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Mediated learning experience as an alternative approach to assessment

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2008-10-21T12:13:38Z
http://hdl.handle.net/10539/5777

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CHAPTER ONE

Introduction

In celebration of a decade of democracy, South Africa has witnessed significant changes in the educational, economic and socio-political arenas, driven by a focus on human rights and equal opportunities for all. During this period of transition in parallel with international trends, a shift in ways of thinking and understanding of intelligence has occurred within a multicultural/multilingual context, resulting in a review and reconsideration of intelligence measures in the field of learners experiencing special educational needs. This has created much debate around the validity and the usefulness of conventional psychological assessment techniques and tools for the South African context.

The search for equitable assessment measures that take into account language, socio-economic status and educational background is an issue of much controversy. All over the world, steps have been taken to prohibit the use of unfair assessment practices. Kleinert, Kennedy and Kearns (1999) cited the Individuals with Disabilities Education Amendments (IDEA) of 1997, which required all States in the United States to have developed and implemented alternative assessment methods by 2000 for individuals with disabilities, who cannot be included in regular educational assessment.

It has been noted in several studies (Owen, 1992; Rushton & Jensen 2003; Rushton & Skuy, 2000) that individuals from certain backgrounds perform inadequately on traditional tests of intelligence compared to other population groups. For example, Owen (1992) administered the Raven's Standard Progressive Matrices (RSPM) without time limits to 1056 White and 1093 Black fourteen-year olds. The White subjects performed one standard deviation above the Black sample. Similarly, Rushton and Skuy (2000) examined the performance of White and Black university students on the RSPM. Based on the normative sample of the United States, results indicated that the White population group scored one to two standard deviations higher than the Black group. It was suggested that although the 1993 United States standardized sample claimed to have been

designed to include “Black” or “African” Americans (Raven, Court & Raven, 1996), the social context of the “Black” population in Africa is different to those of African Americans and therefore economic, educational, social and political factors could have obstructed performance of the Black South Africans.

Similarly, Rushton and Jensen (2003) compared the Black/White differences on the Wechsler Intelligence Scale for Children-Revised (WISC-R) in Zimbabwe with those of the United States population. The results showed that Black/White differences on tests of cognitive ability are predominantly a difference in the “g” or general factor. This general factor is regarded as an innate component that governs performance on all cognitive tasks**.**

From the above studies it appears that the primary source of population differences in cognitive performance tests globally, are impacted by contextual background, cultural understanding, and levels of exposure populations have been provided with, and the degree is likely to be the same as that for differences between individuals within each group (Skuy, Schutte, Fridjhon & O’Carroll, 2001).

A large body of research (Adelman & Taylor, 1979; Feuerstein, Rand & Hoffmann, 1979; Haywood, 2001; Messick, 1980; Sewell, 1987) criticized the practice of traditional forms of intelligence testing. The primary criticism leveled against the usage of standardized testing has been that children from disadvantaged backgrounds cannot perform adequately in relation to children from advantaged backgrounds because of reduced opportunities for learning experiences and deprived social conditions (Messick, 1980; Sewell, 1987). Salvia and Ysseldyke (1988) state that the more an individual’s background is discrepant from the norming population of a given traditional intelligence instrument the more likely an individual’s performance will be incongruent with his/her potential and thus result in educational decisions which are tenuous.

Furthermore, researchers (Adelman & Taylor, 1979; Feuerstein, 1979) note that reliance on traditional methods of assessments for various learning difficulties presented by

children from diverse backgrounds is regarded not only as inadequate but also as an invalid basis for decisions on psycho-educational intervention to address such difficulties.

Although the Binet and Wechsler Scales have been revised over the years, Ashman and Conway (1993) criticize the application and effectiveness of these instruments in present educational practice. These instruments are attacked for exclusively conceptualizing intelligence as a result of product orientations without taking into cognizance the context in which intelligence develops. Ashman and Conway (1997) state that traditional tests of intelligence continue to be widely used instruments both nationally and globally (with the exception of certain states in USA) despite the criticism directed towards them.

Amongst other environmental factors that influence performance of individuals on tests of intelligence are language, cultural factors, socio-economic status and education.

Venter (2000) notes that people from different race groups perform differently on tests of intelligence as a result of language. Venter (2000) further asserts that although intelligence tests can be translated from one language to another, the original meaning is sometimes lost, thus rendering the tests invalid. According to Vygotsky (1978) language is a psychological function, which mediates practically on all other psychological competencies, such as perception, memory, emotions, cognition, goal-oriented behaviour, and motivation. Vygotsky states that language mediates social interaction. Therefore those who are less able to understand the subtle nuances conveyed by language or the pragmatics of language usage (due to a different cultural/linguistic background or just a neurological-based disorder, for example, Asperger's syndrome) may perform less optimally on language based instruments.

According to Strous (2003) a significant difference also exists on intelligent tests within people of the same race group as a result of the language factor. She compared performance of Black South African students who speak English at home (English first language speakers) with those who do not, on the Raven’s Advanced Progressive

Matrices (RAPM) and academic performance. Results revealed significant differences on both the RAPM and academic performance in favour of the Black English first language speakers. It thus seems that English affects intellectual functioning and academic performance.

Gindis (2005) analyzed the data for over 700,000 students across the United States over the period 1996-2001. It was concluded that it takes typical immigrants with 2-5 years in home country schooling in first or home language another 5 to 7 years to reach the 50th Normal Curve Equivalent (NCE) what the average student achieves at that grade level in English, when schooled totally in English.

Closely aligned to language is the issue of culture. Traditional forms of intelligence tests have been criticized for representation of Eurocentric culture and values of individualism versus communalism in an African context (Nell, 2000). As a result of intelligence test items being heavily embedded in a Eurocentric context, issues of bias emerge when such tests are used in South Africa. In certain cases where intelligence tests have been normed on the South African population, the participants are predominantly White. It thus seems critical that when such tests are used, the interpretations are made with caution.

Feuerstein emphasized the importance of delineating the concept of cultural difference from that of cultural deprivation. He illustrated this in a study (Feuerstein, 1990) in which two groups of immigrant children were investigated on traditional psychometric tests. Poor findings were yielded in the first group. Feuerstein attributed these results to the cultural difference of this group, which not only implies that the children were different from Western culture, but were also not familiar with the culture of psychological testing. He postulated that these children had good general learning skills mediated to them in their original culture and thus had positive prospects for overcoming their initial difficulties and could succeed in adapting to the formal educational system of the new culture. Feuerstein regarded the high learning potential of this culturally different group to derive from adequate experience of mediated learning (interpretation made by the

examiner or an adult through which cognitive modifiability is achieved) received by these children in their original community.

Results of the second group were also not satisfactory. However, unlike the first group, the cognitive and educational problems of these children originated not so much in their cultural distance from their past formal educational culture but to the absence of sufficient mediated learning experience in their original culture, which resulted in their lowered learning potential. Feuerstein recognized that this group was culturally deprived. A child is considered to be deprived of mediated learning experience when factors such as social disruption or cultural discontinuity caused by immigration, war, or poverty disrupt and are reflected in the family system. This implies that culturally deprived children have failed to receive appropriate mediation of their native culture and as a result rely almost exclusively on their natural cognitive functions and spontaneous learning skills.

Kozulin and Rand (2000) assert that children, who demonstrate poor responsiveness to short-term learning, and thus lower cognitive modifiability, are most probably suffering from cultural deprivation. In conditions of suffering or adversity, parents tend to confine themselves to the immediate survival needs of the child, thereby neglecting to attend to the transmission of the cultural heritage of their own family and community, or the spiritual aspects of life and the cognitive development of the child.

A study (Strous, 2003) investigated the effects of socio-economic status (SES) on intellectual functioning and academic performance. Although SES was originally defined as including both parent/guardian levels of education and parent/guardian occupation, these two categories could not be collated for statistical reasons. Therefore, students were only classified into two categories in terms of their parent/guardian occupations, namely, skilled/semi-skilled and professional/managerial/executive. Results suggested a statistically significant difference between the skilled/semi-skilled and professional/managerial/executive, in favour of the latter, across the racial groups on

intellectual functioning, but not on academic performance. These findings suggest that socio-economic status does have an influence on intellectual functioning.

Sternberg and Grigorenko (2001a) confirm that traditional tests of intelligence are measures of achievement involving skills typically acquired in the home or at school. Studies (Lopez, 1997; Kaplan & Sacuzzo, 1997) established that children from ethnic minorities or from socially disadvantaged communities tend to under-perform on such measures as a result of their struggle with items that are unfamiliar and unpracticed.

Criticisms directed towards traditional forms of intelligence tests do not necessarily imply that these tests are insignificant or invalid. When the aim of the tester is to obtain current level of cognitive functioning they provide immediate results, as they require less time to administer and to interpret. In addition, they are also applicable to groups. But it seems essential that when they are used, the tester be aware of their limitations. It is also important that he/she is conscious and cautious in the interpretation of the results of the background of the testee. Since factors of language, socio-economic status and education are moderators of performance on intelligence tests, it appears essential that they be taken into consideration when interpreting results.

Conventional tests of intelligence are mostly based on the medical model, which perceives pathology to be located within an individual. Based on the South African context, it appears crucial that this approach be de-emphasized in favour of the ecosystemic approach, which perceives an individual in a holistic manner taking into consideration not only how he/she is functioning but also the context of his/her living.

The conventional conceptualisation of cognition as a stable and fixed entity has been challenged by the idea that cognition is actually a modifiable element capable of being developed and improved. This has resulted in the development of active and directive models of assessing cognition. One such model is the Learning Propensity Assessment Device (LPAD) developed by Feuerstein and his colleagues (1979). This led to the

recognition and increased usage of tests that tap the non-verbal modality such as the Raven's Progressive Matrices and the Cognitive Assessment System Test (Figure Memory subtest). These tests are discussed in detail in the methodology section.

Given the socio-economic, political and educational conditions, which prevailed in South Africa under the apartheid regime and its legacy, which still continues under the current government, it was suggested that application of traditional assessment to individuals from different backgrounds may be unfair to certain groups of people. In addition, the validity of most of these traditional assessments is questioned, since they are generally not normed on diverse South African population. Consequently, alternative form of assessment as proposed by Feuerstein *et al.* (1979) has much more relevance for conducting psycho-educational assessment in South Africa, because Feuerstein's dynamic assessment approach (mediated learning experience) regards cognition not as static but as a modifiable construct appropriate within multicultural and multilingual contexts. This is in accordance with the White Paper Three on Higher Education (Department of Education, 1997), which called for redressing of the historic imbalance of educational provision amongst different race groups. Application of Feuerstein's dynamic assessment approach is believed to be a viable approach to overcome limitations inherent in traditional assessments.

In summary, this chapter explored various issues related to assessment of intelligence within multicultural/multilingual educational contexts. Specifically, the importance of taking into cognizance the contribution of language, cultural background and socio-economic status in the assessment of intelligence were discussed.

