

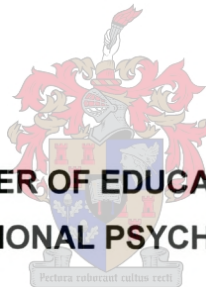
**THE DESIGN AND EVALUATION OF A COGNITIVE SKILLS  
ASSESSMENT CHECKLIST FOR EDUCATORS**

**CARROLL DIANE COOSNER**

**M Ed (Specialised Education), B Ed (Educational Psychology), BA, DSE  
(Remedial), DTSC, HPTD, FIE**

ASSIGNMENT PRESENTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF

**MASTER OF EDUCATION  
(EDUCATIONAL PSYCHOLOGY)**



AT THE

**UNIVERSITY OF STELLENBOSCH**

**SUPERVISOR: PROF CD CILLIERS**

**December 2001**

## **Declaration**

I, the undersigned, hereby declare that this assignment is my own original work, and I have not previously in its entirety, or in part, submitted it at any university in order to obtain a degree.

Date: 1 September 2001.

## Summary

Post-apartheid South Africa has seen a shift to process-centred, outcomes-based (OBE) education. Within this paradigm much has been written and recommended as regards assessment, specifically authentic assessment, which needs to be continuous. Within this transformatory model of teaching and assessment, it is vital for the educator to understand how the learner learns in order to assess him/her authentically.

Because cognition has to do with how learners acquire, store and utilize information, the best way to assess cognitive ability is to assess those thought processes that are involved in arriving at the products of cognition directly. Being process-based and judging the learners' responsiveness to instruction, it becomes important for the educator to examine how a learner learns, before educators can hope to categorise and analyse the learners' ability to learn.

The paucity of the data base search revealed that the design of such a cognitive checklist was imperative. The checklist had to be easily understood, practical and easily implementable.

The researcher based the checklist on Feuerstein's (1980) model, which is underpinned by the concepts of structural cognitive modifiability (SCM) and the mediated learning experience (MLE).

SCM is based on the assumption that human beings have the capacity to modify their cognitive functions and adapt to life's changing demands. They are thus open systems which are amenable to cognitive changes. Structural changes are pervasive and determine cognitive function in a broad series of mental activities. Feuerstein has suggested a list of deficient cognitive functions at the input, elaboration and output phases of the mental act. These serve as guidelines for observational and mediational efforts. The identification of the deficient cognitive function, the level of modifiability and the mediation required to change them are considered to be of vital importance to predicting future learning. This basic assumption shifts the

responsibility for a person's modifiability from that individual to the mediator or educator.

The basic parameters of the cognitive process are subsumed into the cognitive map. These include: content; operation; modality; phase (input, elaboration, output); level of complexity; level of abstraction and level of efficiency.

The present researcher reframed all the basic components of the learning phases into easily accessible English and provided examples of sub-skills (150) necessary for the successful acquisition of learning at that phase of the learning process.

The literature study was followed by a pilot-study. This was carried out in order to refine the checklist and make sure that it was, indeed, user-friendly, easily understood, implementable without training and that it yielded information which the educators found to be professionally beneficial and enriching. The results of the pilot-study were incorporated into 'The Checklist To Assess Cognitive Skills' (Chapter 4).

The result of the research was unanimous as regards the above-mentioned goals. The educators all realised the necessity of linking assessment to instruction and understood how crucial it is that educators understand and appreciate how a learner learns and hence, develops.

## Opsomming

Na apartheid het Suid-Afrika 'n verskuiwing na prosesgesentreerde, uitkomsgebaseerde onderwys (UGO) beleef. Binne hierdie paradigma is baie geskryf en aanbevelings gemaak oor assessering, veral oor outentieke assessering wat deurlopend toegepas moet word. Binne hierdie transformatiewe model van onderrig en assessering is dit van besondere belang dat opvoedkundiges moet verstaan hoe die leerder leer ten einde hom of haar op 'n outentieke wyse te kan assesseer.

Omdat kognisie te doen het met die verwerking, prosessering, storing en aanwending van inligting, is die geskikste wyse om kognitiewe verweë te assesseer, om daardie denkprosesse te assesseer wat direk betrek word ten einde by die produkte van kognisie uit te kom. Aangesien dit proses gebaseerd is, en gaan om die beoordeling van leerders se responsiwiteit op onderrig, word dit belangrik vir die opvoedkundige om te ondersoek hoe 'n leerder leer, voordat die opvoedkundige met enige mate van sukses leerders se leervermoëns sal kan kategoriseer en analiseer.

Die beperkte omvang van die databasis-soektog beklemtoon dat die ontwerp van 'n kognitiewe kontrolelys vir opvoedkundiges imperatief is. Die kontrolelys moet verstaanbaar, prakties en maklik implementeerbaar wees. Die navorser het die kontrolelys gebaseer op Feuerstein (1980) se model wat onderlê word deur die konsepte van strukturele kognitiewe modifieerbaarheid (SCM) en die gemedieerde leerervaring (MLE).

Strukturele kognitiewe modifieerbaarheid (SCM) is baseer op die aanname dat mense oor die vermoë besit om hulle eie kognitiewe funksies te modifiseer en om aan te pas by die veranderende eise van die lewe. Hulle is dus oopsisteme wat vatbaar vir kognitiewe veranderinge is. Strukturele veranderinge is deurdringend van aard en bepaal kognitiewe funksionering in 'n breë reeks van denkkatieweite. Feuerstein het 'n lys van ontoereikende kognitiewe funksies by die invoer-, uitbreidings- en uitvoerfases van die denkhandeling voorsien. Hierdie lys dien as riglyne by beide waargenome en

gemedieerde pogings. Die identifikasie van ontoereikende kognitiewe funksies, die vlak van modifieerbaarheid en die mediëring om dit te wysig, word as van kardinale belang beskou in toekomstige leer.

Die basiese parameters van die kognitiewe proses word gesubsumeer in die kognitiewe kaart. Dit sluit in: inhoud; operasie; modaliteit; fase (invoer, uitbreiding, uitvoer); vlak van kompleksiteit; vlak van abstraksie en vlak van effektiwiteit.

Die navorser het al die basiese komponente van die leerfasies in toeganklike Engels herskrywe en het voorbeelde van 150 subvaardighede, nodig vir suksesvolle verwerwing van leer in daardie spesifieke fase van die leerproses, voorsien.

Die literatuuroorsig is deur 'n loodsstudie opgevolg. Die loodsstudie is uitgevoer ten einde die kontrolelys te verfyn en om te vergewis dat dit werklik gebruikersvriendelik, maklik verstaanbaar, en toepasbaar is sonder opleiding, en dat dit inligting voorsien wat 'n voordelige en verrykende professionele bydrae sal maak. Die bevindings van die loodsstudie is in die Kognitiewe Kontrolelys geïnkorporeer (Hoofstuk 4).

Die navorsingsbevindings het op eenstemmige wyse die realisering van bostaande doelwitte onderskryf. Die opvoedkundiges het almal die noodsaaklikheid van die verbinding tussen assessering en onderrig verstaan en ook van die belangrikheid dat die opvoedkundige begrip en waardering toon van hoe 'n leerder leer en dus ontwikkel.

## **Acknowledgements**

My sincere thanks go to my supervisor, Professor Charl Cilliers, who has been a mentor in the true spirit of the word. He embodies grace under pressure.

To those colleagues of Herzlia Middle School, who enthusiastically committed their time and expertise, my grateful thanks.

My thanks also go to:

- ❖ Melanie Stark, who edited the manuscript;
- ❖ Jane Avis, who edited and critiqued the checklist;
- ❖ Marietjie Oswald, who translated the summary into Afrikaans;
- ❖ Annemarie Maritz, whose library/research assistance was invaluable.

I would not have been able to achieve my dreams without the loving support, faith and confidence that my family and friends have shown me.

## TABLE OF CONTENTS

<b>1. RELEVANCE, STATEMENT OF PROBLEM AND OBJECTIVE OF STUDY</b> .....	<b>1</b>
1.1 Motivation for and relevance of study.....	1
1.2 Research problem.....	3
1.3 Research objective.....	4
1.4 Research design.....	5
1.4.1 Type of research.....	5
1.4.2 Literature study.....	5
1.4.3 Pilot study.....	5
1.4.3.1 Research group.....	6
1.4.3.2 Research instruments.....	6
1.4.3.3 Research process.....	7
1.5 Definition of relevant terms.....	7
1.5.1 Design.....	7
1.5.2 Evaluation.....	7
1.5.3 Checklist.....	7
1.5.4 Assessment.....	8
1.5.5 Cognitive.....	10
1.5.6 Skills.....	10
1.5.7 School Educators.....	10
1.6 Structure of presentation.....	11
<b>2. LITERATURE STUDY</b> .....	<b>12</b>
2.1 Introduction.....	12
2.2 Contextualising the shift to process-centred education in South Africa.....	13
2.2.1 From apartheid education to Outcomes-based Education (OBE).....	13
2.2.2 An explanation of OBE.....	15
2.2.3 A transformative approach to learning.....	17
2.2.3.1 A cognitive view of learning.....	18
2.2.4 A transformative approach to assessment.....	20



2.2.4.1	Authentic assessment .....	22
2.2.5	Closing perspective .....	24
2.3	Theory underpinning the cognitive checklist.....	26
2.3.1	Structural Cognitive Modifiability (SCM) and the Mediated Learning Experience (MLE) .....	26
2.3.2	The cognitive map .....	28
2.3.2.1	Learning phases .....	29
2.4	Guidelines for the construction of a checklist as a teaching tool .....	34
2.4.1	Characteristics of ideal checklists.....	35
2.4.2	Characteristics of checklists as research instruments .....	36
2.4.3	Organisational framework for assessing cognitive skills.....	37
2.4.4	Standards of assessment quality.....	38
2.5	Summary .....	39
<b>3.</b>	<b>PILOT STUDY AND FINDINGS .....</b>	<b>40</b>
3.1	Research method .....	40
3.1.1	Research design.....	40
3.1.2	Qualitative research.....	42
3.2	Research group.....	44
3.3	Research instruments .....	44
3.4	Research process .....	45
3.5	Research findings.....	45
3.6	Discussion of research findings.....	46
<b>4.</b>	<b>THE CHECKLIST TO ASSESS COGNITIVE SKILLS .....</b>	<b>51</b>
4.1	Theoretical rationale of the checklist .....	51
4.1.1	How the language was changed.....	52
4.1.1.2	At the Input phase of the learning process .....	52
4.1.1.3	At the Elaboration phase of the learning process .....	52
4.1.1.4	At the Output phase of the learning process.....	53
4.1.2	Sub-skill components .....	53
4.2	Empirical rationale of the checklist .....	54
4.3	The Checklist to Assess Cognitive (Thinking) Skills .....	54

<b>5. SUMMARY OF FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS</b> .....	63
5.1 Findings and conclusions .....	63
5.2 Educational implications and recommendations.....	65
5.3 Shortcomings of the study .....	67
5.4 Recommendations for further research .....	69
5.5 Closing perspective .....	70
<b>REFERENCES</b> .....	72
<b>ADDENDUM 1</b> .....	78
<b>ADDENDUM 2</b> .....	86

## LIST OF TABLES

Table 2.1 Some differences between apartheid education and transformational Outcomes-based Education (OBE) .....	14
Table 2.2 The input phase of the learning act .....	30
Table 2.3 The elaboration phase of the learning act .....	31
Table 2.4 The output phase of the learning act .....	32
Table 3.1 The difference between a basic research design and an applied research design .....	41
Table 3.2 The differences between a positivist and a phenomenological position.....	43

## CHAPTER 1

### RELEVANCE, STATEMENT OF PROBLEM AND OBJECTIVE OF STUDY

#### 1.1 MOTIVATION FOR AND RELEVANCE OF STUDY

In 1999 the researcher of this assignment completed a research project on 'Dynamic Assessment – A Practical Strategy for School Educators'. The results of the research showed that:

- ❖ educators involved in that study were largely ignorant of the cognitive processes involved in the acquisition of knowledge;
- ❖ to understand cognitive functioning, more training was needed in the learning phases of input, elaboration and output (Feuerstein, Rand, Hoffman, Miller, 1980:73-105).

