or as control/management or executive functions only or both.

Important aspects of metacognition seem to be firstly, that it contains a knowledge component and secondly, a management or control component. The definition has grown and developed over the years and issues such as conscious access to cognition and the value of verbal reports as data have contributed to the confusion. It is also noted that the lack of knowledge and management or control of metacognitive strategies seems to be characteristic of the novice and child with learning problems. It seems that metacognition strategies do not seem to develop naturally in especially children with learning problems and needs to be taught. There seems to be general agreement that metacognition is closely associated with effective learning and forms an integral part of metalearning. For the purpose of this study metacognitive strategy is defined as: behaviour that displays the selection, monitoring and control of the thought processes through which knowledge is acquired and structured. This definition implies knowledge and control/management of cognitive strategies as part of the learning process.

2.4 THE RELEVANCE OF METACOGNITIVE THEORY AND RESEARCH TO THE FIELD OF LEARNING AND LEARNING DISABILITY

The focus of this study is to specifically examine the relationship between metacognitive strategies (as discussed in the preceding section) and academic performance among *children with learning problems.* In this section previous research is explored in order to highlight the findings and related factors involved in research that preceded this project. The difference between effective learners and children with learning problems is highlighted. The difficulties that children with learning problems experience with **self-regulation** are explored as well as deficiencies in **other regulation** and interactive learning processes that have been indicated as primary sources of developmental retardation. **Specific research** on the relationship between metacognition and academic performance is explored. Finally, **reading** as a special issue in this research is briefly considered.

2.4.1 Self-regulation, effective learning and learning problems

Self-regulatory functions are integral to the learning process and are central mechanisms of growth and change and have a central place in the emergent field of metacognition. Inherent to the difference between effective learners and children with learning problems is the issue of self-regulation. Brown (1987:88) states that any active learning process involves continuous adjustments and fine-

tuning of action via self-regulating processes. Psychologists interested in mechanisms of growth and change have traditionally been concerned with self-regulating processes, because a great deal of learning takes place in the absence of external agents. As indicated in the previous section, in recent times the term metacognition has been expanded to encompass regulatory functions, such as error detection and correction. The historical roots of these concepts can be found in most of the major developmental theories. Consideration is given to Piaget's theory of regulation and the growing emphasis in developmental psycholinguistics on error correction, systemisation, and metalinguistic awareness.

Brown (1987:90) summarizes Piaget's theory of regulation in which he examined the mechanisms of learning and the influence of both conscious and unconscious regulatory functions in promoting conceptual change. He distinguishes between three primary types of self-regulation: autonomous, active and conscious regulation. To summarise Piaget's developmental progression: the initial stage of autonomous regulation involves unconscious adjustments and fine tuning of motor actions; next the child becomes capable of testing out theories-in-action, via concrete trial and error. Despite the lack of conscious surveillance on the part of the learner, this active regulation can lead to successful problem-solving. Even though the learner cannot describe how they were accomplished actions can be successfully completed. Consciousness first emerges as the child becomes capable of reflecting on his or her own actions in the presence of the actual event. At this initial stage, reportage is tied to concrete action, but does not direct it. Because consciousness is not directly linked to conceptualisation, the child's

reactions remain elementary, the subject is likely to distort conceptualisations of what he observes, instead of recording it without modification (characteristic of the children participating in this research). At the most mature level, which Piaget would prefer restricted to the stage of formal operations, the entire thinking process can be carried out on the mental plane. The learner can consciously invent, test, modify and generalise theories and discuss operations with others. In brief the developmental progression is from unconscious autonomous regulation to active regulation. Cognitive maturity is characterised by conscious processes that can be carried out exclusively on the mental plane where theories can be created, tested, confirmed, refuted and corrected (Brown, 1987:90).

It is agreed that there are many degrees of self-regulation and that self-regulation is essential for any "knowing act". However, a sharp distinction is made in Genevan psychology, unlike metacognitive literature, between conscious awareness and direction of thought, and self-correction and regulation that can proceed below the level of consciousness. Reference is being made to spontaneous metaprocedural behaviour, rather than to explicit awareness. Piaget specifically distinguishes sharply between active regulation as part of any knowing act and conscious regulation and direction of thought. The first process is age independent; even young learners succeed in action by regulating, correcting, and refining his or her current theories. The second process, guided by reflected abstraction is late developing, and indeed, for Piaget, this is the keystone of formal operational thought. An area of confusion in metacognitive literature is the

essential distinction between self-regulation during learning and mental experimentation with one's thoughts.

Brown (1987:96) reports on research by DeLoache, Sugarman and Brown (1981) who found that young children (24-42 months) are capable of regulating their activities via a systematic procedure of error detection and correction. Of interest is the notion that the child's error correction strategies provide a window through which the child's theories-in-action can be viewed. The very processes used to correct errors reflect the level of understanding the child has of the problem space (so teachers can see the levels and can adapt teaching levels and methods).

The specific question posed in this research is whether it is possible and desirable to teach learning and metacognitive strategies to children with learning problems. In order to justify the teaching of these metacognitive strategies, the following questions must be asked. Do 'normal' effective learners develop and acquire knowledge about learning strategies and do they use these learning strategies? Do they use metacognitive strategies? How do children with learning problems differ from these 'normal' learners?

Viljoen (1993) thinks that effective learners are able to control and focus the thinking processes, to improve learning and to deal with abstract concepts necessary in academic learning. Effective learners ask themselves questions, they organise their thoughts and they connect new content they are trying to learn with previous experiences and knowledge they already own. They try to predict what

is going to happen next and they judge the relevancy and meaningfulness of new information. Effective learners show active interest in learning and problem solving. Effective learners thus know how to execute a learning action and they own a variety of cognitive strategies that work for them.

Conversely, research involving learning disabled children suggests that some learning disabilities are at least partially due to a lack of metacognitive processing. Additionally, studies show that interventions designed to teach learning disabled children how to be more metacognitive can improve the academic performance of these children. For example studies have confirmed positive effects on low achievers in both reading and math, and there is no reason to suspect it cannot help in other areas as well (Montague, Applegate, & Marquard, 1993). In light of this, it should not be surprising that low achievers and those with learning problems also benefit from metacognitive instruction.

Viljoen (1993:121) states one characteristic of children with learning problems is that they do not have these functional cognitive learning strategies. They do not know how to control and focus their thoughts to learn, they do not know how to acquire knowledge or how to remember the information they learned. Children with learning problems then need specific *teaching in how* to learn. They have to make a conscious effort and need to learn effective cognitive strategies to facilitate learning and remembering. When these strategies are mastered they can be applied in a variety of situations. Research shows that children with problems improve after they have been taught specific learning strategies (Viljoen,

1993:121). It appears that effective learners use metacognitive strategies. This stresses the importance of examining the effect of teaching metacognitive strategies to ineffective learners and the observation of the results.

Wong (1990:21) states that metacognitive research gives us better insight into the academic difficulties and failures of learning disabled (LD) children. Wong mentions that one view of the cause of learning disabilities focusses on an ability-deficit. The basic premise of the ability deficit approach seems to be that certain children seem to fail to learn effectively at school because of deficits in processing functions. A child with an auditory processing deficit for instance, will experience difficulty with auditory instructional approaches, such as the teaching of phonics (Wong, 1990:21). Special instructional methods are proposed to help the child learn. This could include building or strengthening the ability deficit. The alternative is to use a different modality of teaching in which the child is able to learn, thus capitalising on the child's abilities and circumventing the ability deficit. A combination of the two has also been proposed. Wong highlights the limitation in this approach. There is often little transfer between strengthening an ability deficit and the application thereof in practice. Doing pure auditory exercises does not necessarily translate to effective use and application of these exercises. Practising phonics in isolation, for instance, will not necessarily lead to improved reading skills. Wong states that the relationship between LD children's ability deficits and their academic failures has yet to be researched and established. In contrast it has been shown that efficient reading and effective studying require metacognitive skills. If we accept that multiple and interactive factors underlie

successful learning, then it can be said that metacognitive skills and strategies play a crucial role in coordinating those factors (Wong, 1990:22).

In summary we realize that the different theories of the causes of poor performance influence the remediation thereof. It has been shown that the ability deficit theory insufficiently explains poor performance and that metacognitive theory certainly adds to the understanding and remediation of learning problems. Self-regulation forms an integral part of the learning process and can be taught.

2.4.2 Other-regulation

Often children, especially those with learning problems, are not adequately instructed in the art of learning which includes the acquisition of metacognitive strategies. Important as the process of self-regulation may be, a great deal of learning occurs in the presence of, and is fostered by, the activity of others. Supportive others, such as parents, teachers, peers, guide a novice to mastery.

Brown (1987:100) reports that a great deal of work conducted on other-regulation has taken place within the framework of Vygotsky's (1978) theory of internalisation. Vygotsky argues that all psychological processes are initially social, shared between people, particularly between child and adult; and that the basic interpersonal nature of thought is transformed through experience to an intra personal process. Thus, for Vygotsky, the fundamental process of development is the gradual internalisation and personalisation of what was originally a social

activity. First the adult (parent, teacher, etc.) controls and guides the child's activity; gradually the adult and the child come to share the problem solving functions, with the child taking initiative and the adult correcting and guiding when the child falters; finally the adult cedes control to the child and functions primarily as a supportive and sympathetic audience. Ideally, teachers function as mediators in the learning to learn process; acting as promoters of self-regulation by nurturing the emergence of personal planning (Brown 1987:100). In school, effective teachers are those who engage in continual prompts to get children to plan and monitor their own activities. The expert teacher may model many forms of critical thinking for students; processes that students must internalise as part of their own problem solving activities if they are to develop effective skills of self-regulation.

Brown (1987:102) states that deficiencies in interactive learning processes have been indicated as primary sources of developmental retardation. It seems that cognitive growth is very heavily dependent on quality of mediated learning that the child experiences. By interacting with an adult, who guides problem solving activities and structures learning environments, children gradually come to adopt structuring and regulatory activities of their own. In South Africa it could be said that one of the principal reasons for poor academic performance of many disadvantaged students is the lack of consistent mediated learning in their earlier developmental histories, because of parental apathy, ignorance, or over commitment. Quite simply, parents in disadvantaged homes were themselves disadvantaged children and cannot be expected to teach what they do not know. If students are to learn independently, the development of a battery of such autocritical skills is essential. Brown (1987:103) reports on Palinscar and Brown's

(1981) research aimed at improving seventh graders reading comprehension. Through a process of modelling the comprehension monitoring activities of the children improved and eventually were able to internalise these procedures and employ monitoring functions for themselves.

In summary, one might say that the child with learning problems often has not been adequately exposed to, or benefited from, the social learning process whereby a procedure or behaviour is guided and monitored by other individuals. There seems to be a breakdown in the gradual growth of the individual as he is supposed to become more experienced or competent, moving toward self-regulation, with another person supervising. The child with learning problems does not seem to be able to self-regulate, or to monitor his own behaviour. In essence, the child displays a poorly developed internalized supervisor, or executive controller, to monitor his performance or behaviour.

2.4.3 Specific research on the relationship between metacognition and academic performance

In order to justify the teaching of metacognitive strategies to children with learning problems it is necessary to explore the results of previous research on the subject. In comparison to literature 10 years ago, today's literature reflects the impact metacognition has had on psycho-educational research and particularly on work with slow children. Metacognitive work has reawakened an interest in the role of consciousness, or awareness, or understanding, in thinking and problem solving.

During the past decade, there has been an explosion of interest in "metacognitive" aspects of academic and social performance. It seems generally that the more advanced or successful performers are characterised as possessing more fully developed metacognitive skills than the less successful performers. The frequency with which metacognitive deficiencies have been cited as a factor in poor academic performance has led, not surprisingly, many psychologists engaged in instructional research, to include metacognitive skills as part of their overall training packages as well as design of curricula developed for use with slow-learning children.

Campione's (1987:117) analysis of the impact of metacognitive theory on training studies serves as a base for the exploration of this section. The changes in training studies can be divided into three sections: training studies prior to the interest in metacognition; the types of metacognitive research that emerged in the early 1970s, and influenced the instructional work; and a number of different types of metacognitive-instructional experiments that have been conducted.

Various studies done, exploring the relationship between components of metacognition and performance, indicate that there is a positive relationship between metacognition and academic performance in general (du Toit, 1990; Lucangeli, Galderisi & Comoldi, 1995; Nieman, 1993; Powell & Makin, 1994; Short, Schatschneider & Friebert, 1993; Slabbert & Brown, 1994; van der Westhuizen, 1989).

Campione (1987:117) notes that around 1970, when work in metacognition began to appear, there was an increase in the amount of instructional research being conducted. It became clear back then that retarded children did poorly on a variety of memory and problem solving tasks in part because they consistently failed to produce the appropriate and necessary strategies. In a host of studies, it was also shown that retarded children could readily be taught to employ task-specific strategies, such as rehearsal and elaboration, with the result that their performance would improve, often quite significantly. Most studies determined the child's immediate response to training. Relevant research began to appear in the mid 1970s; Campione and Brown (1977) provided an early review. At that time a brief summary of the existing situation was that retarded children: a) did not produce the kinds of strategies necessary for efficient performance on a variety of tasks; b) could be taught to carry out strategies, which resulted in improvements in performance, but not to the level of non-retarded comparison groups; c) frequently abandoned the strategy when the experimenter ceased prompting its use, however, extensive training might overcome that problem; and d) failed to apply the strategies to new problems where they would be appropriate (Campione, 1987:117).

Campione (1987:123) states that people involved in mental retardation training work became interested in metamemory. Failures to produce strategies, to carry them out most efficiently, or to transfer them widely might be due to a failure on

the part of the learner to understand the significance of the instructed activities and procedures. Retarded children might not know enough about the memory system to appreciate why the strategies were necessary. Also, they might fail to monitor the effects of instructed strategy use and thus, fail to carry it out as well as might be expected. Therefore, they would derive less than the maximum benefit and/or not realise that the strategy was helpful. As a specific example, consider a child faced with remembering 10 items. If he of she believes that the items can be readily remembered (overestimates his or her memory span), there is no reason for engaging in any specific learning activity, even if one were available. Further, if the learner did not monitor performance on recall trials, he or she would not realise how ineffective his or her learning strategies are. In addition, if instruction is provided, and if performance improves, it is reasonable to expect that the learner will continue to employ that strategy only if he or she monitors its use and notes that it has actually helped; if no such monitoring takes place, it is not surprising that transfer is limited (Campione, 1987:123).

In this study the association between academic performance and the variables age and sex is explored as part of the process of implementing metacognitive strategies during the learning process. Viljoen (1993) states that metacognition is impacted on by learning variables such as; learner characteristics, text- or content characteristics, learning goals, and learning strategies. The variable that has received the most attention is age according to Paris et al., (Viljoen, 1993:117). They state that younger learners know substantially less of themselves

than older learners. They recommend that the tasks children have to perform, the strategies to be used, reading and attention must be adapted to their age.

Buys (Viljoen, 1993:117) confirms that older and more accomplished readers display greater awareness of the demands of a reading task, the aim of reading and of appropriate reading strategies. Accomplished readers also better comprehend the characteristics of good summaries.