Regarding the following chapters, Chapter Two discusses the pros and cons of traditional assessment and dynamic assessment. Unlike traditional assessment, which examines current performance, acquired knowledge and previous learning, dynamic assessment evaluates potential, cognitive processes (how one thinks), areas of deficiencies and means of correction. Furthermore, the theory of Structural Cognitive Modifiability and its construct of mediated learning experience, which forms the basis of understanding the

process of cognitive development (Kozulin & Rand, 2000), is discussed in relation to application of Feuerstein's Learning Potential Assessment Device (LPAD). Limitations of the LPAD are examined.

Chapter Three focuses on the methodology of the current study. Specifically, the rationale, aims, hypotheses, and research design are demonstrated. Chapter Four presents the results derived from the interventions, while Chapter Five discusses implications of these findings in view of the literature. In addition, limitations of this study and recommendation for future research are made.

CHAPTER TWO

Review of the literature

As noted earlier, in this chapter the concepts of traditional and dynamic assessment are critically examined. The theory and application of the Learning Potential Assessment Device (LPAD) is also discussed.

2.1 Debate between Dynamic Assessment versus Static Assessment

Typically, dynamic assessment is contrasted with static assessment. The terms “learning potential assessment” and “dynamic assessment” have been used synonymously to indicate a model of assessment that focuses on the psychological process involved in learning and change rather than the learned products commonly measured with traditional static assessments (Grigorenko & Sternberg, 1998).

Unlike the static conventional intelligence testing, the alternative measurement commonly known as dynamic assessment (DA) assesses not only what an individual has already been exposed to but what he can do (potential) under appropriate guidance. An important characteristic that distinguishes dynamic assessment from static assessment is the *focus on how much change can be produced within a child in a structured learning situation* rather than comparing a child’s performance with his peers (Zaaiman, Van der Flier & Thijs, 2001). Lidz (2002) notes that DA essentially evaluates particular *processes* underlying successful performance and not necessarily the product. DA provides children with the opportunity to learn and to demonstrate change during assessment, and focus is directed on the *how* and why a child learns a particular skill or task (Lidz, 1991a). Thus within the DA framework, inadequate learning is seen as a result of insufficient mediated learning experiences (MLE), which results in inadequate development of cognitive functions at the input, elaboration and output phases of information processing (Jensen, 2003; Utley, Haywood & Tzuriel, 2002).

Haywood, Brown and Wingenfeld (1990) state that DA procedures include teaching and learning of generalisable cognitive processes, identification of specific obstacles that hinder effective learning of generalisable cognitive processes and distinguishing between performance and potential.

By linking assessment and instruction, dynamic assessment techniques promote research on the modifiability of scholastic aptitude and on the development of optimal remediation programmes (Anastasi, 1997). In addition, they can produce more illuminating descriptions of cognitive performance and of its responsiveness to remedial interventions than standardized intelligence tests.

Surveys (Deutsch & Reynolds, 2000; Freeman & Miller, 2001) of UK educational psychologists draw attention to widespread recognition that dynamic assessment can assist in collaborating with educators to plan educational interventions. According to Elliott (2003), there are two broad groupings by which dynamic assessment might contribute to educational intervention, namely, to provide insights into the unique nature of an individual's learning and reasoning, which would assist educators and parents to construct an individual tailored intervention; and to provide a profile that is matched by a prescriptive intervention programme.

As aforementioned, dynamic assessment has been found to be not only a sensitive measure of individuals from diverse backgrounds but also to have the potential to provide insights and guidance for practitioners (Hessels, 1997; Lidz & Elliott, 2000). Distinct from traditional forms of intelligence, dynamic assessment approaches consider the influence environmental factors may have on the individual, in either hindering or facilitation of the actualization of human potential (Lidz, 2002).

Although dynamic assessment serves as a promising approach, Jitendra and Kameenui (1993) criticised it because of the following reasons:

- The operational procedures of DA have not been adequately developed or tested. It has been argued that in some cases it just complements traditional testing.
- Procedures tend to be time consuming particularly when administered on an individual basis.
- General evaluation of dynamic assessment has been difficult as various models have been postulated each stipulating their own definitions, theoretical frameworks and requirements.
- Many of the techniques used have not been empirically tested or authenticated by researchers other than those who originally developed the techniques.

In spite of advantages of dynamic assessment techniques, it is also criticized for lack of generalizability of the remedial effects achieved with these tasks (usually nonverbal reasoning problems similar to the Raven's Progressive Matrices) to real-life academic performance (Anastasi, 1997).

Nevertheless, some authors (Haywood & Tzuriel, 2002) suggest that the use of dynamic assessment can help fulfill three main goals, namely, provide a better estimate of the specified ability; measure new abilities; and improve mental efficiency.

2.2 Development of Alternative Assessment Approaches

As a result of the limitations found with traditional intelligence tests discussed in Chapter One, alternative ways of assessing intelligence have been developed and widely researched. Lidz (2002) asserts that dynamic assessment (DA) approach is an addition to the existing assessment repertory, and not necessarily a replacement of traditional

assessment approaches. She however, argues that dynamic assessment challenges traditional assumptions about how learning and learners are most appropriately evaluated.

Several theorists (Feuerstein, *et al*., 1979; Piaget, 1952; Vygotsky, 1978) made a significant impact on the development of dynamic assessment. Piaget (1952) proposed that for learning to occur, the child should be developmentally (cognitively) ready and that if instruction is to be provided, it should not be geared above the child's cognitive level of understanding. Accordingly, it is maturational processes that play a significant role in development (learning). For Piaget, a child was motivated to learn as a result of what he perceived to be incongruent to his schema (disequilibration).

However, Vygotsky (1978) took a different position from Piaget and stated that a child develops within the context of a culture, which enables him to acquire the content of his thinking (knowledge) and means of thinking (processes). According to him children learn more sophisticated cognitive strategies through interactions with more mature and knowledgeable peers and therefore are not independent explorers as posited by Piaget (1952). Vygotsky (1978, p. 86) thus coined the phrase "zone of proximal development" (ZPD), which he defined as the "distance between a child's actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers". This zone is believed to be an index of the learning potential of the child (Vygotsky, 1978).

Regarding instruction, Vygotsky believed that learning should be geared fairly above the child's level of functioning. Accordingly, "learning that is oriented toward developmental levels which have already been reached is ineffective from the view point of the child's overall development. It does not aim for a new stage of the developmental process but rather lags behind this process" (Vygotsky, 1978, p. 89).

Vygotsky (1978) argued for a close relationship between the individual's internalisation of cognitive processes and the social origins of those processes. He therefore asserted that

each psychological function appears twice in development, initially in the form of actual interaction between people and secondly as an inner internalised form of this interaction. Although Vygotsky believed that genetic and maturational mechanisms play a significant role in the development of cognition, he also emphasised the importance of experiential factors. He articulated that actualization of cognitive development depends on the individual's experience in social interaction with a more competent person than him as defined by the ZPD.

There are several models of dynamic assessment such as Feuerstein's Learning Propensity Assessment Device (LPAD), Vygotsky's graduated-prompt approach, Budoff's test-train-test approach and Campione and Brown's approach. The common feature amongst all these approaches is their primary interest in assessing learner modifiability by means of a test-teach-retest format. Feuerstein's LPAD approach is often compared with Vygotsky's graduated-prompt approach as they overlaps.

During the graduated-prompt approach, the test is presented in a relatively standardized manner as in traditional tests (Brown & Ferrara, 1984). Once the child is unable to complete a task, the examiner gradually provides clues or prompts and assesses how much and what type of information is required before the child is able to perform the task. These prompts are pre-determined according to a careful analysis of the requirements of the task. Once the child completes the task successfully, a different version of the task is presented to determine whether the child can transfer any of the learning to the new task. Bryant, Brown and Campione (1983) found the graduated-prompt method to be effective in predicting children's ability to improve on tasks. Although the graduated-prompt approach has been used widely (Brown & Ferrara, 1984; Campione & Brown, 1987), it has been criticized for providing graduated prompts which are pre-determined, and as a result may not be sensitive to the needs of certain children related to cognitive impoverishment (Missiuna & Samuels, 1988). This may be of particular importance when working with children from a South African context because of the diversity of factors presented by this population as discussed in Chapter One.

In contrast to the graduated-prompt approach, during the initial test phase of the LPAD approach, the child's independent level of performance is used as a baseline measurement against which future learning can be measured. During this phase, administration of the test is presented in a standardized manner similar to that of traditional testing. Once the child reaches a level at which she or he performs unsuccessfully, the assessor intervenes and mediates the task. Instead of adopting a neutral role as in static assessment, the assessor interacts with the child and this interaction is considered an integral part of the assessment (Lidz, 1981). After provision of the intervention, the child is assessed once again to determine how much learning has taken place.

In relation to the current study, only Feuerstein's LPAD approach was adopted for the intervention. An in-depth discussion of this approach is presented in the following section.

2.3 Theory of the LPAD

The LPAD is based on the theory of Structural Cognitive Modifiability (SCM) and its construct of mediated learning experience (Tzuriel & Haywood, 1992). The theory of SCM is focused on an affirmative and humanistic view of an individual's potential to change and adapt to his environment (Lebeer & Roth, 2001). This theory rejects the pessimistic notion of cognition as an immutable and static construct that remains fixed throughout life and replaces it with an optimistic belief that an individual is an open system that is receptive to environmental influences that can produce structural changes in cognitive functioning. Studies (Burgess, 2000; Russell, 2003) confirm that the theory of Structural Cognitive Modifiability is based on the belief that human beings are dynamic and changing, and everyone has the propensity or innate capacity to learn to think.

Accordingly, development of higher levels of cognitive functioning is observed as being dependent upon the individual's opportunity to benefit from mediated learning experiences (MLE). Grigorenko and Sternberg (1998, p.83) define MLE as "interactional

processing which an adult interposes himself between the child and the task and makes learning meaningful for the child". Therefore, by presenting a specific selected meaningful stimulus to a child, the mediator helps the child to create and expand his experience to previously inaccessible areas (Jensen & Feuerstein, 1987; Klein, 2000). Through provision of mediation, the child is able to complete the given task and apply the learning to other areas despite certain intervening cognitive, motivational, situational or cultural factors.

Childhood is probably one developmental stage when the advantages of MLE have the greatest impact on cognitive development. According to Feuerstein (1980, p.16) "the more and the earlier an organism is subjected to MLE, the greater will be his/her capacity to efficiently use and be affected by direct exposure to sources of stimuli".

Two approaches of mediation have been described, (Feuerstein & Feuerstein, 1991; Tzuriel, 2001) namely, interactive mediation and modification of the task. During the interactive mediation, the mediator attempts to delineate the behaviours which could be hindering a child's performance. The mediator observes if the child responds impulsively, if he or she is able to follow verbal instructions, and if he or she can make a plan to solve a problem. In order to identify the causal factor that impedes on the child's learning, the mediator observes the child's deficient cognitive functions. Feuerstein *et al.* (1979) developed the cognitive functions list that enlightens the mediator about the difficulty experienced by the mediatee. Feuerstein conceptualized these cognitive functions into three phases of cognitive processing; namely, the input (data gathering), elaboration (data processing) and output (data expression) phases. These cognitive functions when phrased negatively are cognitive deficiencies and are discussed in terms of their mental phases (Lidz, 2000; Skuy, 1991).

