THE COUNTER TEST : ASSESSMENT IN A MULTI-CULTURAL CONTEXT

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THESIS PRESENTED FOR THE DEGREE

of

M.A. CLINICAL PSYCHOLOGY

IN THE FACULTY OF

SOCIAL SCIENCES AND HUMANITIES

UNIVERSITY OF CAPE TOWN
DECEMBER, 1993

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ABSTRACT

Historically, difference in performance across dominant and subordinate groups on tests of cognitive ability have been observed. Of particular importance is the underperformance of groups on tests. It is proposed that this results from the underlying assumptions of conventional tests. Contextual models (which argue that cognitive ability is socially determined) and research pertaining to Piagetian theory argue that understanding children's socio-ecological contexts, as well as their underlying cognitive processes, enhances assessment of cognitve ability/ competence. Additionally the multitude of factors influencing performance in an intra- and intercultural assessment situation should be considered.

A new test of cognitive ability based on Piagetian Genetic Epistomology, the Counter test, has been developed by Dr V. Grover. Previous exploratory research has indicated performance differences across designated racial groups attending different education systems. This research focuses on understanding performance (on the Counter Test) across "black" and "coloured" groups within the same education system.

A fortuitous sampling technique was used to select a sample consisting of 20 "black" and 20 "coloured" children, aged 8 and 9 years. Demographic data was obtained to understand their socio-ecological context. They were administered the Draw-A-Man and Counter Test (first administration). Results obtained on the Counter Test indicated that designated racial group does not influence performance on the test ($t = 0.203$, $d.f. = 38$, $p > 0.01$) or significant underperformance within each group ($t = 6.901$ "coloured", $t = 9.68$ "black", $d.f. = 19$, $p < 0.01$). The latter is similar to findings on previous research. Possible explanations are given, but further vigorous investigations are indicated.

On second administration, the unstandardized, structured steps based on Feuerstein's Learning Potential Assessment Device were administered to 14 children - criterion underperformance from 1 yr 6mo to 2 yr 9mo on the Counter test. The clinical interpretation of 6 children's performance across administrations enhanced understanding of their cognitive processes and the contingencies affecting their use, and indicated overall improvement in performance. This indicates that "actual" competence can be assessed through more appropriate assessment procedures. Implications for assessment in a multi-cultural context are considered.

ACKNOWLEDGEMENTS

A number of individuals and an education department contributed substantially to this research project. Thus I would like to express my appreciation to :

* My supervisors, Assoc. Professor A. Levett and Ms R Lazarus for their guidance, support and constructive suggestions throughout.

* Professor V. Grover for the use of the Counter test, her assistance in the development of the steps and her interest throughout.

* Ms B. Dickman for her assistance in getting this project of the ground.

* The Department of Education and Culture : House of Representatives, for allowing me to work in the schools.

* The teachers who assisted me.

* The children who willingly participated in this research. They deserve a special note of thanks.

Then a sincere thank you to everybody who has helped and/or supported me throughout my work.

CHAPTER 1

BACKGROUND

1.1 INTRODUCTION

In South Africa, an ever increasing number of children from various backgrounds need to be assessed. Such assessment takes place in a multi-cultural context which is characterized by dominant and subordinate groups (Foxcroft, 1990). The dominant group has the power to dictate several aspects, (e.g. political, social, and economic) of a population's lives in a manner which favours members of the dominant groups and exploits the rest of the population (subordinate group/s) (Boonzaier & Sharp 1988).

In South Africa, individuals have been segregated in different spheres of life - such as educational systems - and this segregation has been based on designated racial groups. It is important to bear in mind that in South Africa cultural differences result from and reflect a political system where designated racial groups have differential access to resources in their environment (Boonzaier and Sharp, 1988). Thus individuals develop in different contexts, i.e., segregated educational systems, residential areas and socio-economic circumstances. Although the similarities between these groups cannot be ignored, for the purpose of this research the effect of the differences on cognitive development will be explored.

Historically, and currently, differences in performance on tests have been found in a wide variety of circumstances. Of particular importance is an observed gap between the performance of the dominant and the subordinate groups. Recent research and theory propose that these variations result from the underlying assumptions of traditional psychometric procedures. It is proposed that these assumptions, as well as the design of psychometric procedures, should be reviewed. Of particular importance to this project are the varying conceptions of cognitive ability, which range from a broad, fixed unitary ability to innumerable skills inseparable from situations (Rogoff, 1981), and how these conceptions influence the interpretation of differences in performance.

A new test of certain cognitive abilities, the Counter Test, has been developed. The Counter Test, a non-verbal test based on Piagetian Genetic Epistemology, was developed to assist in the assessment of cognitive development of individuals with mental handicap, particularly if they have language problems (Grover, 1992). Previous unpublished research on the Counter Test has indicated

differences in performance across designated racial groups. The present research will focus on the understanding of group differences associated with cultural differences - culture defined as designated racial group. It is further proposed that this could be accomplished by exploring the reasoning behind a child's response to a task, i.e., exploring underlying cognitive processes.

In the following section an attempt is made to elucidate/define central concepts, such as competence, which will be used throughout the research. Then, the underlying assumptions of, and changes in, traditional psychometric procedures will be explored. More recent theories about the determinants and assessment of cognitive ability, i.e., the cultural practice perspective, the cultural ecology model, as well as the Learning Potential Assessment Device (LPAD), will then be discussed. A brief description of Piagetian theory will be given, focusing primarily on differences and similarities in performances, across cultures, on Piagetian tasks. Possible explanations for differences and similarities will be explored. Finally, several factors which may influence a child's performance on cognitive tasks will be introduced.

1.2 DEFINITIONS

The definitions of key concepts, which will be used throughout the dissertation, are given in this section.

Competence

According to Ogbu (1981) "...competence is the ability to perform a culturally specified task (p.414)". Furthermore competence is determined by the extent to which one has acquired the skills necessary to perform the specified task. Given that people have to cope with several aspects of daily living, competence includes cognitive, linguistic, social-emotional and practical competencies.

Cognitive Ability

Researchers frequently do not offer a working definition of the concept, cognitive ability. Cognitive ability, intelligence, mental abilities and scholastic aptitude, as measured by current psychometric procedures, appear to be used synonymously (Helms, 1992). Thus an attempt is made to define this concept.

According to Jordaan and Jordaan(1989) cognitive processes include :

a.) **Perception** - activity through which a person recognizes an object, i.e., ascribes meaning to an object.

b.) **Thinking** - activity through which symbolic representations are formed in the presence and/or absence of relevant stimuli, as well as the manipulation, re-organisation and restructuring of these representations.

c.) **Learning and remembering, as well as forgetting** - activity where information (in formal and informal situations) is learnt, reproduced and applied in several ways.

Thus cognitive ability refers to the extent to which a person has the necessary skills, which include strategies, to perform the above inter-related activities. It seems, however that any test of cognitive ability only measures certain activities (related to perception, thinking, learning, remembering/forgetting), as defined by the tasks included within the test.

Cognitive Strategies

This seems to refer to activities employed, as specified by the task, to successfully complete the task. For example, Wicks-Nelson and Israel (1984) indicate that to succeed in a memory task the individual uses strategies, such as mediation, rehearsal and reorganization of material through clustering, in order to remember stimuli.

The above outline is not considered to offer comprehensive definitions of the concepts, but rather to provide working definitions to clarify how the concepts are used in this minor dissertation.

1.3 TRADITIONAL PSYCHOMETRIC PROCEDURES

Historically, the conceptualization of intelligence underlying conventional psychometric procedures was that intelligence is stable and immutable, a broad unitary ability, predetermined by heredity. This conception gradually started to change due to research which indicated that intelligence, as measured by an intelligence test, is influenced by several environmental factors. Furthermore, many psychometricians began to argue that measured intelligence is a hypothetical construct which enables one to explain and predict certain behaviours with some probability of success (Wicks-Nelson & Israel, 1984).

Currently, the most widely used intelligence tests, e.g. the Weschler scales, assess what has been learnt in the classroom situation and predict educational and occupational success quite well. The items in these tests tend to be more relevant to the experience of the dominant group. The norms used for the test also tend to be more representative of the dominant rather than the subordinate groups. These tests are also product-oriented. This means that a child's performance, as measured

in terms of standards which are more representative of the dominant group, is represented by a numerical score (Sattler, 1990; Wicks-Nelson & Israel, 1984). Furthermore, this performance, which is dependent on the acquisition of specific skills in a specific environment, is regarded as his/her actual competence (Feuerstein, 1979). Thus these characteristics of conventional psychometric procedures probably contribute to the differential performances between dominant and subordinate groups.

Attempts have been made to generate assessment procedures which consider the complexity of factors which affect performance. Consequently general intelligence theories have gradually been replaced by theories such as the social constructivist model and cultural relativism. These models argue that cultural differences result from the fact that each cultural group cultivates and develops those skills necessary for adaptation in their particular socio-ecological context, i.e., cognitive abilities are socially determined/transmitted (Richter, 1990).

During the 1940's and 1950's, psychometricians attempted to address cultural differences by developing culture-free tests (test items relevant across cultures). Given the difficulty experienced in developing tasks which are relevant across cultures, psychometricians then attempted to develop culture-fair tests (items relevant to a specific culture). This was also unsuccessful given that the performance of subordinate groups on these tests did not differ from their performance on conventional tests (Richter, 1990; Sattler, 1990). Feuerstein (1979) proposed that this failure is due to the fact that the conceptualization underlying these tests is a mere extension of, and not a change in, the theoretical understanding of intelligence. Given this, the contextualists have argued that it is important to understand the culturally determined cognitive processes underlying the child's performance. This would enable one to develop more appropriate psychometric procedures. The cultural practice perspective and the social-cognitive ecology model are forms of contextualism.

1.4 CONTEXTUAL MODELS ENHANCING UNDERSTANDING OF PERFORMANCE DIFFERENCE ACROSS GROUPS

1.4.1 The Cultural-Ecology Model

The model proposes that a culture's effective environment determines the nature of their cultural tasks, especially adult subsistence tasks. This effective environment/ecology refers to those physical and social factors to which one must adapt in one's environment (Ogbu, 1982; Plug, Meyer, Louw

& Gouws, 1986). This model also proposes that competence is defined by the nature of the culturally specified adult tasks.

The fact that children usually become competent adults within a specific culture suggests that children acquire the necessary competencies which will enable them to perform the adult subsistence tasks. Children acquire these competencies through adults (child-rearing agents), who use culturally standardized techniques/strategies to inculcate the culturally defined competencies. Furthermore, children are motivated to acquire these competencies due to societal rewards for competence and penalties for incompetence. Thus people have a cultural knowledge about the requirements for success/"making it" in the status system of the culture. Additionally, they are aware of the different levels of success, i.e., status positions, which could be attained. Success/"making it" includes the ability to achieve higher positions and the ability to cope with the demands of these positions. This phenomenon is referred to as a "native theory of success". According to Ogbu (1981) :

"A Native Theory of Success thus includes knowledge of the range of available cultural tasks or status positions, their relative importance or value, the competencies essential for attainment or performance, the strategies for attaining the positions or obtaining the cultural tasks, and the expected rewards and penalties for success and failure (p.420)."