In studies done with retarded children, Campione (1987:124) found these children experienced difficulty in producing and transferring metacognitive strategies. For example, they were not as insightful about their memories or aware of the severity of short term memory limitations as non-retarded children of comparable age. They consistently overestimated their memory span and did not reflect on the contents of their memory. They also displayed insufficient task demand knowledge, did not monitor their state of learning accurately, and did not seem to allocate study time differentially to items that they found hard or easy to remember.

In his review of training studies, Campione (1987:126) describes a three level classification system of training studies; *blind studies* where the participants were not told any reason why strategies might be helpful; *informed training* (knowledge) where the learner is given some information about himself, a task, or a strategy; and *self-control training* (control) in which the learner is given explicit instruction about monitoring, checking or evaluating of some of his cognitive resources. Thus,

the metacognitive component can be taught either independently or in conjunction with a specific skill or strategy.

Campione (1987:126) reports on a *blind study* by Brown, Campione and Murphy (1977) where *knowledge or fact alone* were taught to retarded children about their memory. A group of mentally retarded children with mental ages of 6 and 8 were asked to predict how many of a set of 10 pictures they would be able to recall. Results showed that most unrealistically overestimated their ability. After explicit feedback training (Campione, 1987:126) subjects could be induced to become more realistic in their predictions, however, the researchers found it not very profitable to teach retarded children facts about their memory. The strategies taught in isolation tended to be welded to the specific learning context and were not generalised.

Campione (1987:127) reports on a number of *informed studies* where *strategy training* has been *supplemented by information* about the effects of that strategy. The argument is that trained subjects may abandon an instructed routine when prompting is withdrawn, because they do not realise that they performed better when using the strategy, or they do not realise that it may be helpful on more than one task. Campione (1987:128) sites a study with non-retarded children by Kennedy and Miller (1976) who found that an instructed rehearsal strategy was more likely to be maintained in the absence of experimenter prompts if it had been made clear that the use of the strategy did result in improved performance. Thus, supplementing strategy training by providing additional information about their effectiveness or range of utility does lead to increased maintenance.

Informed studies however indicated that subjects did not monitor their performance levels effectively and did not transfer specific skills which led to interest in dealing with more general, transituational or generic skills.

Nieman (1993:283) explored the relationship between metacognition and listening skills. She states that effective listening is assured by using metacognitive and metalearning strategies. Nieman (1993:283) refers to research done by King (1989) on the influence of metacognition on listening comprehension. King explored whether metacognition (by way of self questioning), during listening, contributes to better understanding. The experiment involved two groups of college students. During the normal college programme all participants were taught metacognitive principles as part of normal course content. Comparisons of pre- and post comprehension tests indicate that the implementation of metacognitive skills during listening has a positive influence on performance.

Likewise, Powell and Makin (1994:579) did research on teaching and learning programmes for children with moderate learning difficulties. The programme looked at the focus of attention on own thinking and learning processes within the context of mathematics activities. Self-reporting and self-appraisal were used to increase the children's awareness and subsequent control over thought processes. The research aimed at exploring the possibility of this kind of reflection as a way of enhancing the learning capabilities and self-esteem of the pupils. Comparisons over time within individuals showed a general improvement in performance on tasks over the study period and a corresponding increase in

awareness of their own abilities in relation to tasks and a willingness to engage with the teacher. The researchers state an improvement in performance in mathematics activities resulting from the teaching and learning context, and they suggest that the emphasis given to 'reflecting on one's own thinking' was a significant part of the context (Powell & Makin, 1994:579).

Viljoen (1993:117) states that metacognition has an affective character. The learner's knowledge of his own cognitive achievements and especially his self-evaluation, involving feelings like shyness, helplessness, pride, self-confidence and self-assuredness, further influence his learning effectiveness.

According to Viljoen (1993:118) Baker and Brown (1985) state that the teaching of metacognitive skills results in an improvement of cognitive achievement. The teaching of cognitive skills in isolation is, however, not always successful.

Van der Westhuizen (1989:564) looked at the relationship between metacognition and the making of summaries. He examined the role of two components of metacognition (self-appraisal and self-management) in summarization. He highlights descriptive and comparative studies on the effects of intervention in the making of summaries. He states that research indicates that the planning to summarize is related to summary achievement. He found that skill and age differences affect metacognition. Older learners tend to plan better than younger learners when working on summaries. Indications are that summarization achievement can be improved with knowledge of summarization rules and that

training in metacognitive skills in addition to training in summarization skills, improves summarization achievement (Van der Westhuizen, 1989:564).

Du Toit (1990:23) highlights the importance of metacognitive strategies in learning and remedial teaching. He states that many researchers examined the cognitive disabilities of learning disabled children and have developed educational techniques accordingly. As an outgrowth of this research, researchers have studied metacognition and found that metacognitive strategies are just as necessary for good learning as are cognitive strategies. He states that there is evidence that educators can teach learning disabled children task approach skills by means of cognitive behaviour modification programmes. He concludes by saying that the child who uses principles of metacognition is able to achieve success in a variety of learning situations (Du Toit, 1990:23).

Slabbert and Brown (1994:82) state that metalearning is a process which strives to promote autonomous learning. They state that metalearning has been successfully implemented in conventional education. They conducted empirical research regarding the influence of metalearning feedback on the learning achievement and learning quality of distance learners. Comparisons of experimental and control groups indicated a 6.88% improvement in performance from the students who received metacognitive feedback as compared to a 11.45% drop in achievement from the control group. Their research thus indicated that meta-feedback improves quality of learning (Slabbert & Brown, 1994:82).

Lucangeli, Galderisi, and Cornoldi (1995:11) examined specific and general transfer effects and related memory performance following metamemory training. Their first experiment with a group of fifth graders showed that strategy training improved students' level of knowledge and performance on a categorical memory test. Fifteen days later, students who had received metamemory training outperformed controls on maintenance and near-transfer of the strategy. In their second experiment, third, fourth, and fifth graders with learning difficulties were divided into three groups: a metamemory training group, a metacognitive reading group, and a control group. At the end of the training, the metacognitive groups outperformed the control group in metacognitive knowledge and in academic achievement. Their results suggested that improving children's ability to reflect on their cognitive processes may improve their specific and general academic performances as well as their general cognitive attitude (Lucangeli, Galderisi, & Cornoldi, 1995:11).

In summary, there has been a change in instructional research with children with learning problems since the appearance of metacognitive skills. Training studies have change from merely imparting specific skills to providing knowledge to participants about these skills in a specific study area. More attention is also paid to imparting regulatory strategies necessary to maximise the use of cognitive skills. Great emphasis is placed on the learner's awareness and active management of their cognition and learning processes. It seems that the usefulness of knowledge of cognitive systems, which develop with age and expertise, is reinforced by the progressive acquisition and mastery of management or control mechanisms.

2.4.4 *Reading as a special issue in this research*

In teaching metacognitive strategies, that form part of a normal learning process, children are required to read according to their chronological age. One of the characteristics of learning disabled children is that they often display poor reading skills (Botha, 1991:41), which severely hamper any efforts at teaching skills that require a basic proficiency in reading.

Although not the focus of this study, the researcher acknowledges the importance of study reading which forms one of the main components of learning. In this regard, it is important to remember that when a child studies he must firstly focus on the material itself with the aim of learning it, and secondly, the learner must control his cognition continuously to ensure that the right cognitive activities are used to guarantee that learning occurs. When studying, people thus have to monitor their cognitive processes constantly while they read (Hugo, 1993:57). When reading, a reader should understand what he is reading, must react to it and must integrate the content into his existing knowledge. Metacognition facilitates this process. The following researchers have explored the importance of metacognition in reading.

Hugo (1993:56) states that a reader's conscious knowledge of his level of comprehension while reading is the terrain of metacognition. She states that two groups can be identified; those who read purposefully, with comprehension and

use reading as a tool for learning, and those who have no awareness and lack understanding when reading. The first group, displays metacognition. The second group does not.

According to Stewart and Tei (Hugo, 1993:58) cognition implies that one has the skills, for instance, to read. Metacognition refers to an awareness of and conscious control over these skills. With comprehension and study reading, knowing which strategies to use to construct meaning from text and when to use these strategies to achieve certain goals and the aims of reading, are metacognitive activities.

Metacognition requires a set of processes to be executed. Spring (Hugo, 1993:58) calls these processes metacomponents. Important metacomponents are: plan, strategy, monitor and evaluate. Brown (Wong, 1990:18) discusses a similar set of components that are deployed when a good reader reads a text. These are: Clarifying the purpose of reading, that is, understanding the task demands, both explicit and implicit; identifying the aspects of the message that are important; allocating attention so that concentration can be focussed on the major content area rather than trivia; monitoring ongoing activities to determine whether comprehension is occurring; engaging in review and self-interrogation to determine whether goals are being achieved; taking corrective action when failures in comprehension are detected; and recovering from disruptions and distractions - and many other conscious, deliberate actions to read efficiently.

Brown, Baker and Brown (Wong, 1990:19) state that knowledge about cognition and regulation of cognition are important determinants of successful learning, efficient reading, and effective studying.

Hugo (1993:58) states that metacomponents are important when considering the use of metacognition for study reading purposes. Depending on the reading task, a reader who is reading with the intention of studying, should be able to plan his reading, develop reading strategies, monitor his comprehension while reading and evaluate the section that has been read. By doing so, study reading can become more effective.

Bouwer (1992:14) states that objective reading instruction must assist pupils in establishing an independent, meaning based, strategic reading style. In the case of the child who has learning problems his reading process could be described as a word attack process. Miscues of the letter and sequence discrimination type increase, as attention is diverted from overall textual meaning to words as mere strings of letters. Metacognitive strategies used to gather meaning from text cannot operate at this word attack level. In succession to this stage pupils must become active, goal-oriented readers instead of succumbing to passive failure or learned helplessness, pupils must be taught strategic actions to execute in case of difficulty such as; self-correction by means of strategies such as rereading and using contextual clues. Meaning-based reading strategies appear generally to stem from metacognitive insights. Successful readers know how to monitor and 'repair'; comprehension, adjust reading for different purposes and select helpful

strategies. Many readers do not acquire these skills as a matter of course, but need explicit instruction(Bouwer, 1992:14).

Bouwer further notes that a significant difference was noted in the independent use which good and poor readers in the fourth grade could make of methods previously instructed, to improve their own understanding of a complicated reading task. In order to facilitate the development of effective and fluent reading Bouwer discusses the use and value of using computer reading programmes. Bouwer (1992:15) outlines certain principles which should be adhered to in order to develop a useful, interactive event where the user is actively engaged in monitoring his process of word recognition and textual comprehension in a meaning-based, individualised and integrated manner. One important guideline Bouwer mentions is that computer reading software should be designed expressly to develop readers' cognitive and metacognitive skills in their dealing with the printed text. An example of this would be the monitoring of one's understanding of the text; experimenting with adjustments to achieve optimum comprehension, thus gaining insight into one's strengths and weaknesses and into the inter-relatedness of various aspects of reading; monitoring one's attentiveness while engaged in reading; gradually increasing one's reading fluency; recognising the value of rereading to ensure full understanding and referring to the text to verify facts; and discovering the intrinsic demands of various question types (Bouwer, 1992:13-15).

In the present study it is noted that the pupils participating in the study do have reading problems ranging from mild to severe cases. Even though it would be prudent to first subject the sample to basic reading skills training it is accepted as a limitation of the study that the lack of reading skills will impact on the results. The selection of content material and test structuring will be done keeping these limitations in mind.

2.5 SUMMARY

In conclusion, the research reviewed indicates that there is a positive relationship between teaching components of metacognition and performance. A review of literature indicates that increases in learning have followed direct instruction in metacognitive strategies. These results suggest that direct teaching of these thinking strategies may be useful, and that independent use develops gradually. Review of literature further indicated that most effort and research into metacognition have gone into teaching reading and mathematics leaving the field of social science open to research and there seems to be a gap in the specific exploration of the relationship between metacognitive strategies and academic performance using history as a content subject. It is an aim of this study to fill in this gap.

On a general level, literature indicates that recent research has generally supported the notion that metacognitive strategies are helpful to students in producing more positive academic outcomes. A large percentage of students and

adults fail to use appropriate metacognitive strategies spontaneously. Better students and experts tend to report using metacognitive strategies more often than poorer students and novices. Performance tends to go up on a task once metacognitive strategies have been taught.

Review of literature also indicated that many metacognitive strategies require significant practice to the point where the learner does not concentrate on the strategy itself but on the effective use thereof. Literature revealed that children with learning problems often have difficulty in mastering such metacognitive strategies making it more likely that students will abandon these strategies and that these strategies will not be transferred between tasks. Classroom variables such as mastery orientation can play a role in supporting students' use of metacognitive strategies and student variables such as achievement motivation, depression, locus of control, or perceived self-efficacy might influence the utilization of metacognitive strategies.

Taken as a whole, the field of metacognition represents the potential to improve and refine the educational process, especially for poor performers.

CHAPTER 3

3. METHODOLOGY - RESEARCH DESIGN AND PROCEDURES

3.1 INTRODUCTION

Circumstances and limitations in this study necessitated a single-group experimental design. The same sample group was exposed to an experimental intervention and change was measured. In the absence of a control group the sample group served as its own control. The heterogeneous nature of the learning disabled children's disabilities complicates the evaluation and control of variables that make each individual unique which makes it more appropriate to use the individual as his own control. This chapter reports on the sampling design, research instruments and their application and the procedures of administration.

3.2 SAMPLING DESIGN

A non-proportional or accidental sampling design (Behr 1983:17) was used in this study. This design was necessary since it would be cumbersome and time consuming to identify learning disabled children in mainstream schools and even more so to accommodate children from various schools in one location in an experimental intervention programme.

A state subsidised remedial school was chosen as the only school catering for children with learning problems in the area. For the purpose of this research project it was ideal to work with this group of learning disabled children already identified in the school. Out of the total population of 150 students, it was decided to use a group of 39 children to serve as sample. The experimental nature of the research, made the use of a smaller sample more desirable both in terms of manageability of size and working within the time constraints set for the project.

The study sample consisted of children from grade 4 and 5 classes. The researcher chose the oldest children in the school to facilitate ease of communication and the faster tempo at which the older children would be able to work. Due to the small number of participants all the children from four identified classes were included in the sample (N=39). The sample was made up out of four groups; three English and one Afrikaans medium group. The cumulative records reveal that these children have average intelligence on standardised intelligence tests that were administered as part of the school placement procedure. There was also very little difference between verbal and nonverbal scales on the intelligence tests administered. In this school the teacher-pupil ratio is 1:15. The sample distribution, in terms of grades, age, and sex is shown in Table 3.1 below.

Table 3.1 Distribution of subjects in the study sample(N=39)

	English *Group A* grade 4	English *Group B* grade 4	English *Group C* grade 5	Afrikaans *Group D* grades 4&5
Male	12	9	3	5
Female	0	3	2	5
Average age in years	10.7	10.8	11.6	11.0

* Age range for total group: 9 years 8 months - 12 years 2 months

3.3 RESEARCH INSTRUMENTS AND THEIR APPLICATION

During the course of the research two academic performance tests (History Tests 1 & 2) (ANNEXURE A and B) and the Metacognitive Learning Process Questionnaire (MLPQ) (ANNEXURE C) were used.