The <u>input phase</u> is characterized by the following functions:

- *Exploration*- includes gathering of data, observation and exploration of a situation. Impaired exploration is reflected by hasty, impulsive and disorganized

approach without appropriate attention to what is required, as well as the inability to focus on more than one aspect of opinion. It was essential for participants in this study to be systematic in examining tasks, to stop and think before giving a response.

- *Verbal concepts*- refer to the ability to understand concepts and related words in order to interpret incoming information. Language is used as a tool to receive information (receptive verbal tools). Lack of verbal concepts is manifested by poor comprehension skills, which hampers the interpretation of incoming information. It also involves misinterpretation of instructions and questions.

- *Conserving constancies*- refers to the ability to perceive that the essential property of an event or object stays the same despite changes in peripheral changes. An example of cognitive deficiency that may be experienced involves difficulty perceiving similarities and differences at perceptual level.

Elaboration / processing phase:

- *Task identification*- includes the ability to sense the imbalance and that something needs to be done. Inaccurate definition of a problem may be demonstrated by the inability to see incompatibility between sources of information and difficulty deciding on a course of action to be taken in response to a situation.

- *Selection of relevant cues*- refer to the ability to view all options purposefully in order to discriminate and eliminate what is irrelevant from relevant information.

- *Making comparisons*- entails the ability to spontaneously search for similarities and differences among items and to focus on, or use two or more sources of information simultaneously. This cognitive function was critical for the current study as failure to engage in this process may have resulted in one considering a stimulus without mentioning or making links amongst stimuli.

Output / expressive phase:

- *Expressive verbal tools*- refer to the ability to appropriately communicate ideas, problems and solutions in a manner that can be understood. Impaired expressive tools may be displayed by poor communication skills. For instance, usage of gesture instead of words. It is also characterized by exhibition of poor verbal fluency, such as prolonged pauses, imprecise words, and word finding difficulties.

- *Perseverance*- involves the ability to persevere with difficult and unfamiliar tasks and to try again despite previous failures.

Failure to comprehend instructions and gather information at the input phase impact negatively on the ability to process information at the elaboration phase. This also adversely leads to production of incorrect responses. Therefore, it was crucial for participants to develop and strengthen these cognitive functions.

As already mentioned, conceptualization of cognitive functions and dysfunctions afford a basis on which to identify the mediatee's strengths and weaknesses and to address them appropriately through the provision of Mediated Learning Experiences. Therefore, children's cognitive development is determined by the process of discovering and building their emerging cognitive functions.

Researchers (Mentis, 1997; Skuy, 2002) assert that cognitive deficiencies are interpreted as elements that are fragile and in need of strengthening rather than elements that are completely nonexistent from the cognitive schema of a person. The area of the deficiencies may be in one or more of the three mental phases. The current study was conducted on learners who had difficulty in coping with academic tasks at mainstream level and are thus in a remedial school. It was intended to explore each child's areas of cognitive deficiency and to provide appropriate mediation.

The second approach of mediation is modification of the task. In this approach, the assessor analyzes the assessment tasks in detail and generates hypotheses about potential areas of difficulty. Feuerstein *et al.* (1979) developed the cognitive map which facilitates understanding of potential area of difficulty. For instance, in trying to understand the localized area of the difficulty, the assessor may alter modality of the presentation (for example, in words, pictures, numerical), task content, level of complexity and level of abstraction.

Throughout the assessment, the assessor would note the child's independent knowledge in all the originally designated skill areas, the deficient cognitive functions which seemed to be interfering with his performance, the amount and type of teaching that was required to mediate the function and the extent to which this new learning was generalized to other tasks (Lebeer & Roth, 2001; Missiuna, 1990).

Feuerstein *et al.* (1979) maintain that cognitive development of individuals is often masked, not necessarily because of distal conditions (poverty, neurological impairment, emotional disturbance in the child or low socio-economic status), but occurs as a result of inadequate exposure to MLE opportunities (proximal condition). Feuerstein states that although distal conditions are commonly found in individuals with less optimal cognitive development that does not necessarily mean they are causal factors but rather correlational variables. As a result of adequate and appropriate exposure to MLE, cognitive functions would be enhanced.

In support of Feuerstein's notion, a study (Bradley, Whiteside & Mundfrom, 1994, p.47) investigated children from low socio-economic status and revealed that the presence of mediating factors such as "the caregiving context served as protective mechanisms" which presented these children with adequate sustenance, stimulation, support and structure. Studies (Mahoney & MacDonald, 2003; Nord, Brimhall & West, 1997) corroborated that parental care or participation is an important contributor to learners'

opportunity of succeeding academically. Shayer (2000) commented that parents, older siblings and teachers could act as mediating agents that enrich cognitive processes by framing and organizing the environment for the mediatee, in order to enable him/her to learn more efficiently.

Feuerstein and Feuerstein (1991) provide a list of twelve parameters which guide the mediator during the dynamic interaction with a learner. These parameters are mediation of intentionality and reciprocity, transcendence, meaning, competence, regulation and control of behaviour, sharing, individuation, goal planning, challenge, self-change, search for optimistic alternatives and mediation of a feeling of belonging. They are divided into three categories, namely, universal criteria, situational criteria and integrating orienting belief system criteria. The *universal criteria* is found in all interpersonal interactions and is essential for the creation of conditions for general development, while the *situational criteria* occurs in addition to the universal criteria as a result of opportunities presented by certain situations. *Integrating orienting belief system criteria* involves instilling a positive sense of belief that is necessary to integrate changes in functioning into cognitive structures for sustained behavioural change (Feuerstein, 1990).

Since parameters found within the universal criteria are essential for any interaction to be recognized as mediation, they are described in more detail than other parameters found within the situational and integrating criteria.

- Mediation of Intentionality and Reciprocity

The mediation of intentionality and reciprocity includes a purposeful and intentional act in which the mediator actively works to focus attention of the mediatee on the stimuli (Lidz, 2000; Skuy, Mentis & Mentis, 1996). The mediator arouses the mediatee's attention and interest so as to enable the mediatee to be receptive to learning. Stimuli are then selected according to their purpose. To be certain that mediation takes place and that no misunderstanding occurs during the interaction, the mediatee is encouraged to respond accordingly. This criterion was essential for the present study, whereby the mediator

attracted students' interest and focuses to a shape of a stimulus and provided prompts to ascertain their understanding.

- Mediation of Meaning

Ausubel (1968) has long recognized the significance of meaning as a powerful determinant of efficient learning process. During the process of mediation of meaning, the activity is made meaningful to the mediatee by reflecting on its importance and relevance. Meaning is experienced when the goal and feelings are validated and affirmed in a genuine way, and this is assimilated into the mediatee's sense of self (Seokhoon, 2001). The mediator enthusiastically, energetically and affectively interacts with the mediatee in an attempt to overcome any form of resistance that might be already present.

- Mediation of Transcendence

Feuerstein (1990) points out that a mediator does not limit the interaction to the initial learning situation, rather the mediator has always in mind the imperative to widen and transfer particular goals to other goal situations not immediately apparent. Transcendence therefore entails going beyond the immediate interaction to connect the behaviour to goals, directions, future areas and expectations (Seokhoon, 2001). During this process, the learning is generalized to other events which have happened in the past or which are anticipated in the future. Lidz, (1991a) and Tzuriel (2001) are of the view that transcendence helps individuals to think hypothetically. In light of the current intervention programme, mediation of transcendence was focused at ensuring that participants understand how activities or information are interconnected and become capable of transferring knowledge from one context to another (mediation to the assessment).

2.4 Application of the LPAD

The Learning Potential Assessment Device (LPAD) has been found to be of significant value with learning disabled children, low-functioning individuals, slow learners, the blind, and the deaf including culturally different and bilingual individuals (Jensen &

Feuerstein, 1987). Unlike other models of dynamic assessment that focus on particular skills, the LPAD is perceived to be a global dynamic model that focuses on general skills and abilities (Kriegler & Skuy, 1996). It is also different from other models because of its qualitative nature and therefore enables the mediator to deal with the individual needs of each individual in question as it is not prescriptive (Minick, 1987).

The LPAD battery consists of 15 instruments aimed at assessing cognitive processes related to perception, attention, memory, problem-solving, and logical reasoning. These include the Organization of Dots, Complex Figure Drawing Test, Reversal Test, Diffuse Attention Test (Lahy), Positional Learning Test, Plateaux Test, Associative Recall (Functional Reduction and Part-Whole), 16 Word Memory Test, Tri-Modal Analogies, Raven Coloured Progressive Matrices and Standard Progressive Matrices, Set Variations B-8 to B-12, Set Variations I, Set Variations II, Representational Stencil Design Test (RSDT), Numerical Progressions and the Organizer.

Several studies conducted at international and national levels have demonstrated the effectiveness of mediation based on Feuerstein's theory of SCM and its construct of mediated learning experience. At an international level, a study (Feuerstein, Feuerstein, Falik & Rand, 2002) investigated the cognitive modifiability of twenty children and youth with Down syndrome. Approximately half of this sample was diagnosed by traditional psychometric tests as functioning within the upper limits of mild retardation and borderline ranges. Amongst other tests used to measure the ability to learn and improve abstract thinking were the Raven's Coloured Progressive Matrices (Sets A, AB, B), the Standard Progressive Matrices (Sets A, B, C, D, E) and the LPAD Set Variations instruments. They were administered according to the LPAD procedures discussed in chapter three.

Results of the dynamic assessment demonstrated how modifiable this sample was when provided with MLE, and the levels of higher function and abstract thinking they were able to demonstrate and achieve. Specifically, the scores achieved on the Raven Matrices administered according to the LPAD procedures showed the higher functioning subjects (who were below normative levels on conventional non-dynamic procedures) to be well

within the normative range for their ages. Although this study highlights the usefulness of MLE and provides hope to individuals who present with congenital conditions, it does not state the period of the intervention. It further makes it difficult to judge the degree of mild to intensive mediation, thus rendering replicability of this study difficult.

Seokhoon's study (2001) investigated the significance of social interaction in facilitating knowledge acquisition and transfer. Mediated learning experience was used as a teacher-student interactionist model that is particularly applicable to "high-risk students". In a pilot study of four community education centres in Singapore, an experimental group of 52 students received a combination of mediated learning experience and the usual academic programme for four months, while a control group of the same size received only the academic instruction. All the learners had an average age of eleven years. According to their teachers these children had difficulty in concentrating, poor study skills and work habits, and they lacked confidence and motivation. Students were tested using Raven's Standard Progressive Matrices (RSPM) and the Cognitive Abilities Test (CAT), and a record of class tests in mathematics and English was compiled. Results showed that the mediated learning experience classes in three of the four centres performed better on mathematics, though no significant improvement was noted in English, RSPM and CAT scores.