Thus a native theory of success develops from past adaptation to the effective environment. Furthermore it is reinforced or altered by contemporary perceptions and interpretations of available opportunity structures within the effective environment (Ogbu, 1981; 1982).

1.4.1.1 The Multi-cultural Industrial Society

In the multi-cultural industrial society the effective environment consists of inter-related technological, economic, social and political sectors. Given that resources are not evenly distributed in the environment and different groups in the society have unequal access to these resources, the "overall" effective environment is divided into different segments. These segments could be described as particular effective environments with varying degrees of resources. The distribution of various social groups in these differing environments is usually implemented and maintained by the dominant group. The distribution is such that subordinate groups have to occupy and exploit marginal environments (Jordaan & Jordaan, 1989; Ogbu, 1982). Consequently the subsistence tasks (thus the competencies) for the dominant and subordinate groups differ in important ways.

Given the nature of the adult subsistence tasks available to the subordinate groups in their particular effective environment and society as a whole, they acquire rules of behaviour for achievement and related competence which differ from those of the dominant group. Thus the differential performance of the subordinate group does not result from deficient skills, but rather from the use of different skills (Van Den Berghe, 1980).

Additionally, competence in the "overall" effective environment tends to be associated with (middle class) success in school and society. Consequently some members of the subordinate groups modify their existing competencies to acquire those necessary for school success. They probably perceive school success as providing them with the opportunities to achieve new, desirable adult positions. Thus these individuals modify their particular "native theory of success" because of their contemporary perception and understanding of their opportunity structure (Ogbu, 1981; 1982).

1.4.2 The Cultural Practice Perspective

This perspective argues that skills are acquired in specific learning activity contexts. Thus the development of an appropriate psychometric procedure involves determining the extent to which a specific test (a context) resembles the function-specific tasks to which the person is exposed in his/her cultural context. This model proposes a test where:

a.) Tasks should be relevant to different contexts - thus task-equivalence should be achieved.

b.) The specific test constitutes a context which is relevant for people from different contexts - thus context-equivalence should be achieved.

c.) Furthermore it is proposed that when (a) and (b) have been established, the test, regardless of the person's cultural background, would elicit a person's "real" cognitive ability.

Thus the model proposes the development of a psychometric procedure which entails the testing of the transfer of cognitive abilities across situations.

Although the achievement of task- and context-equivalence will be difficult, the "understanding of factors leading to the application of [cognitive] strategies across situations (intersituational generalization) may be in our reach" (Miller-Jones, 1989, p. 363). This "understanding" could

probably be achieved through employing the underlying assumptions of the social-cognitive ecology model.

1.4.3. The Social-Cognitive Ecology Model

The model is based on the cultural-ecology model and focuses on cognitive competencies. The model proposes that individuals have transcontextual knowledge or cognitive ability. Thus cultures facilitate the development of competencies which emphasize thinking processes (e.g. identifying problems, generating alternative solutions) which allow children to cope with a variety of problem situations, including novel situations (Miller, Pascual-Leone, Campbell & Juckes, 1989). It also proposes that children have a variety of cognitive strategies/abilities including those which the test-maker wants to elicit. The availability of specific cognitive abilities is influenced by the organization of a child's cognitive abilities. This organization is established through the demands of the cultural tasks and problems in his/her socio-cultural ecology (Ogbu, 1981). The availability of cognitive abilities is also determined by the meaning a child ascribes to a task situation. This meaning reflects cultural values for the interpretation of a situation and is acquired through socio-cultural interactions (Miller-Jones, 1989).

The above implies that a child's interpretation of a task is influenced by the features of the task, as well as the meaning ascribed to a task as determined by his/her cultural experience. Thus a child's performance is influenced by his/her (mis)understanding of the task and not necessarily by the lack of particular competencies/skills (Miller-Jones, 1989).

1.4.4 The Learning Potential Assessment Device (LPAD)

Feuerstein (1979) proposes a model of cognitive abilities based on the assumption that a child may not necessarily have the cognitive strategies required by the test-maker, but given the opportunity would be able to learn the cognitive strategies. Although this model differs from the contextualist theories, it also proposes that one needs to understand underlying cognitive strategies in order to understand a person's cognitive competence - defined as the ability to learn. Bearing in mind the definition of cognitive ability, this definition is not necessarily a different definition from those proposed earlier by the researcher. Rather, it emphasizes a specific aspect/activity of cognitive ability, which cannot operate in the absence of perception and thinking.

1.5 UNIVERSALIST APPROACH : PIAGETIAN THEORY

The universalist approach, which includes theories such as Piaget's theory of cognitive development, "has as its conceptual goal the description of the development of abstract logically necessary thinking, the structures of which are constructed through the person's mental reflections on his/her actions in the world" (Piaget quoted in Miller-Jones, 1989, p. 363). An underlying assumption is that the theory is applicable across cultures, with the proviso that cultural factors may influence the age at which specific stages are attained (Piaget, 1974) - the literature differs in terms of the extent of the influence they claim Piaget ascribes to environmental/cultural factors. The question is to what extent cross-cultural data supports this assumption. Although cross-cultural Piagetian studies primarily focus on the concrete operational stage, attention has also been given to the sensori-motor and formal operational stages. The following findings have been generated :

a.) The qualitative aspects of the theory (the sequence of stages and substages) are similar for individuals, regardless of their cultural environments.

b.) Horizontal decalages, referring to the phenomenon where an individual displays differential performance across tasks with similar underlying logical structure, occur in most assessment situations (Niaz, 1991) - including intercultural situations (Dasen & Heron, 1981).

c.) The quantitative aspects (the chronological age at which stages are attained) show considerable intercultural and some intracultural variation (Dasen & Heron, 1981).

1.5.1 The Sensori-motor Stage

Cross-cultural studies (e.g. Kopp, Khoka & Sigman, 1977) indicate differences in the chronological age at which the substages of sensori-motor development are attained, i.e., quantitative differences exist. These studies (e.g. Goldberg, 1972) also found that the qualitative characteristics of sensori-motor development are similar in all infants regardless of differences in their cultural environments.

1.5.2 The Concrete Operational Stage

Of particular interest to this research project are quantitative differences in the attainment of the concrete operational stage. Findings in cross-cultural research have been reflected through developmental curves. These developmental curves give information about the development of a concept studied in a specific experimental situation, and do not reflect an operational stage or any

other global construct. Depending on the concept studied these curves indicate "rates" of development in non-Western children :

a.) in advance of that of Western children,
b.) similar to that found in Western children,
c.) slightly slower to that found in Western children, although all children eventually attain the concept.
d.) at first similar or delayed compared with that of the Western children, but then it seems that members of the "other" culture "never" attain the concept in a substage/stage. This curve is known as a "asymptote" (Dasen & Heron, 1981; Piaget, 1974).

1.5.2.1 Possible Explanations (Curves a, b, and c)

In the same population, including Western populations (Ashton, 1975) one finds types a, b and c curves for some concepts and type d curves for other concepts. In comparing the development of particular concrete operational concepts, across three cultures, viz., Eskimos, West African agriculturists and Aborigines, Dasen (1975) illustrated that certain concepts develop faster in some than in other non-Western cultures. It appears that the development of any conceptual area within the concrete (and formal) operational stage is determined by a people's particular ecology or effective environment (Berry, 1976; Ogbu, 1982). Thus in understanding the non-Western culture within which adults/children have seemingly not reached a certain stage, it could be inferred from their daily activities that they are functioning in these stages (Dasen & Heron, 1981). This could be applicable to any situation where the level of competence is assessed.

Nyiti (1982) argues that it is erroneous to assume quantitative differences are due to cultural differences. Firstly, these differences may be due to methodological difficulties present in most cross-cultural studies - in addressing these, variation in performance will be eliminated. Secondly, the experimenters' inadequate knowledge of the child's language and culture is also problematic. This usually results in communication barriers, which, if addressed, eliminate intercultural differences on Piagetian tasks (e.g. Nyiti, 1976). Thirdly, for Nyiti (1982) standardized tests are problematic, because they create a situation where the child is assessed within a theoretical framework, instead of the child's frame of reference (open interview, Piaget's clinical method) - this results in differential performances.

South African Research Reynolds (1989) undertook research with 49 school and non-school going Xhosa-speaking children living in Crossroads, over a period of one year. Average age of children at beginning of the studies was 7 years 5 months. The research included seven Piagetian tasks, as well as a pre-test, midyear and post-test experimental design. Results indicated :

i.) Pre-test results were relatively poor compared with later scores.
ii.) No child performed at the concrete operational level for seriation (developmental curve c).
iii.) At least half of the children achieved conservation of continuous and discontinuous quantity, substance and number (developmental curve c and b, as well as individual differences).

Given the children's performance on all the tasks, Reynolds (1989) proposes that many socio-cultural factors influence the adequate assessment of a child's "actual" competence. Underperformance could be due to language difficulties and children's unease with the situation (being tested by a strange person). When children were not interested in the tasks at hand they did not pay attention - obviously this influenced their performance. Further, the children did not seem to realise that paying attention is imperative for optimal performance on such tasks. The extent of children's experience with the test material also seemed to positively (if familiar with material) or negatively (if unfamiliar with material) influence their performance on the tasks.

The above positions do not necessarily refute each other, but rather illustrate the multitude of factors which influence competence in intra- and intercultural testing situations.

1.5.2.2 Possible Explanations (Curve d)

Flavell and Wohlwill (quoted Dasen & Heron, 1981) argue that competence is a theoretical construct describing what an individual knows or could do in a timeless, ideal environment. An experimental/assessment task determines what an individual knows or could do within the constraints (e.g., memory limitations, affective components) under which the person has to function. These constraints influence the probability that a cognitive strategy will be elicited in a given situation, resulting in the competence/performance distinction. Therefore underperformance does not necessarily imply incompetence, but rather that the test inadequately assesses the child's actual competence.

Research has shown that through minimal input (training) overall improvements in performance have occurred (Bovet,1974; Frets-Van Buuren, Letuma & Daynes, 1990; Miller et al., 1989; Rogoff, 1981). It seems that the input defines the demands of the task to children, e.g., "tells" them which cognitive strategies are required and how to use them. Additionally, improved performance on second exposure to a task may result from a practice effect. The practice effect refers to the learning which occurs due to prior exposure to a task (Miller et al., 1989). This improvement probably constitutes a more appropriate assessment of the child's competence.

Thus a child's performance on any assessment task does not necessarily reflect his/her actual (cognitive) competence. This competence/performance distinction could result in the apparent "absence of concrete operational concepts" (curve d). Moreover this "absence" does not refer to the absence of all concrete operational reasoning, but only to those concepts that have no/little cultural relevance (Dasen & Heron, 1981).