3.3.1 History Test 1

History Test 1 is a teacher made test designed by the researcher. In previous studies researchers made use of tests and scales developed, designed and standardised for their specific projects and samples. Lucangeli, Galderisi and Cornoldi (1995:14) for example, used a free recall test to test the effect of metamemory training. In their second experiment Lucangeli et. al. (1995:15) used the M+ Mathematics Achievement tests and the De Beni and Pazzaglia's (1991) test of reading metacognitive knowledge. Vadhan and Stander (1994:308) used regular classroom exams in their design. In the absence of suitable instruments,

Sibaya (1996:92) designed an achievement test based on the syllabi of her sample group. Similarly the researcher decided to create a curriculum based performance test based on the specific history content from the selected history textbook by Clacherty and Ludlow (1995:76-89). Designing the test enabled the researcher to structure the tests in accordance to the set objectives.

In this research project curriculum-based assessment was deemed the most appropriate method of assessing academic performance. History Test 1, as described below, falls into the sphere of Curriculum-based assessment (CBA). Using a standardised norm referenced test would not have been appropriate in measuring performance on the specific history content presented during the experimental phase of the research. Curriculum-based assessment fulfils all the needs of the objectives set for determining academic performance in this specific project. These tests are comparable to tests usually used by teachers to determine academic performance in the given school i.e. teacher-made tests.

The use of Curriculum-based assessment can be supported by the findings of previous studies which used this method of assessment. According to various authors (Ariel, 1992:201; Hallahan & Kaufman, 1994:170; Mercer, 1991:148; Olson & Platt, 1992:97) curriculum-based assessment is a formative evaluation method designed to evaluate performance in the particular curriculum to which students are exposed. It measures procedures for monitoring student progress and intervention effectiveness, following steps such as taking a baseline, teaching and finally testing. It usually involves giving the students a small sample of items

from the curriculum. The goal is to keep track of the student's progress. Formative evaluation is less concerned with how the student compares with other students and more concerned with how the student compares with himself or herself. Proponents of this assessment technique argue that it is preferable to comparing students with national norms or using tests that do not reflect the curriculum content learned by students.

In curriculum-based assessment (CBA) the number of correct answers serves as the performance measure. Comparisons made in local reference groups seem more relevant than comparisons with national norm groups used in commercially developed standardised tests and the use of CBA decreases the possibility of biassed assessment. Thus CBA indicates how children with special needs are performing in their special setting.

Fuch, Fuch and Stecker (Hallahan & Kaufman, 1994:170) state that research indicates that CBA results in positive changes for both teachers and students with learning disabilities. Teachers who use CBA have more objective information for assessing whether students are meeting their goals and are more likely to modify their instruction if their students are not meeting those goals, than those teachers using norm referenced assessment. They further state that students also make more academic progress when CBA is in use compared to norm referenced assessment.

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Mercer (1991:148) reports that achievement in basic skills can be measured by using school curriculum generated items. Curriculum-referenced assessment is used to measure a student's competence in terms of the school curriculum. It is individually referenced, so that judgements can be made about an individual student's progress. It is also peer-referenced, so that the "normality" of a student's performance can be reliably determined using locally developed peer sampling.

The aim of History Test 1 was to satisfy the first objective of the study, i.e. to determine the academic performance of pupils *before* the intervention had taken place.

The history textbook by Clacherty and Ludlow (1995:76-89) was chosen in consultation with the teachers of the participating school. The teachers also guided the researcher in the selection of the chapters utilised in the research. For the purpose of History Test 1, Chapter Seven - 'Early farmers in South America' was used as content. No changes were made to any of the content. The chapter was translated into Afrikaans from the original English for use with the combined Afrikaans medium group D. Great care was taken to ensure translation accuracy. Translation accuracy was verified by an Afrikaans first language practitioner.

The History Test 1 consisted of six parts.

Part One consisted of a multiple-choice type test. The correct answer had to be circled. It was intended that part one measure factual recall of detailed information

from a fictional story. The score obtained in Part One served as an indication of the pupil's ability to learn, and recall factual information that had to be extracted from a story.

Part Two consisted of, "Fill-in the missing words" type of questions. Part Two was intended to measure recall of factual information, the ability to synthesise and recall the gestalt structure of the chapter (a content page was compiled by the individual children after part of the process was modelled by the class teacher. Afterwards the teacher facilitated agreement on a standard content page that was studied by all the participants). The score on the first test served as baseline and could be compared with the score on the second test to indicate whether exposure to metacognitive strategy training had made a difference.

Part Three consisted of short questions, mixed among longer questions, based on the content of the chapter. The mix of questions matched the usual structure used by teachers. Questions such as, "Name two things that..., Wool was used for ..., Give the date of ..., etc.", were used. Part three was intended to measure the recall of factual information based on the chapter's content.

Part Four consisted of longer questions based on the content of the chapter. Part four was intended to measure the recall and synthesis of information where descriptions and explanations are required.

Part Five allowed the opportunity at the end of the test for each pupil to complete a self-rating scale. This scale was included to supply qualitative information about the pupils' subjective feelings about their performance on the test.

Part Six, the last part, was a little space at the end of the test where the children were given the opportunity to give feedback to the teacher on the test. This might have included information such as: problems experienced, attitudes about the test, the learning process and other emotional indicators. Part Six was included for the benefit of the teachers, as some of them indicated the need for feedback.

The scoring of the test was done by the researcher. Each correct item on the test received one point. The raw scores from the separate parts, as well as the total scores, were converted to percentages.

During the intervention stage the participants were told in broad terms how the test would be structured and what would be expected of them. The pupils were told that there would be a comprehension-multiple-question-type test based on the story in the chapter and that they had to know facts, names and dates. They had to be able to reproduce the content page. They would have to answer short questions on the rest of the content and they would have to be able to answer longer, describe-and-explain-type questions.

These instructions were given after the content was presented and before they started studying. The reason for giving this information was to facilitate the planning process that forms part of the meta-learning process.

The test was completed during normal school hours. It was so planned that the children would write the test early in the morning, since many of the children use medication to facilitate concentration and would not be able to perform according to ability later on in the day.

After consultation with teachers it was decided that a time limit of 1.5 hours would give all the participating children an opportunity to finish the test (some children worked considerably slower than the group and would need more time than the estimated 40-60 minutes. Teachers usually allowed the slower children more time to complete tasks). Teachers supervised during the tests. The tests were scored by the researcher and feedback was given only to the teachers.

3.3.2 History Test 2

For all purposes the structure, motivation, application and scoring procedure of History Test Two was the same as History Test 1. The only difference was in the content. Chapter Eight - 'Early Farmers in Southern Africa' from the same history text book by Clacherty and Ludlow (1995:90-104) was used. This chapter was also translated into Afrikaans from the original English for use with the combined Afrikaans medium group-D. No changes were made to any of the content.

3.3.3 The Metacognitive Learning Process Questionnaire

In this study the Metacognitive Learning Process Questionnaire (*MLPQ*) was used to ascertain which of the skills taught children with learning problems knew, used and to what extent they were used.

History Tests One and Two give ample measurements of academic performance, but shed little light on the subjective metacognitive learning process the children followed as part of the experiment. The *MLPQ* provides self-reported retrospective information on what the children themselves felt about their learning process and on their knowledge and use of cognitive and metacognitive strategies.

In line with the assumptions about the learning process, the MLPQ is structured in such a way that it asks questions about the whole learning process. It questions the planning, execution, monitoring, assessment and management of the outcome phases of the learning process. The number of correctly answered questions will determine the pupil's effectivity as a learner. It is assumed that if low achievers adopted the strategies of high achieving students, they should improve their cognitive efficiency. The assumption that high achievers have knowledge of and use metacognitive strategies in their learning process serves as basis for this questionnaire.

Throughout the literature review it was noticed that many of the studies done in the field of metacognition focus on components or parts of the learning process

and seldom on a complete learning cycle to which pupils are exposed during a new section of the curriculum and where they follow a 'natural' process of learning and testing. This 'natural' learning cycle would include being introduced to new content, having the opportunity to give meaning to the content, studying the content, writing some sort of test and finally reviewing results, in contrast with studies where specific strategies are taught and tested (such as memorising lists of meaningless words) detached from the 'normal' learning process usually followed in the classroom. We assume for the purpose of this study that the pupils participating in this study follow such a 'natural' learning process.

The questions in sub-sections of the MLPQ follow a natural sequence that matches a meta-learning process. The pupils were asked to answer questions on their attitude and motivation; ability to plan their learning process; their knowledge and use of cognitive and metacognitive strategies, their ability to concentrate, which influences their ability to process information, their test writing activities, their activities after the test and a number of study skills that could form part of an effective learning process.

The Metacognitive Learning Process Questionnaire (*MLPQ*), was based on and adapted from the Metamemory, Memory strategy and Study Technique Inventory (MMSSTI) (Van Ede & Coetzee, 1996). Literature shows that in previous research many researchers adapted and based their instruments on previously developed instruments, such as Swanson and Rubadeu's (1988) 17-item questionnaire based on Kreutzer, Leonard and Flavell's (1975) battery (Short, 1992:233).

Sharratt and Van den Heuvel (1995:60) adapted and translated the metamemory interview schedule of Kreutzer et al.(1975) (Sharratt & Van den Heuvel, 1995:60). Purdie, Hattie and Douglas (1996:90) based their Student Learning Survey on the Self-regulated Learning Interview Schedule developed by Zimmerman and Martinez-Pons (1986) (Purdie, Hattie & Douglas, 1996:90), and Lucangeli, Galderisi and Cornoldi (1995:13) used the Italian adaption of a metamemory questionnaire (Lucangeli, Galderisi & Cornoldi, 1995:13).

Van Ede and Coetzee's (1996) MMSSTI inventory focusses mainly on metamemory, memory strategy and study techniques as factors of metacognition and the learning process. It was developed to be used with tertiary students at university level. Van Ede and Coetzee specifically developed their scale to rectify the shortcomings they noticed in instruments that assess metacognition or metamemory. One of the differences in their instrument is that it distinguishes between knowledge and use of strategies (Van Ede & Coetzee, 1996:90). Another advantage of adapting the scale was that it was developed using local population groups unlike other international scales mentioned. After consultation with the developers of the MMSSTI inventory, the researcher decided to adapt it for use with primary school pupils with learning problems.

The original MMSSTI inventory consisted of 93 self-report items that were designed to assess metamemory, memory strategies, study techniques and the mental load of students at tertiary level. The developers state that the questionnaire was designed to assess: how effectively students regulate and

monitor their information processing; their knowledge and use of encoding and retrieval memory strategies; to what extent they apply processes that could lead to better understanding of and insight into the text material they have to study; the extent of their questioning attitude; and their mental load, which can reduce the efficiency of their memory performance (Van Ede & Coetzee, 1996:90).

Exploratory factor analysis by the developers yielded 12 factors/sub-scales: three measure metamemory, five measure memory strategies, three measure study techniques and one measures mental load. The sub-scales proved to have satisfactory internal consistencies. The conclusion of Van Ede & Coetzee's (1996) factor analysis study was that the MMSSTI appears to be a factorially heterogeneous instrument with homogeneous sub-scales and fills a gap in the repertoire of instruments that are available to assess students on tertiary level (Van Ede & Coetzee, 1996).

After consultation with the developers of the MMSSTI 63 of the original 93 items were selected and simplified. Some of the original 93 items were not deemed suitable for use with primary school children with learning problems due to the complexity of the concepts. Items were grouped in seven sub-scales as opposed to the 12 sub-scales used in the original questionnaire. The seven sub-scales are: Attitude and Motivation, Planning, Studying a chapter, Concentration, Writing a test, After the test, and Study skills. The level of language used in the MMSSTI scale was not appropriate for use with primary school children and had to be simplified. The Five-point Likert-type scale was also simplified to binary yes-no

options. Due to time constraints the questionnaire was not piloted (recognised as a limitation of the study).

The MLPQ questionnaire used in this study was designed to question pupils on what they had done specifically when they studied for History Test 1 and 2. The aim was to limit generalizations, based on previous experiences and what they usually do and rather focussed on what they had actually done studying for their tests. Since the aim was to determine change within a specific experimental design, it was deemed necessary to apply the question-set after the first content test.

A strength of using a questionnaire such as the MLPQ is that an analysis of the individual items and sub-scales can supply diagnostic information on the individual's learning process.

The questionnaire was applied after each of the history tests. The pupils received an answering sheet with 63 yes/no options. The children were not informed of the seven grouped areas under investigation. The questions were slowly read by the researcher and the children circled their choice. No explanations or clarifications were given. Questions were repeated on request.

The Metacognitive Learning Process Questionnaire was scored according to an answer key by the researcher. Total scores out of 63 points were converted to percentages. Sub-totals were calculated for each of the seven sub-categories.

The percentage scores indicate the degree to which the pupil matches the ideal effective learner's learning process. The higher the percentage, the closer the match to that of an effective learner. The retrospective and subjective nature of the questionnaire was kept in mind when data were analysed and interpreted. As discussed in the literature review in chapter two, self-reported data gathered from children with learning problems may not be very accurate or reflect the true nature of the children's knowledge and use of metacognitive strategies. The information gathered from the MLPQ was regarded as qualitative in nature indicative of general tendencies rather than specific quantitative facts.

The researcher's assumption was that the pupils' retrospective self-reflections on their knowledge and use of metacognitive strategies would be unrealistic on the completion of the questionnaire after the first test and that a more realistic view would be taken after the intervention and the second history test.

Reflection could possibly range from honest, informed, accurate self-reflection to over optimistic, delusional projections or a pessimistic, self-devaluating evaluation. A comparison of pre- and post intervention scores on the Metacognitive Learning Process Questionnaire could possibly indicate whether students perceived a change in their knowledge and use of strategies and skills involved in the learning process.

3.4 PROCEDURES OF ADMINISTRATION

One of the main components of this research project was the intervention stage. During this stage the researcher executed a number of pre-planned steps in order to satisfy the objectives of the study.

The research was completed over a period of six weeks. Permission was obtained from the participating school. Two days were spent observing to familiarize the researcher with teaching methods used and the level at which children were functioning. Discussions were held with teachers about the process and selection of materials used.

In order to motivate and to facilitate cooperation, the researcher explained to the pupils that they would be engaged in a project to help them discover and improve their learning process.

There were three phases in the research. Phase One involved the teaching of the content of Chapter Seven - 'Early farmers in South America' from the history textbook by Clacherty and Ludlow (1995:76-89). Before the teaching commenced the teachers and researcher discussed and standardised the methodology that was used in the teaching process. The methodology and tasks outlined in Chapter Seven served as guidelines for standardised presentation. The researcher attended part of the first lesson and gave feedback on their presentation to the teachers in the form of a group discussion. Teachers spent four days teaching the

subject content. Thereafter, children were given four school days to study for the test. The pupils wrote History Test 1 to determine their academic performance before any intervention. Afterwards they completed the Metacognitive Learning Process questionnaire to determine their learning process before the pre-test.