In another study, Tzuriel and Kaufman (1999) explored the relation between Mediated Learning Experiences and cognitive modifiability among the children who had undergone cultural change. In this study, the Israeli-born children (n = 23) performed significantly better on the Raven's Coloured Progressive Matrices (RCPM) and on two preschool dynamic assessment measures of learning potential, namely, the Children's Inferential Thinking Modifiability test (CITM) and the Children's Analogical Cognitive Modifiability test (CATM) as compared with the Ethiopian children before the mediation. However, after a short period of intervention, the Ethiopian children performed comparatively with their Israeli counterparts. In a different context, Rand and Kaniel (1987) investigated 113 underperforming teenage Bedouin boys, and after a short period of intervention based on Feuerstein's approach, a significant improvement on tests of

intellectual functioning was found on the post-test scores. In another study, Strang and Shayer (1993) investigated cognitive deficiencies experienced by high school Chemistry students in the United States and later provided mediated intervention. Again, significantly improved results from the pre-test assessments were demonstrated.

Tzuriel (2001) investigated the differential effects of intensity of investment on the LPAD on a population of fourth to ninth graders in both culturally deprived (n= 595) and regular (n= 799) schools. The two LPAD tests (Variations I and Variations II) were administered to all 1394 learners under differential learning conditions. The classes were randomly divided into the following three groups, namely, high learning, low learning and no learning. The Raven's Standard Progressive Matrices (RSPM) was used as a pre-test and post-test. Based on the pre-test results of the RSPM, the subjects were divided into three categories of high, medium and low for each group separately. Following the mediation, post-test results on the RSPM demonstrated a significant difference in favour of high learning and low learning groups. Most importantly, although the low learning group showed significant improvement, the high learning also demonstrated significant improvement. Accordingly, this study demonstrated that the higher the amount of mediation invested the greater the results. These findings indicate the usefulness of the LPAD in improving intellectual scores. It will be of interest to determine whether significant improvement in post-test scores would be demonstrated in the current study.

In a South African context, series of studies (Mehl, 1991; Seabi & Cockcroft, 2006; Skuy, Gewer, Osrin, Khunou, Fridjhon, & Rushton, 2002; Skuy & Shmukler, 1987; Sochet, 1992) confirmed the effectiveness of MLE in improving cognitive and academic functioning of university students. Skuy and Shmukler (1987) examined the usefulness of Feuerstein's LPAD. An experimental study comprising 60 Indians and 60 Coloured students was implemented. Although significant improvement was yielded within these two groups, improvement was more evident within the Coloured students, who historically were more deprived than the Indians. These results seem to imply that effects

of mediation are more crucial where little or no mediated learning experience has been provided.

Mehl (1991) investigated cognitive deficiencies documented by Feuerstein on thirty Physics students at the University of Western Cape. MLE was used as a vehicle for mediating the cognitive deficiencies identified. The study constituted of an experimental group which was exposed to a programme of MLE and a control group that received regular instruction. Results yielded significant difference in favour of the experimental group, thus ascertaining the importance of the mediation in improving cognitive functioning. Although Mehl's study indicated the duration (45 minutes) of the interviews conducted person-to-person to document cognitive deficiencies as the students attempted to solve two kinematics problems, it however, did not show length of the mediation (intervention). As a result, replication of the study may be difficult.

A study (Samuels, Lamb & Oberholtzer, 1992) investigated adults with learning difficulties. The LPAD identified areas of deficient cognitive functioning and assessed the effect of various factors on performance. It was found to be useful with this population and also identified areas of cognitive strength and efficient cognitive functioning, which was found to be essential in providing information regarding planning future interventions.

Sochet (1992) investigated efficacy of dynamic assessment in determining university admission for disadvantaged students. Given their disadvantaged schooling, it was hypothesized that their scholastic marks were not an accurate reflection of their abilities. Following the mediation intervention, significant improvement in performance was yielded, which Sochet interpreted as suggesting the effectiveness of this technique.

A study (Skuy, Gewer, Osrin, Khunou, Fridjhon, & Rushton, 2002) investigated the effects of Mediated Learning Experiences on improving cognitive functioning of psychology students (n = 98) in a predominantly White tertiary institution. The Raven's Standard Progressive Matrices (RSPM) served as a pre- and post-test measurement of

intellectual ability. Mediation was only provided to the experimental group, which was divided into four subgroups (race), for purposes of the intervention. Although analysis of the pre-test scores yielded significant difference due to the effect of race, the post-test results yielded significant difference as an effect of the mediation and non-significant results as an effect of race.

In a recent study (2006), Seabi and Cockcroft studied a sample of 111 first year Engineering students who were exposed to pre- and post-test measurements of intellectual ability, namely the Raven's Advanced Progressive Matrices (RAPM) and the Learning Propensity Assessment Device's (LPAD) Organiser subtest. Measures of academic achievement (mid-year results and year-end results) were also collected. Of the 111 students, 45 constituted the experimental Mediated Learning Experience group, which was compared to two groups of 36 and 30 students each, and which constituted the Tutor and Peer groups respectively. While the mediator for the MLE group was guided by the MLE parameters of intentionally, consciously and actively eliciting cognitive functions by initiating discussions and responding to the participants within the Mediation group, the tutor served as a bystander to assist those students who experienced difficulties in solving engineering problems within the Tutor group. In contrast, participants within the Peer group were only able to consult one another for assistance. The intervention was conducted for ninety minutes over a five-week period.

Although significant improvements were found at post-test of the RAPM in all three groups, only the Mediation group demonstrated significant improvement on the Organiser. Of the seven academic variables assessed, six yielded significant improvement within the Mediation group, while two of these variables demonstrated significant improvement within the Tutor group. No significant improvement was shown on any academic variables within the Peer group. Consequently, it was concluded that exposure to adequate and appropriate MLE is effective in improving academic achievement of students, thus supporting the existing research in this domain.

In spite of these advantages, Feuerstein's dynamic assessment approach has not escaped criticisms. The following section discusses critics directed against this approach.

2.5 Limitations of the LPAD and its theory

Although investment in the LPAD may offer new avenues for development of insight into cognitive functioning of an individual, its administration is time consuming and costly when administered individually (Haywood, 1988). Frisby and Braden (1992) argue that just because MLE results in improved cognitive functioning, this does not necessarily imply that deficiency was caused by the lack of it, since improvement by something does not imply that a deficiency of that same thing is the cause of the original deficiency. Since the theory of SCM purports that irrespective of age, race and aetiology provision of MLE results in improved cognitive functioning, some have postulated that one's chronological age may limit the effectiveness of modifiability. Furthermore, Rand (1991, p. 75) a colleague of Feuerstein supports the position that within the "SCM theory, the main emphasis is on cognition, while the affective-motivational aspects of functioning remain peripheral and only sketchily explicated".

As the instruments of the LPAD tools involve many skills, in order for them to be used and interpreted correctly, trainers need to be well trained and experienced. Jitendra and Kameenui (1993) noted that it is difficult to interpret the results, as issues such as the selection of dependent measures and pre-training differences between instructors assigned to experimental and control groups vary.

Although several critiques have been leveled against the theory of Structural Cognitive Modifiability, it remains to be a widely adopted approach in educational environments and parent-child interactions as well as in cross-cultural studies, because of its effectiveness in alleviating cognitive deficiencies and enriching individuals with appropriate tools for survival (Mehl, 1991; Schur, Skuy, Zietsman, & Fridjhon, 2002; Tzuriel & Kaufman, 1999). Therefore there is sufficient evidence to support the ongoing

application of the SCM theory. The researcher in the present study was well aware of these criticisms in terms of theory and application.

In this chapter the pros and cons of static and dynamic assessment approaches were highlighted. Dynamic assessment examines potential rather than current performances, cognitive processes rather than products of previous learning, areas of deficiencies and means of correction rather than identifying the lack of acquired knowledge. It also provides information on the type and amount of intervention necessary to achieve higher levels of functioning (Haywood, 1988). Given the historical background of South Africa, dynamic assessment tests may offer a promising and attractive solution to assessment and also assist in meeting educational needs of the learners. Therefore the current study attempted to investigate effects of mediation in improving performance on nonverbal intelligence test, Raven's Coloured Progressive Matrices.

CHAPTER THREE

Methodology

3.1 Context of the Current Study

This research study was conducted at a private school within an urban area located in Johannesburg. This is a multi-racial school, which serves mainly upper and middle class communities. It admits learners from Grade 0 up to Grade 7. Learners attending this school are those that are challenged in mainstream schools due to learning difficulties; second language problems or who are struggling because of disadvantaged educational background. Learners that attend these schools normally function at an Average to Below Average Intelligent Quotient (IQ) and are not reaching their maximum potential in a mainstream school. In an attempt to enhance affective-motivational factors, to enrich socio-cognitive functioning and to improve school performance of children, a multi-disciplinary team approach is used in teaching and assessments. For learners experiencing difficulty in learning, assessments are carried out by a professional team from various related specialisation fields. In addition to the supportive role of Psychologists, Speech Therapists, Occupational Therapists, and Remedial Therapists, there is a variety of extra-mural activities. Much about this school is captured by their vision statement "*Let None be left behind*".

3.2 Rationale

The White Paper Three on Higher Education (Department of Education, 1997), outlined two primary goals for transformation, namely, "to redress the historic imbalance between educational provision for Whites compared with Coloured, Indian and Black students and the transformation of the whole educational system to provide an educational design for the needs of the 21st century" (Entwistle, 2000., p.185). Achievement of these goals presents a great challenge and much controversy exists as to which method could be used to best attain them. The rationale for the study stemmed from the assumption that mediating cognitive deficiencies in learners would have the influencing power to

positively alter the course of cognitive development. This would be demonstrated by significant improvement in cognitive functioning (on the Raven's Coloured Progressive Matrices) after the provision of appropriate mediated learning experiences. In addition gaps in scholastic functioning and language deficiencies would be addressed.

This study was a joint initiative between the remedial school which participate in the study and the researcher in an attempt to enhance cognitive functioning and to optimize learners' learning experience. The findings of the current study would offer a sound theoretical basis for the operation of intervention strategies in childhood education and early intervention services, in accordance to the proposal in the Education White Paper 5 (Department of Education, 2001) and the draft Children's Bill (Department of Social Development, 2002).

Although there is well established empirical evidence to support the effectiveness of MLE, there are limited dynamic assessment studies conducted on younger children, particularly in the South African context. It was therefore hoped that through the application of a dynamic assessment approach, learners exposed to this intervention programme will benefit and insight gained into the value of such a tool in South Africa be obtained.

3.3 Aims of the Study

1. General Aim

The general aim of the study was to investigate the effectiveness of Feuerstein's mediated intervention programme on younger learners (10 to 12 years) who present with learning difficulties in a remedial school, to determine whether exposure to this intervention could yield significant improvement in cognitive functioning as assessed by the Raven's Coloured Progressive Matrices. Since mediation in this context focused on small groups, it was hoped that mediated learning experience intervention would demonstrate positive results.

2. Specific Aims

1. To evaluate the effectiveness of a mediated intervention programme to improve the performance of learners as measured by the Raven's Coloured Progressive Matrices.