1.6 FACTORS INFLUENCING PERFORMANCE

1.6.1 Education

Generally literature indicates a positive relationship between schooling and performance on Western styled tests (Rogoff, 1981; Tollman & Msengana, 1990). Although Stevenson (1982) indicated that schooling is an independent variable which (positively) influences cognitive development, he also proposed that environmental variables influencing school attendance/schooling, and thus also cognitive development/performance on tests, should not be ignored.

In South Africa, pupils have been exposed to segregated education systems based on designated racial groups, viz.:

a.) Department of Education and Training - "Black"
b.) Department of Education and Culture : House of Representatives - "Coloured".
c.) Department of Education and Culture : House of Delegates - "Indian".
d.) Department of Education - "White".

Additionally, pupils can also attend private schools - this is usually possible for those pupils whose parents can afford the fees at these schools. Since 1977 pupils have been allowed to attend private

Acculturation also implies a change in a person's learning experience, by altering his/her context, over the course of his/her development. This could result in the development of a cognitive repertoire which enables a person to cope differently with the demands of the environment, including an assessment situation. Alternatively, this could interrupt the acquisition of known cultural/subsistence tasks, and thus also cognitive strategies (Berry et al., 1986). This probably occurs when individuals are negotiating their new position in an effective environment. Feuerstein (1979) proposes that underperformance in such a situation does not necessarily reflect cognitive inability, but rather a "failure" of the context to impart necessary cognitive strategies .

The "coloured" and "black" groups in South Africa have probably experienced different acculturative influences (extent and type) because of the "differences" in their socio-political histories. These differences in acculturation, to some extent, could probably account for performance differences observed between the two groups.

1.6.4 Socio-economic Status

According to Plug et al.(1986) socio-economic status (SES) refers to a person's position in a community as determined by his/her financial status, occupation and social status. Currently, literature indicates a positive relationship between performance on (intelligence) tests and SES. This implies that children living in an affluent environment would probably perform better on tests than children living in less privileged circumstances. Claassen and Schepers (1990) showed that group differences (designated racial groups and language groups) in performance on an aptitude test could mainly be explained through environmental variables, such as parents' educational attainment, associated with SES. Thus, it appears that SES to some extent determines a group's socio-ecological context which influences the development of cognitive strategies resulting in differential performance on tests.

1.6.5 Emotional Factors

Claassen and Schepers (1990) indicated that attitudinal and motivational variables explained a small part of variance in performance across designated racial groups. Sattler (1990) also refers to the influence of emotional factors, e.g., anxiety, influences a child's overall performance on a test.

1.7 SUMMARY

Clearly there is an overlap, as well as interactive relationship, amongst the above factors. Nevertheless, it is also proposed that they are independent variables which influence cognitive development and thus performance on tests/tasks (Claassen & Schepers, 1990; Stevenson, 1982). This influence is due to the fact that these factors contribute to the development of specific socio-ecological contexts which determine the development of cognitive ability. Additionally these factors provide (differential) contexts for learning the concepts that are measured by psychometric procedures. It is also important to bear in mind that in South Africa, in relation to the dominant group, subordinate groups could be said to experience marginalized socio-ecological contexts, e.g., generally lower SES and inferior education systems.

Research has shown that underperformance by members of a non-Western culture or a subordinate group should not be taken at face value. It has been illustrated that if one understood the socio-ecological context within which the subordinate group exists, it could be inferred from their daily activities that they are indeed functioning competently. Furthermore, existing competence (of the groups which underperform) is also illustrated through their ability to acquire measured concepts (training studies).

Another position which attempts to account for "underperformance" is the performance/ competence distinction, i.e., where a child's level of competence is inadequately assessed. This could be due to several factors relating to or affecting the assessment procedure, the tester, the child and the child-tester relationship.

The above clearly illustrates the multitude of factors which influence a child's performance on a task. Given that it is impossible to eliminate all these factors, researchers propose that cross-cultural studies should attempt to elicit cognitive processes/strategies which at first might not be evident (Bovet, 1974; Feuerstein, 1979). Additionally an attempt should be made to understand at least some of the environmental variables, as well as emotional factors, which influence performance. It is argued that such an approach will enhance understanding of the child's process within the assessment situation, resulting in a more adequate understanding of underlying competence.

The above theoretical background was used to formulate the specific problem explored in this study.

1.7.1 Statement of the Problem

Previous exploratory, unpublished research on the Counter Test indicated that while 6 and 7 year olds attending Department of Education and Training schools performed age-appropriately, 8 and 9 year olds in these schools could only perform at a 7 year level on the Test, giving a performance distribution which is skewed to the left. The Counter Test performances of children at racially-integrated private schools, however, regardless of their sex or designated racial group, adhered to the distribution which one would expect of a standardized test. Thus there was no obvious difference between the performance of children in racially-integrated private schools (B. Dickman, personal communication, 1993). This difference (across education systems) could be explained by several culturally determined variables, such as the fact that the children experienced different education systems. Thus to explore this variable it was decided to explore performances between groups within the same education system.

General Hypothesis

Performance differences in children from different socio-ecological backgrounds do not necessarily reflect differences in competencies/abilities.

Hypothesis 1

Different cultural experiences (designated racial group) determine which cognitive strategies (competencies) will be elicited in an assessment situation.

Hypothesis 2

Latent cognitive strategies (competencies) can be elicited through appropriate assessment procedures.

Thus research such as this study will contribute to the development of appropriate assessment procedures for a multi-cultural context. It will also contribute to defining the nature of the research required when a new instrument is developed.

CHAPTER 2

RESEARCH METHODOLOGY

2.1 SAMPLE AND SAMPLING PROCEDURE

The sample consisted of 40 children, twenty 8 and twenty 9 year olds, from two schools, one in Claremont and one in Woodstock. The schools are under the control of the Department of Education and Culture - the department formerly catering for so called "coloured" children. The sample was chosen in such a manner that numbers were equal across designated racial groups (twenty "coloured" and twenty "black" pupils). This was done to conform to the requirements of the quantitative analysis.

The children in the sample conformed to the following criteria:

a.) the child was seen as an average pupil with no unusual strengths or weaknesses, or current emotionally distressing home circumstances. Given that the data will probably also be used in the development of norms for the test, this criterion was necessary.

b.) in the case of the "black" children, the child had not recently joined the school from the Department of Education and Training schools, i.e., the child had been a pupil at the specific school for at least 6 months. This period would probably have allowed the child to become sufficiently familiar with the demands of his/her new environment.

As the aim of the research was not to obtain a picture of a specific population, but only to explore hypotheses in a preliminary fashion, a fortuitous sampling technique was used (Rosenthal and Rosnow, 1991). Although the results cannot be generalized to a population, they could form the basis for further hypothesizing pertaining to appropriate assessment procedures.

Demographic data were obtained to gain a greater understanding of the children's backgrounds. This enabled one to take into account variables such as socio-economic status, which could influence the overall outcome.

2.2 METHOD

2.2.1 Instruments

2.2.1.1 The Counter Test

The Test consists of 5 sections :

1. Section A (3 Tasks)

This section consists of very simple tasks of colour and shape recognition. This section is omitted when it is estimated that the subject is functioning at or above the 5 year level.

2. Section B (3 Tasks)

This section assesses the child's ability to accurately reconstruct simple patterns which include regular alternations of two forms.

3. Section C (3 Tasks)

This section assesses the child's ability to build a configuration from a model which the tester has constructed in front of the child (1 task) or behind a screen (2 tasks). This section is introduced through a practice example.

4. Section D (3 Tasks)

This section assesses the child's ability to produce configurations from memory. The tester builds a model in front of the child (1 task) or behind a screen (2 tasks). The child is allowed to look briefly at the model, after which s/he has to reproduce it from memory. No practice example is provided in this section.

5. Section E (6 Tasks)

This section confronts the child with new tasks which involve the analysis and reconstruction of more complex configurations. Further, the tasks require certain transformations, e.g., vertical transposition or a figure-ground problem. Other tasks require that a child should perceive a pattern as a whole and discover how each row and/or column is logically related to preceding and succeeding ones (Grover, 1992). In this section a demonstration task which is scored and a practice example are provided.

Scoring

A child's performance on the Counter Test is assessed as correct, as an expected error for which varying degrees of scores may be allocated or as incorrect. Thus the scoring is graded, i.e., a child obtains a score (ranging from full score to nought) according to his/her level of performance on a specific task (Grover, 1992).

2.2.1.2 Unstandardized Structured Steps

The steps (See Appendix A) were devised by the researcher and are based on Feuerstein's LPAD, which was developed to assess ability to learn the strategies needed to successfully perform unfamiliar tasks. The steps entail questioning and giving the child feedback about his/her performance, as well as training of cognitive strategies. Thus the child is assisted, through questioning, labelling and providing an example similar to the task on the Counter Test, in isolating particular cognitive strategies (required to successfully complete task) from his/her cognitive repertoire (Feuerstein, 1979).

These steps were used in a second administration and provided the researcher with intervention strategies to assist the children when they experienced difficulty in successfully completing the tasks. The steps include :

a.) A second exposure (the sections which the child had failed on the Counter Test was re-administered) to determine whether the child is able to learn from previous exposure to the tasks.

b.) An enquiry procedure to determine whether the child recognizes his/her mistake and attempts to change the solution.

c.) Feedback to emphasize similarities between the expected solution and the child's solution. This may possibly encourage the child to rethink his/her solution.

c.) The practice example was used to define the expectations of the task and establish whether the child can generalize strategies used in this task to similar tasks. The practice example introduced for any task has the same underlying logical structure as the task in question.

The enquiry procedure and feedback were introduced when the child was unable to successfully complete a task on the second exposure. The practice example was introduced when the child was unable to make the necessary correction after the enquiry procedure and/or feedback alone, and only when it had not been introduced previously on a specific section (C and D) or subsection (E).

A coding system of errors based on the scoring system of the Counter Test and devised by the researcher, was used during second administration. The child's performance was assessed as correct, as a minor error (which indicates an almost full score), as a typical error (this indicates a performance closer to nought) or as incorrect.

2.2.2 Procedure

The children were assessed individually, during normal school hours. The assessment involved a first administration (Draw-A-Man and the Counter Test), as well as a second administration (sections failed on the Counter Test and the unstandardized structured steps).

2.2.2.1 First Administration

Each session lasted about forty minutes per child. It involved the following:

a.) The Draw-A-Man was used to familiarize the child with the assessment situation and the researcher. (This data will probably be important in the development of norms for the Counter Test).

b.) The Counter Test was administered to provide an indication of a child's performance represented by a numerical score.

The first administration was introduced as follows : "I am sure you are wondering why I have asked you to come here today. You see a new set of games was worked out for children. We need children like you to show us if children will like the games or not. The games are patterns, puzzles and pictures to build. Some of it will be easy and some of it will be hard, but you'll see as we do the tasks. I just want you to try to do it. But first I need you to draw me a picture of a man."

After the Draw-A-Man was completed, the researcher administered the Counter Test.