During Phase Two pupils received metacognitive strategy training by the researcher over 8 sessions, each session lasted 50 minutes. The researcher followed the normal classroom routine followed by the teachers when presenting new content in order to minimise the disruptive influence of the intervention. A process of modelling and active participation was used to teach the various skills, strategies and methods. Pupils were encouraged to engage in the whole process.

The pupils' first exposure to, and use of, a metacognitive strategy was the introduction to the concept and usefulness of time management. Observation indicated that most of the pupils were not consciously aware of how much time it would take them to complete various tasks. They displayed poor estimation abilities and were not in the habit of monitoring and adjusting their use of time (a metacognitive skill). During the intervention training the practice of estimation, monitoring this estimation and recording time-on-tasks, were reinforced. Pupils had to write their estimation of time-on-task intended, and had to compare it with actual time-on-task spent.

In the next step of the process in Phase Two, the history text book by Clacherty and Ludlow (1995:76-89) was used as content. Chapter Seven - 'Early farmers in

South America', the same chapter that had served as content of the pre-intervention history test, was used. The familiarity of recently completed work would facilitate the acquisition of strategies without having to deal with new content that could possibly have been overwhelming and distracting to the learning disabled child.

The various strategy components were introduced during the course of going through the chapter as a modelling process by the researcher. The researcher explained and demonstrated as well as solicited active participation from the groups in discovering, practising and implementing various strategies during the different stages of the learning process while progressing through the content and structure of the chapter.

The first step in dealing with a chapter was a general familiarization with the content and linking it to previous knowledge and work done. This was achieved by paging and skimming through the chapter, and short discussions on interesting aspects of the content.

The chapter roughly consisted of a fictional story/fable about the life of farm children living in Peru, a pictorial depiction of a farming scene in Peru (used throughout the chapter as reference source and to answer various questions from), short descriptions, pictures and questions on farming life including topics such as growing crops, tools, storing food and seeds, changing the land, irrigation and terraces, settled life, keeping animals, making things, and exchanging goods.

Starting with the story, the researcher inquired from the group what process they would normally follow in learning this type of content and how successful their methods had been in the past. The researcher suggested testing a different method to which the group agreed. The follow steps were demonstrated and engaged in with the children:

The researcher and children read a sentence, (later progressing to a paragraph), checking to see if it was understood by asking what it was all about, and then choosing and underlining a word that would serve as a reminder of the whole sentence. After this was completed, the words were copied on separate paper underneath one another forming a list. The list was checked against the story to ensure that all the words were copied, if not corrections were made (metacognitive skill). The next step was to point at each word and to try to say the corresponding sentence. The pupils had to check and correct their responses. Following that, they had to cover the list and recall each word and corresponding sentence, revealing each word sequentially to check and correct their responses. Next they had to close their eyes and recall the words and sentences, checking and correcting as they went along. This was a very different process from what the pupils normally followed. Teachers reported that before the intervention pupils mostly read their work over and over in order to memorise it.

The contents page was dealt with next. The value and method of creating a contents page (a metacognitive measure) were demonstrated to the pupils. A visualisation and chaining strategy was demonstrated to the pupils as a way of

memorizing the contents page. The pupils were given the opportunity to use the method and encouraged to monitor and correct their responses. The aim was to introduce pupils to another metamemory process that could be used for memorisation and recall.

The next step in the learning process was to learn the rest of the chapter. The same method of reading, underlining, making a list, and memorization, used during the story, was employed. The aim was to show the pupils that a strategy can be generalized and used in different situations. An index card outlining the steps the pupils followed was used as a visual reminder. Only parts of the content were used to demonstrate the process. The pupils practised applying the steps as homework.

In dealing with information that could be seen as content for possible long questions, the groups were taught to identify this kind of information and to learn the information using the same method as used with short questions. The difference between short and long questions was explained. The pupils were shown how a longer question required an answer containing pertinent facts grouped together in an understandable whole. The meta-process of monitoring and correcting made it easier for them to ensure that they included all the information.

It is important to state that the aim of the study was not to teach comprehensive metacognitive strategy use to the groups, but rather to introduce the idea of

adding metacognitive strategies to their learning process. Comprehensive training in the knowledge and use of cognitive and metacognitive strategies would take infinitely longer than the time allocated for this research project and could be the focus of future research. A variety of *cognitive* strategies is available that can be used during the learning process. However, the *metacognitive* component of the learning process essentially stays the same regardless of the specific cognitive strategy. For an example, a pupil that makes a list to remember information employs a cognitive strategy. When the pupil makes a list to check whether all the work has been covered or recites the list and checks to see if the recalled information is correct, that pupil is using a metacognitive strategy. The aim of the first list is to remember information. The aim of the second list is monitoring and correction. Adding awareness, choice, monitoring and correction to any cognitive strategy turns it into a metacognitive strategy.

During the third phase the teachers spent four days teaching the content of Chapter Eight - 'Early farmers in Southern Africa' from the history textbook by Clacherty and Ludlow (1995:90-104). Thereafter, children were given four school days to study for the test. The pupils wrote History Test 2 to determine their academic performance after the intervention. The Metacognitive Learning Process Questionnaire was readministered after History Test 2.

The next chapter highlights the results of the academic performance tests (History Tests 1 & 2) and the results of the Metacognitive Learning Process Questionnaire will be analysed and discussed.

CHAPTER 4

4. PRESENTATION AND ANALYSIS OF DATA

4.1 INTRODUCTION

In this chapter the data gathered during the experimental phase of the research are presented and analysed. This consists out of data obtained from the pre- and post experimental intervention academic performance tests (History Tests 1 & 2) (ANNEXURE A & B) and the Metacognitive Learning Process Questionnaire (MLPQ) (ANNEXURE C). The data will be presented and discussed in accordance with the following research objectives that were set:

1. to determine the academic performance levels of children with learning problems *before* the experimental intervention.
2. to determine the academic performance levels of children with learning problems *after* the experimental intervention.
3. to find out whether academic performance before and after the intervention is associated with the variables of age, and sex.
4. to ascertain which of the skills taught, children with learning problems actually used and to what extent.
5. To determine the difference in academic performance *between the four groups* of the sample before and after the experimental intervention.

4.2 THE STUDY SAMPLE

Table 4.1 Distribution of subjects in the study sample(N=39)

	Group A grade 4	Group B grade 4	Group C grade 5	Group D grades 4&5
Male	12	9	3	5
Female	0	3	2	5
Average age in years	10 y 7 m	10 y 8 m	11 y 6 m	11 years

* Age range for total sample: 9 years 8 months - 12 years 2 months

Table 4.1 presents the sample distribution in terms of sex and average age in years. A non-proportional accidental sampling design (Behr, 1983:17) was used in this study. Four groups (A-D) of learning disabled, grades 4 and 5 children were included in the sample. The results of all four groups are presented, since each group was treated individually. The sample comprises of three English and one Afrikaans medium groups. The groups displayed average intelligence on standardised intelligence tests that were administered as part of the school's placement procedure. There was also very little difference between verbal and nonverbal scales on the intelligence tests administered. This sample (N=39) consisted mostly of white pupils.

One limitation of the study was the composition and grouping of the sample. As mentioned, it was decided to compare the four class groups (groups A-D) since each group was treated individually (for practical reasons such as space and time limitations). The researcher expected that performance results would be similar

between groups and that such a similarity would serve as a control measure. Change in performance resulting from the intervention could more reliably be ascribed to the intervention using four groups treated individually as opposed to one big group. Since intra and inter age differences were relatively small, the groups were regarded as comparable. About 74% of the sample group were boys and the remaining 26% were girls making it difficult to make meaningful comparison between academic performance and the variable sex. The relationships between the variables sex and age, and academic performance were nonetheless explored.

4.3 THE ACADEMIC PERFORMANCE LEVELS OF CHILDREN WITH LEARNING PROBLEMS *BEFORE* THE EXPERIMENTAL INTERVENTION

A teacher-made history test was used as an instrument for this part of the experiment. History Test 1 is a curriculum-based content test (discussed in chapter 3). The scores obtained from this first test served as baseline scores before any of the metacognitive strategies were taught to the pupils.

Table 4.2 Result of academic performance *before* the experimental intervention (N=39)

	Group A - grade 4	Group B - grade 4	Group C - grade 5	Group D - grades 4&5
N	12	12	5	10
$\bar{x}$	59	52	59	55
SD	9	6	8	10

The values in the table are in percentage, sample mean=56% and SD=8

Table 4.2 presents the results, in percentages, of the academic performance of the four groups *before* the experimental intervention. These scores indicate the academic performance of pupils before they were exposed to metacognitive strategy training. The raw data in this chapter have been converted to percentages (Bohrnstedt & Knoke, 1982:28) to facilitate comparison. The mean score for each group on History Test 1 is presented. The calculated mean score of the total sample is 56% and the standard deviation is 8 (APPENDIX B).

Table 4.3 Result of the four parts of History Test 1 (N=39)

	Group A - grade 4 N=12	Group B - grade 4 N=12	Group C - grade 5 N=5	Group D - grades 4&5 N=10	$\bar{x}$
Part 1 % of Comprehension correct	96	95	98	95	96
Part 2 % of contents page correct	32	48	47	37	41
Part 3 % of short questions correct	68	61	68	60	64
Part 4 % of long questions correct	41	23	36	34	33

The values in the table are percentages of correct answers for the four parts

Parts 1-4 indicate the mean scores of each group on a specific section of the test. The figures under each group indicate the average percentage each group got correct on that specific part of the test. The diagnostic value behind presenting these parts becomes clear as they indicate in which parts the pupils achieved well and in which areas they performed poorly.

The four groups (A, B, C and D) did very well in parts 1 and 3 (96% and 64% respectively). The four groups did poorly in parts 2 and 4 (41% and 33% respectively). The pupils had very little experience in dealing with information such as in the contents page where they had to learn facts and the structure in which the facts had to be recalled. Likewise they found it difficult to deal with learning information required in a longer question. The pupils performed relatively well on the comprehension part where they had to memorise the facts of a story.

This could be attributed to the fact that they did such exercises in school. They also did not have to write down answers in this part of the test but merely marked the correct answers. An average score of 64% on short questions indicates that they were reasonably able to learn and recall short factual information.

It was hypothesised there would be no difference in academic performance among the four groups before the experimental intervention in History Test 1.

Table 4.4 Summary table for One-way analysis of variance for the four groups on History Test 1

Source	*Sum of squares*	*df*	*Mean square*	*F*
Between groups	367	3	122.49	1.82
Within groups	2357	35	67.34	

Table 4.4 shows a one-way statistical analysis of variance using the F-test (Behr, 1983: 75). The value of F-test (1.82) is not significant at the conventional levels (.05 and .01 levels. Hence the hypothesis that there is no difference in academic performance among groups A, B, C and D on History Test 1 is accepted.

4.4 THE ACADEMIC PERFORMANCE LEVELS OF CHILDREN WITH LEARNING PROBLEMS *AFTER* THE EXPERIMENTAL INTERVENTION

A teacher-made curriculum-based content test (History Test 2), similar but not identical to History Test 1, was used to obtain the data (discussed in chapter 3). The following table indicates the average percentage scores obtained by the various groups.

Table 4.5 Result of academic performance *after* the experimental intervention (N=39)

	Group A - grade 4	Group B - grade 4	Group C - grade 5	Group D - grades 4&5
$\bar{x}$	67	59	77	63
SD	8	11	8	12
N	12	12	5	10

The values in the table are in percentage, sample mean=65 and SD=11

Table 4.5 presents the results, in percentages, of the academic performance of the four groups *after* the experimental intervention. These scores indicate the academic performance of pupils after they were exposed to metacognitive strategy training. The objective is to determine whether there is a difference in academic performance after the metacognitive strategy instruction. The calculated mean score of the sample is 65% and the standard deviation 11.

Table 4.6 Result of the four parts of History Test 2 (N=39)

	Group A - grade 4 N=12	Group B - grade 4 N=12	Group C - grade 5 N=5	Group D - grades 4&5 N=10	$\bar{x}$
Part 1 % of Comprehension correct	86	82	96	91	89
Part 2 % of contents page correct	97	92	96	70	89
Part 3 % of Short questions correct	62	49	72	59	61
Part 4 % of long questions correct	44	38	56	44	46

Table 4.6 indicates the mean scores of each group on a specific section of the test. Figures derived from table 4.6 also indicate raised scores on the contents page part (89%) and long questions part (46%). A decrease in the comprehension part (89%) and short question part (61%) is indicated. Group C, a group comprising solely five 5th grade children on average scored 10% higher than the other 3 groups.

It was hypothesised there would be no difference in academic performance among groups A, B, C and D on History Test 2.

Table 4.7 Summary table for One-way analysis of variance on History Test 2 among groups A, B, C and D

Source	*Sum of squares*	*df*	*Mean square*	*F*
Between groups	1117	3	372.26	3.63
Within groups	3593	35	102.65	

In Table 4.7 a one-way statistical analysis of variance using the F-test (Behr, 1983: 75) is presented. Table 4.7 shows significant difference among groups A, B, C and D for the F-value 3.63 at the .05 level of significance (but not at the .01 and .001 level of significance) and hence the hypothesis that there is no difference in academic performance between groups A, B, C and D on History Test 2 is rejected at a 5% level of significance. Thus, a difference is indicated in the average scores between the four groups in History Test 2 after the experimental intervention and the hypothesis that there is no difference in academic performance between the four groups of the sample both before and after the experimental intervention is rejected.

4.5 A COMPARISON OF ACADEMIC PERFORMANCE *BEFORE* AND *AFTER* THE EXPERIMENTAL INTERVENTION

In order to be able to make this comparison, we need data on academic performance before and after the experimental intervention. The average scores in History Tests 1 and 2 are compared. Since we want to test for the significance of difference between two means of correlated/paired or dependent samples, the student t-test will be an appropriate statistic for this analysis (Behr, 1983:70).

Table 4.8 **A comparison of academic performance before and after the experimental intervention**

Groups	Before experimental intervention	After experimental intervention	d	d^2
A	59%	67%	8	64
B	52%	59%	7	49
C	59%	77%	18	324
D	55%	63%	8	64
$\bar{x}$	56%	65%		
Σ			41	501

It was hypothesised that pupils who are taught metacognitive and study skills would show no difference in academic performance after the experimental intervention.

Calculations using the t-test, based on figures from table 4.8, indicate that: H_0 is rejected at a 5% level of significance, but not at a 1% level of significance. The

calculated t-value t_c = 3.951 for df=3. Thus, $t_c > t_{0,0}$ for df=3, however, $t_c < t_{0,0}$ .The difference between the mean scores is accepted as significant at the .05 level. This implies that with 95% confidence, the difference between mean scores is real and that it is likely to occur again in samples drawn from the same population in 95 cases out of 100.

4.6 THE RESULT OF DETERMINING WHETHER ACADEMIC PERFORMANCE IS ASSOCIATED WITH SEX

At the outset of the research it was hypothesised that there would be no relationship between academic performance and the variables sex and age.