2. To compare performance of learners within the group mediation and those within the individual mediation on the Raven's Coloured Progressive Matrices.

These aims were operationalised as the following hypotheses.

3.4 Hypotheses

1. The intervention programme would significantly improve Raven's scores of the learners.

2. Learners within the Individual Mediation group would perform significantly better than those within the Group Mediation on the Raven's Matrices.

3.5 Research Design

Figure 1 gives an overview of the research design. Participants were selected by systematic random sampling, assigning them to Individual Mediation or Group Mediation. A pre-post test mixed methods design was adopted. Data analysis is also summarized in Figure 1.

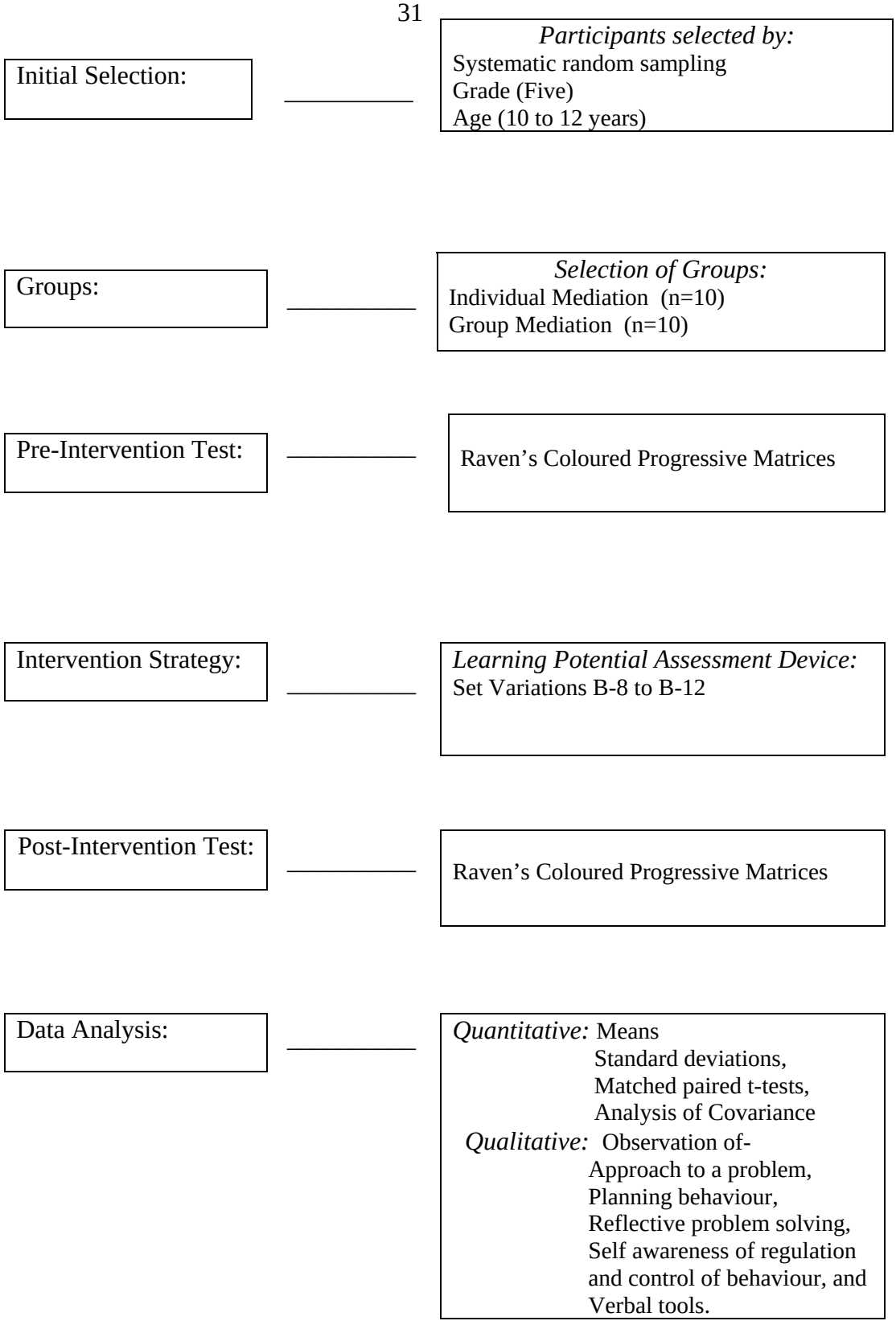


Figure 1: ***Overview of the Research Design***

3.5.1 Sampling Procedure

Of the total complement of 34 learners in the three Grade Five classes 20 learners participated in the current study. A systematic random sampling approach was used for selection of participants. This sampling method involved a process whereby a random number is used to generate every element in the sample (Moser & Kalton, 1971). By implementing this approach, all the learners in the current study had an equal chance of participating in this study. These participants were randomly selected on a procedure to form the Individual Mediation group and the Group Mediation sample. This involved a table of random numbers, which was used to select only the first element in the sample, and thereafter, every third element was included.

3.5.2 Participants

The current research study was conducted at a Remedial School in Johannesburg. From the Grade Five classes, twenty learners participated in this study. It was a suggestion by the school that the Grade Five classes be targeted. It was assumed that they would cognitively engage well in the process and that if further follow-up is needed, they can be investigated before being promoted to a new school in Grade Eight. The sample consisted of 11 (55 percent) males and 9 (45 percent) females. The participants' ages ranged from 10 to 12 years. The sample comprised three racial groups, namely, Whites 90 percent (n=18), Indians 5 percent (n=1) and Blacks 5 percent (n=1).

Initially, ethical clearance was obtained from the Gauteng Education Department for permission to work with the Grade Five learners. Permission was also sought from the school principal (Appendices C and D). Information sheets and consent forms were sent to parents of the Grade Five learners. Parents signed the consent forms to indicate that they understood the purpose of the study and the voluntary basis of participation of their children (Appendices E and F). Assent forms were completed by the learners. The assent forms indicated that subject participation was voluntary and that they could withdraw from the study at any time without penalty (Appendices G and H).

3.5.3 Experimental Design

A pre-experimental research design, in particular a one group pre-test-post-test approach was adopted. In this design, participants served as their own control, and comparisons were made before and after intervention. It was assumed that differences occurring between the pre- and post-test would be due to the effect of the intervention. However, the researcher acknowledges the shortcomings of this approach, regarding its limitation of internal validity. For instance, differences between the pre-post tests could be as a result of extraneous variables, such as maturation or the Hawthorne effect. Furthermore, between- groups' performances (Individual Mediation and Group Mediation) were conducted to determine which one would demonstrate significant improvement.

3.5.4 Testing and Intervention Procedure

All participants in this study underwent pre-test and post-test phases, whereby they completed measures according to the standard instructions, with both a group and an individual intervention in-between.

During the pre-test phase, all participants were simultaneously exposed to the Raven's Coloured Progressive Matrices (RCPM). The RCPM comprises sets of diagrammatic puzzles and it is discussed in detail in section 3.8.1. The participants were required to identify a missing part for each item from several options. Following the standardized instructions in the Ravens Manual (1956), the participants were given the instructions for completing the RCPM. An initial test phase took place to determine the participants' independent level of performance- a baseline against which future learning could be gauged. Since the RCPM measures an individual's capacity for clear thinking without time limit (Raven, Court & Raven, 1988), it was not timed. However, the majority of participants completed the RCPM within twenty-five minutes. The researcher conducted the baseline measurements with the help of an educator who was briefed before the actual testing.

For the intervention, a group of ten participants constituted a Group Mediation sample and they were exposed to Set Variations B-8 to B-12. Similarly, the other ten participants were exposed to Individual Mediation on Set Variations B-8 to B-12, which was administered according to LPAD procedures. The participants within the Group and Individual Mediation were exposed to the same conditions. However, intense mediation was only provided within the Individual Mediation group in terms of time and the nature of one to one interaction. The participants from the Group Mediation only received intervention of approximately three hours. However, since participants within the Individual Mediation were exposed to one-to-one interaction, intervention period varied. It ranged from two to four hours for a week, with intervals of 10 to 15 minutes. As already mentioned, it is within the latter group that participants interacted with the mediator on an individual basis, thereby enabling him to specifically focus on the locus of the deficiency per participant.

The intervention was geared towards correcting thinking patterns that impair learning, developing accurate perception, insight and understanding of the participant's thought processes. Specifically, participants were encouraged to develop effective thinking strategies, refrain from impulsivity, be precise and systematic in gathering of data, clearly identify and define problems, devise a plan of action, and avoid trial and error responses, look for logical evidence and reflect before responding. These responses were considered crucial for these participants as they are learners who were not coping in mainstream schools due to learning difficulties and other factors required by the demands of learning.

The mediator intervened when it was necessary and assisted the participant/mediatee as much as needed to complete the tasks. As aforementioned, aspects that were covered included:

- *Regulation of behaviour*, which implies inhibiting impulsivity, overcoming blocking that may obstruct mediatee’s successful performance;
- *Developing accurate perception* through systematic approach to gathering of and understanding of the problem, and being precise and clear;

- *Production of reflective and analytic insight*, whereby mediatees were assisted to think about the nature of tasks and their requirements and to be critical of their solutions; and
- *P*rovision of *appropriate verbal tools* necessary to receive, store, process/elaborate and express information.

During the mediation, the researcher assumed the role of mediator between the mediatees' thinking processes and the cognitive strategies being taught. The approach was of a process-oriented nature rather than content focused. During the interaction, the mediator was guided by the parameters of Mediated Learning Experiences as discussed in the literature review on initiating discussions and responding to the participants (Feuerstein *et al*., 1979). The overall goal of the mediation was to heighten individual awareness of the learning process, and to make concepts more meaningful and understandable. Through this process, it was expected that the participants' cognitive structures would be modified. As a result, this mediation process was argued to induce intrinsic motivation, which is crucial in preventing a state of continuous dependency on extrinsic motivational sources that are not always afforded by the environment.

Set Variations B-8 to B-12 was administered according to LPAD procedures and thus served as vehicle for mediating cognitive deficiencies. Set Variations B-8 to B-12 is discussed in detail in section 3.8.2.

It is noteworthy to mention that in addition to the lectures attended on mediation the researcher was also exposed to workshops on mediation provided by Professor Skuy, a certified mediation instructor, and Professor Falik, a colleague of Professor Feuerstein.

A week after the intervention, the whole sample was again given the same measure as in the pre-test. During this post-test phase, all the participants completed the RCPM to determine if improvement from pre-test scores can be demonstrated. This measure was administered according to the same procedure and instructions as in the pre-test phase.

Both the testing and intervention took place over a two week period. The researcher scored the test and an independent research assistant verified the accuracy of the scoring as well as the captured data.

3.5.5 Data Analysis

In experimental research, data analysis involves calculation of scores between variables, particularly those manipulated and those affected by the manipulation. Pollard (1986) states that only experimental data can conclusively demonstrate causal relations between variables.