2.2.2.2 Second Administration

The researcher chose 14 children (criterion : underperformance on Counter Test ranging from 1yr 6mo to 2yr 9mo) to re-administer sections of the test which the child failed. Now when the child failed on items the researcher intervened by using the intervention strategies indicated by the unstandardized structured steps. The steps were used to explore the child's cognitive strategies

when doing the Counter Test. This would probably enable one to develop an understanding of the cognitive processes underlying the child's performance. For each of the 14 children, the second administration occurred 7 days after the first administration. The duration of the second administration was about 90 minutes, including a break of 15 minutes.

The second administration was introduced as follows : "You remember the first time you were here, well I could see that some of the tasks were difficult for you, others were easy for you. This time I would like you to try again and I will give you clues and ask you questions when you do the tasks. I just want to see if I cannot help you with those that are hard for you."

The children rarely asked questions in reaction to the introduction on first and second administration, they merely agreed to participate.

Given that a comprehensive description of the child's behaviour was sought, a narrative record of the child's performance was made (Shaughnessy & Zechmeister, 1985). The following guidelines were used to make the record :

a.) Notes were taken during testing.
b.) The steps provided the researcher with a precise operational definition of what should be observed and recorded.
c.) Summaries of what the child said were generally noted and some direct quotes were also included.

2.2.3 Method of Data Analysis

2.2.3.1 Quantitative Analysis (Hypothesis 1)

The T-test (across groups and within groups), means and standard deviations were used to examine statistical relationships within the data (Rosenthal and Rosnow, 1991).

2.2.3.2 Qualitative Analysis (Hypothesis 2)

Analysis of Observational Data

The clinical interpretation of the observed performance on first and second administration was used to understand the underlying cognitive strategies and the difficulties encountered by children when completing tasks. Thus the children's responses across first and second administration were used to deduce their underlying psychological processes, which include cognitive processes.

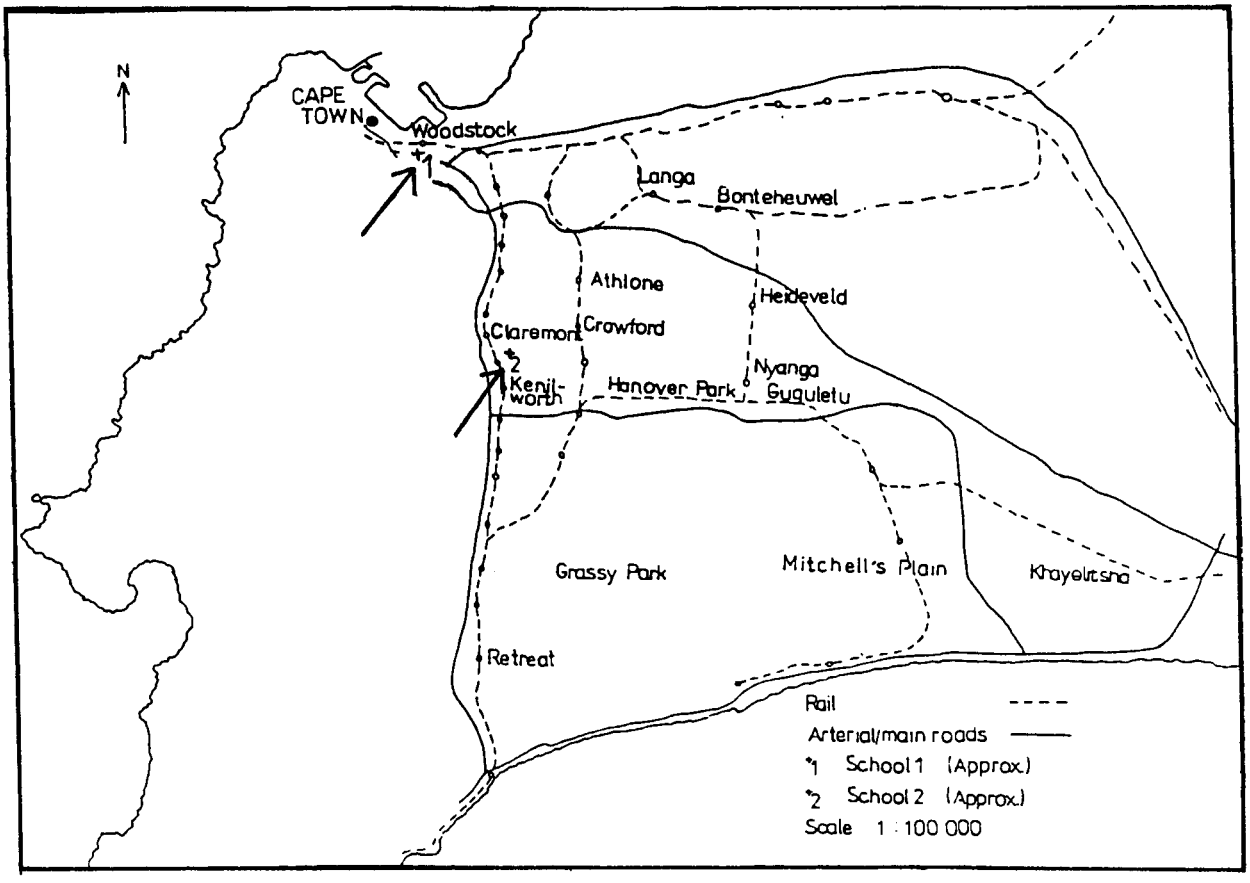
CHAPTER 3

RESULTS

3.1. DEMOGRAPHIC DATA

At school 1 and school 2 most "black" children live in Langa, Guguletu and Khayelitsha. They mostly travel to and from school by public transport. At School 1 quite a few of the "coloured" children lived within walking distance from school (Woodstock). The other "coloured" children lived in areas such as Mitchell's Plain, Bonteheuwel and Heideveld, travelling to school by car or public transport. At school 2 the "coloured" children mostly live in "coloured" areas nearer to Claremont, such as Hanover Park, Crawford and Retreat. They also travel to and from school by public transport. Teachers assessed the home (financial) circumstances of most children as comfortable.

Fig 1 : Cape Peninsula - indicating the areas where the children live and the approximate location of the two schools.



3.2 QUANTITATIVE ANALYSIS

In this section the following statistical relationships will be explored:

i.) whether the observed gap in performance across groups is significant, where performance is indicated by the difference between expected and obtained scores (See Appendix B);

ii.) whether the gap between the mean expected score and the mean obtained score is significant.

3.2.1 Performance Difference across Groups

The means and standard deviations for the difference between the expected and obtained scores in each group are provided in Table 1. Observed data (t (20) = 0.203, d.f. = 38, $p > 0.01$) indicates that designated racial group ("coloured" and "black") did not influence performance on the Counter Test.

Table 1 Means and standard deviations for the difference between expected and obtained scores in each group.

	"Coloured"	"Black"
Difference		
$\bar{x}$	-13.75	-14.9
s	9.107	6.882
n	20	20

3.2.2 Performance Difference between Expected and Obtained Scores within Each Group

The means and standard deviations for the expected and obtained scores for each group are provided in Table 2. Each child's observed performance (obtained score) was compared to his/her expected performance (where the expected performance was determined by the score expected based on chronological age). The mean for the obtained scores was significantly lower than the mean for the expected scores (t (20) = 6.901, d.f. = 19, $p < 0.01$) for the "coloured" group. The same result was observed for the "black" group (t = 9.68, d.f. = 19, $p < 0.01$). The standard

deviations for the two groups were equal (i.e. 8.715 and 6.635 respectively) by the F-test (F = 1.715, d.f. = 19 and 19, $p > 0.01$).

Table 2 Means and standard deviations of the two groups in terms of their expected and obtained scores.

	"Coloured"	"Black"
Difference		
$\bar{x}$	86.25	86.35
Average age	8yr 11mo	8yr 11mo
s	4.811	4.4043
n	20	20
Obtained score		
$\bar{x}$	72.2	71.45
Average	7yr 7mo	7yr 6mo
s	8.715	6.653
n	20	20

The average age at which the "coloured" group was performing was 7 years 7 months. The average age at which the "black" group was performing was 7 years 6 months. This finding indicates that "coloured" and "black" children could perform tasks competently at a 7 year level, while struggling with tasks at the 8 and 9 year level (See Qualitative Analysis). This is similar to a previous finding in exploratory research on the Counter Test (See p.15).

3.3 QUALITATIVE ANALYSIS

3.3.1 Observed Performance on First and Second Administration

3.3.1.1 Introduction

Six of the 14 protocols were analysed in more detail. These were chosen because it was the researcher's impression that they were representative of the performance observed for the 14 children who were retested.

Observed performance will be described for each section (B, C, D, and E) as follows :

i.) A summary of the children's performance during the first administration (FA) will be given.

ii.) On second administration (SA) when children displayed minimal difficulties in their performance, a general comment will be given. Where great difficulty, resulting in different outcomes were observed, extensive comments will be offered. The researcher will use the children's performance (correct, minor error, typical error or incorrect) on second exposure as a guide for reporting intervention strategies used and the outcome of their final product (See Appendix C).

Changes to this proposed format, as well as the working definitions of terms, will be presented as they arise. This is done to assist the reader, i.e., explanations for changes and working definitions of terms are more readily accessible to the reader.

3.3.1.2 Section B

Tasks : B1, B2, B3

First Administration (FA)

All children successfully completed the tasks in this section. Thus SA was not indicated.

3.3.1.3 Section C

Tasks : Practice Example, C1, C2, C3

First Administration

Four of the children successfully completed the tasks in this section. The other 2 children successfully completed C1 and C3, but made minor errors on C2.

Second Administration

All children successfully completed the tasks on second exposure.

3.3.1.4 Section D

Tasks : D1, D2, D3

First Administration

Although it appeared that all children understood the requirements of the tasks (i.e, after having configurations exposed for about 5 seconds, children build them from memory), they had varying degrees of success in competently completing the tasks. It appeared that 4 children understood that they had to remember the configuration, but seemingly they had difficulty remembering the configuration - this influenced their overall performance. Another child's performance was influenced by his poor concentration on this section. Only one child had little difficulty in successfully completing the tasks.

Second Administration

D1 : Performance

The children's performance on second exposure was similar to that on FA.

Correct (five children)

Five children successfully completed the task on second exposure.

Minor error (one child)

This child gave the correct solution, after successfully completing the practice example.

D2 : Performance

Correct (one child)

One child successfully completed the task on second exposure.

Minor Error (three children)

Three children successfully completed the task after feedback.

Typical Error (one child)

This child gave the correct solution to the task, after successfully completing the practice example. On enquiry, she indicated that her success was due to the successive exposure (first on second exposure and then again after practice example) to the model which she had to remember.

Incorrect (one child)

Another child correctly completed the practice example, but then gave an incorrect solution to the task. This child seemed very anxious, she apparently became confused by the attempts made to assist her (intervention strategies) and was overwhelmed by the task.

Note : Although children still made errors in completing D2, there was an improvement in their performance on second exposure, as well as after the implementation of intervention strategies. (Subsequently this will be indicated as improvement)

D3 : Performance

Correct (four children)

Four children successfully completed the task on second exposure.