Table 4.9 Cross tabulation of Sex and Academic Performance *before* the experimental intervention (N=39)

	Sex	
	Male	***Female***
Those who obtained below 56%	*16*	*4*
Those who obtained 56% and above	*13*	*6*

χ^2 =0.69 df=1

Table 4.9 presents a cross tabulation of *academic performance on History Test 1* and *sex* before the experimental intervention. Statistical analysis was done employing the chi square test (Bohrnstedt & Knoke, 1982:106). Based on the figures in table 4.9 and for df=1, chi-square test at p=0.05 is 3.841, at p=0.01 is

6.635 and at p=0.001 it is 10,827. The calculated chi-square value =0.69 is less than any of these values. Thus, the null hypothesis is accepted and the alternative hypothesis is rejected. There seems to be no significant difference between male and female pupils' academic performance in History Test 1 before the experimental intervention.

Table 4.10 Cross tabulation of Sex and Academic Performance in History Test 2 *after* the experimental intervention (N=39)

	Sex	
	Male	***Female***
Those who obtained below 56%	*15*	*2*
Those who obtained 56% and above	*14*	*8*

χ^2 =3.044 df=1

Table 4.10 presents the cross tabulation of *academic performance on History Test 2* and *sex* after the experimental intervention. Statistical analysis was performed employing the chi test. Based on the figures in table 4.10 and for df=1, chi-square test at p=0.05 is 3.841, at p=0.01 is 6.635 and at p=0.001 it is 10,827. The calculated chi-square value = 3.044 is less than any of these values. This figure is noticeably higher than the value after the first test, but the null hypothesis is accepted and the alternative hypothesis is rejected. There still seems to be no significant difference between male and female pupils' academic performance on History Test 2 after the experimental intervention.

The hypothesis that there is no relationship between academic performance and sex is accepted to be valid for both History Tests 1 & 2.

4.7 THE RESULT OF DETERMINING WHETHER ACADEMIC PERFORMANCE IS ASSOCIATED WITH AGE

The initial hypothesis was set that there would be no relationship between academic performance and age.

Table 4.11 Cross tabulation of Age and Academic Performance in History Test 1 *before* the experimental intervention (N=39)

	Age	
	9-10	***11-12***
Those who obtained below 56%	9	10
Those who obtained 56% and above	10	10

χ^2 =0.027 df=1

Table 4.11 presents a cross tabulation between *History Test 1 academic performance* and *age* derived before the experimental intervention. Pupils were grouped according to age. Pupils were further grouped according to those who obtained scores above the mean and below the mean.

A slight difference of 3%, in favour of the 9-10 year olds, is indicated. The chi square test was used as analytical tool. Based on the figures in table 4.11 and for

df=1, chi-square value at p=0.05 is 3.841, at p=0.01 is 6.635 and at p=0.001 it is 10,827. The calculated chi-square value = 0.027 is less than any of these values. Thus, the null hypothesis is accepted and the alternative hypothesis is rejected. There seems to be no significant difference in the cross tabulation between the two age groups and academic performance on the first history test.

Table 4.12 Cross tabulation of Age and Academic Performance in History Test 2 *after* the experimental intervention (N=39)

	Age	
	9-10	***11-12***
Those who obtained below 65%	10	8
Those who obtained 65% and above	9	12

χ^2 =0.626 df=1

Table 4.12 presents a cross tabulation between *academic performance* and *age* derived after the experimental intervention. Pupils were again grouped according to age. Pupils were further grouped according to those who obtained scores above the mean and below the mean.

Based on the figures in table 4.12 and for df=1, chi-square value at p=0.05 is 3.841, at p=0.01 is 6.635 and at p=0.001 it is 10,827. The calculated chi-square value = 0.626 is less than any of these values. Thus, the null hypothesis is again accepted and the alternative hypothesis is rejected. There seems to be no significant difference in the cross tabulation between the two age groups and academic performance on both the first and second history test.

4.8 THE RESULT OF ASCERTAINING WHICH OF THE SKILLS TAUGHT CHILDREN WITH LEARNING PROBLEMS USED AND TO WHAT EXTENT

The fourth objective was to ascertain which of the skills taught, children with learning problems had knowledge of, actually used and to what extent. In order to achieve this objective it is necessary to examine the results of History Test 1 and 2 , as well as data gathered by the Metacognitive Learning Process Questionnaire (MLPQ).

4.8.1 Results from the 4 parts of History Test 1 and 2

A comparison of results of the four sub-tests on History Tests 1 and 2 would indicate actual differences in performance. Each of the four parts measures the application of knowledge and use of various cognitive and metacognitive strategies.

Table 4.13 Differences in mean scores on parts 1-4 for each group on History Test 1 and 2

	Part 1 % of Comprehension correct	Part 2 % of contents page correct	Part 3 % of Short questions correct	Part 4 % of long questions correct
Group A - grade 4 N=12	-10	65	-6	3
Group B - grade 4 N=12	-13	44	-12	15
Group C - grade 5 N=5	-2	49	4	20
Group D - grades 4&5 N=10	-4	33	-1	10
$\bar{x}$	-7	48	-3	12

The values in the table are percentages

Table 4.13 indicates the difference in mean scores that each group attained on that specific part of History Tests 1 and 2. These figures were obtained by subtracting the scores (converted to percentage) of History Test 1 (table 4.3) from History Test 2 (table 4.6). The table clearly indicates that there was a substantial improvement on part 2 (contents page) followed by an improvement on Part 4 (long questions). The table also shows a decrease on part 1 (comprehension) and part 3 (short questions). It is significant that there is an increase displayed on both the part 2 and 4 (contents page & long questions), since these were areas that required a higher level of knowledge and use of cognitive and metacognitive strategies.

Statistical analysis based on the figures in table 4.13 using the t-test yielded the following results. It is indicated that there is no statistically significant difference on part 1 (comprehension) between History Test 1 and 2 (tc=-2.830 for df=3, tc<t0.01 and tc<t0.05).

Similarly, employing the same technique, it was found that there was a significant difference on part 2 (contents page) between History Tests 1 and 2 (tc=7.180 for df=3, tc>t0.01 and tc>t0.05). On part 4 (long questions) a significant difference was found on the 0.05 level of confidence but not at the 0.01 level (tc=3.307 for df=3, tc<t0.01 and tc>t0.05). No significant difference was indicated on part 3 (short questions) between History Test 1 and 2 (tc=-1.095 for df=3, tc<t0.01 and tc<0.05).

In short it is clear that there was a significant difference on the contents page and long question parts of History Test 1 and 2. These differences occurred after the experimental intervention during which time strategies were taught to the children in order to improve their academic performance.

4.8.2 Results from the MLPQ

The MLPQ was used to determine which of the skills, strategies and processes pupils reported to have used during their learning process. The MLPQ was completed before and after the experimental intervention. Figures 4.2 to 4.8 each reflect the before and after scores of the different sub-scales of the MLPQ. The

average score of each group (A-D) is given in percentage. This percentage indicates how each group collectively responded to the questions of the particular

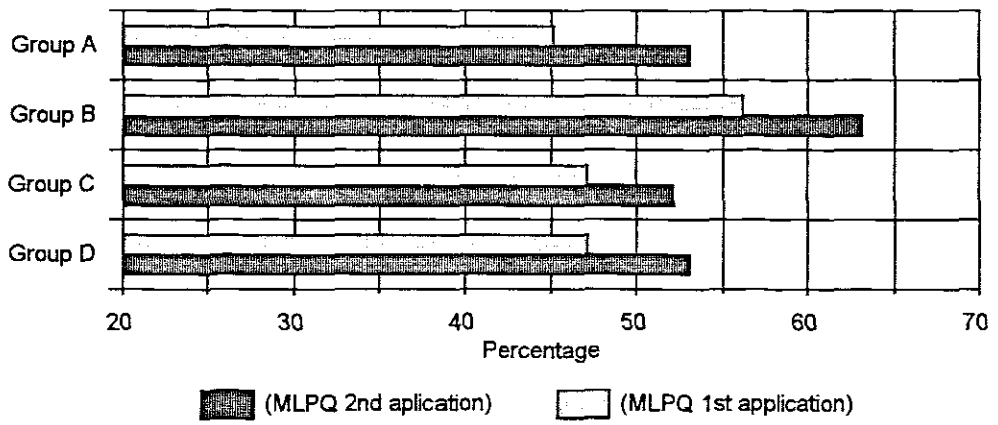

Figure 4.1 Comparison of MLPQ 1 and 2 total scores (N=39)

sub-scale. A score of 100% will indicate that the group answered all the questions of that particular sub-scale positively. Positive in this case means answering in such a way that the answers contribute towards the ideal profile of the effective learner. One point is allocated for each positive answer and the scores were converted to percentages to facilitate comparison between sub scales. Thus, the higher the percentage, the closer the group moves towards the ideal profile of a learner that uses metacognitive strategies (APPENDIX D).

Figure 4.1 shows the comparison between the first and second application of the Metacognitive Learning Process Questionnaire (MLPQ). The reader is reminded that the MLPQ was employed to gather self-reported retrospective information from the pupils about their learning process. Figure 4.1 indicates an increase in percentage in the second applications of the MLPQ. The Pearson product moment correlation coefficient was used to measure the linear association between the

before and after scores on the MLPQ. A positive correlation of r=0.65 and SE_r = 0.09 was found. This correlation score indicates a moderate relationship between the first and second application of the MLPQ. This means that the responses given on the second application of the questionnaire are moderately correlated with those on the first application. This implies that the MLPQ can be used with some degree (Behr,1983:46) certainty to gather information for which it was designed and that it would be possible to say with moderate reliability that under similar circumstances the sample group would produce a similar response pattern.

Table 4.14 A comparison of performance results on the sub-scales of the MLPQ

Sub-tests of MLPQ	1st application of the MLPQ	2nd application of the MLPQ	*d*	d^2
Attitude	65	45	-20	400
Planning	40	36	-4	16
Cognitive and metacognitive strategies	48	62	14	196
Concentration	38	50	12	144
Test activities	57	66	9	81
After test activities	75	75	0	0
Study skills	41	47	6	36
$\bar{x}$	52	54	2	125
SD	14	14	12	140
N	7	7		
Σ			17	873

Table 4.14 indicates the percentage scores on the sub-scales of the MLPQ on the first and second application (APPENDIX E). Statistical analysis using the t-test, based on the figures in table 4.14, indicates that if α=0.546 for df=6 then there is no significant statistical difference between the two applications of the MLPQ at the .05, .01 and .001 levels of significance.

Figures 4.2 to 4.8 show comparisons between the first and second application of each sub-scale of the MLPQ questionnaire. By studying these figures it becomes apparent how the pupils themselves viewed the change in their knowledge and use of the cognitive, metacognitive and other learning strategies and factors relating to their learning process. The use of the MLPQ gives insight into the unseen learning process of the pupils.

On each of the seven sub-scales of the MLPQ, as represented by figures 4.2 to 4.8, the raw scores were converted to percentages to facilitate comparison between the sub-scales. The higher the percentage, the closer the group matches the attitude of the ideal learner as determined by the MLPQ. The percentages of the first and second application on each sub-scale are compared in order to determine how the pupils' perception of their knowledge and use of cognitive, metacognitive and related learning skills had changed after they had been taught these skills. It is important though to keep in mind that the pupils' original responses on the first application of the MLPQ might not necessarily have been accurate portrayals of their actual knowledge or use of strategies and skills. In order to evaluate their knowledge and use of metacognitive strategies, they would

need the insight that training in metacognitive strategies brings to the process. Observation of and discussion with pupils indicated an attitude among the group that they knew and did more than what was reported by their teachers. The teachers and researcher agreed that the impulsive nature and inaccurate self-evaluation by the pupils were reflected in the first application of the MLPQ. The reader is reminded of the impulsive nature of the child with learning problems as discussed in chapter two. Therefore, lower scores on the second application should not necessarily be viewed negatively. Lower scores might indicate a more realistic reflection of knowledge and use of skills after the experimental intervention. These premises are valid for each of the seven sub-scales of the MLPQ.

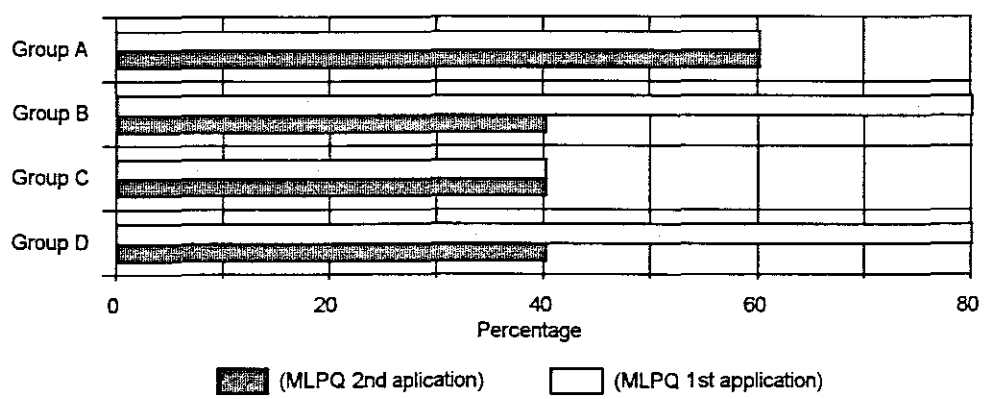

Figure 4.2 The comparison of percentage scores on attitude and motivation (N=39)

Figure 4.2 indicates the degree of motivation and general attitude towards studying for a test. The pattern of responses is the same for groups A and C and for B and D. Based on classroom observation the researcher speculates that pupils from groups B and D were demotivated on the second taking of the test

when they realized the effort it takes to achieve results. Scores for groups A and C indicate no difference between the first and second administration on the attitude and motivation sub-scale. The researcher expected a positive change in the attitude and motivation of the pupils, but the research was done at the end of the last term of the school year and the pupils appeared demotivated in general. The researcher also observed that Group A was generally more motivated about the project than the other groups and that Group C (grade 5) were not as interested in participating. The reasons for their lack of interest were not explored.

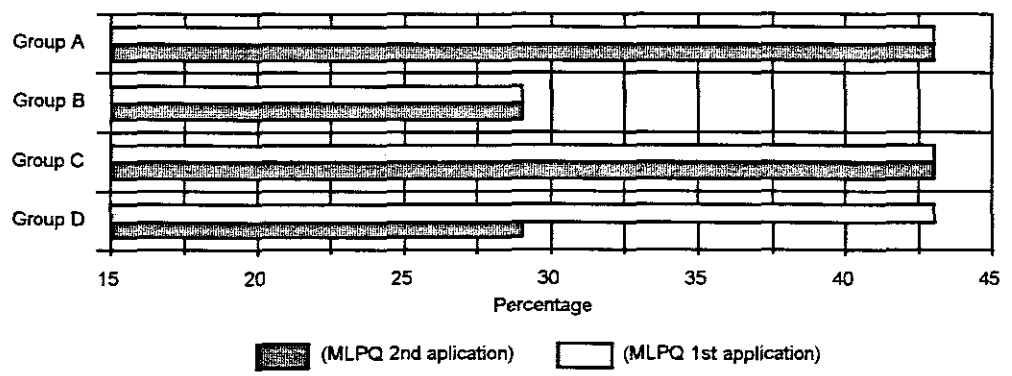

Figure 4.3 The comparison of percentage scores on Planning (N=39)

Figure 4.3 shows the groups' degree of planning when studying. The scores for all the groups are under 50%. Group D's score decreased on the second application of the MLPQ. No change was reported by the pupils on their knowledge and use of planning during the learning process. This implies that the ability to plan during the learning process is not highly developed among this particular group of children with learning problems. The researcher speculates that planning as a skill requires the ability to view the learning process as a whole and to recognise and plan the steps involved in executing the process. The limited

intervention period did not allow for in depth training in this specific area. Future research could focus on this aspect of metacognition.