From this, the prioritized recommendations (Coosner, 1999:72-75) were to:

- ❖ develop accurate rating scales;
- ❖ establish appropriate categories of observation;
- ❖ use these rating scales within each section of the three learning phases;
- ❖ make educators aware of the cognitive processes underpinning learning.

Developing a checklist of learners' cognitive functions would clarify for educators exactly which sub-skills are necessary for the learning process to take place. This concept can best be summarized in an extract from the above-mentioned research:

*Because cognition has to do with how learners acquire, process, store and utilise information, the best way to assess cognitive ability is to assess those thought processes that are involved in arriving at the products of cognition directly. Being process-based and judging the learners' responsiveness to instruction, it is important for the educator to examine how a learner learns before educators can*

*hope to categorise the learners' ability to learn. Once educators know how a learner learns, they can generate specific, individualized programmes which will directly address the learners' needs. (Coosner, 1999:73-74.)*

Other major advantages of the development of such a checklist would be the:

- ❖ early identification of 'at risk' learners;
- ❖ provision of valuable information about the learners' strengths and how the educator could use these to compensate and develop areas of cognitive weakness.

Alternatively, if the educator was not able to remediate these areas,

- ❖ the learner could be referred to an educator who could help with the remediation; or
- ❖ the learner could be referred for more comprehensive intellectual testing.

For these reasons it is obvious that a cognitive skills checklist, which elucidates all the skills and splinter skills, is a valuable and practical tool for educators.

The extensive data base search revealed that not only did a checklist to assess the cognition of learners not exist, but that there was no direct research being done on developing such a strategy. Thus the need for, and relevance of, an educator-friendly and practical strategy to assess and evaluate cognitive processes, as well as to be able to monitor the cognitive growth of learners' outcomes, is not only evident, but vital. This is particularly imperative in the light of the transformative nature of Outcomes-based education (OBE) which has been adopted by the South African government in post-apartheid South Africa.

Curriculum 2005 (launched by the National Department of Education in April 1997, and implemented in 1998, starting at grade 1) is a process-based education system where standards are defined in terms of learning outcomes. The emphasis is on what the learners know and can do at the end of a course of

learning. This paradigm shift emphasises cognitive processes, rather than mere knowledge.

Ideally all educators should be aware of the principles of educational assessment and should be involved in continuous assessment of learners. Accordingly, 'assessment emphasises the performance of the learner, thereby not only assessing what the learner knows, but also what the learner can do' (Jones 1995, in Engelbrecht, 1997:59).

The Draft Policy on Assessment for General and Further Education and Training in South Africa encouragingly asserts that 'assessment policy underpins and strengthens the new outcomes-based approach to teaching and learning' and that 'assessment should be aimed at determining to what degree specific predetermined outcomes have been achieved to assist the learner to progress to higher levels of achievement' (Engelbrecht, 1997:60). The challenge for educators is therefore how to evaluate and assess the cognitive processes of learners.

Developing, and testing, a cognitive skills checklist directly addresses this challenge.

## **1.2 RESEARCH PROBLEM**

South Africa is presently facing many challenges owing to the implementation of political transformation in the post-apartheid era. One of the areas particularly affected is the education system, which needs to be transformed into an inclusive, OBE model, which will provide for the diversity of learners in South Africa. The vast majority of educators in South Africa are under-qualified to teach the basics of education, let alone to implement the sound cognitive procedures which form a crucial part Curriculum 2005. (Cilliers, Park & Thiar, 1999:36-38)

These authors are further convinced that cognitive education, which is founded on the basic premises that largely fulfil all the requirements of the challenges, can contribute to facilitating educational changes.

In addition to this, programmes which have been developed to facilitate and remediate thinking skills (e.g. Cognet, BrightStart, Instrumental Enrichment) are problematic within the South African context. They are expensive, sophisticated and specialised. They require lengthy (and expensive) training to administer, and many are simply not adapted to the South African context or reality.

The researcher's previous study proved that educators were largely ignorant regarding what encompasses the learning process.

Such problems may lead to Curriculum 2005 not being adequately implemented.

The research problem addressed in the present study is to assess the impact of a checklist which has been designed to help educators meet some of the needs previously identified.

### **1.3 RESEARCH OBJECTIVE**

The research objective flows from the research problem: namely to design a checklist of learners' cognitive skills for use by educators. This needs to be educator-friendly, classroom-based, easily accessible as regards content and language, and which requires no specialised training to apply. Such a strategy should be able to be implemented without delay.

## **1.4 RESEARCH DESIGN**

### **1.4.1 Type of research**

In assessing the feasibility and applicability of the checklist, the researcher will be using basic research within a qualitative approach. (See Chapter 3 for an explanation of these terms.)

### **1.4.2 Literature study**

The literature study functions as the theoretical basis for the research and is used to ground the researcher's findings. The literature study contextualises the shift in South Africa to process evaluation. This will include an elucidation of the transformative approach to learning, which encapsulates the cognitive viewpoint, and the transformative approach to assessment, including the vital aspect of authentic assessment.

The literature study also gives the background information to the theory underpinning the design of the checklist and the guidelines on the criteria used in the construction of the checklist itself.

### **1.4.3 Pilot study**

The empirical study took the form of a pilot study. It focuses on the qualitative results of implementing the checklist in a school in Cape Town, in order to determine its applicability, user-friendliness, practicality and feasibility.

The aim of piloting was not to generate statistical, empirical results, but to ascertain whether this checklist is practical, usable and whether educators understand it and perceive it to be useful. The results of this pilot study were



used to make the necessary adaptations and refinements to the cognitive checklist. (See Chapter 4.)

#### **1.4.3.1 Research group**

The research group consisted of educators from a fully inclusive co-educational, private school in the Cape Peninsula. They were a small purposively selected sample. The researcher has worked with these 'simpatico' educators for the past 4-15 years. They were selected for their dedication to the profession, for their commitment to personal growth and for the empathy and creative enthusiasm which they display towards the learners and their work.

The selection of this dedicated sample was a deliberate attempt by the researcher to correct the shortcomings of the previous research (1999), where the sample was too big. A major shortcoming of the size of the previous sample was that the high-level inferences they made, because they were entirely subjective, were problematic. This was especially the case as training had not been extensive.

It was hypothesized that the quality of responses from a small, purposively selected sample of trusted professionals would be of greater value to the researcher for the current study as they have all been members of Learning Support Teams. It was further hypothesised that they would be able to make the leap from educator to that of observer and scientist.

#### **1.4.3.2 Research instruments**

The following qualitative research instruments were utilised:

- ❖ a checklist to assess learners' cognitive skills;
- ❖ a structured, formal questionnaire.

### **1.4.3.3 Research process**

The pilot study included the following processes:

- ❖ critical editing of the checklist by a consultant, who is also an author of a series of Science text books;
- ❖ establishing the willing cooperation of the purposively selected sample;
- ❖ completing the checklist and questionnaire.

## **1.5 DEFINITION OF RELEVANT TERMS**

### **1.5.1 Design**

The term as used in this study simply embraces a dictionary definition of the term, that is 'adaptation of means to ends; preliminary sketch for plan; delineation; general idea; construction from parts' (The Concise Oxford Dictionary, 1976:278).

### **1.5.2 Evaluation**

In the context of this study, the term means to critically assess the cognitive checklist in the light of the research objectives and the educators' suggestions, and to refine it further in the light of these inputs.

### **1.5.3 Checklist**

The checklist is seen as a tool whereby the educator can constructively assess and delineate areas of strength and weakness in the learning process.

A checklist presupposes that 'observers are not expected to record all the behaviour (of the subjects) which they observe, but only those behaviours which are regarded as indicators of the dependent variable in question' (Huysamen,

1994:140). The checklist will give explicit descriptions of all the different concrete behaviours which should be regarded as indicators of the dependent variable.

Thus observers act as raters of behaviour, and need to be trained in advance about the specific behaviours which should be regarded as indicators of the dependent variable. They should have a clear understanding of the definition of the dependent variable. 'The less the observer is expected to evaluate or interpret whether or not a particular behaviour is indicative of the dependent variable, the better the chances of obtaining a satisfactory interrater reliability' (Huysamen, 1994:142).

Recording will be done in the following categories:

- ❖ always
- ❖ mostly
- ❖ sometimes
- ❖ rarely
- ❖ never.

The checklist is regarded as being practical, insofar that it can be used without time-consuming and costly training, and that it will be readily accessible, both in user-friendliness and in price.

#### **1.5.4 Assessment**

The root of the word 'assess', derives from the Latin word "assidere", which means to sit beside. Sitting beside someone suggests a close relationship and a shared experience (Satterley, in Kriegler & Skuy, 1996).

Educational assessment is described by most researchers as a process by which information is systematically gathered, concerning a learner's qualities, characteristics and environment. 'The purpose of assessment has moved increasingly during the past few years from identification, classification and

diagnosis towards promoting and supporting learning and opportunities, with the emphasis on educational assessment and effective intervention' (Engelbrecht, 1997:10).

Assessment is done in order to plan for learning. This cannot be done unless the educator understands what kind of learning is taking place. Thus educators need to know:

- ❖ What the learner can do;
- ❖ What the learners' points of growth and development are;
- ❖ What the learner needs to be able to do in the long run, so that a programme can be set up to facilitate this growth and development.

Assessment, according to the WCED Assessment Guidelines for C2005 (1998:5), therefore should:

- ❖ Identify and take prior learning into account;
- ❖ Motivate learners;
- ❖ Be ongoing;
- ❖ Be diagnostic;
- ❖ Help learners to see that they are on a learning pathway;
- ❖ Cover a range of evidence;
- ❖ Involve, where possible, an assessment team.

According to the same document, assessment is not only about what the learner is or is not doing, it is about prognosis as well, and as such relates to what the educator is or is not doing. The educator needs to be reflect on the following:

- ❖ What are the learning results telling me about the programme that I am structuring;
- ❖ Am I working to help learners achieve their potential;
- ❖ Is there something I am doing, or not doing, getting in the way;
- ❖ Is the best kind of learning going on here.