Minor Error (one child)

This child successfully completed the task after feedback.

Incorrect (one child)

Another child who incorrectly performed the task on both the FA and second exposure, successfully completed the task after feedback.

Note : All the children displayed improvement.

Summary : The children usually completed D1 and D3 more successfully than D2 - this was noticed during the FA and SA. Their success on D1 possibly resulted in overconfidence and poor concentration during D2. This possibly led to the failure on D2. This failure probably enhanced their understanding of the extent of the demands of the tasks. Thus their concentration improved, resulting in an overall improvement in their performance on D3. For tasks D1 and D3 on Section D an immediate improvement in performance was observed after the second exposure. Improvement on D2 was only evident after the practice example was administered. This improvement apparently resulted from the successive exposure to the configuration and not from completing the practice example.

3.3.1.5 Section E

Tasks : Edem (Demonstration task which is scored), E1, E2, E3, Practice Example, E4 and E5

First Administration

Generally, the children struggled on this section. At times it appeared that some understood the task instructions, but could not apply the strategies needed to successfully complete it. Other children apparently did not understand the expectations of the tasks.

Most children apparently did not use the cues and variables provided to solve the task. (Cues and variables refer to the pictures of configurations provided, as well as the colour and form - circles, triangles and squares - dimensions of the tasks which could assist one in successfully completing them.) Four of the children seemed to experience analysis/synthesis difficulty when doing the tasks, while the other two displayed no/little difficulty. It appeared that those who apparently did not use the cues and variables in solving tasks usually had difficulty with analysis/synthesis. All the children were unable to do the transformations on E2 and E3, which were required to successfully complete the tasks.

Only one child's performance appeared to be influenced by the time limit, i.e., she competently completed tasks when the researcher allowed her to work an extra minute. It was the researcher's opinion that the other children would not have benefited from this extra time. One child appeared demotivated, probably owing to her sense of failure. Another appeared to be embarrassed by his failure. The other children's emotional reaction to the test was not evident.

Second Administration

On section E the children displayed some, but not always substantial, improvement in their performance.

Edem : Performance

Correct (five children)

Five children successfully completed the task. One of them only did so after the researcher encouraged him to use the picture to solve the task.

Incorrect (one child)

This child gave an incorrect solution. Although he correctly completed the task, he unexpectedly changed it to the solution which he gave during the FA. He successfully completed the task after feedback.

Note : The children's performance on second exposure was similar to that on FA. They displayed improved performance after intervention strategies were implemented.

E1: Performance

Correct: (two children)

Two children successfully completed the task on second exposure. One of them who had much difficulty with the task on FA, now easily completed it.

Minor Error (one child)

During the enquiry procedure the child indicated that he recognized the minor mistake, but he made no attempt to change the solution. He also gave no response after feedback. The researcher decided not to administer the practice example, because he easily became tired and irritable. This could affect his concentration on subsequent tasks.

Typical Error (two children)

One child successfully completed the practice example, but then experienced much difficulty in correctly completing the task. She was only able to do so after the researcher encouraged her to think through the task. The other child, with the assistance of the researcher, successfully completed the practice example. She identified her mistake on her final product, but was unable to improve her solution.

Incorrect (one child)

One child had much difficulty in doing E2 - his final product was incorrect. He knew that his solution was wrong, but was unable to correct it. He also tended to break up an almost correct product, and his subsequent solution was usually incorrect. The child, with assistance from the researcher, successfully completed the practice example. Regardless of this, his final product was still incorrect.

Note : Although children still made errors in completing E1, there was an improvement in their overall performance.

E2 : Performance

The transformation on this task entails vertical transposition. First the whole figure, of which the top and bottom half are similar, is exposed. Then the child has to build the whole pattern from the top half which is provided.

Correct

None of the children could give a correct solution to E2 on second exposure.

Minor Error (One Child)

During the enquiry procedure the child recognized her error and spontaneously corrected it. It appeared that she used the available cues and variables in arriving at the solution. She also had no/little difficulty with analysis and synthesis. Furthermore she seemed to understand the transformation needed to solve E2.

Typical Error (two children)

One child, in arriving at this solution, seemed to be using the cues and variables in solving the task. He seemed to have some difficulty in doing the transformation. (Minimal/some difficulty with transformation refers to a performance where the child seemed to have understood the transformation required, but for some reason was unable to apply this understanding successfully.) Furthermore, he seemed to have some difficulty with analysis and synthesis on this task. This child successfully completed the task after the practice example was administered.

The other child attempted to use cues and variables in solving the task. But he experienced analysis/synthesis difficulty, as well as difficulty understanding the transformation required. He successfully completed the practice example and told researcher which cues should be used in doing the task. Thus it was the researcher's impression that he understood the underlying logical structure. Regardless of this, his final solution was incorrect.

Incorrect (three children)

One child, in arriving at this solution, seemed to be using the cues and variables in solving the task. Furthermore, he seemed to have some difficulty in doing the transformation expected, as well as with analysis and synthesis. This child successfully completed the task after the feedback.

Another child experienced analysis/synthesis difficulty, as well as difficulty in doing the transformation required. Although the child was uncooperative during the enquiry procedure and feedback, she responded well during the practice example - she successfully completed it. Regardless of this, her final product was incorrect.

The third child attempted to use the cues and variables and had little, if any, analysis/synthesis difficulty. He had difficulty in understanding the nature of the transformation required. He made a typical error after feedback. This error was probably due to his inability to do the required transformation. He then successfully completed the practice example. Although he apparently understood the transformation, given his performance on the practice example, he once again made a typical error similar to that made after the feedback.

Note : The children had difficulty in doing the required transformation on FA and second exposure. The children displayed an improved performance after the intervention strategies were implemented.

E3 : Performance

To successfully complete this task a figure-ground transformation was required where the child had to build the two parts (black and red) of a picture separately. The researcher will refer to the black part as the "figure" and the red part as the "ground".

Typical Error (six children)

Child 1 used the cues and variables, experienced minimal difficulty in doing the transformation and with analysis/synthesis. She successfully completed the practice example, after which she correctly completed the task. She carefully thought through the task - she used the spaces around the "figure" as cues to build the "ground".

Child 2 attempted to use the cues and variables. She had difficulty in doing the transformation, as well as with analysis and synthesis. She successfully completed the practice example, after which she correctly completed the task.

Child 3 attempted to use cues (the picture) to complete the "figure". She then refused to do the "ground". It appeared that she had difficulty in doing the transformation and with analysis/synthesis. She then successfully completed the practice example, but her final product was similar to that on second exposure (typical error).

Child 4, in making the typical error, merely built the "figure", then repeated the configuration to build the "ground". He did not use the cues and variables and had much difficulty in doing the transformation, as well as with analysis/synthesis. He responded to feedback by making the same changes to the "figure" and "ground". The practice example was not administered due to his tendency to become irritable when he failed on tasks. Final product - typical error with slight improvement from that on second exposure.

Child 5 used the cues and variables. Apparently he experienced minimal difficulty in doing the transformation and with analysis/synthesis. He was unsuccessful in completing the practice example; now it appeared that he did not understand the transformation required. In doing the task he carefully thought through it. His final product reflected a typical error and there was a slight improvement from his performance on second exposure.

Child 6 attempted to use cues and variables, and experienced some difficulty in doing the transformation and with analysis/synthesis. With some assistance from the researcher, he

successfully completed the practice example. His final product was incorrect. He verbally indicated what he should do to correct the product, but he was unable to implement his suggestions.

Note : All the children made the same typical error on FA and the second exposure, with a slight improvement in their performance after the intervention strategies. They were usually able to build the "figure", but then had difficulty in building the "ground". This indicates that they heard and responded to the instructions ("build the red and black part separately"), but were unable to do the figure-ground transformation.

Practice Example : Performance

All the children successfully completed the task. From the explanations that they gave for their solutions, it was inferred that they understood the underlying reasoning of the task.

E4 : Performance

Correct (two children)

On FA both gave an incorrect solution, but on second exposure they experienced no/little difficulty in successfully completing the task.

Typical Error (one child)

It was inferred from the child's response during the practice example that she understood the underlying reasoning for the progressive changes in the pattern (demands of task). Regardless of this her final product was unchanged from that on second exposure - typical error.

Incorrect (three children)

One child successfully completed the task after feedback. She did not explain how she arrived at the solution - she could not or did not want to explain the solution.

Another successfully completed the practice example. It was inferred from his response during the practice example that he understood the demands of the task. Regardless of this his final product was wrong. On questioning him about his solution, his response probably indicated that he learnt to give the "correct" explanation - he used the terms used by the researcher during the administration of the practice example.

The third child, on second exposure, was unable to explain how he arrived at the (incorrect) solution. Due to his previous performance on the SA the researcher decided to terminate testing, thus no intervention strategies were implemented.

Note: Although the children still made mistakes in completing E4, there was some improvement (as compared with that on FA) in their performances on second exposure and after the intervention strategies.

Summary : The children struggled to successfully complete tasks on section E during FA and SA. Regardless of this they displayed improved performance on SA, although at times only a slight improvement was observed. Occasionally, a child's performance deteriorated on the SA. It seemed that if children used the cues and variables provided by the task, as well as had no/little difficulty with the required transformation and analysis/synthesis, they also benefited more (improved performance) from the SA. The children displayed no/little improvement when they had much difficulty with the above-mentioned factors. It was also observed that the children, across administrations, appeared to be interested in giving a solution, instead of thinking through the task - this negatively influenced their performance. They were probably more interested in responding to what they thought the researcher expected from them, rather than to the expectations of the task.

On the second exposure some, but not substantial, improvement was observed. This was especially evident for the tasks towards the end of the section which require several manipulations of cues/variables. The children occasionally reacted to the enquiry procedure. They responded more competently to the feedback when they made minor errors after the second exposure. The children who appeared to have difficulty understanding the underlying reasoning of the tasks gave no/little response to the feedback. It seemed that through the feedback the researcher merely provided more instructions without giving a concrete example which might elucidate the problem for the child. This was particularly evident when the child was faced with tasks requiring transformations which s/he apparently did not understand.

It seemed that the practice example defined the demands of the tasks more adequately for the child, enhancing his/her performance. At times the child could perform the practice example, mostly without assistance from the researcher, but was unable to perform the more complex tasks on the Counter Test. This is probably due to the fact that the more complex tasks, which had the same underlying logical structure as the practice example, involved more dimensions which the child had to account for.

3.3.1.6 Emotional Factors (Section D and E)

The emotional factors appeared to play a major role in the children's overall performance, especially during the SA.

One child was extremely anxious and reluctant to perform tasks during the SA. She appeared to be overwhelmed by the situation, i.e., the demands of the intervention strategies, resulting in her apparent inability to think through the tasks. Her anxiety was probably increased by her inability to perform tasks successfully. Furthermore, being recalled for testing may have conjured up several fantasies which could not be directly assessed. Her extreme anxiety was not noticed on first administration, possibly due to the fact that she was soft spoken and shy. It appears that she had an extremely negative reaction to an unfamiliar testing situation which would negatively influence her performance on all psychometric tests. It is important to bear in mind that all children at some point appeared/became anxious during testing, but they usually responded appropriately to the researcher's attempts to put them at ease.