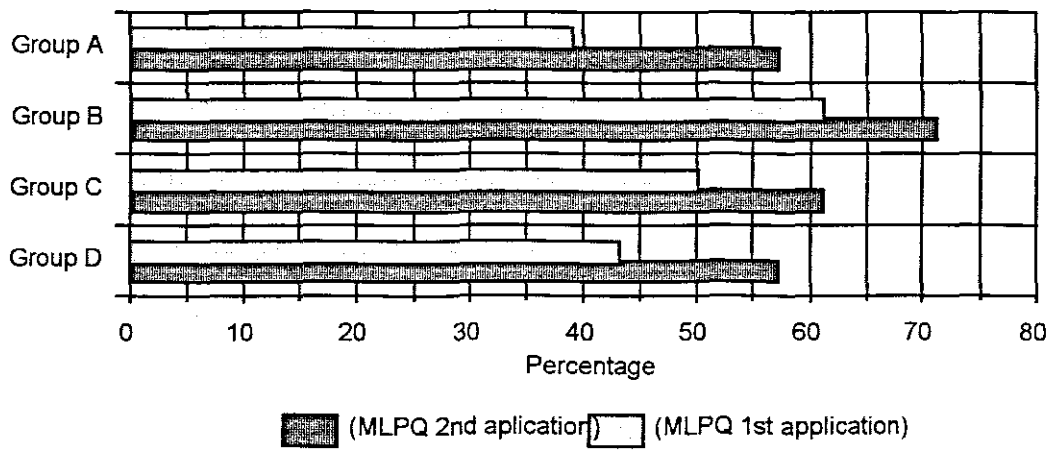

Figure 4.4 The comparison of percentage scores on cognitive and metacognitive strategies (N=39)

Figure 4.4 shows the degree of knowledge and use of cognitive and metacognitive strategies. All four groups show increased levels on the second application. General feedback from the pupils indicated that they felt empowered after they acquired cognitive and metacognitive strategies. Pupils reported that their newly acquired knowledge in the use of metacognitive strategies made it easier to engage in the learning process. They reported that it was easier to start the learning process and to continue the process by using actual study skills as compared to the strategy poor learning process they followed before.

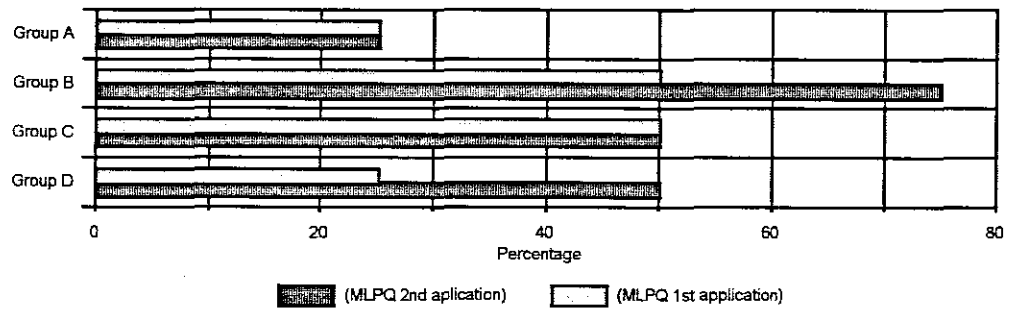

Figure 4.5 The comparison of percentage scores on concentration (N=39)

Figure 4.5 displays the degree of concentration reported by the pupils of the four groups. While Groups A and C reported no increase, Groups B and D showed a positive increase on the second application of the MLPQ. Informal feedback from pupils indicated that they found it easier to concentrate when they used their newly acquired strategies during study sessions.

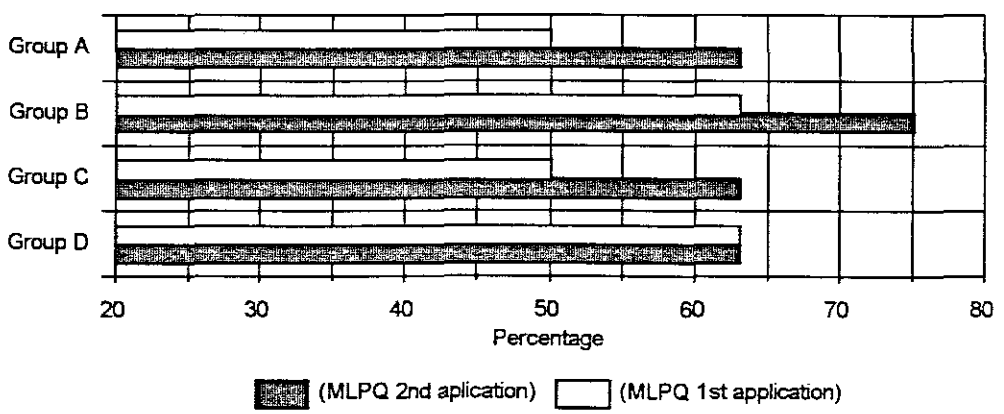

Figure 4.6 The comparison of percentage scores on test writing process (N=39)

Figure 4.6 shows the degree to which pupils utilised strategies during the process of writing the test. Groups A, B, and C showed a positive increase in knowledge and application of these strategies, whereas group D showed no increase on the second administration of the MLPQ.

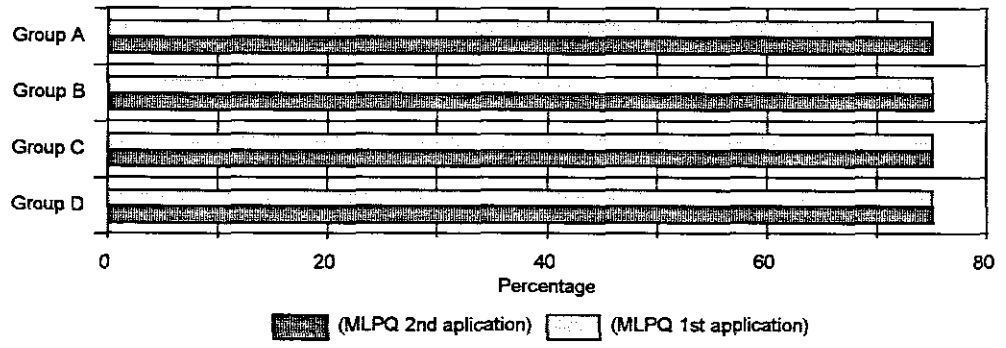

Figure 4.7 The comparison of percentage scores on after test activities (N=39)

Figure 4.7 reports on pupils' monitoring and correction activities after a test. It is noted that all four groups showed no difference between the first and second application. These fairly high percentages may be based on previous classroom experience where the pupils are urged by their teacher to correct their work. Whether pupils are actually aware of and take cognisance of their after test activities cannot be ascertained.

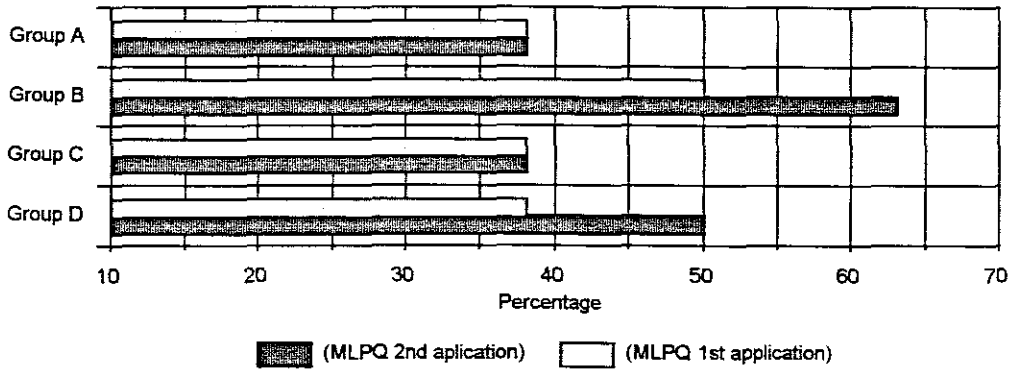

Figure 4.8 The comparison of percentage scores on study skills (N=39)

Figure 4.8 displays the degree to which pupils believed their knowledge and use of study skills improved. Groups B and D clearly showed improvement, whereas groups A and C stayed on the same level. It seems that groups B and D

experienced a change in their study skills knowledge after the experimental intervention as opposed to no change reported by groups A and C.

4.9 SUMMARY

In summary, the sample group as a whole showed improvement in a positive direction on the Metacognitive Learning Process Questionnaire which indicates that in retrospect pupils subjectively perceived an increase in their knowledge and use of learning process strategies after the experimental intervention. The raw score totals of the first and second applications of the MLPQ were converted to percentages in order to facilitate comparison. The mean score of the sample group was 49% on the first application of the MLPQ compared to 55% on the second application. The difference between the average scores shows an increase of 6% after the experimental intervention. If a score of 100% is regarded as the ideal score, it is clear that the sample group did not score very highly. It can be noted that a positive increase on the MLPQ was achieved at the same time as a positive increase is recorded for academic performance on History Test 2. The difference between the first and second application of the MLPQ however, was *not* statistically significant.

The researcher hoped that the experimental training would bring about a definitive change in all the sub-scales of the MLPQ. A decrease in part 1 (comprehension) and part 3 (short questions) on the History Test 2 might be linked to the poor ability to plan as indicated by the Planning sub-scale of the MLPQ. It is possible

that the children diverted study time and focus from the comprehension part (in which the commented they did well) and short question part and spent more time applying newly acquired strategies to study for the contents page (part 2) and the long questions (part 4). The results from the second application of the MLPQ, after the experimental intervention, also indicated a decrease on the attitude and motivation sub-scale. An insignificant difference was noted on the concentration, after test activities and study skills sub-scales. Pupils did however report an increase in knowledge and use of strategies on the studying of a chapter (cognitive and metacognitive strategies) and test writing sub-scales of the MLPQ. These sub-scales question specific knowledge and application of cognitive and metacognitive strategies involved in the metalearning process. Pupils answered positively on questions such as: did you write down the contents page by looking at it?, do you know what key words are?, did you learn your key words?, did you try to remember the story you made up to help you remember?, etc. This increase coincided with an increase on part 2 (contents page) and part 4 (long questions) in the history tests.

4.10 DISCUSSION

The main aim of this study was to explore the relationship between metacognitive strategies and academic performance among children with learning problems. The question was posed whether it is possible and worth the effort to teach metacognitive strategies to children with learning problems. The main aim was achieved by exploring a number of set objectives.

The **first objective** of this study was to determine the academic performance levels of children with learning problems *before* the experimental intervention. Findings showed that a group of 39 pupils achieved a score of 56% on a history test before they were taught any metacognitive strategies.

The **second objective** was to determine the academic performance of the pupils on the second history test, similar but not identical to the first. The pupils were on that occasion given the opportunity to use the strategies they had been exposed to during the experimental training phase of the intervention in their learning process. The group's score significantly increased to 65%. This implies that they were able to learn and apply these metacognitive strategies in their learning process which coincided with an improvement in their academic performance. This finding is in line with previous research (Romaineville, 1994:359-66; Nieman, 1993:283; Lucangeli, Galderisi & Cornoldi, 1995:11, Powell & Makin, 1994:579). The results of this study also show that children, specifically those with learning problems, can master and apply metacognitive skills as shown by similar findings in previous research (Du Toit, 1990:23). In terms of percentage scores the groups' performance levels were average.

The **third objective** of this study was to determine whether academic performance is associated with the variables of age and sex. This objective was achieved through statistical analysis of the data gathered from History Test one and two as well as demographic data collected. The findings indicated no significant association between academic performance and the variables of age

and sex. This implies that metacognitive strategies can be mastered regardless of the age and sex of the child. This finding differs from previous research where it was found that the ability to learn and use metacognitive skills is age related (Geary, Klosterman & Adrales, 1990:448; Van der Westhuizen, 1989:567; Viljoen, 1993:117). It must be noted though that in previous research, such as that reported by Viljoen, very young children are compared to much older children. The researcher is of the opinion that the wider the age range of children, the greater the probability of significant difference in ability to learn and use metacognitive strategies among the sample subjects. The implications are that the acquisition and use of metacognitive strategies are not dependent on the age or sex of subjects such as those in the age range that participated in this study.

The **fourth objective** was to ascertain which of the skills taught children with learning problems had knowledge of, actually used and to what extent. Results from the self-report Metacognitive Learning Process Questionnaire (MLPQ) and the analysis of the results of the sub test of History Test one and two were used. Quantitative findings from the MLPQ indicated that there was a 6% difference between the mean scores of the first and second applications, but that the difference was not statistically significant. Overall, the findings indicate that the pupils did not report significant differences in their knowledge and actual use of the skills taught after the intervention on the MLPQ. Closer inspection of the sub-scales of the MLPQ indicates how the sample (N=39) as a whole performed; the sample showed a decrease on the attitude and motivation sub-scale, and no significant increase on the planning, concentration and after test activities sub-

scales. The sample showed an increase on the cognitive and metacognitive strategies and test writing skills sub-scales of the MLPQ. The implications of these results are that pupils with learning problems are able to acquire and use metacognitive strategies, as indicated by an increase in cognitive and metacognitive strategies knowledge and use, study skills, as well as test writing abilities sub-scales. The acquisition of these metacognitive strategies is however grouped with a negative attitude and motivation, poor concentration, poor planning ability and mediocre after test activities which may inhibit the effective acquisition and use of metacognitive strategies.

Examination of the results in History Tests 1 and 2 indicated that the performance levels on the contents page part and the long question part increased significantly. Increases in these parts of the tests are meaningful since these two parts reflect the knowledge and the use of metacognitive strategies more than the other two parts.

The **last objective** was to determine the difference in academic performance *between the four groups* of the sample before and after the experimental intervention. Results in History Test 1 indicated no significant differences in performance levels among the four participating groups of the study sample. Results in History Test 2, however, indicated a statistically significant difference in academic performance between the four groups after the experimental intervention. Although no statistical significant relationship was found between academic performance and age, it is noted that group C's (grade 5) performance

improved by 18% compared to Group A (8%), Group B (7%) and Group D (8%). The researcher speculated that maturity and being part of a smaller group might have contributed to the better performance of Group C.

Qualitative analysis of the data gathered during this study indicate that when the children were taught specific cognitive and metacognitive strategies, such as a visualisation technique (cognitive strategy) and accompanying monitoring and management technique (metacognitive strategy), they were able to apply these skills which coincided with an improved academic performance. These improvements were noted in an increase on the contents page and long question parts of the second history test. This discovery is supported by research involving many different aspects of metacognitive strategies and in various subject fields, such as in reading (Bouwer, 1992:12), memory and transfer effects (Lucangeli, Galderisi & Cornoldi, 1995:11) and mathematics (Powell & Makin, 1994:579). This study aimed at adding to existing research by using history as a content subject.