### **1.5.5 Cognitive**

The word 'cognitive' is the adjective formed from the word 'cognition'. 'Cognition literally means "meaning" and includes all the mental processes by which a learner becomes aware of his/her environment or gains knowledge, organizes and applies knowledge. It encompasses all mental processes from perception to response' (Cilliers, 1999:23).

According to McCown, Driscoll & Roop (1996:28) 'cognitive development is the growth in our capabilities as learners. Cognitive Developmental Theory attempts to explain how humans acquire and construct knowledge for themselves and their world'.

It is the educators' task to develop the learners' underlying cognitive functions, which have to do with the ability to learn and to become an autonomous learner.

### **1.5.6 Skills**

The dictionary definition of this word is 'expertness; practiced ability; facility in an action or in doing or to do something'. (The Concise Oxford Dictionary, 1976:1071)

### **1.5.7 School educators**

For the purposes of this study, this term means appropriately trained educators who are currently involved in the practice of teaching.

## **1.6 STRUCTURE OF PRESENTATION**

### **Chapter 2: Literature Study (pp 12-39)**

The Literature study contextualises the shift to process-centred education. The transformative nature of teaching and assessment within this paradigm are addressed. The study also includes the theory underpinning the theoretical design of the checklist and the criteria which were used as guidelines for the construction of such a checklist.

### **Chapter 3: Pilot Study and Findings (pp 40-50)**

The checklist was piloted to find out whether it was practical, user-friendly and required no training in order to complete it.

### **Chapter 4: The Checklist to assess Cognitive Skills (pp51-62)**

On the basis of the pilot study, the checklist was further refined.

### **Chapter 5: Summary of findings, conclusions, implications and recommendations (pp 63-71).**

This chapter summarises the findings of the research and from this draws implications. The chapter also contains the shortcomings of the research and recommendations for future research.

**References:** (pp 72-77)

**Addenda:** (pp 78-86)

## CHAPTER 2

### LITERATURE STUDY

#### 2.1 INTRODUCTION

An extensive and exhaustive data base library search (EbscoHost, PsychInfo, Eric, SA Studies, Nexus data base of the NRF) to find material relating to existing checklists, failed to reveal that anything similar exists. This made the design of a cognitive skills checklist more imperative. Further, it was decided to focus on the underlying South African context, with its shift to Outcomes-based education (OBE). Given this understanding, the shift to process-centred education in South Africa and how the contribution of Cognitive Education fits such a model, is important.

Much has been written about assessment within the OBE model of education. It was clear to the researcher that if educators are to assess learners authentically, they need to know how a learner learns and what the cognitive strengths and weaknesses of the learner are.

The foci of the literature study are:

- ❖ The shift to process-centred education in South Africa, and the difference between education in the apartheid era and OBE, specifically as they relate to teaching and learning.
- ❖ The underpinning of the transformative approach to learning and the transformative approach to assessment is underwritten by authentic assessment.
- ❖ The provision of background knowledge in the theory underpinning the design, which is based on Feuerstein's theory (1979, 1980). This elucidates structural cognitive modifiability (SCM) and the mediated

learning experience. The design of the current checklist incorporates learning phases which are part of the cognitive map.

- ❖ The guidelines used for the construction of a checklist as a teaching tool.

## **2.2 CONTEXTUALISING THE SHIFT TO PROCESS-CENTRED EDUCATION IN SOUTH AFRICA**

### **2.2.1 From apartheid education to OBE**

The Government Gazette no 16312 of 1995, which was called The White Paper on Education and Training, was the long-awaited education policy document of South Africa's democratically elected ANC government, which sought to 'transform the legacy of the past by building a just and equitable system' (Government Gazette no 16312, 1995:17). This document recognised the massive inequalities that existed in the past.

1995 was a landmark year: there was now a single, non-racial, education system for all, which was encapsulated in Curriculum 2005. Equal access to basic education for all was guaranteed, based on the principles of: redress of inequalities, equity, quality of education being improved and a commitment to rehabilitate schools and colleges. The goal of the education and training policy was to ensure that all learners have access to a lifelong learning programme.

Table 2.1 on p 14 illustrates some differences between apartheid education and OBE. Naicker (1999) has written persuasively that implicit in this, is the need for a paradigm shift for educators. Paradigms not only include ways of thinking, seeing and evaluative judgments, but they also include practices. Thus learning programmes and materials must be customized to cater to and support the diverse needs of learners.



**Table 2.1: Some differences between apartheid education and transformational Outcomes-based Education (OBE)**

<b>PARADIGMS</b>	<b>APARTHEID EDUCATION</b>	<b>TRANSFORMATIONAL OBE</b>
<b>Theory of education arising from the paradigm</b>	Fundamental Pedagogics	Transformational Outcomes-based education
<b>Assumptions</b>	Consideration of race, disability, sex and class	Non-racist, non-disabilist, non-sexist, anti-class
	Excludes contextual, historical and sociological considerations in the analysis of teaching and learning	Considers seriously historical, contextual, sociological and economic factors and how they influence teaching and learning
<b>Model Practices</b>	Apartheid education	South African Schools Act
	Inflexible, high level of control	Flexible
	Ideologically driven	Development of reflective, critical thinker encouraged
	Segregation emphasised	Inclusion emphasised
	Pass/fail approach to assessment	Every step is progress, no matter how small
	Placement in remedial/special or classes for the gifted	Inclusive education
<b>Tools</b>	Standardised tests	Criterion-referenced assessment
	Norm-referenced testing	Authentic assessment

(Naicker, 1999:78-79)

### 2.2.2 An explanation of OBE

The move towards Outcomes-based Education (OBE), with its emphases on lifelong education, achieving of outcomes and the application of learning, signals an attempt to meet the criteria of quality education for all, while catering for diverse needs. OBE bases curriculum design, content design and delivery on the assessment of knowledge, skills and attitudes which are needed by both the learner and society.

The principle of lifelong learning takes the following basic ideas into consideration (Van der Horst & McDonald, 1997:241):

- ❖ every individual has the right to fulfill his/her potential;
- ❖ no-one is ever too old or too young to learn;
- ❖ we need to learn how to learn;
- ❖ a positive learning environment is required;
- ❖ technology must be used as a resource;
- ❖ learning is not restricted to the formal school environment;
- ❖ our ideas of intelligence have changed to include multiple intelligence and not only intellectual intelligence as measured by IQ tests;
- ❖ we have to be educated to cope in a global society;
- ❖ we need to influence worldwide change by positively working towards global environmental awareness and world peace.

According to Naicker (1999:87-89), OBE is described as a system where:

- ❖ the future is the anchoring point. All planning starts from insights into learning future life roles. These become the outcomes towards which all teaching and learning are directed;
- ❖ the entire system is involved in planning the exit outcomes, and is organized to ensure that learners can demonstrate the desired outcomes;
- ❖ the learner and educator are both very clear about what the learner needs to demonstrate at the end of the learning experience;

- ❖ the outcomes are described with action, observable verbs;
- ❖ knowledge is relevant to the context of the learner;
- ❖ learners progress into the next phase with their age cohorts;
- ❖ educators interact with learners with the understanding that there are different learning styles and different learning rates. Educators should adapt the teaching to the pace of the learner;
- ❖ a variety of assessment methods are used to capture a range of information. The information is used to assist the learner in understanding his/her progress in relation to the outcomes and to help the educator to assess his/her teaching in order to plan successive teaching and learning;
- ❖ educators have high expectations of learners, irrespective of the pace at which they learn;
- ❖ the curriculum is based on the acknowledgement of the interrelatedness and integratedness of attitudes, knowledge and skills;
- ❖ assessment will therefore focus on what the learner can do with the knowledge in authentic, integrated contexts and downplay the mere possession of knowledge.

Van der horst and McDonald (1997:90) summarise the roots of OBE as:

- ❖ educational objectives;
- ❖ competency-based education;
- ❖ mastery learning;
- ❖ criterion-referenced assessment.

Curriculum 2005 aims to create learning environments that celebrate diversity and experiences that acknowledge learning rates, levels and styles. This approach is seen as accommodating a range of needs within an integrated education system.

Thus it is necessary for educators to take stock of their current positions and instructional practices so that they can plan for the future. A vital part of that plan includes a transformative approach to learning and to assessment.

'Distinguishing among types of outcomes helps us to understand the cognitive processes involved in achieving learning outcomes. Knowledge of outcomes does not ensure, however, that students will achieve them. Teachers must determine the instructional events (the outward conditions of learning) that will support the cognitive processes involved' (McCown et al. 1996:369).

### **2.2.3 A transformative approach to learning**

'The Transformatory Approach defines effective learning as learning that leads to change at the level of the individual, the group, the organization and, ultimately, society' (Askew & Carnell, 1998:7). This is an holistic approach which emphasises the interconnection between the emotional, social, spiritual, physical and cognitive dimensions. It involves the understanding that the self is central in the learning process; that the learner has an impact on the context and vice versa and that action learning processes involve learning about learning. The approach further states, inter alia that: capacity for learning is not fixed and can be increased; capacity for learning increases as learning increases; only learners are in the position to identify and tell others what they have learned.

As far as the learning process is concerned, this approach is congruent with Cognitive Education in that reflection on experience is viewed as an essential part of action learning. Reflection on the self as learner, and the context of learning, is also regarded as essential to the process. This infers that it is vital to make the learning explicit.

This Transformatory Approach to learning 'moves towards an organismic view of the person who is active in the change process' (Askew & Carnell, 1998:20).

The approach stresses that educators are primarily learners and that learning is lifelong. The approach emphasises that learning leads to change at the level of the individual, group, organisation and society.

McCown et al. (1996:16-17) stress that a person needs to make sense of his/her experience and to learn from it. They further state that to be an expert educator, one must become an expert learner. In their view, the key to learning about teaching is reflective construction, which 'entails thinking critically about the principles and concepts of educational psychology and classroom practice in order to develop a theory of teaching' (McCown et al, 1996:16). As long as the educator continues to consult the research and principles that are generated by educational psychologists, the knowledge base will grow. As long as the knowledge base continues to grow, the educator will always have an opportunity to reflect on new knowledge and therefore be able to construct an ever-growing theory of teaching. This is consistent with the theory of Cognitive Education.

### **2.2.3.1 A cognitive view of learning**

A cognitive view of learning, according to Woolfolk (1998:246) is a 'general approach that views learning as an active mental process of acquiring, remembering and using information'.

According to Royer, Cisero & Carlo (1993:204) a working definition of a cognitive skill is that it:

- ❖ consists of an integrated mixture of specific facts and procedures for utilising those facts;
- ❖ can be acquired through training and/or experience;
- ❖ is applicable to a number of activities within a defined domain of activity, but its use is generally confined to that domain;
- ❖ goes through several ordered stages while being acquired. These ordered acquisition stages transform the skill from an activity that is slow

and highly taxing on the cognitive system, to an automated set of activities that may place virtually no load on the system.

Poplin (1988) in her article on holistic/constructivist principles of the teaching/learning process suggests that the task of schools is to help learners develop new meanings in response to new experience.