In the present study, analyses of descriptive statistics were provided in order to elicit means, standard deviations and ranges of the variables of the sample. To determine the distribution of the pre-test scores for the Ravens Coloured Progressive Matrices (RCPM), the Kolmogorov-Smirnov test of goodness fit was conducted and it yielded a normal distribution for the variables. As a result of normality of the distribution of scores, parametric tests were employed. For the post-test scores, a review of the distribution did not indicate serious violation of the normality assumption.

To test *Hypothesis One*, a paired t-test was utilized to determine if improvement in Raven's scores from the pre-test phase to the post-test phase can be demonstrated in each group (Individual Mediation and Group Mediation). To investigate whether there was a significant difference between the groups on the RCPM post-test scores (*Hypothesis Two*), an Analysis of Covariance (ANCOVA) was performed. The pre-test scores of the RCPM served as the covariates. By controlling the effects of the differences that the groups (Individual Mediation and Group Mediation) may bring to the picture, effectiveness of the intervention were easily investigated without confounding variables.

In addition to a quantitative approach that was used, qualitative observations were made to provide in depth understanding of the results, to determine what cognitive dysfunctions

were manifested, to what extent they were modified, and what brought about these modifications.

3.6 Instrumentation

Instruments used in the present study derived from the Learning Potential Assessment Device (LPAD). Only the Raven's Coloured Progressive Matrices (RCPM) and the Set Variations B-8 to B-12 were utilized.

3.6.1 The Raven's Coloured Progressive Matrices (RCPM)

(Raven, J. C. 1956)

The Ravens Progressive Matrices (RPM) are among the most researched and widely used of all culture-reduced tests (Ravens, 2000). The RPM measures the capacity of an individual to understand meaningless figures, notice the relations between them, visualize the nature of the figure completing each system of relations presented, thereby developing a systematic method of reasoning (Raven, Court & Raven, 1988). To solve problems presented in these matrices and to form gestalts and relationships a well developed perceptual ability is required. The LPAD manual reports that for an individual to complete the matrices successfully, a high level of vigilance and attention are involved along with a good capacity for the processes of discrimination, problem definition, comparative thinking, representational thinking and inferential thinking.

Rand and Kaniel (1987) reported reliability coefficients of .8 and .9 for the RPM. The RPM was designed to assess Spearman's "g" factor - the general factor of intelligence. It taps on the non-verbal modality and has the varying levels of complexity, namely the Raven's Coloured progressive Matrices (RCPM) primarily used for children, Raven's Standard Progressive Matrices (RSPM) and Raven's Advanced Progressive Matrices (RAPM) for adolescents and adults respectively. This research study used the Raven's Coloured Progressive Matrices (RCPM) because it is a non-verbal test, which would counteract limitations of a verbal test.

Since Grade Five learners constituted the sample for the current study, the RCPM was used. It consists of three sets namely, A, AB and B with a maximum score of 36. The total score of an individual provides an index of his intellectual capacity (Raven, Court & Raven, 1988). In the RCPM, for each given problem the participant chooses a response that completes the model from among the six given alternatives. Given the fact that these items progressively become more difficult, Feuerstein (1980) reports that it is vital for establishment of baseline of functions to identify areas that require intervention. Furthermore, inability to select the correct answer from the given options enables the examiner to analyze the errors, which facilitate understanding of the respondent's cognitive deficiencies, motivational and affective aspects responsible for difficulty in completing the measure successfully (Feuerstein, 1980).

Although the RPM has been standardized only in the United Kingdom (1992), United States of America (1993) and Germany (1997), several studies confirmed the significance of the RPM as a measure of intellectual functioning (Grieve & Viljoen, 2000; Rushton & Jensen, 2003; Skuy *et al*., 2002; Strous, 2003; Zaaiman, Van der Flier & Thijs, 2001). Despite the RPM being used in well over 1000 international and local studies because of the understanding that it is culture free, several criticisms have been directed against RPM. Irvine (1969) condemned the notion that a test with figural content or low verbal content can automatically be assumed to be unbiased, suggesting that non-verbal tests were biased in ways that are different and probably more complex to define. Anastasi (1997) suggests that the RAPM has somewhat lower predictive validity with academic success. Despite such critiques levelled against the Raven's Progressive Matrices, it remains the preferred non-verbal measure of intellectual functioning. Appendix A provides an example from the RCPM.

3.6.2 Learning Potential Assessment Device (LPAD) Variations B 8 – B 12

(Feuerstein, Haywood, Rand, Hoffman and Jensen, 1986)

The LPAD Variations B 8 – B 12 consist of sets of six variations on five Raven's Coloured progressive Matrices (RCPM) items. Like the RCPM, it measures the same components such as an individual's ability to form comparisons, to reason by analogy and to organize spatial perceptions into systematically related wholes (Tzuriel & Haywood, 1992). In each of the sets, the original matrix is used for extensive mediation while the remaining six matrices are used for dynamic assessment. Appendix B provides some examples from the LPAD Variations B 8 – B 12.

Battle (2002) claims that the term 'culture fair' is now used to describe the test rather than 'culture free' as no measure can be described as being entirely 'culture free'. Consequently, the measures employed in the present study need to be viewed from the perspective of their demonstrated effectiveness in measuring what they are supposed to measure and their degree of yielding consistent results over a period of time.

CHAPTER FOUR
Results

4.1 Overview of Data Analysis

Descriptive and inferential statistics were employed to analyze the data from the responses of the subjects of this study. Statistical Analysis System (SAS) version 8 was utilized to conduct statistical analyses. The Kolmogorov-Smirnov test of goodness fit was conducted to determine the distribution of the pre-test and post-test scores of the Ravens Coloured Progressive Matrices (RCPM). It yielded a normal distribution for the variables and parametric tests were employed. The paired t-test was used to evaluate the means between pre-test and post-test scores. According to Statistica (2003), a t-test can be used even if the sample size is small (below 30), as long as the variables are normally distributed within each group.

Two levels of analysis were conducted in order to provide a comprehensive set of results. The first level of analysis focused on descriptive statistics and describes the sample, in terms of the mean scores and standard deviations of all the variables. The second level of analysis consisted of inferential statistics. In the current study, inferential statistics employed focused only on tests of significant difference. This implies that paired t-tests investigated whether significant improvement from pre-test to post-test scores could be yielded within the Group Mediation and Individual Mediation. In addition, Analysis of Covariance (ANCOVA) was utilized to control for possible initial differences, and the pre-test scores served as the covariates.

4.2 Descriptive Statistics

Table 1.1 below provides demographic information about the sample. As indicated in this table, 90 percent of the participants were White, while the Africans and Indians equally constituted 5 percent each. As described in the methodology chapter, this sample was divided into two mediation groups for the purposes of intervention. Irrespective of race

and gender, the mediation groups, namely, Individual Mediation and Group Mediation comprised 50 percent each. In terms of gender, 55 percent of the participants were males while 45 percent were females. The mean age of this sample is 11.1 with age range of 10 to 12.

Table 1.1 Demographic Information about the Sample

Race			**Mediation**			**Gender**			**Age**			
	n.	*%*		*n.*	*%*		*n.*	*%*	*Mean*	*SD*	*n.*	*Range*
African	1	5	Individual	10	50	Male	11	55	11.1	0.64	20	10-12
White	18	90	Group	10	50	Female	9	45				
Indian	1	5										

The pre- and post-test means and standard deviations of the Ravens' scores are presented in Table 1.2 for each of the Individual Mediation and Group Mediation. As can be observed from this table, out of 36 RCPM scores the Group Mediation's performance on the pre-test fell within the upper level of 28. In contrast, the Individual Mediation's score is within the lower level of 28. Nonetheless, the post-test score of the Individual Mediation group is slightly above that of the Group Mediation.

Table 1.2 Mean Scores on the RCPM by Mediation Condition

Variable	**RCPM** (36 scores)					
	Pre			**Post**		
	N.	Mean	SD	N.	Mean	SD
Individual Mediation	10	28.0	6.0	10	31.5	1.9
Group Mediation	10	28.9	3.6	10	31.0	2.8

4.3 Inferential Statistics

As mentioned in the methodology chapter, *Hypothesis One* projected that following the intervention, improved Raven's scores of the participants will occur in each of the groups. To determine whether significant improvement resulted, paired t-tests were conducted within each group on the pre- and post-test Raven's scores.

As demonstrated in Table 1.3, although the t-test revealed statistically significant difference ($t = -2.72$; df: 9; $p < .05$) between the pre- and post-test Raven's scores of the Individual Group, no statistically significant difference was found within the Group Mediation on this variable.

Table 1.3
Results of paired t-tests within each group on the RCPM

Variable	DF.	*SD*	*t.*
Individual Mediation	9	4.1	-2.72*
Group Mediation	9	3.9	-1.67

* $p < 0.05$

Hypothesis Two postulated that participants within the Individual Mediation group will perform significantly better than those within the Group Mediation on the Raven's scores as an effect of nature of the mediation. To test this hypothesis, Analysis of Covariance was conducted (ANCOVA) and the pretest scores served as the covariates.

As illustrated by Table 1.4, results of the Analysis of Covariance yielded no statistically significant difference between the Individual Mediation and Group Mediation. This implies that no mediation condition was great enough to yield significant difference. Therefore, statistically significant score ($F = 9.20$; df: 17; $p < .01$) demonstrated in the table is due to the influence of pre-test score differences.

Table 1.4
Comparison of the effects of Individual Mediation and Group Mediation

Variable	DF.	*F*	*Sig.*
Pre-test	17	9.20	0.0075**
Mediation	1	0.53	0.4748

** $p < 0.01$

Figure 2 demonstrates that the pre-test score of the Individual Mediation was lower than that of the Group Mediation. However, in the post-test phase, although a significant improvement was found within the Individual Mediation, it was not great enough to yield significant difference between the two groups.

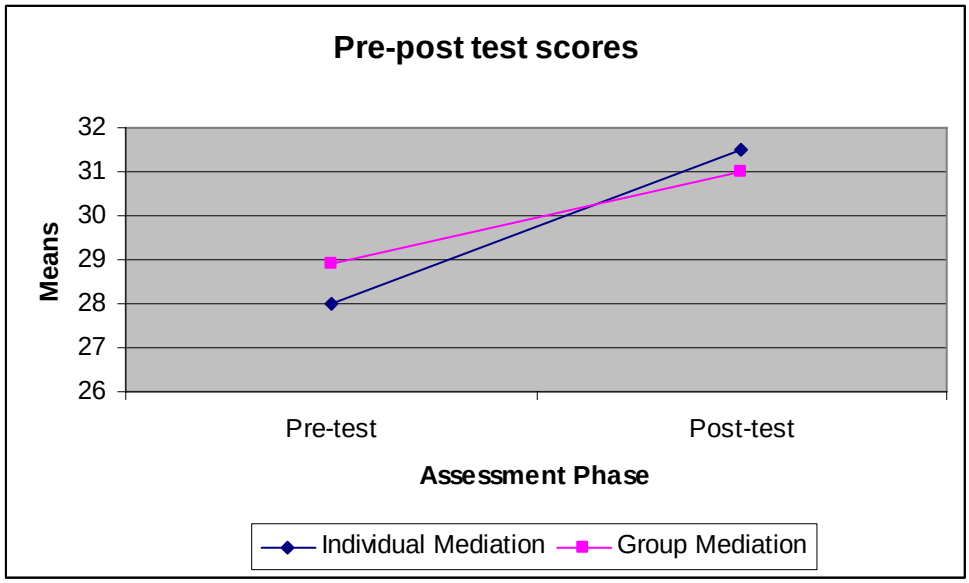


Figure 2: Comparison of Pre-Post Test Means

Regarding qualitative observation, both the Individual and Group Mediation displayed to a lesser degree inadequacies in reflecting on the problem to be solved (for instance, defining what a task required, how it can be approached), which seemed to result in a lack of goal orientation. This further appeared to disrupt the organization and systematization of exploratory behaviour.