Another child was uncooperative and irritable when he could not perform tasks adequately during the SA. It appeared that he did not pay attention to the tasks and had an impulsive approach, which created the impression that he was not thinking through tasks. He also became demotivated, often giving up on tasks because he did not want to struggle with it any longer. Consequently he only displayed little improvement in his performance on the SA.

Contrary to the above, another child became very motivated during the SA. This is probably due to the fact that the success she experienced illustrated for her that she could perform tasks adequately if she applied herself more vigorously.

CHAPTER 4

DISCUSSION

In the following chapter the researcher will discuss the statistical relationships observed within the data and across research projects. In doing this the researcher will draw on the findings of the qualitative analysis, as well as the demographic data obtained. Then the findings of the qualitative analysis will be explored. Finally the possible implications of the research project will be discussed.

4.1. PERFORMANCE DIFFERENCE

In this section the researcher attempts to account for :

a.) The fact that cultural experiences (defined as designated racial group) did not appear to determine competencies in the assessment situation.
b.) The significant underperformance within each group on this test.
c.) The similarities between findings (underperformance) of this research and that done previously.

4.1.1 The Socio-ecological Contexts (a,b and c)

The teachers assessed most of the children as experiencing comfortable financial circumstances. Thus the children might possibly experience at least lower middle-class SES within the "black" and "coloured" communities. This is also indicated by the fact that parents are apparently able to afford the travelling costs from as far as Mitchell's Plain and Khayelitsha. However, the two groups' SES must be seen within an overall context of poor economic circumstances and unemployment. It is proposed that the "black" and "coloured" groups would be more severely affected by this economic climate. Thus (lower) middle-class SES may only mean that the parents are employed and able to provide for their families' most essential needs. Furthermore, the extent to which families do without some essentials in order to afford the children's travelling costs, may be a factor.

Thus the groups' SES appear to be similar - this is a factor which influences overall performance on tests of cognitive ability (Claassen & Schepers, 1990). This factor possibly contributed to the lack of difference between groups and to the observed "similar" underperformance within each group. Firstly, this underperformance probably results from the child's inability to apply his/her existing

cognitive strategies. Secondly, it arises from the child's apparent inability to perform the required transformations required, i.e., the lack of cognitive strategies. (This will be discussed in more detail in section 4.2.)

Although the children may not necessarily experience similar SES, they could be considered to be part of families who are upwardly mobile. This view arises from the fact that parents spend much money to send their children to schools which they probably perceive as providing their children with better opportunities and facilities than those in their own residential areas. Although "coloured" children attending School 1 probably do so because the school is within their residential area, this is not true for the other "coloured" children in the sample. Thus it is argued that parents probably communicate to their children that they must attain scholastic success which would enable them to become more successful within society (Ogbu, 1981; 1982). Given that parents are probably not well educated due to the inequalities within the South African education system(s), they do not necessarily have the skills to assist their children in acquiring the strategies necessary to be successful.

Furthermore, the children's educational environment probably perpetuates the parental message of being successful. This success is measured by whether a child is able to give a correct answer to a question and not necessarily whether s/he understands the underlying reasoning of the task. The likelihood of such a scenario increases with an increase in the number of pupils per class. Thus it seems as if their socio-ecological context tends to dictate what they should do in a specific situation, i.e., be successful, give the correct answer, instead of cultivating cognitive strategies which would allow them to address problems across situations. This context may also create a situation where the child learns to react to what s/he thinks the adult expects, rather than to the actual demands of a task. This may contribute to the extent, as well as the nature, of the underperformance.

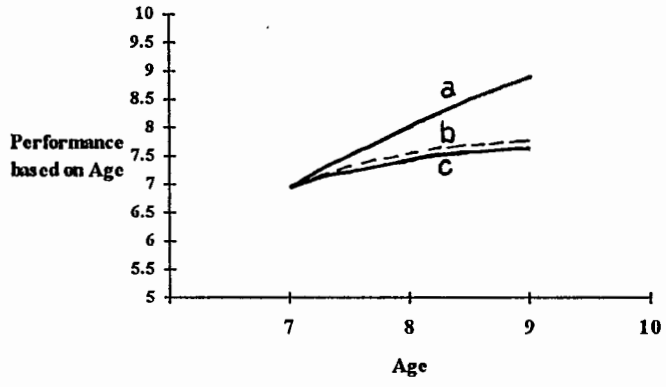
Given that parents possibly work long hours, as well as struggle with problems pertaining to their families' livelihood, it is argued that the children do not receive the kind of attention which is conducive to the acquisition of cognitive strategies measured by assessment procedures such as the Counter Test. After school these children probably receive care from a family member, e.g., an older sibling, who ensures that the child is safe and stays out of danger, rather than being concerned with the development of the child's (cognitive) abilities. Additionally, these children are exposed to political unrest which creates an emotionally and physically insecure environment which may impede (cognitive) development (Reynolds, 1989). Thus it is argued that the children's

underperformance does not necessarily reflect cognitive inability, but rather that aspects of their familial and school context hinder the use of, as well as the transmission and acquisition of cognitive strategies measured in the assessment situation (Feuerstein, 1979). This is evident from the improved performance on the SA.

Previous research suggests that different education systems lead to differential performances on this test (B. Dickman, personal communication, 1993). However, this research indicates that the performance of "coloured" and "black" children at "coloured" schools is similar to the performance of "black" children at "black" schools, i.e., regardless of being exposed to different education systems, children achieved similar results on the test.

Fig 2 : Performance on the Counter Test across Education Systems

a. Performance of "white", "coloured" and a few "black" children at two private schools
b. Performance of "black" children at a "black" school in Langa
c. Performance of "coloured" and "black" children at two "coloured" schools



It is proposed that the children in both "black" and "coloured" schools experience different, but marginalized, education environments compared to their peers in private schools. This is evident from factors such as the discriminatory financial resources that the "black" and "coloured" schools receive, inequalities pertaining to the training of teachers, and the teacher-pupil ratio in "black and "coloured" schools (Nasson, 1986; SAIRR, 1992). The resources used in the classroom setting at these schools are probably less sophisticated, if at all present, than those used in private schools. Thus it is argued that the children in "black" and "coloured" schools experience inferior education

environments which probably impede the acquisition of cognitive strategies, including those which are measured by the Counter Test. Furthermore, the children attending private schools probably experience higher SES than the children in "coloured" and "black" schools. This difference in SES may also account for the observed difference between the performance of the children in "black and "coloured" schools and the children in private schools.

Thus although these groups live in segregated residential areas, speak different home languages and have different socio-political histories, the fact remains that these children experience a marginalized effective environment (Berry, 1976; Ogbu, 1981; 1982). Thus it is proposed that although the differences between groups cannot be ignored, similarities between these groups probably play a greater role in their overall performance (underperformance) on the Counter Test. This would probably also be true for other tests of cognitive ability.

4.1.2 Sampling Difficulties (b)

Teachers were involved in selecting the sample. It was noticed that teachers tended to define an average child differently. For example, a teacher saw one of the children as an average pupil in her class, but still gave him an A-symbol signifying above-average performance in class. On questioning, it emerged that this child is considered average only because the children who were repeating the standard, performed better than he did. The child was excluded from the sample. This difference in definition among teachers probably resulted in the sample consisting of low average, average and high average children. As the researcher was unable to accurately assess a child's scholastic ability/performance, she could thus not control for this variable. A possible means of controlling for this variable would have been to use a larger sample, but given the scope of the research project, it was not feasible.

There was in fact difficulty in finding a sample at all. During the sample selection which was done in deliberation with the teachers, the researcher discovered that it was difficult to find children who adhered to all the criteria indicated in section 2.1 (See p.16). Consequently all possibilities were explored to ensure that the children in the sample adhered to the stated criteria. Therefore at School 1 four children from the so-called Bridging Class were included as the teacher indicated that they would be able to cope as low average/average pupils in the mainstream class.

4.1.3 Introduction to the Assessment Situation (a and b)

An oversight on the part of the researcher is that the teachers were not given a standard procedure for introducing the researcher and test situation to the children. Thus the researcher is not sure what input, if any, the teachers gave to the pupils. When the researcher went to fetch pupils for testing, teachers' usually said: "If you're good you can go with the lady." At times teachers also reverted to threats "Only the naughty ones go to the lady. Let me see who's naughty." The children possibly developed fantasies about the researcher and the test situation which could have influenced their performance. Thus the teachers' introduction of the test to children might have contributed to the observed underperformance.

4.1.4 Administration of the Counter Test (a,b and c)

Given that most children underperformed on the test, and that this finding (underperformance) had been observed in previous research, there was probably no/little difficulty pertaining to the manner in which the researcher administered the test. In other words it seems very unlikely that both researchers would deviate from the standard administration of the test to such an extent that it would account for the "similar" underperformance across research projects.

4.1.5 The Counter Test (a, b, and c)

It was proposed previously that a possible explanation for children's performance on Section D could be their impulsivity in their approach to D2 after their initial success (See p.26). Another possible explanation could be that their performance on Section D possibly indicates difficulties in the progressive complexity of the tasks. It is argued that D1 could be to easy in terms of D2, with no/little difficulty in the progression of D2 and D3. Alternatively D2 may possibly be more complex than D3, while D3 possibly follows D1 in terms of complexity. Thus, if another task could be included on the section (D1, D1a, D2, D3) or these tasks could be ordered in a different manner (D1, D3, D2) it would probably allow the child to benefit more from the strategies which they had used in the previous tasks. It may also address the children's apparent impulsivity.

4.2 UNDERSTANDING UNDERPERFORMANCE : SIX CHILDREN

The improvement in performance on second administration suggests that latent cognitive strategies can be elicited and/or trained through appropriate assessment procedures (Bovet, 1974; Miller et al., 1989; Rogoff, 1981). The improved performance on second exposure is possibly due to the practice effect which result from prior exposure to a task(s). This probably indicates children's ability to learn (without training or teaching) from previous exposure to the task(s) (Sattler, 1990). These results also illustrate that the use of appropriate cognitive strategies is influenced by several inter-related factors relating to or affecting the child, the researcher, the test situation, and the child-researcher relationship, to name but a few.

4.2.1 The Child in the Assessment Situation

The fact that children probably became more familiar with the demands of the tasks on SA might have enhanced their performance. It is important to bear in mind that apparent familiarity with the demands of the tasks does not necessarily lead to improved performance (Niaz, 1991). Thus it is argued that the availability of the cognitive strategies required by the task, e.g., memory strategies which are specifically developed in the school context, concomitant with familiarity with the demands of the tasks, improve overall performance. For example on Section D where children had to build configurations from memory, it was the researcher's impression that as they became more familiar with the demands of the tasks, they remembered configurations more adequately.