Constructivism describes the learning process in terms of the construction of new knowledge through the processes of transformation and self-regulation. Because learning is self-selected, self-motivated and self-constructed, the best predictor of what learners will learn next is what they already know and what interests them. Unless educators know what is already known and perceived by learners as meaningful, 'it will be very difficult, if not impossible, for us to know in what context and time to present new experiences to our students in a manner which will captivate their interest and set their spirals spinning with new meaningful constructions' (Poplin, 1988:407).

This viewpoint is corroborated by Meadows (1993:333) who states 'enhancing cognitive development, or facilitating cognitive acquisition, are central concerns of education'. This author further states that strategies, metacognition and basic knowledge are integrated in the cognitively competent person; that they operate in the appropriate sequence, often automatically and flexibly, according to how the task's demands are being met. In addition to this, good thinkers 'will be people who enjoy thinking' (Meadows, 1993:333), because they:

- ❖ have a confident attitude to cognitive tasks;
- ❖ are willing to extrapolate from the familiar to the unfamiliar;
- ❖ take risks and go beyond the information given;
- ❖ make mistakes and learn from them;
- ❖ do not take their success for granted;
- ❖ will be able to identify the source of their success. (Meadows, 1993:333)

The purpose and form of cognitive assessment, according to Royer et al. (1993:202-203) is:

- ❖ to identify the learner's current status in a developmental model of cognitive skills attainment. This assessment can then be used to prescribe future instructional experiences;
- ❖ to provide diagnostic information;
- ❖ to focus on qualitative and quantitative aspects of performance.

These authors acknowledge that procedures for assessing gains in cognitive instructional systems have not received much attention thus far and that 'there is a need for assessment procedures that can assess the learning outcomes of instructional systems that are based on cognitive theory' (Royer et al. 1993:203).

#### **2.2.4 A transformative approach to assessment**

South Africa's Curriculum 2005 requires that educators move from norm-referenced to criterion-referenced forms of assessment. It suggests that 'educators should focus far more attention on the ability of learners to do, to perform rather than simply being able to memorize or understand information' (Gultig, Lubisi, Parker & Wedekind, 1998:49).

According to the SAQA Bulletin (1999), OBE assessment is not focused on assessing only what learners can do, but also what they know and how they integrate generic abilities to demonstrate achievement. 'Generic abilities' refers to problem-solving, decision-making, analysing, etc. This document states that assessment in education and training is about making judgments about the results of learning so that decisions can be made. These decisions have to do with the learner and with the learning programme. In making judgements, certain principles governing assessment have to be stated transparently. The principles are:

- ❖ fairness (must not in any way hinder or advantage a learner);

- ❖ validity (assessment measures what it purports to measure);
- ❖ reliability (refers to the test's consistency).

According to Tilstone, Lacey, Porter & Robertson (2000:28), assessment 'is a process through which teachers can identify individual pupil's levels of development, their strengths and needs, their interests, their favoured learning style, their responses to teaching styles, their optimum learning environment and the support they need in order to learn most effectively. It is a dynamic process: one which is sensitive to changes and capable of picking up potential for learning rather than seeking out specific difficulties'. These authors advise that when looking for an assessment tool that will help in this analysis, the tool should:

- ❖ enable analysis of the processes of learning, not just the product;
- ❖ offer teaching advice, as well as diagnosis.

All of this is corroborated in the Education White Paper 6 (July 2001) which stresses the importance of developing professional capacity in all educators, specifically in curriculum development and assessment.

Naicker (1999:110-112) asserts that assessment within OBE aims to assist the learner and to help the educator improve his/her teaching. The approach to assessment pays attention to both end products (knowledge, skills, attitudes) and processes (cognitive skills – conceptual understanding, analysing, evaluating, problem-solving, etc).

An essential characteristic of assessment within the new system is that educators have to give learners continuous feedback during the learning process. This helps them to learn and to improve their competencies.

According to McCown et al. (1996:168-169), 'assessment is part of instructional practice'. They define assessment as 'the process of gathering, analysing, and interpreting information about students and their progress at school. It is a



comprehensive and multifaceted analysis of performance' (McCown et al. 1996:424).

These authors further acknowledge that as assessment is an integral part of teaching and learning, it is not just a means of monitoring learner performance. Assessment is thus a way to improve learning, because educators and learners alike can use assessment information to adjust the learning experience.

Successful learning depends on accurate and informative feedback following assessment of progress towards a goal. Educators conduct assessments to communicate learner progress to a variety of audiences – learners, parents and the community.

#### **2.2.4.1 Authentic assessment**

Part of transformative assessment is called authentic assessment. Woolfolk (1998:548) argue that the need for authentic assessment grew out of a need for greater accountability in education, as it was perceived that standardised tests led many educators to “teach to the test”. These tests tended to focus learners and learning on basic skills and facts and assessed skills that have no equivalent in the real world. ‘Students are asked to solve problems or answer questions that they will never encounter again; they are expected to do so alone, without relying on any tools or resources and while working under extreme time limits. Real Life just isn’t like this’ (Woolfolk, 1998:548).

Authentic assessment can be defined as a process which ‘concerns the measurement of complex performances and higher-order thinking skills in real life contexts...the goal of authentic assessment is to make tests more integral to learning tasks so that skills such as problem-solving and critical thinking can be measured’ (McCown et al. 1996:426-427).

In response to these criticisms, the authentic assessment movement was born.

Woolfolk (1998:548) defines authentic assessment as a 'measurement of important abilities using procedures that simulate the application of these abilities to real life problems'.

'Authentic assessment thus requires learners to demonstrate complex tasks, rather than individual skills practised in isolation' (Van der Horst & McDonald, 1997:168). They also argue that authentic assessment:

- ❖ provides a more direct measure of higher-order learning goals than do more traditional measures;
- ❖ reflects a more constructivist orientation to learning because it requires learners to demonstrate complex tasks, rather than small, discrete skills practiced in isolation;
- ❖ will bring an increase in instructional attention to standardised achievement tests;
- ❖ supports classroom instruction;
- ❖ collects evidence from multiple activities;
- ❖ promotes teaching and learning among the educators;
- ❖ reflects local values, standards and controls.

Assessments are authentic when they meet the following criteria (McCown et al. 1996:440):

- ❖ they are engaging and worthy problems or questions of importance;
- ❖ they represent real-life, interdisciplinary challenges;
- ❖ they present learners with complex, ambiguous, open-ended problems and tasks that integrate knowledge and skills;
- ❖ they require students to produce a quality product and/or performance;
- ❖ they require students to justify/defend their products/choices;

- ❖ they provide criteria and standards that may be modified through discussion;
- ❖ they recognise and value students' multiple abilities, varied learning styles and diverse backgrounds.

The advantages of authentic assessment are that they:

- ❖ work well in responding to student diversity (abilities, learning styles and cultural backgrounds);
- ❖ tend to be motivational in providing learners with tasks which they perceive as worthwhile, interesting and relevant;
- ❖ provide educators with a multidimensional view of learner performance (not only performance, but affective characteristics);
- ❖ help learners to learn how to monitor their own performance;
- ❖ provide a means of communication among parents, learners and educators;
- ❖ have systematic validity (serve as an impetus for curriculum change).

'When teachers adopt authentic tasks as a way to assess learning, they tend to adjust their instruction to provide more practice with the same kind of tasks' (McCown et al. 1996: 440-441).

### **2.2.5 Closing perspectives on the relevance of assessment to this research**

In order for assessment to improve learning, 'it should provide a multi-dimensional picture of what the students can know and do. It should respect students' diversity in ways of understanding. It should suggest actions teachers can take to improve the educational development of their students and the quality of their educational programs' (McCown et al. 1996:427).

To take advantage of the assessment techniques, educators need to understand:

- ❖ assessment goals;
- ❖ procedures for constructing assessments;

- ❖ criteria for judging and improving the quality of assessments.

According to Royer et al. (1993:238), 'assessments having processing authenticity measure a cognitive skill that is a critical component of the authentic task skill. A critical component skill is one that, if absent, would prevent the acceptable performance of the authentic task. Assessments having processing authenticity would have diagnostic value in that they would identify the critical skills that had not been acquired and they would add evidence that students had truly acquired the desired complex skill'. Authentic processing skills can only be identified by determining the nature of the component skills that underlie a complex skill.

Lidz and Greenberg (1997:89-90) stress the need for a link between assessment and intervention and for a description of learners in the process of learning. Thus the technique that is used to elicit the information needs to be more qualitative and process-oriented. These authors stress:

- ❖ The fact that the results of such an intervention could increase the accuracy of the identification of learners who need referral for comprehensive assessment.
- ❖ The tool used could also differentiate learners who merely need more practice and those who demonstrate more significant learning difficulties.
- ❖ A further benefit would be to educators who would find the information that was generated useful in their educational programming and planning.
- ❖ The educator could also use the measure over time in order to monitor the learner's response to the educator's special programming efforts.
- ❖ Thus it is absolutely clear that assessment is part of the tuition process, not an event in its own right.
- ❖ Assessment is about learning and opportunities, and not about labelling and categorising.

In conclusion, it is vital to remember that:

- ❖ assessment is outcomes-based i.e. the outcomes to be assessed must be selected before the assessment task is structured;
- ❖ assessment is performance based (learners must demonstrate their competence while they are being assessed). Thus the process and the eventual product must be assessed;
- ❖ assessment must, as far as possible, be authentic.

(Hanekom, Rossouw & Engelbrecht, 1999:15)

The checklist (Chapter 4) was drawn up taking all these factors into account

## **2.3 THEORY UNDERPINNING THE DESIGN OF THE COGNITIVE CHECKLIST**

‘In any description of the learner during the course of the assessment process, it is the list of the cognitive deficiencies that is most relevant, and it is remediation of these deficiencies that is directly addressed by the assessment’ (Lidz, 1991: 11).

It is this researcher’s belief that within the South African situation, every educator will need to have the knowledge and skill to assess and access learners in their classrooms who need additional academic support. This is in line with the ideals of transformational OBE and with those of inclusion.

### **2.3.1 Structural cognitive modifiability (SCM) and the mediated learning experience (MLE)**

Feuerstein’s approach to assessment rests on two pillars:

- ❖ the theory of structural cognitive modifiability (SCM);
- ❖ the mediated learning experience (MLE).

The basic assumptions of the SCM theory are that human beings are open systems, which are amenable to cognitive changes that affect their functioning.

Feuerstein's theory of SCM emphasises the 'importance of culture, the essential nature of belief and value systems, and the significant part played by mediators in the cognitive development of children and adults across their life time' (Burden, 1996:104).

Cognitive modifiability is best explained by the MLE theory. As such, cognitive development requires MLE (Haywood & Tzuriel, 1992:10).

*MLE refers to an interactional process in which adults, usually the parents, interpose themselves between children and the world to modify a set of stimuli by affecting their frequency, order, intensity and context. Mediators arouse in children vigilance, curiosity and sensitivity to the mediated stimuli, and create for and with the children temporal, spatial and cause-effect relationships among stimuli. Feuerstein et al. (1979, 1980, 1987, 1988) suggested 11 characteristics of MLE, however, only the first three are considered as necessary and sufficient for any interaction to be classified as a mediated interaction: intentionality and reciprocity, meaning and transcendence. (Haywood & Tzuriel, 1992:10)*

Using the proposed checklist will require an investment in attacking the cognitive deficiencies, poor learning habits and motivational patterns that are responsible for poor performance. This presupposes that the educator has the knowledge, commitment, dedication and intentionality to become involved in the process (Tzuriel & Feuerstein, 1992:187).