It was observed that most of the participants within the Group Mediation had difficulty waiting to take turns, they were competitive, which impacted negatively on their ability to accurately comprehend what the task required. They were noted to often engage in trial and error responses, which imply that they tended to respond to first and most salient stimuli before they had gathered all the available data. Consequently, external regulation by the researcher was imperative.

Unlike their mediation counterparts, most of the participants from the Individual Mediation seemed anxious and hesitant to respond. However, they appeared to relax as the mediation process progressed. Optimal conditions crucial to motivate the child to open up to mediation, and enhance self-confidence or inhibit hesitancy when faced with unfamiliar contents were afforded. They also demonstrated difficulties relating to lack of verbal tools, for example they had tendency to confuse *horizontal* line versus *vertical* line. Acquisition of a systematic approach to the tasks, strategies and orderly explorative behavior were offered.

CHAPTER FIVE
Discussion

5.1 Interpretation of Findings

Generally, mediated learning experience processes which are characterized by mediator-mediatee interactions are associated with cognitive modifiability as demonstrated in dynamic assessment rather than with static assessment studies.

The present study explored the effects of mediation on learners within a remedial school setting and to what extent exposure to mediated intervention would yield significant improvement in cognitive functioning as assessed by the Raven's Coloured Progressive Matrices. It was anticipated that significant improvement from pre-test scores would be demonstrated following a mediated learning experience intervention.

Specifically, *Hypothesis One* evaluated the pre- and post-test scores of the Raven's Matrices within each group. This hypothesis suggested that both the groups (Individual Mediation and Group Mediation) would demonstrate significant improvements. However, the results of the matched paired t-tests only revealed statistically significant improvement of scores from pre-test to post-test within the Individual Mediation.

It seems that since participants within the Individual Mediation were exposed to intense and individualised intervention this could have played a crucial role in yielding a significant result. This result corroborated findings reviewed in the literature, which established the usefulness of the theory of Structural Cognitive Modifiability (SCM) and Mediated Learning Experience (MLE). For example, Mehl (1991) confirmed that identification of cognitive deficiencies and provision of adequate and appropriate mediation in the context of Physics revealed significant differences between the experimental and control groups. Furthermore, a study (Strang & Shayer, 1993) confirmed that identification of cognitive deficiencies and provision of mediated intervention yielded significant improved findings. Similarly, Tzuriel and Kaufman, 1999) demonstrated the significance of mediation in modifying cognitive dysfunctions.

It needs to be noted that this result (within the Individual Mediation on the pre-post test differences) was significant at the lower level of significance ($p < 0.05$). Therefore it is likely that should the intervention have been provided for a longer period of time, and with a larger sample a result of higher significance ($p < 0.01$) might have been achieved.

Although the pre-test mean of the Individual Mediation was slightly lower than that of the Group Mediation, the post-test mean of the Individual Mediation was fairly higher than that of the Group Mediation. It therefore seems that the effects of the mediated learning experience intervention are exceptional where provision of mediation has been inadequate. This postulation is based on the study (Skuy & Shmukler, 1987) that investigated efficacy of the mediation with Indian and Coloured students. Skuy and Shmukler (1987) illustrated greater significant improvements within the Coloured group and attributed findings to the Coloured group's historical deprivation. This implies that due to ceiling effects, the degree of the effectiveness of mediation could become minimal.

Insignificant results of the Group Mediation were not anticipated and thus failed to replicate the findings from previous studies (Seabi & Cockcroft 2006; Skuy, Gewer, Osrin, Khunou, Fridjhon, & Rushton, 2002; Tzuriel & Kaufman, 1999), which demonstrated that provision of mediated intervention results in improved performance on the Raven's Coloured Progressive Matrices. It is argued that this result could have been negatively influenced by a short period of intervention. It is also possible that the intervention was inadequate.

Although no statistically significant improvement was demonstrated within the Group Mediation, a positive trend in terms of improvement was illustrated. This finding could imply that the intervention was appropriate but insufficient to exert significant improvement.

Hypothesis Two postulated that participants within the Individual Mediation would perform significantly better than those within the Group Mediation on the Raven's

Coloured Progressive Matrices. However, the results of the Analysis of Covariance demonstrated no statistical significant difference between the two groups on the Raven's Matrices. These findings were not expected since the groups differed in terms of the duration and the degree or intensity of the mediation. Although these results were not anticipated, they could be understood based on the fact that both the groups have been exposed to the same mediation process, which is crucial in heightening awareness and fostering the ability to reflect on thought processes.

Given that the pre-test and post-test means of the participants within the two groups were high, it is plausible that these findings are due to the effect of their background and not necessarily because of the result of mediated intervention. Therefore, since the present study was conducted within the context that serves largely upper and middle class communities, it is suggested that their context provided adequate sustenance, stimulation, support and structure, as discussed in the studies (Nord, Brimhall & West, 1997; Bradley, Whiteside, & Mundfrom, 1994). Therefore once changes have occurred, a self-perpetuating process is generated where the mediatee experiences a dynamic of continued modification, which is an active process of continued changes thereby projecting into the future the acquired changes (Falik, 1999).

Parents of participants in the current study might have provided them with "human interactions that generated the capacity to change, to modify themselves in the direction of greater adaptability and toward the use of higher mental processes" (Feuerstein, 1979, p. 110). Hence these participants became modified through direct exposure to stimuli (Feuerstein *et al*., 1980). This suggests that participants after understanding instructions regarding completion of the Raven's Coloured Progressive Matrices, they were able to reflect on the process and generate ways of arriving at the solutions.

5.2 Implications of the Results

Statistically significant improvement demonstrated by the Individual Mediation on the Raven's Coloured Progressive Matrices post-test, indicated the usefulness of mediation.

It is deduced that after the mediation, the participants were better able to cope with the task. This supports Feuerstein's theory that initial poor performance was a result of a lack of mediated learning experiences rather than inherent differences or deficiencies. In addition, provision of appropriate mediated learning opportunities enabled the participants to function adequately. The modification that transpired after such a short investment holds out the promise for even greater change after longer-term intervention.

Thus the use of mediation provides a more accurate and fair assessment of abilities enabling the examiner to identify the individual's potential. Furthermore, it is also useful to identify strengths and weaknesses which can then be incorporated into an intervention programme best designed for the individual in question.

However, given that when the pre-test means of the two groups (Individual Mediation and Group Mediation) were controlled and the post-test means were tested, which yielded insignificant results, the mediation intervention in this regard rendered the findings inconclusive.

5.3 Limitations of the Study

Although results from the present study provide some significant avenues for academic programmes and future research, there are some limitations to the current study that should be addressed.

A major limitation of the current study is the lack of a control group against which results obtained within the experimental groups could be compared to. Since this was not a rigorous study, the extent to which findings can be attributed solely to the mediated learning experience intervention must be treated with caution.

The short period of intervention is another limitation. A long-term intervention programme where cognitive modifiability will be more permanent and pervasive is suggested.

Due to the context of this study, participants could be regarded as a homogenous sample of middle to upper socio-economic-strata. Therefore a larger sample across socio-economic-strata may confirm cognitive modifiability as an effect of MLE interventions.

Another limitation is the small sample size. This precludes generalization to the larger population. Nonetheless, this research can provide a useful pilot study to inform future large-scale rigorously controlled experimental programmes.

Since the Individual Mediation had more exposure to the tasks and more time with the mediator, the attention and time effects were not uniform for both the groups. It may have been useful to equalise this and to compare the results.

5.4 Suggestions for Future Research

This research study provides insights into the use of dynamic assessment with learners within a remedial school and offers potential as an assessment tool. The following suggestions with regard to future research are made:

- Given that a significant improvement was found within the Individual Mediation, but that there was no significant difference between the Individual Mediation and the Group Mediation, a large-scale in-depth MLE investigation in a heterogeneous sample across different socio-economic-strata is recommended.

- There is a need to ascertain the amount of time necessary to devote to MLE interventions before it takes effect (Burden, 1990, p. 83).

- Although quantitative approaches may be adopted, it seems essential to keep extensive observational records to identify important factors which are operative at the input, processing/elaborational and output phases. These factors should include both cognitive deficiencies as well as cognitive strengths. This would contribute positively towards psycho-educational assessments, as background of

South African population is diverse. In addition, it would serve as an equitable approach that may be sensitive to the needs of the population.

5.5 Conclusion

The fundamental aim of this research study was to investigate the effects of mediation on a sample of Grade Five learners in a remedial school. The Raven's Coloured Progressive Matrices was used as a measure of cognitive functioning. Following a period of mediated intervention, significant improvement was demonstrated only within the Individual Mediation. Hence usefulness of mediated learning experience as an alternative approach to assessment was confirmed. Given the historical background of South African context, dynamic assessment serves as an essential approach to psycho-educational assessment. However, since there was no statistically significant difference between the two groups (Individual Mediation and Group Mediation), on the post-test scores, these findings are inconclusive.

Nonetheless, mediated learning experience is considered to make learning meaningful and personally relevant to learners and encourages them to become actively involved and to take personal responsibility in the learning process. In accordance with Schaefer (1990, p.21) "through MLE children develop cognitive strategies and intrinsic motivation that contribute to academic achievement".