Conversation with the pupils indicated that although they experienced the positive effects of the strategies they learned and used, they felt that the method was cumbersome and too much effort was required to implement it. This attitude could be ascribed to the nature of their learning problems and the effort required in acquiring and using new strategies. It was noticeable that the children were able to remember and recall the work verbally, but they were not as eager to formulate and put their answers in writing. The implementation of the strategies taught required a fair amount of reading and writing, skills which they had problems with.

They were however able to acquire and use these strategies notwithstanding underlying basic skills deficiencies.

In summary, this research has indicated that children with learning problems are able to acquire and use metacognitive strategies in spite of their disabilities. A significant increase has been shown in academic performance after training in metacognitive strategies, which makes teaching these strategies to children with learning problems well worth the effort. The negative impact of factors that influence the learning process such as, attitude, concentration, motivation and planning and follow-up activities after tests, detract from the positive benefits of acquiring and using metacognitive strategies.

In the final chapter a summary of the research is presented as well as the conclusions, limitations and recommendations for further research.

CHAPTER 5

5. CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter focusses on the objectives achieved in the study. Conclusions are drawn from the findings of the investigation. Limitations of the study are highlighted, and recommendations are made for further research.

5.2 THE STUDY

Children with learning problems were the subjects of investigation in this dissertation. In this study the researcher set out to determine whether it was possible to teach a group of 39 fourth and fifth grade children, metacognitive strategies, and to determine whether they would be able to employ the metacognitive strategies as part of a metalearning process. The effective use of these metacognitive strategies was tested and observed in the pupils' academic performance.

5.3 REALISATION OF OBJECTIVES AND CONCLUSIONS

The primary aim of examining and describing the relationship between metacognitive strategy instruction and academic performance of children with learning problems, has been met by achieving the following objectives.

Firstly, as part of an experimental design, the academic performance levels of children with learning problems were determined *before* the experimental intervention. A teacher made curriculum-based history test was used to determine performance levels. The results of the first test served as baseline scores used for comparison against further testing. Results indicate no significant difference in performance levels among the four participating groups of the study sample. The groups' percentage scores on performance are the same.

Secondly, the academic performance of these children was determined *after* the experimental intervention. A similar, but not identical, teacher made curriculum-based history test was used to determine performance levels. Results indicate a statistical difference among the four groups at a 0.05 level of significance.

Thirdly, the effect of the experimental intervention on the second performance trial was determined. This was achieved by comparing the results of the first and second history tests. A comparison of the mean scores of the before and after tests, indicates a significant statistical increase of 9% in academic performance.

Findings therefore indicate that academic performance improved after the subjects participated in metacognitive strategy training.

One objective was to determine whether academic performance is associated with the variables of age and sex. This objective was achieved through statistical analysis of the data gathered from History Tests one and two as well as demographic data collected. The findings indicate no significant association between academic performance and the variables of age and sex. The implications are that the acquisition and use of metacognitive strategies are not dependent on the age or sex of subjects.

The last objective was to ascertain which of the skills taught children with learning problems had knowledge of and to what extent they were used. This objective was realised by the application of the self-report Metacognitive Learning Process Questionnaire (MLPQ) and the analysis of the results of the sub-test of History Tests one and two. Quantitative findings from the MLPQ indicate a 6% difference between the mean scores of the first and second applications, but the difference is not statistically significant. The MLPQ findings indicate that the pupils did not reveal significant differences in their knowledge and actual use of the taught skills after the intervention. Further inspection of the sub-scales of the MLPQ indicates how the sample (N=39) as a whole performed. An observation was made of a decrease in the attitude and motivation sub-scale, and no significant increase in the planning, concentration and after test activities sub-scales. The sample shows an increase in the cognitive and metacognitive strategies, test writing and study

skills sub-scales of the MLPQ. The implications of these results are that an increase in cognitive and metacognitive strategies knowledge and use, study skills, as well as test writing abilities, is accompanied by negative attitude and motivation, poor concentration, poor planning ability and mediocre after test activities. It seems that the process of effectively acquiring and using metacognitive strategies is inhibited by the above mention negative factors.

An examination of the results in History Tests one and two indicates that the performance levels on the sub-scales, contents page and the long questions, increased significantly. Increases in these parts of the tests are meaningful since these parts reflect a high level of knowledge and use of metacognitive strategies.

In summary, the results of the findings in this research indicate that it is possible to teach metacognitive strategies to children with learning problems. It is also clear that knowledge and use of these strategies may significantly improve academic performance. There are however detracting negative factors that influence the learning process such as negative attitude, poor concentration, motivation, planning and poor follow-up activities.

5.4 LIMITATIONS OF THE STUDY

A limitation of this study is the short amount of time spent teaching the pupils who participated in the metacognitive strategies intervention. One reason for this is the lack of cognitive strategies that the pupils display which was discovered during the

training process. The pupils also work at a very slow pace because of their poor motivation, concentration and reading and writing abilities. The heterogenous nature of their learning disabilities is also a problem. The reality of doing research among special populations of limited numbers was accepted as a limitation of this study. The fact that only 39 pupils across two grade levels, speaking two languages were used is recognised as a limitation. It would have been ideal to have used two comparable groups. Ideally the interval between the first and second applications of the performance test should have been greater in order to give pupils the opportunity to assimilate the metacognitive strategies taught. It would also have been more effective to have had time to pilot the MLPQ questionnaire.

Another limitation in this study is the pupils' inability to express themselves in writing which makes it difficult to accurately measure their academic performance. The pupils seem to have coped better when they had to circle correct answers and write short answers, rather than longer sentences and paragraphs. Factors such as test phobia, motivation and attention, etc. that could possibly influence academic performance are not directly addressed in this research. It was however the intention of the researcher to examine the abilities of learning disabled children in their natural circumstances with all the given limitations and demands.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH

Possible avenues for further research include areas such as the impact of factors associated with learning problems and disability on the acquisition of metacognitive strategies and consequent academic performance. It could also be meaningful to examine the acquisition of metacognitive strategies by 'normal' children. The researcher also feels that further research into instruments that measure the knowledge and use of cognitive and metacognitive strategies for young children would be meaningful.

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ANNEXURE A

Pre-Intervention History Test 1

Name_____**Teacher's name**_____

Answer ALL the questions as best you can. Remember, you did study for this test. Think before you answer.

We will start with questions about the story *[part 1]*

Draw a circle around the right answer

1. The people in the story stayed in *South Africa / South America / North America.*
2. The brother's names were _____ and _____
3. The farmers stayed in *Karoo / Pandor / Peru.*
4. The twins were identical, only their *mom / dad / teacher* could tell them apart.
5. Their home had *brick walls / mud walls / clay walls.*
6. Their house had *1 / 2 / 3* windows.
7. They grew *cabbages / beans / potatoes.*
8. The brother in the field had to chase away the *rats / birds / fruit flies.*
9. The name of the bad person in the story is *Rumble / Lightning / Thunder.*
10. He sometimes stole *animals / people / money.*
11. He put the brother he caught in a *box / jail / sack.*
12. A *mountain goat / llama / alpaca* told the other brother who to ask for help.
13. The name of the beautiful bird was *Tondo / Condor / Rumble.*
14. The brother who called the big bird played on his *panpipes / flute / wooden whistle.*
15. The big bird offered him the use of his *feathers / wings / strong legs.*
16. The windows of the palace were made of *rock / ice / glass.*

Fill in the gaps *[part 2]*

This is the content page.

The next questions are about the rest of the chapter *[part 3&4]*

Questions about Farming life

1. Name 2 crops the farmers grew_____
2. Name 2 things the men did_____

3. Name 2 things the women did_____

_____

4. Name 2 tools they used in the fields_____

5. Name 2 things in which grain is stored

_____

6. What are Chuños and explain how it was made_____

_____

_____

_____

Questions about Changing the land

7. Some places in Peru were very _____and_____
8. Explain how the farmers irrigated_____

_____

_____

9. Explain what terraces are_____

_____

10. Why did the farmers build terraces_____

_____

11. What did the farmers use for fertilizers_____
12. Why do we say the farmers lived a *settled* life_____

_____

_____

_____

13. Name 2 animals they kept_____
14. How many kilograms could the big animals carry_____
15. The llamas wool were used to make

_____and_____

16. The alpacas wool were used for_____

17. They made pots and used them to store _____and_____

18. Why did some farmers stop farming and then did other things_____
_____

Questions about Exchanging goods

19. Explain how the people of Peru bartered or exchanged goods_____
_____
_____
_____

The Inca Empire

20. Give the dates when the Inca Empire was very big and powerful (_____)to(_____)

21. The King of the Incas was called _____

22. Describe what a Quipu is and what it was used for_____
_____
_____

Congratulations - You have finished the test ! ☺

How do you think you did? *[part 5]*

full marks / more than half right / less than half right / very bad.

[part 6]

Do you want to say something about the test to your teacher? Use this block.

ANNEXURE B

Post-Intervention History Test 2

Name_____ **Teacher's name**_____

Answer ALL the questions as best you can. Remember, you did study for the test. Think before you answer.

We will start with questions about the story *[part 1]*

Draw a circle around the right answer

1. The people in the story stayed in *South Africa / South America / Southern Africa.*
2. The children were called _____ and _____
3. They were *hunters / orphans / adopted.*
4. The people who killed their parents were called the *Batwana / Selwanas / Mpafane.*
5. They travelled down the *Nkomazi river / Dumduma river / Selwana river.*
6. The children lived off *fish and crabs / fish and snails / fish and eels.*
7. When they got to the Mzinto coast they lived in the *bushes / a mud hut / a kraal.*
8. The nearby people were called the *Ibombos / Imtwana / Dulamas.*
9. There was a drought and the people lived off their *cattle / fish / buffalo.*
10. The children ate the meat of the *legs / face / bones.*
11. The Imtwana noticed every time they killed an animal there was a gentle *fire / wind / rain.*
12. They found the children when they saw their *hut / fire smoke / heard their voices.*
13. They could not plant because they had no *cattle / seeds / tools.*
14. The man who had seeds was called *Jumbalo / Gogo / Njilo.*
15. He put a fence around his land to keep out the *pigs / wild dogs / horses.*
16. The place where the amaMboto live is today called *Zululand / Harding / Mbotoland.*

Fill in the gaps *[part 2]*

This is the contents page:

Chapter 8 - Early farmers in southern Africa

A farming story from southern Africa

1. _____ did farmers live in southern Africa?
2. How did farmers live in southern Africa?

2.1 _____

2.2 _____

2.3 _____ _____

2.4 _____

2.5 _____

2.5 _____ _____ _____

2.6 _____ _____

2.7 _____ _____ _____ _____

3. Making iron tools

3.1 _____ _____

3.2 _____ _____

The next questions are about the rest of the chapter *[part 3&4]*

Questions about How farmers lived in southern Africa

1. Name the place where the people lived **S**_____
2. Name 3 things the farmers and hunter-gatherers traded

_____

3. How many years ago did they live here_____
4. Give 3 reasons why they decided to live there_____

_____

5. What evidence, about the farmers, did the archaeologists find there?

6. What food did the farmers plant and eat

7. What did the farmers store food in

8. Tell me how the farmers got the first mealie seed

9. Where did the they store grain *outside, how was this made?*

10. Name 2 things the farmers used to build houses

11. Describe how their cattle looked?

12. What did they use the cattle for?

13. Name four things farmers did

14. What did men do?

15. What did women do?

16. What did the farmers keep in the middle of their settlements?_____

17. Explain how some farmer became rich and powerful_____

_____

_____

_____

_____

_____

18. Why did the farmers need iron tools?_____

_____

19. Explain how iron was smelted_____

_____

_____

_____

20. What was a bellow made from?_____

21. Tell me how they made iron tools_____

_____

_____

_____

_____

22. Why do you think that making iron was a secret_____

_____

Congratulations - you have finished the test! Thank you for your hard work

[part 5]

How do you think you did? *Full marks / more than half right / less than half right / very bad*

Do you want to say something about the test to your teacher? Use this block.

[part 6]

ANNEXURE C

Metacognitive Learning Process Questionnaire - Adapted by W.J. van Rooyen

(Based on and adapted from the *Metamemory, Memory strategy and Study Technique Inventory - MMSSTI* - Compiled by DM van Ede & CH Coetzee (1996)).

Preamble to participants:

Remember when you studied for the test the other day? Well, I want you to answer some questions about what you really did when you studied. If you answer all questions truthfully as best you can, it will help you to do better when you study for your next test.

Questions - circle the answer that is true for you: (Participants use separate answer sheets)

1.	**Attitude and motivation**	1 point scored in correspondence to profile	Profile
1.	Was it difficult for you to start learning?		N
2.	Did you like learning for the test?		Y
3.	Did you want to study for the test?		Y
4.	Did you feel you just did not care, that you wanted to give up and forget about the test?		N
5.	Do you always feel like this when you study?		N
2.	**Planning**		
6.	Did you find that you stopped studying a lot to find something you wanted to use, like a pen, ruler or book?		N
7.	Did you find that you did not have enough time to learn all the work?		N
8.	Did you feel it was too much and you would never get it in your head?		N
9.	Did you find there were things you had to study that you did not understand?		N
10.	Did you work out how long it would take you to study a page?		Y
11.	Can you tell how long it will take to study a page?		Y
12.	Did you study during all the periods your teacher gave you?		Y
3.	**Cognitive and Metacognitive strategies studying a chapter**		
13.	Did you look at the chapter heading and the contents page to see what you had to study?		Y
14.	Did you read the contents page?		Y
15.	Did you page through the whole chapter looking at headings, pictures and anything interesting, before you started studying?		Y
16.	Did you try saying the contents page out of your head before going on?		Y

17.	Did you write down the contents page by looking at it?	Y
18.	Did you write down the contents page without looking at it?	Y
19.	Did you think that the work reminded you of work you have done before?	Y
20.	Did you first read all of the chapter before doing anything else?	Y
21.	Did you stop and go back if you did not understand something you had read?	Y
22.	Did you stop reading and say what you had read in your own words?	Y
23.	Did you stop reading and say what you had read and checked to see if you had answered correctly?	Y
24.	Did you underline important words?	Y
25.	Did you make a summary?	Y
	What kind of summary?	
26.	Do you know what key words are?	Y
27.	Did you learn your key words?	Y
28.	Did you say your key words without looking and then check to see if you were right?	Y
29.	Did you learn your key words again when you got them wrong?	Y
30.	Did you learn the work by mostly reading it over and over?	N
31.	Did you check to see if you could remember?	Y
32.	Did you learn the work by writing it down mostly?	Y
33.	Did you check to see if your summaries were correct?	Y
34.	Did you write notes when you read through the chapter?	Y
35.	Did you stop and think about what a sentence really means?	Y
36.	Did you know how to find the important stuff the teacher might ask in the test?	Y
37.	Did you make questions that you answered to see if you knew the work?	Y
38.	Did you write these questions and answers?	Y
39.	Did you check if your answers were correct?	Y
4. Concentration		
40.	Did you find it difficult to sit still to study for a period?	N
41.	Did you find yourself thinking about other things when you were studying?	N
42.	Did you find yourself distracted by sounds around you when you studied?	N
43.	Did you feel tired and not interested when you had to study? N	

5. Test writing activities		
44.	Did you have blanks, where you could not remember anything when you wrote the test?	N
45.	Did you try to do something when you could not remember?	Y
46.	When you wrote your test did you think back to when you read the work to help you remember it?	Y
47.	Did you try to see in your mind where you had read the work?	Y
48.	Did you try to think of the work that was on the same page to help you remember?	Y
49.	Did you try to see the pictures that you had made of the work?	Y
50.	Did you try to remember the story you had made up to help you remember?	Y
51.	Did you try and remember the rhymes or clues you had made to help you remember?	Y
6. Activities after the test		
52.	When you get your test back, do you check to see what you got wrong?	Y
53.	Do you ever ask yourself why you got something wrong?	Y
54.	Will you study differently for the next test?	Y
55.	Do you know different ways of learning?	Y
7. Study skills		
56.	Did you make a spider chart or mind map when you studied?	Y
57.	Did you write down important words?	Y
58.	Did you make a rhyme or word with the first letters of work you wanted to remember, like a clue?	Y
59.	Did you make up a story of the work to remember it better?	Y
60.	Did you make pictures of words in your head and put them together in a row to remember?	Y
61.	Did you make a summary of all the headings of the work you must learn?	Y
62.	Did you say the work over and over?	Y
63.	Did you read the work over and over?	Y
	Total	

ANNEXURE D

ZULULAND REMEDIAL SCHOOL
ZOELOELAND REMEDIëRENDE SKOOL
PO BOX 572, EMPANGENI, 3880 PHONE: 0351-27740 FAX: 27331

1996-11-01

TO WHOM IT MAY CONCERN

This is to certify that I have granted permission to

WILLEM VAN ROOYEN

to do his research projects at the Zululand Remedial School.