### **2.3.2 The cognitive map – a tool for assessment**

The cognitive map is central to Feuerstein's theory.

According to Burden (1996:106) 'the notion of a cognitive map, incorporating the notion of learning phases and allied to MLE, offers convenient and helpful heuristics.' The cognitive map gives the key elements that are involved in the successful completion of any mental act.

*The cognitive map represents a model in terms of which mental acts may be analysed according to seven parameters: content, operations, modality, phase, level of complexity, level of abstraction and level of efficiency. In our theoretical framework, the map, in conjunction with the inventory of deficient functions, explains cognitive behaviour by analysing its components, and locating and interpreting any weaknesses that may occur. Through a process-orientated approach, the cognitive map and repertoire of deficient functions enable a dynamic assessment of the child's functioning. (Feuerstein et al. 1980:113)*

According to Lidz (1991:17), 'using these dimensions enhances the assessor's ability to predict the generalizability of assessment results to the instructional situation.' Earlier Lidz (1987:444) had stated that 'it is therefore a prerequisite of a dynamic assessment to have a coherent notion of the cognitive functions expected to be involved in the solution of tasks selected for inclusion in the assessment, as well as a working list of possible deficiencies'. This same author attests that 'Feuerstein (1979, 1980) and his colleagues have provided the most explicit listing of such deficiencies, based on the input-elaboration-output model of the mental act' (Lidz, 1987 444).

### 2.3.2.1 The learning phases as part of the cognitive map

The idea of learning phases (input-elaboration-output) was introduced into the cognitive map. In approaching a cognitive task, 'individuals take in information (input), process this in an effective and efficient manner (elaboration) and express a solution that is appropriate to the demands of the situation' (Burden, 1996:106). Individuals with learning difficulties may demonstrate problems in any learning phase, for example at the input (does not take in all the relevant information or acts impulsively); elaboration (does not apply appropriate strategies) and/or output phase (cannot formulate thoughts in comprehensible language).

Feuerstein et al. (1980) conceive of deficient functions as being a product of a lack of, or insufficiency of, MLE, resulting in compromised cognitive performance. 'The deficient functions relate to and help identify the prerequisites of thinking. In this sense, they refer to deficiencies in those functions that underlie internalised representational and operational thought and should not be confused with the operations or contents of thought ... The deficient functions provide a means for understanding and diagnosing the reasons for an individual's low manifest level of performance' (Feuerstein et al. 1980:71).

These deficient functions are presented in four categories (Feuerstein et al. 1980:73).

- ❖ Impairments in cognition at the input phase of the learning act.
- ❖ Impairments in cognition at the elaboration phase of the learning act.
- ❖ Impairments in cognition at the output phase of the learning act.
- ❖ Affective-motivational factors.

The following three tables are a visual representation of the learning phases (adapted from Feuerstein et al. 1979, 1980) on which the checklist is based:



**Table 2.2: The Input phase of the learning act**

<b>Cognitive function</b>	<b>INPUT</b>	<b>Cognitive dysfunction</b>
1. Clear	<b>Perception</b>	Blurred and sweeping
2. Systematic	<b>Exploration of a learning situation</b>	Impulsive
3. Precise and accurate	<b>Receptive verbal tools and concepts</b>	Impaired
4. Well developed	<b>Understanding of spatial concepts</b>	Impaired
5. Well developed	<b>Understanding of temporal concepts</b>	Impaired
6. Well developed	<b>Ability to conserve constancies</b>	Impaired
7. Precise and accurate	<b>Data gathering</b>	Impaired
8. Well developed	<b>Capacity to consider more than one source of information</b>	Impaired

**Table 2.3: The Elaboration phase of the learning act**

<b>Cognitive function</b>	<b>ELABORATION</b>	<b>Cognitive dysfunction</b>
1. Accurate	<b>Definition of the problem</b>	Inaccurate
2. Ability to	<b>Select relevant cues</b>	Impaired ability to
3. Ability to	<b>Engage in spontaneous comparative behaviour</b>	Inability to
4. Broad and wide	<b>Mental field</b>	Narrow and limited
5. Need for	<b>Spontaneous summative behaviour</b>	Impaired need for
6. Ability to	<b>Project virtual relationships</b>	Inability to
7. Need for	<b>Logical evidence</b>	Lack of need for
8. Ability to	<b>Internalise events</b>	Inability to
9. Ability to use	<b>Inferential-hypothetical thinking</b>	Restricted use of
10. Ability to use	<b>Strategies for hypothesis testing</b>	Impaired
11. Need for	<b>Planning behaviour</b>	Lack of
12. Adequate	<b>Elaboration of cognitive categories</b>	Impaired
13. Meaning	<b>Grasp of reality</b>	Episodic

**Table 2.4: The Output phase of the learning act**

<b>Cognitive function</b>	<b>OUTPUT</b>	<b>Cognitive dysfunction</b>
1. Mature	<b>Communication modalities</b>	Egocentric
2. Participatory	<b>Output responses</b>	Blocking
3. Worked through	<b>Output responses</b>	Trial and error
4. Adequate	<b>Expressive verbal tools</b>	Impaired
5. Precise and Accurate	<b>Data output</b>	Impaired
6. Accurate	<b>Visual transport</b>	Impaired
7. Appropriate	<b>Behaviour</b>	Impulsive/Acting-out

(Adapted from Feuerstein et al. 1979; 1980.)

According to Feuerstein et al. (1980), deficiencies of input and output do not impair the learners' functioning to the same extent, as do deficiencies in the elaboration phase. Thus input and output are peripheral determinants of the cognitive processes, in contrast to the elaboration phase which has a more central position and is more essential for proper cognitive functioning. Elaboration is believed to determine our cognitive behaviour. Even with impairments in the input and output phases, if the learner is able to elaborate, he or she can bypass the barriers in these phases. (One only needs to think of Helen Keller in this regard.)

Haywood and Tzurriel (1992) state that deficiencies in these phases of the mental act serve as a guideline for observation and mediational efforts. 'Identification of

deficient cognitive functions, the level of their modifiability and the mediation required to change them are considered to be of critical importance for prescription of future learning' (Haywood & Tzuriel, 1992:12).

According to these authors, the compilation of a profile gleaned from this assessment 'would specify change in deficient cognitive functions; specific content areas and operations; non-intellective components (motivation, feeling of competence and the degree of efficiency across the assessed functions' (Haywood & Tzuriel, 1992:15).

This is reiterated in Feuerstein et al. (1987) where it is explicitly stated that the cognitive map permits location of the deficient functions, which are analysed during the process-orientated assessment.

In the present study, the educators used the cognitive map in an attempt to pinpoint deficient cognitive functions. Therein lies the development of the cognitive checklist as proposed in this study project.

Sewell (1987:437), in summing up, states that 'a cognitive map ... clearly delineates the potentially deficient functions within three phases of mental activity: input, elaboration and output. It is within the established seven parameters of the cognitive map that the cognitive tasks are organised. The sensitivity of this process to environmental, motivational and cognitive problems is a decisive factor in making this assessment process an alternative for testing the culturally different child.'

This would be a further compelling reason for the inclusion of this type of assessment in the present study project.

## **2.4 GUIDELINES USED FOR THE CONSTRUCTION OF A CHECKLIST AS A TEACHING TOOL**

This researcher has been immersed in the practice of education for the past twenty-seven years in primary education, specialised education (mentally disabled), as a remedial therapist and latterly as a mainstream teacher in an inclusive Middle School. She not only teaches Grade 9 English, but was also instrumental in establishing the school's Learning Centre which serves the specialised educational needs of about 12% of the student body. In this capacity, she works collaboratively with a Learning Team and liaises with other professionals. As part of these professionals' evaluations, she has been exposed to the completion of checklists for many years and has long perceived a need for a checklist to assess cognitive skills. The researcher's years of practical experience helped her to identify those aspects which would help to make the checklist user-friendly and easily implementable.

In devising the present checklist, the researcher wanted to make it explicit that the checklist would serve as a teaching tool for educators. Thus the researcher, from years of experience, decided to express the entire checklist in a positive form as this would be what the educator would be looking for and striving towards. The checklist would provide the educator with a blueprint of what to aspire to.

The checklist is an example of a criterion-referenced test which measures mastery of very specific objectives. It informs how well a task can be done. It should thus tell the educator exactly what a learner can or cannot do. (Woolfolk, 1998:522)

Gultig, Lubisi, Parker & Wedekind (1998:50-57) state that in order to develop criterion-referenced test, a developer must have access to task information on

- ❖ required skills and knowledges;
- ❖ necessary performances that must be accomplished;
- ❖ criteria associated with each performance that is identified;
- ❖ conditions under which each performance must be accomplished.

These authors further state that the test development process involves the establishment of performance objectives for each appropriate task. The features of adequate objectives are that they:

- ❖ are involved with only one concept per objective;
- ❖ are specific in terms of their primary intent;
- ❖ include indicators of the necessary performance(s) which are direct and readily achievable;
- ❖ are specified in precise, operational terms.

#### **2.4.1 Characteristics of ideal checklists**

According to Baine (1996:21-24), the characteristics of ideal checklists are that:

- ❖ behaviours are defined in terms of observable, measurable indicators;
- ❖ the checklist item should describe the variety of conditions under which the learner is eventually expected to perform;
- ❖ the conditions described in the checklist item should describe the most difficult, commonly found conditions and the most common range of conditions. Instruction would be inadequate if it did not prepare a learner under the most difficult, commonly found conditions;
- ❖ the item should specify the minimum, acceptable standards of performance by which to judge the behaviour;
- ❖ the performance should be described in the form of observable, measurable verbs;
- ❖ checklist items should state explicit standards of performance that can be used to determine if the learner has acquired the minimum, essential skills necessary to prevent failure at a subsequent level of instruction

and/or to perform in an acceptable manner in situations in which performance of the skill is usually required;

- ❖ there must be a compromise between an item that is very long and precise – and unlikely to be used – and a concise item, lacking detail;
- ❖ a well-written item should describe the essential information to permit those people who are most likely to use the checklist to test and teach essentially the same skills.

#### **2.4.2 Characteristics of checklists as research instruments**

According to the Baine (1996:14), the validity (extent to which the test measures what it is being used to measure) and reliability (the consistency with which the test measures whatever it measures) of an instrument is enhanced when the observations recorded are clearly defined.

This author further states that assessment instruments used in educational programming should measure a learner's current level of functioning so that the educator will know where to begin instruction and have items sequenced hierarchically so that the educator will know what to teach next.

Brown (1986:2-3) states further that the instrument should assess functional tasks required in contemporary and future environments in which the learners are likely to be required to perform. Ideally too, the instrument should assess function rather than form. Function focuses on the purpose the behaviour is supposed to serve and form refers to the specific act. The form approach overlooks the possibility that there may be many ways to accomplish the same outcome. The instrument should further provide a fine-grained task analysis of the skills being assessed.