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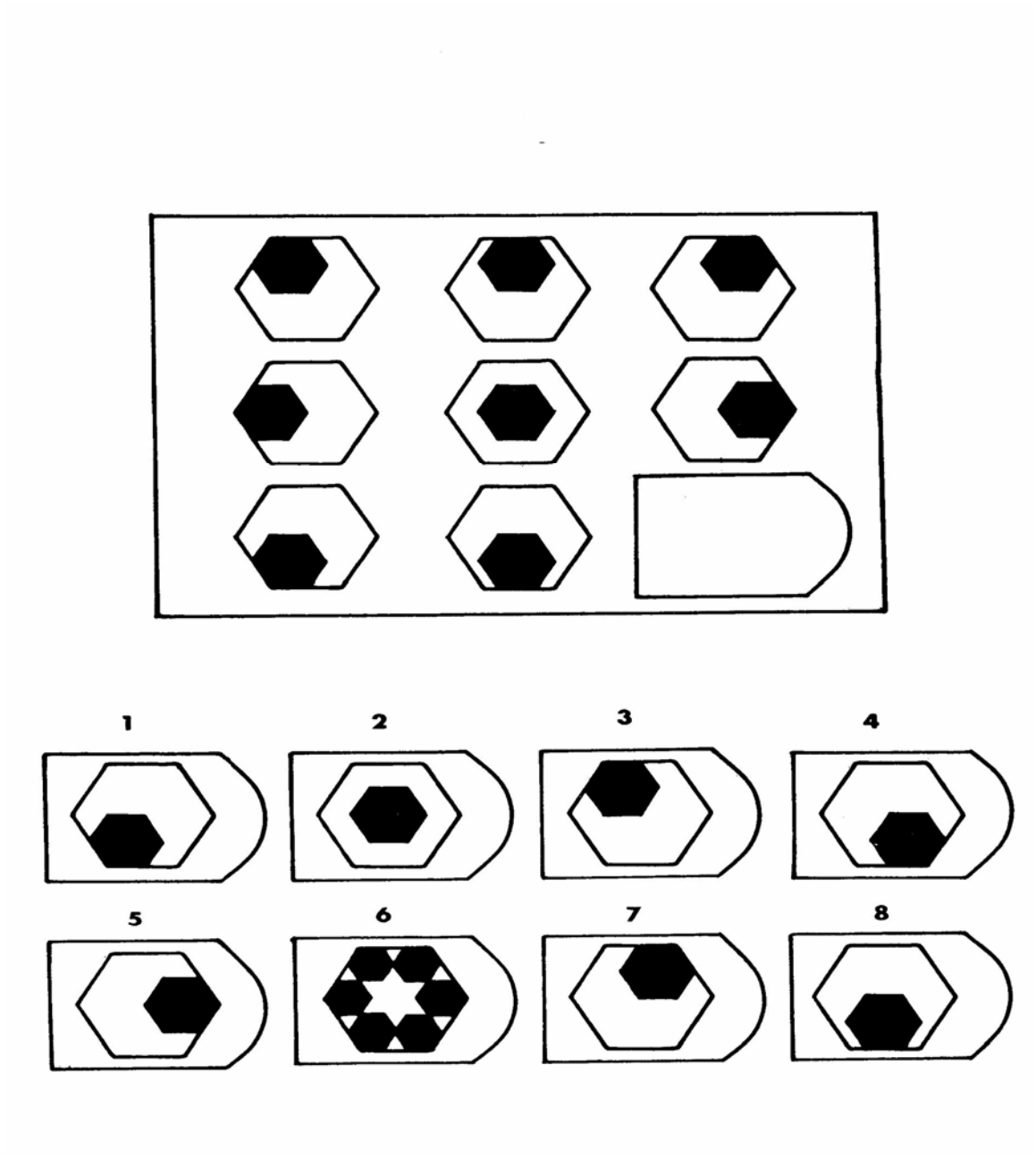
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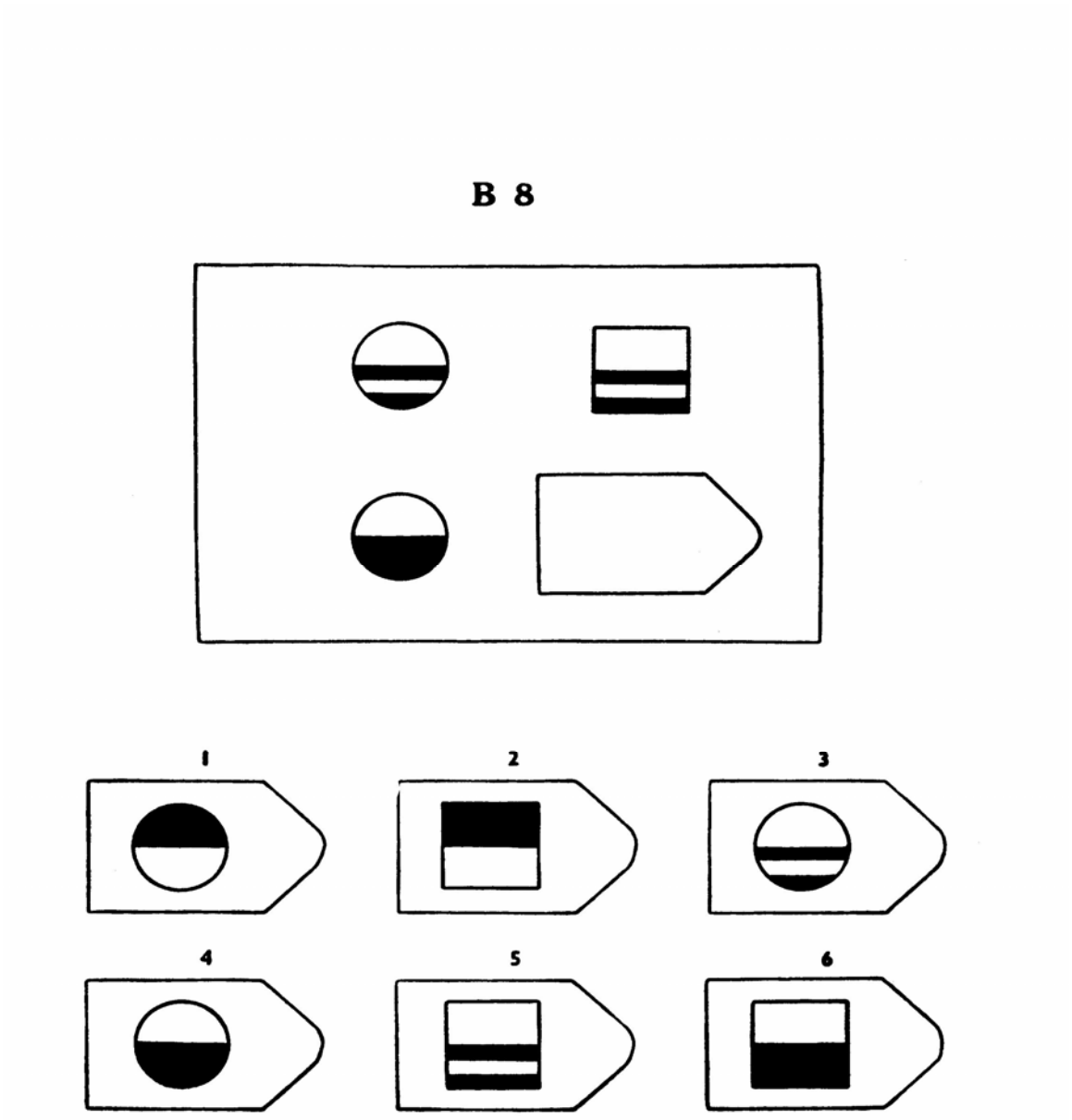
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APPENDICES

APPENDIX A: AN EXAMPLE OF THE RAVEN'S COLOURED PROGRESSIVE MATRICES (RCPM)



APPENDIX B: AN EXAMPLE OF THE LEARNING POTENTIAL ASSESSMENT DEVICE (LPAD) VARIATIONS B 8-B 12



APPENDIX C: PRINCIPAL INFORMATION LETTER



Dear Ms. Jones

I am Joseph Seabi, a student at the University of the Witwatersrand. I am conducting research for the purposes of obtaining a Masters in Educational Psychology degree and I would like to request permission to conduct this study at your school.

My research study aims to evaluate the effectiveness of a test-teach-test method of cognitive assessment in improving the learners' cognitive strategies, for example their problem solving skills. The research will consist of three steps, namely, examination of the level of cognitive strategies used (pre-test), an intervention to improve cognitive strategies, and examination of learned cognitive strategies (post-test).

The researcher has sought permission from parents of learners to engage them in the study. Participation is voluntary, and no person will be disadvantaged in any way for choosing to participate or to withdraw at any time. Confidentiality will be ensured and no identifying information will be included in the research report.

Learners will also be asked to complete a form showing that they are willing to participate in the study.

Kindly fill in the attached form giving your consent to conduct the research at your school.

Kind regards

Joseph Seabi

APPENDIX D: PRINCIPAL CONSENT FORM

I _____ consent to this study conducted by Joseph Seabi on the evaluation of the effectiveness of a test-teach-test method of cognitive assessment in improving cognitive strategies of the Grade Five Learners.

Signed _____

Date _____

APPENDIX E: PARENT INFORMATION LETTER



Dear Parents/Guardians

I am Joseph Seabi, a student at the University of the Witwatersrand. I am conducting research for the purposes of obtaining a Masters in Educational Psychology degree and I would like to invite your child to participate in a study on mediated learning.

My research study aims to evaluate the effectiveness of a test-teach-test method of cognitive assessment in improving the learners' cognitive strategies, for example their problem solving skills. The research will consist of three steps, namely, examination of the level of cognitive strategies used (pre-test), an intervention to improve cognitive strategies, and examination of learned cognitive strategies (post-test).

Participation in this study is voluntary, and no person will be disadvantaged in any way for choosing to participate or to withdraw at any time. Confidentiality will be ensured and no identifying information will be included in the research report.

Please fill in the attached form to give your consent for the participation of your child in this research project.

If you have any questions or queries please contact me at 011 706-8246 or 083 312 2948. My e-mail address is jo.seabi@gmx.de.

Kind regards

Joseph Seabi

APPENDIX F: PARENT CONSENT FORM



Parent/Guardian consent form

I/WE, _____, the parent/guardian of _____ consent to our child's participation in the study conducted by Joseph Seabi on the effectiveness of a test-teach-test method of cognitive assessment in improving the learners' cognitive strategies.

I/WE understand that:

- Participation in this study is voluntary
- I/WE may withdraw our child from the study at any time without our child suffering any prejudice
- No information that may identify our child or his/her family will be included in the research report, and his/her responses will remain confidential.

Signed _____

Date _____

APPENDIX G: PARTICIPANT INFORMATION LETTER



Dear Participants

I am Joseph Seabi, a student at the University of the Witwatersrand. I am carrying out research for the purposes of completing a Masters in Educational Psychology degree and I would like to request you to participate in this study.

My research study aims to measure the effectiveness of a programme focused on improving cognitive strategies (problem solving, how to reason through a problem). The study will examine (check) the level of thinking strategies, help to improve thinking strategies, and re-examination of whether the level of thinking strategies has improved as a result of the help. Learners will also be given a similar test to examine whether they can show (demonstrate) the learning.

You have the right to say no. If you participate and later feel that you want to withdraw, you will not be penalized. Confidentiality will be ensured and no identifying information will be included in the research report.

Please fill in the attached form to give your permission for participating in this research project.

Kind regards

Joseph Seabi

APPENDIX H: PARTICIPANT CONSENT/ASSENT FORM

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

I, _____ agree to participate in the study conducted by Joseph Seabi on the examination of a programme that assesses and teaches some problem-solving skills.

I understand that:

- Participation in this study is voluntary
- I may withdraw from the study at any time

- No information that may identify me will be included in the research report, and my responses will remain confidential.

Signed _____

Date _____