It appeared that children were answer-oriented - it was the researcher's impression that the children were more concerned with providing a solution than thinking a problem through. It is argued that when the child is answer-oriented, eg., s/he probably does not plan his/her approach to a task, and does not fully use the cues available to solve a task, it limits his/her performance. The limitations which this approach places on children's performance are emphasized by the fact that when the children were encouraged to think through tasks and had the cognitive strategy required by the task, they were successfully.

The children's inability to perform the cognitive operation required by a task obviously impeded their performance. This was particularly evident towards the end of the Counter Test. They seemed to be able to learn a cognitive strategy required by a task (indicated by their ability to successfully complete a practice example), but were unable to apply the strategy to a more complex task on the Counter Test. This could be due to the fact that the tasks on the Counter Test had more dimensions

which the child was unable to account for. This may also suggest that the practice example did not teach the child how to apply the required cognitive strategy. Furthermore, if a child apparently understood the underlying reasoning of a practice example (on the Counter Test and/or steps) but still performed poorly, it may imply that the child was able to grasp an unfamiliar cognitive operation, but as yet had not consolidated his/her learning. This could explain the child's subsequent inability to perform more complex tasks with the same underlying logical structure. Another explanation may be that the children experienced difficulty in applying their existing and/or acquired cognitive strategies. This application difficulty was particularly evident when children apparently understood the underlying reasoning of a task, but were unable to successfully complete it.

A child's mood (See Emotional Factors p.33) could enhance/impede his/her performance on a test (Claassen & Schepers, 1990; Reynolds, 1989; Sattler, 1990). Given that children could recognize their errors, but did not attempt to correct their solutions, possibly indicate their insecurity and/or anxiety within the assessment situation - this could hinder their performance. The fact that children passively accepted instructions, gave no indication as to whether they had understood the instructions in the manner that the researcher intended them (Miller-Jones, 1989). This could possibly negatively affect the child's overall performance.

4.2.2 Researcher Influencing Performance

Given that the researcher had much invested in the results, she may have unknowingly placed pressure on the children to perform tasks successfully. This expectancy may have influenced the administration of the test, the scoring, the child's behaviour and the child-researcher relationship. Furthermore, the researcher is a stranger about whom the child may have many fantasies - this could have impeded his/her performance (Reynolds, 1989). This influence could be present in any assessment situation.

On the FA the researcher mostly summarized children's performance in terms of a score. On second administration the researcher made a more detailed record of children's performance. This difference in the purpose of assessment could have influenced the researcher's observations in the assessment situation, and subsequently the overall assessment of the children's cognitive abilities. This could have been addressed by using a second observer to check the reliability of the researcher's observations, but this was not feasible due to the expense involved. An alternative means of limiting this bias is to be aware of it (Shaughnessy & Zechmeister, 1985).

4.3 IMPLICATIONS

4.3.1 Assessment in a Multi-cultural Context

This research project has illustrated that a multitude of factors could influence performance on the Counter Test and possibly other psychometric procedures. Given that one cannot account for all these factors it seems that one needs to investigate underperformance more vigorously. It appears that procedures, such as the steps, which are based on the principles of the LPAD (Feuerstein, 1979) could enhance one's understanding of underperformance by possibly highlighting difficulties affecting performance and assess a child's actual cognitive ability more adequately (eliciting and/or teaching cognitive strategies). Firstly, these procedures allow the clinical interpretation of performance across assessment situations. This may highlight difficulties affecting a child's performance. These difficulties are not always immediately evident. Secondly, it may allow one to assist the children in the assessment situation by attempting to ensure that they understand the expectations of the task, encouraging them to apply themselves in the assessment situation and eliciting/teaching the cognitive strategies required. This is probably a more flexible approach which could possibly address difficulties affecting performance and thus result in a more adequate assessment of actual cognitive ability. Given the above it appears beneficial to use procedures based on the principles of the LPAD.

Obviously before this proposal is implemented more research about training in the assessment situation in the South African context is required. Given that this project did not explore the effect of training over a more substantial period, this could be done through future research.

It may appear that the approach is not time and cost effective. This may be true in the short-term, but given its possibilities for detecting difficulties (other than incompetence), it would allow for more adequate intervention strategies. This in the long-term would be more cost and time effective. This approach also allows for results which indicate how the child does things, rather than what the child knows. This would enable the clinician to facilitate a process where professionals, such as teachers, become less interested in a score (less product-oriented) and more interested in the child's process in the assessment situation. It will also model for the child that s/he should be process-oriented, an approach which would enable him/her to cope more competently in unfamiliar situations.

4.3.2 The Counter Test

Regardless of the proposed explanations offered for the observed statistical relationships within data and across research projects, further investigation is needed to arrive at more conclusive explanations for the observed findings. Thus future research pertaining to the Counter Test, as well as to other assessment procedures, should account more systematically for variables such as socio-ecological factors. This would allow one to be more specific about the influence of these factors on a child's performance on tests of cognitive ability. Given that children did benefit from the practice examples provided for E2 and E3 during second administration, it is suggested that practice examples could also be introduced for E2 and E3 on the Counter test. As previously mentioned (See p.38) the ordering of the tasks on Section D may need revision.

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APPENDIX A

UNSTANDARDIZED STRUCTURED STEPS

GENERAL

Goals :

* To explore the underlying cognitive strategies used by the child in making his/her response.
* To explore the factors affecting the use of these strategies.
* To facilitate a correct response.

Aim to accomplish these goals through :

Second Exposure

To assess whether the child can benefit (improved performance) from prior exposure to a task.

Verbal Input

Enquiry Procedure

To assess the child's opinion about his/her product, especially whether the child can recognize his/her mistakes and attempts to change his/her solution.

Feedback

Feedback, based on the scoring sheet, is given to the child about his/her product.

Example :

Child has to build a house - roof three triangles and walls two squares - from a picture. The child makes a mistake in his/her final product. Researcher : I can see that you have built the walls just the same, you have put the two squares together to make the walls. The roof is a bit difficult to do. You have used the three triangles quite nicely, but you did not put it quite the same way as in the picture.

This emphasizes similarities and differences between expected solution and the child's solution. This may possibly encourage the child to rethink his/her solution. It would probably also confirm that the child understood instructions and the underlying cognitive reasoning required, as well as consolidate his/her learning.

Manual Manipulation

Practice Example

A practice example which has the same underlying logical structure as the task failed will be introduced only after the child is unable to make the necessary correction after feedback alone. The practice example will only be introduced once on a section (See section C and D) and subsection (See section E).

It is proposed that the above-mentioned intervention strategies will encourage the child to think through/analyse a task. This will enable him/her to produce and/or discover logical "evidence" for each manipulation done in order to arrive at the solution (Feuerstein, 1979).

Types of Response from Child on Second Administration:

1. Correct Response
    a. Spontaneous, self-initiated correction of response.
    b. Correction after feedback
    c. Correction after intervention
2. Partially correct response
3. Incorrect response
4. No response

STEPS

Section B

Given age range (8 and 9 year olds) it is expected that child will be able to successfully complete tasks.

Section C

Look carefully at your flower and then at mine. Are they just the same?

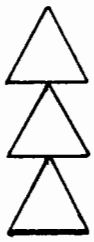
a. Spontaneous correction.
That is right, why did you change it?
RESPONSE: Yes
Look carefully.
RESONSE: No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

b. Feedback from researcher based on scoring sheet.

RESPONSE: Correct (Proceed to next task)
That is right, why did you change it?
c. RESPONSE: Incorrect (Practice Example)

PRACTICE EXAMPLE
(The practice example used in test)

Xmas tree



Goal :
Emphasize comparison between model and child's own configuration.
Allow for systematic analysis taking cues such as form and position into account.
Define expectations to the child.

Look I am building a Xmas tree - first this triangle, now this triangle, now this one. The Xmas tree is built with three black triangles *(much pointing and showing with fingers)*.

Include child in building second red Xmas tree.
First triangle
What must come here? Show me.
Why have you put it here?
Second triangle
Now I take this one, I put it here just like this *(pointing to black tree)*.
Third triangle
What comes here? Show me.
Why have you put it here?
Look they are just the same *(pointing)*. This Xmas tree has 3 black triangles, this Xmas tree has 3 red triangles.
Then child has to build Xmas tree. Return to task.

Subsequent failures on Section C

Are you quite sure about the answer? Think carefully.

a. Spontaneous correction
That is correct, why did you change it
RESPONSE: Yes
Feedback from researcher in terms of scoring sheet.

RESPONSE: No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

b. Feedback from researcher (right and wrong) in terms of scoring sheet.
RESPONSE: Correct (Proceed to next task)
That is just the same, why did you change it?

c. RESPONSE: Incorrect
Administer Practice example or proceed to next task Practice Example will only be administered once on this section.

Section D

Are you quite sure about the answer? Think carefully.
a. Spontaneous correction
That is correct, why did you change it
RESPONSE: Yes
Look carefully.
RESPONSE: No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

b. Feedback from researcher (right and wrong) in terms of scoring sheet.
RESPONSE: Correct (Proceed to next task)
That is right, why did you change it?

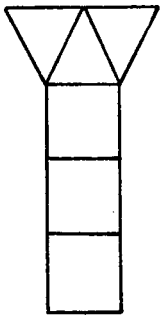
c. RESPONSE: Incorrect (Practice Example)

PRACTICE EXAMPLE

Torch

1.

2.



Goal : Emphasize the underlying process, to define the expectations of the task, as well as to establish whether child can generalize the task.

Communicate following to child (problem solving technique):
1. Identifying figure (Whole)
2. Remembering figure
3. Identifying parts of figure (Part)
4. Remembering parts of figure
5. Output

Researcher builds example
This is a torch, this is the light of the torch (1) and this is the handle (2) of the torch (pointing). Remember the torch.

1. This is the light of the torch (use screen to cover handle)
We use 3 triangles (indicating with fingers and pointing to example) to make the light
We put this one here, then this one, then this (pointing)
Remember we use 3 triangles (indicating with fingers and pointing to example) to make the light

2. This is the handle of the torch (use screen to cover light)
What do we use to make the handle? Show me.
RESPONSE: Incorrect
We use 3 squares (indicating with fingers and pointing to example) to make the handle.
We put this one here, then this one, then this (pointing).
Remember we use 3 squares (indicating with fingers and pointing to example) to make the handle.
RESPONSE: Correct
Remember we use 3 squares (indicating with fingers and pointing to example) to make the handle.

Break up example and ask child to build from memory.
Correct
Comment : I see you remembered that we use 3 triangles to make the light and 3 squares to make the handle.
Incorrect
Comment : Feedback re product.

Return to task.
Comment on final product : Nicely done
I can see you have tried nicely

Subsequent failures on Section D

Are you quite sure about the answer? Think carefully.

a. Spontaneous correction
That is correct, why did you change it
RESPONSE: Yes
Feedback from researcher in terms of scoring sheet.