### **2.4.3 Organisational framework for assessing cognitive skills**

Royer, Cisero, & Carlo (1993:207-208) provide an organisational framework for categorising techniques in assessing cognitive skills. These are:

- ❖ knowledge organization and structure which can provide indices of skill development;
- ❖ depth of problem representation which refers to the ability to perceive the principles underlying the problem, rather than focusing on the surface structure of the problem;
- ❖ quality of mental abstraction which refers to the learner's ability to imagine the operation of systems within the domain. The presence and sophistication of these systems are other ways of assessing skill development within the domain;
- ❖ efficiency of procedures which refers to the ability to utilise efficiently those skills that have been acquired. This is another index of growing skills' development;
- ❖ automaticity of performance refers to the ability to handle many aspects of performance in an automatic and nearly load-free manner, thereby leaving a certain amount of cognitive capacity available for performing other activities (eg. integrating information, planning etc.). The ability to perform tasks in a automatic and capacity-free manner is yet another index of skilled performance;
- ❖ metacognitive skills for learning refer to the ability of the individual to reflect on and to control performance in a useful and efficient manner. Skilled performers in this domain have the capability of planning their activity, monitoring the success or failure and altering behaviour in accordance with the monitoring activity.



#### **2.4.4 Standards of assessment quality**

McCown et al (1996:502-503) have provided a comprehensive list of standards of assessment quality that support the teaching-learning process. Standards of assessment quality include the fact that there should be:

- ❖ clear and appropriate goals;
- ❖ transparency as to the purpose of the assessment;
- ❖ a match between the method of the assessment and the goal;
- ❖ sufficient and representative sample of items that measure what students have to learn;
- ❖ control over sources of extraneous interference.

Sometimes a checklist is compiled which gives explicit descriptions of all the different concrete behaviours which should be regarded as indicators of the dependent variable. These behaviours should be mutually exclusive (a particular behaviour should fall into one category only) and exhaustive (together they should provide for all the possible forms of behaviour which qualify as indicators of the particular dependent variable). (Sudman & Bradburn, 1982)

Observers act as raters of behaviour as they have to decide if a particular behaviour falls within a particular category. Interrater reliability may be improved by carefully defining the dependent variable and by properly training observers in advance about the specific, concrete behaviours which should be regarded as indicators of the dependent variable. Specifically, observers should be careful that fatigue or over-confidence does not negatively influence the quality of their rating. Therefore, the less the observer is expected to evaluate or interpret whether or not a particular behaviour is indicative of the dependent variable, the better the chances of obtaining a satisfactory interrater reliability. Raters need to ignore, and not be influenced by, any behaviours which are not listed on the checklist.

This underscores the importance of the pilot study, which should have identified all the specific, concrete behaviours, which should have qualified for inclusion on the checklist. (Huysamen, 1994:140-142.)

Van der Horst & McDonald (1997), stress that evaluation is not merely quantitative, but is qualitative. Therefore a rating scale is generally used with a checklist. 'Rating scales are measurement instruments that are especially helpful in judging skills, procedures and personal and social behaviour' (Van der Horst & McDonald, 1997:191). They are used to judge the frequency of an occurrence of some behaviour or the quality of some performance. Scales may be represented by numbers (e.g. 5-1) or by attributive adjectives (e.g. excellent-poor) on a continuum.

Although there are limitations, these methods of assessment are sources of corroborative information that may be useful if the data are used in conjunction with other sources of evidence and if the limitations of the methods are taken into consideration when interpreting the data.

## **2.5 SUMMARY AND CONCLUSION**

The literature study has thus served to provide a contextualisation and theoretical rationale for the proposed cognitive checklist. This researcher has used Feuerstein's theory precisely for its complexity and comprehensive nature, as well as its applicability and relevance to the South African context and the new educational dispensation. The empiricism is not an issue for the cognitive checklist which is proposed.

The present checklist has used the theory in practical, implementable and user-friendly ways in order to promote authentic assessment.

## **CHAPTER 3**

### **PILOT STUDY AND FINDINGS**

The purpose of this chapter is to present the pilot study which was carried out to refine the checklist for educators, which should be practical, user-friendly, easily implementable and which should not require lengthy and expensive training. The pilot study results will be presented in the refined form as the 'Checklist to Assess Cognitive (thinking) Skills' in Chapter 4.

#### **3.1 RESEARCH METHOD**

##### **3.1.1 Research design**

The researcher used basic research which is grounded firmly in the experimental method, and has as its goal the creation of new knowledge about how fundamental processes work. Basic research is, in many ways, a 'relatively protected research' which allows the researcher to build facts and theory incrementally in an environment generally of low stress and few outside influences or interruptions' (Hedrick, Bickman & Rog, 1993:1).

The distinguishing feature of basic research is that it is intended to expand knowledge by identifying universal principles that contribute to our understanding of how the world operates. The environment of applied research however, differs substantially from the environment of basic research.

Table 3.1 visually demonstrates the difference between a basic research design and an applied research design:

**Table 3.1: The differences between a basic research design and an applied research design**

<b>CATEGORY</b>	<b>BASIC RESEARCH</b>	<b>APPLIED RESEARCH</b>
<b>PURPOSE</b>	Develop universal knowledge	Understand/address problems
	Answer single questions	Answer multiple questions
	Discover statistically significant relationships or effects	Discover practically significant relationships or effects
<b>CONTEXT</b>	Academic settings	Government, business, industrial
	Self initiated	Client initiated
	Solo researcher	Research team
	Lab or class	Field
	Flexible	Inflexible
	Single discipline	Multidisciplinary
	Low cost sensitivity	Higher cost sensitivity
	Funded by grants	Funded by contracts
	Less time pressure	More time pressure

(Adapted from Hedrick, Bickman & Rog, 1993:4-6.)

The first criterion of the research method is the selection of a research design, as 'the design serves as the architectural blueprint of the research design' (Hedrick, et al, 1993:38).

According to Hedrick et al. (1993:44-50), when the researcher selects a design, the following needs to be borne in mind, as the selection of a design affects:

- ❖ the credibility of the research. This refers to the validity of a study and whether the design is sufficiently sound to provide support for firm conclusions and recommendations;

- ❖ its usefulness. This refers to whether the design is targeted appropriately to answer the specific questions of interest;
- ❖ its feasibility. This refers to whether the research design and plan are reasonable given the requisite time and other resource constraints;
- ❖ design decisions. Knowing how precise an answer must be, is crucial.

Descriptive approaches, which are used in basic research, are appropriate when the researcher is attempting to answer “what is” or “what was” questions. Generally the information needs are to quantify some entity/entities. They are generally easy to implement and yield results in a fairly short space of time.

According to Huysamen (1994), whenever data collection instruments are used in a study, they should be a pilot-study in the planning phase. Piloting ensures that the instruments are designed optimally to capture all the required research information. Sometimes this involves changing the wording of a question or clarifying the coding instructions, so that the data collectors all follow consistent procedures. Sometimes, too, the pilot-study will indicate such significant problems that the entire instrument will need to be restructured or the choice of data collection approach rethought. (Huysamen, 1994:140-141)

### **3.1.2 Qualitative research**

The researcher used qualitative methods of research. ‘Quantitative research is based on observations that are converted into discrete units that can be compared to other units by using statistical analysis ... Qualitative research, on the other hand, generally examines people’s words and actions in narrative and descriptive ways, more closely representing the situation as experienced by the participants’ (Maykut & Morehouse, 1994:2). Qualitative research is based on a phenomenological position, while quantitative research is based on a positivist position. The difference between these two approaches is explained in Table 3.2:

**Table 3.2: The differences between a positivist and phenomenological position.**

<b>QUESTION</b>	<b>POSITIVIST</b>	<b>PHENOMENOLOGICAL</b>
How does the world work?	By dividing and studying reality in parts, the whole can be understood.	Reality can only be understood as socio-psychological constructions forming an interconnected whole.
What role do values play in understanding the world?	Values can be suspended in order to understand.	Values are embedded in the research and mediate and shape what is understood.
Are causal linkages possible?	Causality is central. Cause is the prime focus.	Events are mutually shaped. Multidirectional relationships can be discovered.
What is the possibility of generalization?	Explanations can be generalized from both time and place.	Tentative explanations for one time and place are possible.
What does research contribute to knowledge?	Seeks verification or proof of propositions.	Seeks to discover or uncover propositions.

(Adapted from Maykut & Morehouse, 1994:12.)

Qualitative methodology was used to interpret the structured checklist and questionnaire, as the number (10) of respondents was deemed too little for quantitative methodology.

The ten educators were given the checklist and the questionnaire and were asked to select one learner and rate them according to the criteria of the checklist. They were asked to hand in the checklist and questionnaire four days

later. They were told that it was a pilot-study and were specifically asked to be critical of the process and of the content of the checklist. They were alerted to the fact that they needed to respond to the attached questionnaire.

### **3.2 RESEARCH GROUP**

The researcher selected educators from a private, Middle School to participate in this research project. This was a purposively selected sample as regards convenience, especially accessibility. They were purposively selected for their perceived dedication and commitment to their practice. Purposive samples fall into the category of non-probability samples. 'Non-probability sampling is frequently used because of considerations of convenience and economy' (Huysamen, 1994:37).

The researcher has worked with these professionals for at least the past four years (some in excess of ten years) and has noted their professionalism, creativity and sheer passion for their career.

The researcher made a point of selecting one educator from each academic subject area offered at the school. This was thought to be important, especially as regards the implication of transfer of knowledge between subject areas and to ensure that the checklist was not subject specific.

### **3.3 RESEARCH INSTRUMENTS**

These were the structured checklist (Addendum 1) and the formal, structured questionnaire (Addendum 2).

### **3.4 RESEARCH PROCESS**

The empirical research process began with the pilot-study. Once this was designed and compiled by the researcher, it was critiqued and edited by Mrs Jane Avis, an experienced educator, editor and co-author of a series of Science text books. She acted as both consultant and editor of the checklist.

The educators were not trained in the completion of the checklist. They were asked on 23<sup>rd</sup> July, 2001 if they would be willing to take part in the research. Approximately one week later, on the 31<sup>st</sup> July, they were given the pilot-study (Addendum 1) and the questionnaire (Addendum 2).

They were asked to focus on one learner whose performance was of concern to them. Of interest was the fact that each of them spontaneously mentioned a learner as the researcher handed them the forms. They were told that the completed forms would be collected on 6<sup>th</sup> August.

### **3.5 RESEARCH FINDINGS**

The educators all completed the checklist and questionnaire on time and all said that it had been an enlightening experience.

All (10) of the educators found the checklist to be:

- ❖ clear,
- ❖ easily understood,
- ❖ easy to use,
- ❖ professionally helpful.

They unanimously found that, having completed the checklist, they were able to pinpoint in which phase of the learning process the learners' cognitive strengths and weaknesses lay.



All of the educators agreed that there was sufficient content in the checklist for them to be able to remediate areas of weakness or to alert those who could.