Yours faithfully

MRS SR VAN VUUREN
ACTING PRINCIPAL

APPENDIX A

Percentage scores of the four groups of the sample on History test 1 and 2, and the percentage scores on each of the four parts of the tests.

Respondent No	sex	age	group	History test 1	Part 1	Part 2	Part 4	Part 3	History test 2	Part 1	Part 2	Part 4	Part 3
1	f	10.02	d	71	100	82	44	83	76	94	60	71	74
2	f	11.00	d	64	100	45	53	63	68	100	100	33	65
3	f	10.07	d	60	100	36	31	79	73	100	100	52	65
4	m	10.03	d	52	88	45	34	54	52	100	90	19	35
5	f	10.06	d	54	100	36	31	58	56	100	10	38	58
6	m	11.09	d	46	94	9	28	54	65	71	100	57	55
7	m	11.06	d	52	82	27	34	67	47	71	10	43	48
8	f	11.02	d	55	94	27	41	58	72	94	90	52	68
9	m	11.03	d	56	100	27	47	50	77	94	100	57	74
10	m	12.02	d	35	94	36	0	38	47	82	40	19	48
11	m	10.11	a	52	94	27	28	67	65	59	100	48	68
12	m	10.08	a	74	94	45	59	92	70	100	100	33	68
13	m	10.01	a	50	100	27	25	58	60	94	100	33	45
14	m	10.04	a	64	100	45	44	75	86	88	91	38	65
15	m	11.10	a	39	76	0	28	46	59	47	91	48	61
16	m	11.01	a	61	100	45	50	54	63	100	100	29	52
17	m	11.02	a	61	94	27	44	75	63	88	91	33	58
18	m	10.00	a	57	94	36	38	67	86	94	100	76	84
19	m	11.02	a	67	100	36	50	79	75	100	100	57	65
20	m	10.02	a	57	94	27	44	63	61	88	91	29	58
21	m	9.11	a	60	100	45	38	67	64	82	100	48	52
22	m	9.08	a	62	100	18	47	75	73	88	100	57	65
23	m	11.05	c	51	94	45	22	63	74	94	100	48	71
24	f	12.01	c	61	100	27	47	67	71	94	82	52	68
25	m	11.04	c	63	94	64	44	67	86	100	100	76	81
26	m	11.03	c	51	100	27	25	63	68	94	100	43	58
27	f	11.08	c	70	100	73	44	83	84	100	100	62	84
28	m	11.03	b	39	76	36	9	54	36	59	55	14	32
29	m	10.06	b	51	100	64	16	58	60	100	100	38	39
30	m	11.07	b	57	82	55	34	71	59	71	100	43	48
31	f	11.00	b	57	100	45	38	58	70	94	100	43	65
32	m	11.02	b	50	100	36	16	67	66	82	100	57	52
33	f	11.01	b	48	100	45	9	63	61	94	100	33	48
34	m	9.08	b	62	88	45	50	67	64	65	73	62	61
35	m	10.04	b	54	100	64	25	54	78	94	100	62	71
36	m	10.06	b	52	94	36	22	71	53	88	100	19	39
37	f	10.01	b	51	100	73	13	58	59	100	100	29	42
38	m	10.06	b	51	94	45	25	58	43	59	82	24	32
39	m	10.11	b	49	100	36	22	54	65	76	100	38	65
Sample avarage				56	95	40	33	64	65	87	89	44	59
Sample SD				8	7	17	14	11	11	14	23	16	13

APPENDIX B

Percentage score of the four groups of the sample on History test 1 and 2, and the percentage scores on each of the four parts of the tests and the averages for each of the four groups.

Respondent No	sex	age	group	History test 1	Part 1	Part 2	Part 4	Part 3	History test 2	Part 1	Part 2	Part 4	Part 3
1	f	10.02	d	71	100	82	44	83	76	94	60	71	74
2	f	11.00	d	64	100	45	53	63	68	100	100	33	65
3	f	10.07	d	60	100	36	31	79	73	100	100	52	65
4	m	10.03	d	52	88	45	34	54	52	100	90	19	35
5	f	10.06	d	54	100	36	31	58	56	100	10	38	58
6	m	11.09	d	46	94	9	28	54	65	71	100	57	55
7	m	11.06	d	62	82	27	34	67	47	71	10	43	48
8	f	11.02	d	55	94	27	41	58	72	94	90	52	68
9	m	11.03	d	58	100	27	47	50	77	94	100	57	74
10	m	12.02	d	35	94	36	0	38	47	82	40	19	48
Group average				55	95	37	34	60	63	91	70	44	59
11	m	10.11	a	52	94	27	28	67	65	59	100	48	68
12	m	10.08	a	74	94	45	59	92	70	100	100	33	68
13	m	10.01	a	50	100	27	25	58	60	94	100	33	45
14	m	10.04	a	64	100	45	44	75	66	88	91	38	65
15	m	11.10	a	39	76	0	28	46	59	47	91	48	61
16	m	11.01	a	61	100	45	50	54	63	100	100	29	52
17	m	11.02	a	61	94	27	44	75	63	88	91	33	58
18	m	10.00	a	67	94	36	38	67	86	94	100	76	84
19	m	11.02	a	67	100	36	50	79	75	100	100	57	65
20	m	10.02	a	57	94	27	44	63	61	88	91	29	58
21	m	9.11	a	60	100	45	38	67	64	82	100	48	52
22	m	9.08	a	62	100	18	47	75	73	88	100	57	65
Group average				59	96	32	41	68	67	86	97	44	62
23	m	11.05	c	61	94	45	22	63	74	94	100	48	71
24	f	12.01	c	61	100	27	47	67	71	94	82	52	68
25	m	11.04	c	63	94	64	44	67	86	100	100	76	81
26	m	11.03	c	51	100	27	25	63	68	94	100	43	58
27	f	11.06	c	70	100	73	44	83	84	100	100	62	84
Group average				59	98	47	36	68	77	96	96	56	72
28	m	11.03	b	39	76	36	9	54	36	59	55	14	32
29	m	10.06	b	51	100	64	16	58	60	100	100	38	39
30	m	11.07	b	57	82	55	34	71	59	71	100	43	48
31	f	11.00	b	57	100	45	38	58	70	94	100	43	65
32	m	11.02	b	50	100	36	16	67	66	82	100	57	52
33	f	11.01	b	48	100	45	9	63	61	94	100	33	48
34	m	9.08	b	62	88	45	50	67	64	65	73	62	61
35	m	10.04	b	54	100	64	25	54	78	94	100	62	71
36	m	10.06	b	52	94	36	22	71	53	88	100	19	39
37	f	10.01	b	51	100	73	13	58	59	100	100	29	42
38	m	10.06	b	51	94	45	25	58	43	59	82	24	32
39	m	10.11	b	49	100	36	22	54	65	76	100	38	65
Group average				52	95	48	23	61	59	82	92	38	49
Sample average				56	96	40	34	64	65	87	89	44	59
Sample SD				8	6	16	13	11	11	14	23	15	13

APPENDIX C

Differences between the four parts of history tests 1 and 2

Respondent No	Group	Part 1	Part 2	Part 4	Part 3
1	d	-6	-22	28	-9
2	d	0	55	-20	2
3	d	0	64	21	-15
4	d	12	45	-15	-19
5	d	0	-26	7	-0
6	d	-24	91	29	1
7	d	-12	-17	8	-18
8	d	0	63	12	9
9	d	-6	73	10	24
10	d	-12	4	19	11
AVERAGES		**-5**	**33**	**10**	**-1**
11	a	-35	73	19	1
12	a	6	55	-26	-24
13	a	-6	73	8	-13
14	a	-12	45	-6	-10
15	a	-29	91	19	15
16	a	0	55	-21	-3
17	a	-6	64	-10	-17
18	a	0	64	39	17
19	a	0	64	7	-15
20	a	-6	64	-15	-4
21	a	-18	55	10	-15
22	a	-12	82	10	-10
AVERAGES		**-10**	**65**	**3**	**-6**
23	c	0	55	26	8
24	c	-6	55	6	1
25	c	6	36	32	14
26	c	-6	73	18	-4
27	c	0	27	18	1
AVERAGES		**-1**	**49**	**20**	**4**
28	b	-18	18	5	-22
29	b	0	36	22	-20
30	b	-12	45	8	-22
31	b	-6	55	5	6
32	b	-18	64	42	-15
33	b	-6	55	24	-14
34	b	-24	27	12	-5
35	b	-6	36	37	17
36	b	-6	64	-3	-32
37	b	0	27	16	-16
38	b	-35	36	-1	-26
39	b	-24	64	16	10
AVERAGES		**-13**	**44**	**15**	**-12**

APPENDIX D

Raw score results of the 1st and 2nd aplication of the MLPQ (N=39)

scores out of a total of:		63	63	5	5	7	7	28	28	4	4	8	8	4	4	8	8
Respondent	Group	MLPQ1	MLPQ2	Attitude1	Attitude2	Planning1	Planning2	Cog&mc strat	Cog&mc strat	Concentration1	Concntration	Test write1	Test write2	After test1	After test2	Study skills1	Study skills2
1	D	30	30	5	2	0	1	14	14	0	1	5	5	3	3	3	4
2	D	30	24	4	4	5	3	11	7	1	3	4	3	4	3	1	1
3	D	43	45	5	2	2	1	15	23	3	2	7	7	3	4	8	6
4	D	40	42	4	1	3	2	16	21	1	2	6	6	4	3	6	7
5	D	21	32	1	2	4	2	8	15	0	1	4	5	3	4	1	3
6	D	30	30	3	1	1	3	13	15	2	0	5	4	3	4	3	3
7	D	30	42	3	1	2	2	13	24	2	3	5	6	2	2	3	4
8	D	30	31	4	2	0	3	13	13	2	0	5	4	3	4	3	5
9	D	12	30	2	2	2	4	4	14	0	2	2	2	2	2	0	4
10	D	36	20	4	1	6	1	12	10	0	2	5	3	3	1	6	2
11	A	39	40	4	5	3	2	14	19	3	2	7	6	4	3	4	3
12	A	18	23	2	3	3	3	8	9	0	0	2	3	1	2	2	3
13	A	19	30	1	1	3	2	6	16	1	0	4	4	3	4	1	3
14	A	36	47	4	2	4	4	9	22	2	2	7	6	4	4	6	7
15	A	27	31	3	3	2	5	11	12	1	1	3	3	3	3	4	4
16	A	21	32	5	4	3	3	6	12	0	0	5	7	2	3	0	3
17	A	25	31	3	3	3	1	11	14	0	1	2	6	3	4	3	2
18	A	34	38	3	3	4	3	19	20	1	1	2	4	2	3	3	4
19	A	27	36	4	3	4	3	11	19	2	1	3	4	1	3	2	3
20	A	42	36	4	4	5	3	16	15	3	1	6	5	4	3	4	5
21	A	25	36	3	3	3	3	9	19	2	2	5	3	2	3	1	3
22	A	32	27	4	3	4	2	9	12	2	1	5	6	4	2	4	1
23	C	31	38	1	2	2	3	15	18	3	2	3	5	4	3	3	5
24	C	25	38	2	1	3	3	11	19	2	0	2	7	3	4	2	4
25	C	33	32	4	2	2	1	16	18	1	0	4	5	4	4	2	2
26	C	32	32	2	2	2	2	16	17	1	0	4	4	3	3	4	4
27	C	27	25	2	1	2	1	13	15	2	0	5	4	1	2	2	2
28	B	46	49	0	1	3	3	24	27	0	0	7	7	4	4	8	7
29	B	41	49	3	4	2	4	21	23	1	4	5	7	4	3	5	4
30	B	18	39	0	1	0	3	16	21	0	0	1	6	0	4	1	4
31	B	38	40	3	3	3	4	18	20	2	2	5	7	2	1	5	3
32	B	25	18	3	1	2	1	8	9	1	0	5	5	4	2	2	0
33	B	41	45	4	4	3	5	19	20	3	4	6	6	2	2	4	4
34	B	55	50	4	2	7	5	24	23	3	3	8	8	3	3	6	6
35	B	23	21	0	0	2	1	16	13	1	1	1	4	1	0	2	2
36	B	47	48	5	4	3	4	21	22	3	3	5	6	3	3	7	4
37	B	35	48	3	3	4	6	16	20	1	3	4	7	4	4	3	5
38	B	17	25	3	1	2	2	8	13	0	0	1	2	3	3	0	4
39	B	44	50	4	3	4	3	17	23	3	3	7	7	3	3	6	8
AVERAGE		31	35	3	2	3	3	14	17	1	1	4	5	3	3	3	4

APPENDIX E

Percentage scores converted from raw scores for the 1 st and 2 nd application of the MLPQ (N=39)

Application	Group A	Group B	Group C	Group D	Average
Attitude 1	60	80	40	80	65
Attitude 2	60	40	40	40	45
Planning 1	43	29	43	43	40
Planning 2	43	29	43	29	36
Cognitive & metacog-nitive strategies 1	39	61	50	43	48
Cognitive & metacog-nitive strategies 2	57	71	61	57	62
Concentration 1	25	50	50	25	38
Concentration 2	25	75	50	50	50
Test writing 1	50	63	50	63	57
Test writing 2	63	75	63	63	66
After test 1	75	75	75	75	75
After test 2	75	75	75	75	75
Study skills 1	38	50	38	38	41
Study skills 2	38	63	38	50	47