RESPONSE: No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

b. Feedback from researcher (right and wrong) in terms of scoring sheet.
RESPONSE: correct (Proceed to next task)
That is just the same, why did you change it?

c. RESPONSE: incorrect
Administer Practice example or proceed to next task The Practice example will only be administered once on this section

Section E

Edem - E1

Look carefully at your ..... and then at the picture? Are they just the same.

a. Spontaneous correction.
That is just the same. Why did you decide to change it?
RESPONSE: Yes
Look carefully.
RESONSE No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

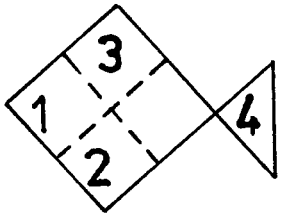
b. Feedback from researcher (right and wrong) based on the scoring sheet.
RESPONSE: Correct (Proceed to next task)

c. RESPONSE: Incorrect (Practice Example)
Practice example will only be administered once during performance on Edem and E1.

PRACTICE EXAMPLE

(Introduce card)

Fish



Look at this it is a fish. Help me make the fish with the counters.

(First show only part that must be build, cover remainder with card. Then show part in relation to rest of model. For example, show only mouth then uncover rest of figure. Now child builds only mouth while seeing the whole figure. Continuously remind the child that s/he must use the picture).

1. First the mouth, we use a square in this way to make the mouth.
2. Now the tummy, we use a square in this way to make the tummy.
3. This is the back - What do we use to make the back? Show me.

RESPONSE: correct.

Now you make the back.

RESPONSE: incorrect.

That is not quite right, we use two squares to make the back. We put the squares together and push it next to the tummy and the mouth.

4. This is the fin - What do we use to make the fin? Show me.

RESPONSE: correct

Now you make the fin.

RESPONSE: incorrect

That is not quite right, we use a triangle to make the fin like this.

You see the picture and the model are just the same - we use four squares and 1 triangle (pointing).

Break up example.

Now you make the fish - giving assistance as required.

(Irrespective of whether example had been successfully completed proceed to previous task, i.e., Edem/E1).

E2

Are you sure about that answer?

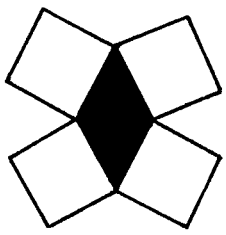
a. Spontaneous correction.
That is correct. Show me how you worked it out.
RESPONSE: Yes
Look carefully.
RESPONSE: No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

b. Feedback from researcher (right and wrong) based on scoring sheet.
RESPONSE: Correct (Proceed to next task)
That is just the same, why did you change it?

c. RESPONSE: Incorrect (Practice Example)

PRACTICE EXAMPLE
(Introduce the two cards)

Exa



Exb

Look at the pattern. This is the top half and this is the bottom half. You see the top half and the bottom half are just the same *(point)*.
This *(point to Exb)* is the top half of this *(point to Exa)*.
We are going to make the whole pattern. This part *(point to Exb)* and the bottom part *(point to the space where the bottom part would be on Exb)*.
Researcher makes top half.
We look at the picture to make the top half.
Remember the top half and the bottom half of the pattern are just the same. Now how do you think we will make the bottom half? Show me.
Assist child, as required.
Comment : We look at the top half (pointing to figure) and the picture to make the bottom half.

Return to E2.
Comment : I can see you have tried nicely.
Proceed to E3

E3

Tell me what I have asked you in the beginning?
Is that the way to do the task?

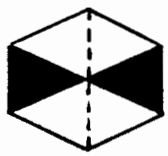
a. Spontaneous correction.
That is correct. Show me how you worked it out.
RESPONSE: Yes
Look carefully.
RESONSE No
Why do you think it is not the same?
What do you think you can do to get it just the same? Show me.

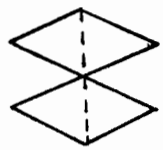
b. Feedback from researcher (right and wrong) based on scoring sheet.
RESPONSE: Correct (Proceed to next task)
That is just the same, why did you change it?

c. RESPONSE: Incorrect (Practice Example)

PRACTICE EXAMPLE
(Introduce card with the whole figure, as well as the clippings of the black and red parts)

Whole Figure Black Part Red Part





Look nicely, here is a black part and here is a red part.
We'll make the black part here on the table and the red part next to it on the table. We make it apart.

We'll make the red part. I look at the whole pattern, I take out the red part (cover the black part with the reverse side of the black clipping and make taking out motion with hand). See I took it out. Now you build the red part. Assist child as required.

Comment (after red part is completed) : We look at the picture. We put the side of the two triangles next to each other like this. Then we put the sides of these triangles next to each other. Now we push this together, just like the picture. You see the red part is finished.
Now you make the black part.
Assist as required.
You see we have build the red and black parts next to each other.
Return to E3.
Comment : I can see you have tried nicely.
Proceed to next task.

E4 and 5

Are you sure about that?

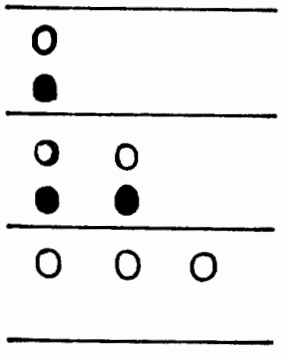
a. Spontaneous correction/attempts to correct item.
That is correct. Show me how you worked it out.
RESPONSE: Yes
Show me how you worked it out.

RESONSE No
Show me how you worked it out.

b. Feedback from researcher (right and wrong) in terms of the scoring sheet.
RESPONSE: Correct (Proceed to next task)
That is correct. Show me how you worked it out.

RESPONSE: Incorrect (Practice Example)

PRACTICE EXAMPLE
(Introduce card)



Aim - To communicate following to child :
The use of the whole pattern (studying the whole pattern).
The changes within the pattern.
How changes assist the child in solving problem.

Look at the whole pattern.
Here we have one red circle one black circle
Child reads out second section.
Tell me how you worked it out.
Child completes third section.
RESPONSE: correct
Tell me how you worked it out.

RESPONSE: Incorrect.
Tell me how you worked it out.
Assist child as required.

Read with child :
1 red circle (cover remaining bottom of pattern)
2 red circles (cover remaining bottom of pattern)
3 red circles

1 black circle (cover remaining bottom of pattern)
2 black circles (cover remaining bottom of card, allow some time for child to provide 3 black circles.)
3 black circles

Then comment : Look at the changes in the number (1, 2, 3)and the changes in colour (red and black) to work out the answer. We use the whole pattern to think out the answer.

APPENDIX B

Table : Difference between expected score (determined by chronological age) and score obtained (test score). Minus denotes below expected performance. Plus denotes above expected performance

	"Coloured"			"Black"		
Subject	**Expected Score**	**Test Score**	**Difference**	**Expected Score**	**Test Score**	**Difference**
1	86	80	-6	86	68	-18
2	78	66	-12	79	80	+1
3	81	61	-20	90	68	-22
4	78	76	-2	89	72	-17
5	87	84	+3	92	76	-16
6	88	64	-24	91	68	-23
7	89	61	-28	91	68	-23
8	86	86	0	84	81	-3
9	83	72	-11	84	71	-13
10	82	67	-15	81	65	-16
11	85	72	-13	84	67	-17
12	83	68	-15	84	66	-18
13	81	56	-25	84	69	-15
14	88	82	-6	81	72	-9
15	88	78	-10	87	74	-13
16	92	84	-8	87	77	-10
17	92	78	-14	83	58	-25
18	92	71	-21	92	87	-5
19	93	64	-29	92	76	-16
20	93	74	-19	87	67	-20

APPENDIX C

KEY

Result

Res 1 - Performance on first administration

Res 2 - Performance on second exposure

Res 3 - Performance (final product) after intervention strategy - the intervention strategy introduced just before the final product will be indicated.

Performance

Incorr - Incorrect

M Error - Minor error

T Error - Typical error

Other Terms

EP - Enquiry Procedure

Feedb - Feedback

Interven - Intervention strategy introduced

Prac Ex - Practice Example

N/Resp - No Response

No Admin - Not Administered

PERFORMANCE ON FA AND SA

Testee	1	2	3	4	5	6
Section D						
D1						
Res1	Correct	M Error	Correct	Correct	Correct	Correct
Res2	Correct	M Error	Correct	Correct	Correct	Correct
Interven						
Prac Ex	Correct	Correct	Correct	Correct	Correct	Correct
Res3	Correct	Correct	Correct	Correct	Correct	Correct
D2						
Res1	T Error	M Error	T Error	T Error	M Error	Correct
Res2	M Error	M Error	T Error	M Error	Correct	M Error
Interven						
Feedb		Response		Response		Response
Prac Ex	Correct		Correct			
Res3	Correct	Correct	Incorr	Correct	Correct	Correct
D3						
Res1	T Error	M Error	Incorr	T Error	M Error	Correct
Res2	M Error	Correct	Incorr	Correct	Correct	Correct
Interven						
Feedb	Response		Resposne			
Res3	Correct	Correct	Correct	Correct	Correct	Correct

Section E						
Edem						
Res1	Correct	Incorr	Correct	Correct	Correct	Correct
Res2	Correct	Incorr	Correct	Correct	Correct	Correct
Interven						
Feedb		Response				
Res3	Correct	Correct	Correct	Correct	Correct	Correct
E1						
Res1	Incorr	T Error	Incorr	Incorr	M Error	T Error
Res2	T Error	Correct	T Error	M Error	Correct	Incorr
Interven						
EP				Said task		
				Incorr		
Feedb				N/Resp		
Prac Ex	Correct	Correct	Correct	No Admin		Hard
				(mood)		
Res3	Correct	Correct	T Error	M Error	Correct	Incorr
E2						
Res1	Incorr	Incorr	Incorr	Incorr	Incorr	Incorr
Res2	Incorr	T Error	Incorr	T Error	M Error	Incorr
Interven						
EP					Correct	
Feedb	Response					Response
						(T Error)
Prac Ex		Correct	Correct	Correct		Correct
Res3	Correct	Correct	Incorr	Incorr	Correct	T Error

E3						
Res1	**T Error**	**Incorr**	**Incorr**	**T Error**	**T Error**	**T Error**
Res2	**T Error**	**T Error**	**T Error**	**T Error**	**T Error**	**T Error**
Interven						
Feedb				**Response (T Error)**		
Prac Ex	**Correct**	**Correct**	**Correct**	**No Admin**	**Correct**	**Incorr**
Res3	**Correct**	**Incorr**	**T Error**	**T Error**	**Correct**	**T Error**
Prac Ex of CT	**Correct**	**Correct**	**Correct**	**Correct**	**Correct**	**Correct**
E4						
Res1	**Incorr**	**Incorr**	**No Admin**	**Incorr**	**Incorr**	**T Error**
Res2	**Correct**	**Incorr**	**Incorr**	**Incorr**	**Correct**	**T Error**
Interven						
Feedb			**Response**			
Prac Ex				**Correct**		**Correct**
Res3	**Correct**	**Incorr**	**Correct**	**Incorr**	**Correct**	**T Error**