### **3.6 DISCUSSION OF RESEARCH FINDINGS**

The researcher had informal conversations with some of the educators when they returned the forms. The consensus was that they had enjoyed the process and were quite over-awed by their new-found knowledge of what encapsulates the learning process.

Although all the educators found the checklist easy to understand, some made suggestions which would increase clarity. These will be noted here and applied to the prototype in Chapter 4. The suggestions were:

- ❖ to reformulate questions which had the word 'not' in them;
- ❖ to separate those questions which were asking two things (goal-oriented/organized; and written/verbal tasks) into individual questions;
- ❖ to avoid repetition of categories;
- ❖ to be more subject specific.

The first point was not considered relevant, as only one educator found this. This was discussed in depth with the editorial consultant and was left as is, especially as it made perfect sense. The second point was rectified and applied to the refined checklist.

Regarding the repetition of categories which one educator noted. It needs to be noted that these repetitions are actually part of the theory that informs the checklist, i.e. some skills are important in more than one phase of the learning process.

Only two of the educators noted that a cognitive checklist may need to be more subject specific to address needs in specific learning. These comments were made by educators from specialised departments of Mathematics and Hebrew.

Examination of the specific sub-skills which these educators had marked as lacking in clarity, the researcher concluded that they were being quite literal in their judgments and were not extrapolating what they knew about the learner to a different context. For example, the Mathematics educator said two sub-skill categories in 'accurate data gathering' and 'ability to consider more than one source of information' in the Input phase of the learning process were not applicable to mathematics, specifically the sub-skills of researching and extracting information and gathering data from various sources.

In conversation with this educator, she realized that making meaning in mathematics was actually data gathering. She later understood that in the oral presentations that each learner does per term, these research skills are being used.

A further example quoted by this educator were that 'can summarise the text by finding main points' and 'can extract the moral of the story' in the Elaboration phase under the category of 'Ability To Select Relevant Cues' were not applicable to mathematics. In conversation with her, she realized that finding 'the moral' was the same as "making meaning". This same educator felt the learner could only 'learn large sections of work for tests' as he/she was "forced" to work through the revision programme, and thus did quite well. It needed to be pointed out that we were evaluating the cognitive skills only.

The Hebrew educator consistently marked the categories that had to do with concepts concerning: spatial, constancy, comparisons and communication, as not being applicable to Hebrew. In conversation with her it became apparent that she had not separated having the vocabulary from having the skill.

These concerns will be addressed in Chapter 5 when the shortcomings of the research are discussed.

It is interesting to note that the Afrikaans teacher, who is involved with the special needs programme of non-Afrikaans-speaking learners, had no such comments. I hypothesised that this has to do with her inherent understanding and ability to see a global picture, in addition to the fact that she works very closely with the school's Learning team.

These examples serve to show that the completed checklist needs to be evaluated very carefully in a collaborative manner with a trusted colleague. It also underscored to the researcher how literally some of the data was interpreted by two of the educators. This needs to be borne in mind when refining the prototype, and is further addressed in Chapter 5.

The educators found the checklist easy to use for the following reasons:

- ❖ the separate headings and three main divisions forced the educator to think about each category before attempting to respond to the checklist;
- ❖ the checklist focused various aspects of the learner's cognition, detailing most, if not all, of his/her capabilities;
- ❖ the checklist was detailed, yet all the components were concise;
- ❖ the checklist was set out in a very logical manner;
- ❖ the choice of wording for the rating scale was useful.

One educator noted that it was not easy to answer every question, as there were gaps in her knowledge of the learner's behaviour as the learner only has a fifty-minute lesson with her four times a week, in a class of twenty-five others. In conversation with her, she pointed out that she now knew which areas she needed to focus her attention, in order to 'know' him better.

One other educator noted that some areas were difficult to evaluate, as one cannot 'see' the skill.

The checklist was perceived as being helpful in that it:

- ❖ clarified the cognitive components inherent in the learning process;
- ❖ provided an opportunity to understand and evaluate the learner more objectively;
- ❖ forced educators to focus on the learners' specific strengths and weaknesses;
- ❖ provided a structure to examine the situation more carefully and systematically;
- ❖ made educators aware of the gravity of the learners' situation;
- ❖ encouraged the educators to take action and to find ways to 'reach' the learner;
- ❖ encouraged educators to speak to colleagues to check if the learner exhibited the same strengths/weaknesses in other subjects;
- ❖ made it possible for the educators to view the learner differently, by paying attention to his/her development;
- ❖ elucidated for the educators specifically what is needed for a learner to learn;
- ❖ reminded educators about the importance of skills to be acquired; particularly of data gathering, organization and structure of information;
- ❖ made them more empathetic towards the learner;
- ❖ motivated them to do something to help the learner achieve better, especially as they were aware of where the strengths/weaknesses lay.

In terms of using the knowledge gained to enhance teaching, the educators felt that completing the checklist would:

- ❖ make them focus on the learners' weaker components;
- ❖ allow them to take this knowledge into account regarding methodology, content and layout when working with this learner;

- ❖ alert them to the fact that learners learn differently and that they need to present their content differently;
- ❖ make them re-evaluate their practice;
- ❖ help them to re-evaluate the learner after specific and strategic input;
- ❖ make them conscious of individualising their teaching methods;
- ❖ allow them to use the knowledge they had gained for all learners;
- ❖ help them to create a detailed profile of the learner;
- ❖ confirm aspects of a learners' hypothesized cognition;
- ❖ give them ideas to use some of the questions in mark schemes and rubrics;
- ❖ make lesson plans more streamlined, in order to focus on the specific needs of a particular learner;
- ❖ be used in a strategic way to remediate the learner, using the identified areas of strength;
- ❖ motivate both the educator and the learner.

The educators' personal and professional comments about the checklist were most edifying and gratifying as they showed a deep level of self-reflection, especially as it highlighted for them how much they need to know their learners.

They came to the conclusion that when a lesson was presented, they tended to concentrate on the content being taught, rather than the learners' functioning and how much of the information they had grasped. They realised that 'having taught a good lesson', was no reflection of how well the content was grasped.

Most importantly, the checklist made them aware of what to look out for when teaching.

The pilot-study of the checklist thus achieved its objective of being a user-friendly and easily implementable tool to assess learners' cognitive skills.

## CHAPTER 4

### THE CHECKLIST TO ASSESS COGNITIVE (THINKING) SKILLS

#### 4.1 THEORETICAL RATIONALE OF THE CHECKLIST

The proposed cognitive checklist is based on the following summary of Feuerstein's theoretical design. (See Chapter 2 for details.)

Implicit in the theory are the concepts of structured cognitive modifiability (SCM) and the mediated learning experienced (MLE).

- ❖ SCM is based on the assumption that human beings have the capacity to modify their cognitive functions and adapt to life's changing demands. They are thus open systems which are amenable to cognitive changes.
- ❖ Feuerstein (1980) devised a list of deficient cognitive functions, at the input, elaboration and output phases of the mental act. These phases are part of a cognitive map.
- ❖ The cognitive map aids the categorization and definition of the components of the mental acts. 'The cognitive map is the basis for the analysis of the cognitive behaviour. The specific parameters of the map, or model, serve in analyzing the various components' (Feuerstein, 1980:105).
- ❖ The researcher has ensured that all parameters of the cognitive map are subsumed into the checklist. The parameters are:
  - ❖ content
  - ❖ operation
  - ❖ modality
  - ❖ phase in which the specific mental act takes place

- ❖ level of complexity
- ❖ level of an abstraction
- ❖ level of efficiency .

These serve as guidelines for observational and mediational efforts. The identification of the deficient cognitive function, the level of modifiability and the mediation required to change them are considered to be of vital importance to predicting future learning. This basic assumption shifts the responsibility for a person's modifiability from that individual to the educator.

#### **4.1.1 How the language was changed**

For the checklist to be user-friendly and easily accessible by educators, the components of the learning phases were clarified by changing the language and adding in examples.

##### **4.1.1.2 At the Input phase of the learning process**

- Perception → Perception (gathering information through the senses)
- Exploration of a learning situation → Approach to the learning situation
- Receptive verbal tools and concepts → Hearing and language
- Understanding of spatial concepts → Well developed understanding of spatial concepts
- Understanding of temporal concepts → Understands time
- Ability to conserve constancies → Understands that some things remain constant
- Data gathering → Accurate data gathering
- Capacity to consider more than one source of information → Ability to ...

##### **4.1.1.3 At the Elaboration phase of the learning process**

- Definition of the problem → Ability to define problem accurately
- Select relevant cues → Ability to select relevant cues

Engage in spontaneous comparative behaviour → Ability to compare  
Mental field → Can process a number of things simultaneously  
Spontaneous summative behaviour → Seeing the world in terms of numbers/  
quantity  
Project virtual relationships → Applies previously learned skills to new  
situation  
Logical evidence → Need for logical evidence  
Internalise events → Ability to internalize events  
Inferential – hypothetical thinking → Ability to think hypothetically  
Strategies for hypothesis testing → Uses strategies for hypothesis testing  
Planning behaviour → Sees need for planning behaviour  
Elaboration of cognitive categories → Uses language to aid thinking skills  
Grasp of reality → Meaningful grasp of reality

#### **4.1.1.4 At the Output phase of the learning process**

Communication modalities → Ability to communicate  
Output responses → Ability to persevere  
Output responses → Systematic working through of a task  
Expressive verbal tools → verbal expression  
Data output → Accurate representation of data  
Visual transport → visual memory  
Behaviour → Appropriate behaviour

#### **4.1.2 Sub-skill components**

Each component which made up the learning process in a particular phase had between 4-7 sub-skills listed under the particular heading. These were examples of the cognitive skills which one would expect to find under that particular category.



## **4.2 EMPIRICAL RATIONALE OF CHECKLIST**

Apart from the above, broad theoretical rationale, the proposed checklist was further based on the following summarized empirical findings. (See Chapter 3 for details.)

- ❖ The educators found that the shaded headings added clarity and gave them an appreciation of what comprises the thinking/learning process.
- ❖ The educators could appreciate the necessity of linking assessment to teaching.
- ❖ The educators had a comprehensive and in-depth analysis of the learners' cognitive strengths and weaknesses.
- ❖ Completion of the checklist forced them to examine their practice very carefully.
- ❖ The educators changed their methodology once they knew where the cognitive strengths and weaknesses were.
- ❖ If they could not remediate the weak area, they were able to alert someone who could.
- ❖ Completing the checklist thus increased the accuracy of their perceptions, and confirmed their hypotheses, of learners who needed referral.

## **4.3 A CHECKLIST TO ASSESS COGNITIVE (THINKING) SKILLS**

The proposed checklist follows. The introductory first page includes:

- ❖ background information;
- ❖ instructions;
- ❖ explanation of the rating scales.

## A CHECKLIST TO ASSESS COGNITIVE (THINKING) SKILLS

### Background Information

This checklist focuses on 3 phases of the learning process.

- ❖ The **Input** phase is the phase where information is gathered (by the senses) in order to do a task or solve a problem. If difficulties are experienced at this level, they will affect how the task is tackled at the Elaboration phase and how the final product is expressed/presented at the Output phase.
- ❖ During the **Elaboration** phase the information is processed. This is the phase where the 'actual work' is done and is the phase where the incoming information from the Input phase is sorted, organized, analysed and tested in order to arrive at an answer or product that can be expressed at the Output phase.
- ❖ The **Output** phase is where the information that was gathered in the Input phase and processed in the Elaboration phase, is communicated as an answer, solution or product. The quality of certain Output functions will vary with the accuracy and success of the Elaboration phase and the Input phase.

### Instructions

- ❖ To get optimal value from the application of the checklist, only apply it to learners with whom you are well acquainted.
- ❖ Always bear in mind the age-appropriateness of the abilities of the learner.

### Explanation of rating scale:

- **always** = occurs in every instance
- **mostly** = occurs with regularity
- **sometimes** = occurs in some situations, but not others
- **rarely** = very seldom in evidence
- **never** = not in evidence at all

**PLEASE TURN OVER**

### Input phase of the learning process

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<b>☐ Perception (gathering information through the senses)</b>					
• learner gathers information carefully and thoroughly (no guessing)					
• focuses on relevant details					
• learner's response is precise					
• can see the situation as a whole, not as separate units					
• can differentiate between relevant and irrelevant details					
• can use past experience to interpret new information meaningfully					
<b>☐ Approach To The Learning Situation</b>					
• is organised in approach to his/her work					
• is goal-oriented in approach to his/her work					
• can think through a task systematically and in an orderly manner					
• takes the time to gather and assess the information needed					
• can control own speed and precision when solving a problem					
• thinks carefully before responding					
• can integrate all aspects of the situation					
<b>☐ Hearing And Expressive Language</b>					
• can listen and interpret the spoken language accurately					
• uses comprehension skills to understand the situation					
• interprets instructions and questions accurately					
• uses language as a tool for reasoning and communicating in social interaction					
• has knowledge of vocabulary, grammar and sentence construction					
<b>☐ Well Developed Understanding Of Spatial Concepts</b>					
• can describe position and relationship between objects (e.g. uses 'top', 'out', 'in'.)					
• knows left from right					
• can plan and use space efficiently and appropriately					
• can understand/follow directions given to him/her					
• can place him/herself in relation to others or objects (the idea of personal space)					
<b>☐ Understands Time</b>					
• can understand the sequence and order of events					
• understands and plans timetables					
• can keep to schedules					
• uses time effectively					
• understands that actions/events have outcomes					
• can delay gratification (rewards/punishment)					
• understands how actions in the present will have consequences for the future					

**Input phase of the learning process (continued)**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<input type="checkbox"/> <b>Understands That Some Things Remain Constant</b>					
• understands conservation and reversibility (e.g. $3+2=5=4+1=5$ ; $3 \times 5=5 \times 3$ )					
• knows that concepts are the same, despite different presentation (e.g. $A=a$ )					
• understands that size, shape, quantity remains the same if position changes					
• can apply concept to different examples (e.g. graphs in maths and science)					
<input type="checkbox"/> <b>Accurate Data Gathering</b>					
• understands importance of being accurate when gathering data					
• ensures that data is clearly stated, detailed and accurate in presentation					
• can work well independently					
• can evaluate when data is missing or has been distorted					
• can research and extract information from a vast set of media (books, video)					
• checks that the copying (e.g. from board) is correct					
<input type="checkbox"/> <b>Ability To Consider More Than One Source Of Information</b>					
• can think about 2 or more sources of information together (e.g. X, Y axes in graphs)					
• knows to gather data from various sources (books, video, internet)					
• considers all the information needed to complete the task					
• is able to see an issue from differing points of view					
• can remember all the facts needed for completing the task					
• can put disjointed parts together to form a meaningful whole					
• can understand and accommodate differing opinions					

### Elaboration phase of the learning process

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<input type="checkbox"/> <b>Ability To Define Problem Accurately</b>					
• can identify a problem and describe it (able to see what task requirements are)					
• has good data gathering skills with respect to the specific assignment					
• demonstrates insight in assessing a situation					
• is curious about problems					
• is decisive in responding to a situation (can see what has to be done and does it)					
<input type="checkbox"/> <b>Ability To Select Relevant Cues</b>					
• can summarise a text by finding the main points					
• can define the goal of the task					
• can find points to substantiate an argument					
• can eliminate irrelevant alternatives (as in MCQ and in word sums)					
• can extract the moral of the story					
• can stick to the point in an argument, discussion or debate					
• can learn large sections of work for tests and exams					
<input type="checkbox"/> <b>Ability To Compare</b>					
• is decisive in decision-making (can weigh up pros and cons)					
• spontaneously searches for similarities/differences when approaching tasks					
• can compare two objects (mentioning their connection; not one at a time)					
• uses 'similar', 'like', 'unlike', 'different' in spoken language					
• takes note of individual differences and does not make sweeping generalisations					
<input type="checkbox"/> <b>Can Process A Number Of Things Simultaneously</b>					
• is able to think abstractly					
• can argue about possibilities, future outcomes, alternative approaches					
• can recall relevant information from past experience					
• can remember details of places visited, stories read and movies seen					
• has good short term memory recall - no difficulty in remembering bits of information recently stored					
• has good long term memory - no difficulty in retrieving information stored a while ago					
• remembers facts on an ongoing basis (does not need constant reminders/clues)					
• can link information from different sources of information into a meaningful whole					
<input type="checkbox"/> <b>Seeing The World In Terms Of Numbers/Quantity</b>					
• sees necessity for quantifying things (does not respond with 'lots', 'I don't know')					
• can quantify events, ideas and materials in order to compare, evaluate and put into perspective (concern with the 'how many' of things around him/her)					

**Elaboration phase of the learning process (continued)**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
• can apply number concepts					
• can summarise data and extract underlying concepts					
<input type="checkbox"/> <b>Applies Previously Learned Skills To New Information</b>					
• can apply previously learned rules to make new associations and insights					
• is active in class, applying 'old' information to 'new' to make it meaningful					
• does not experience 'new' information as isolated and separate from 'old'					
<input type="checkbox"/> <b>Need for Logical Evidence</b>					
• actively looks for explanations to problems					
• can argue logically to support his/her train of thought					
• can support judgments, arguments and responses with adequate explanation					
• does not display a passive 'so what' attitude in the face of problems					
• generally uses a consistent strategy in formulating opinions					
• responds rationally and in a mature way to situations					
• is not easily persuaded to adopt solutions of others, without thinking it through					
<input type="checkbox"/> <b>Ability To Internalise Events</b>					
• can build on experience or past learning					
• is able to solve problems in 'his/her head' (no concrete aids or sensorial input is needed)					
• has no difficulty completing tasks based on previously internalised processes (e.g. knowing that multiplication is also used for long division)					
<input type="checkbox"/> <b>Ability To Think Hypothetically</b>					
• can formulate a rule once given a number of examples					
• can link events and see similarities in order to make generalisations and inferences					
• engages in 'if...then' thinking in order to generate alternatives					
• can reflect back to similar past experience to generate possible solutions					
<input type="checkbox"/> <b>Uses Strategies For Hypothesis Testing</b>					
• when problem-solving, tries alternative methods rather than fixating on one					
• does not guess/estimate, but uses appropriate and systematic methods					
• uses systematic and efficient approaches in testing alternative hypotheses					
• can make suitable choices based on what it is not (i.e. in MCQ, if it is not 'a' or 'c', it must be 'b')					
<input type="checkbox"/> <b>Sees Need For Planning Behaviour</b>					
• is able to delay gratification to in order to plan and invest in the long term					
• constructs and follows a plan to achieve goals or solve problems					
• can identify the specific steps involved in following a plan					

**The elaboration phase of the learning process (continued)**

	<b>ALWAYS</b>	<b>MOSTLY</b>	<b>SOMETIMES</b>	<b>RARELY</b>	<b>NEVER</b>
<ul style="list-style-type: none"> <li>sees the need to plan (does not live in the 'here and now', only solving immediate problems)</li> </ul>					
<b>☐ Uses Language To Aid Thinking Skills</b>					
<ul style="list-style-type: none"> <li>when solving a problem, is able to explain precisely what is being done</li> </ul>					
<ul style="list-style-type: none"> <li>is able to discover, name and verbalise ideas</li> </ul>					
<ul style="list-style-type: none"> <li>can express him/herself and 'think through' approach to tasks in a systematic way</li> </ul>					
<ul style="list-style-type: none"> <li>can explain concepts in depth (good expressive vocabulary)</li> </ul>					
<ul style="list-style-type: none"> <li>is able to apply a rule to a more difficult example</li> </ul>					
<b>☐ Meaningful Grasp Of Reality</b>					
<ul style="list-style-type: none"> <li>has a good understanding of how things are related/connected in his/her world</li> </ul>					
<ul style="list-style-type: none"> <li>does not see things as isolated and episodic (sees relationships)</li> </ul>					
<ul style="list-style-type: none"> <li>can anticipate and predict consequences ('if...then')</li> </ul>					
<ul style="list-style-type: none"> <li>can see implications of an action</li> </ul>					
<ul style="list-style-type: none"> <li>controls urge to react impulsively when he/she has a setback</li> </ul>					

**Output phase of the learning process**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<b>Ability to Communicate</b>					
• written answers are clear, precise and easily understood					
• verbal answers are clear, precise and easily understood					
• can see things from others' point of view (empathic and flexible)					
• communicates effectively on an interpersonal level when explaining viewpoints					
• listens and takes into account, the perspective of another					
• is sensitive to others' needs and responds appropriately					
• can work well in a group					
<b>Ability to Persevere</b>					
• is prepared to try again, despite previous failure					
• perseveres with difficult or unfamiliar tasks					
• can initiate a different approach/strategy when previous was unsuccessful					
• shows good motivation in solving new problems					
• shows esteem and confidence when confronted with a challenging task					
<b>Systematic Working Through Of A Task</b>					
• thinks/plans an answer carefully (not trial and error)					
• works logically and rationally through a problem					
• shows no tendency to repeat errors (i.e. learns from mistakes)					
• can learn in an unstructured learning environment					
• can impose order on what may first appear to be chaotic (bombardment of ideas)					
• can establish a goal and devise a strategy to reach it					
• when has a strategy, will stick to it					
<b>Verbal Expression</b>					
• can communicate answers clearly and effectively (precise vocabulary and language)					
• has the words to say what is meant					
• can describe the process of what is being done in a precise manner					
• selects correct words to give clear and precise descriptions of what is said					
• can use creative and descriptive language					
<b>Accurate Representation Of Data</b>					
• task is detailed and accurate (not full of careless errors and inadequate detail)					
• does not omit/distort the details/data of the collected facts					
• presents material in a meaningful way					
• responses are relevant and appropriate					
• shows a thorough grasp of the assignment/topic that was tackled					



**Output phase of the learning process (continued)**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<input type="checkbox"/> <b>Visual Memory</b>					
• can reproduce visual information (from board, etc)					
• correct/accurate reproductions of original stimuli (copies picture correctly)					
• focuses on relevant information with sufficient detail (copies word/sum correctly from board)					
• good visual memory (able to carry an image in his/her head)					
<input type="checkbox"/> <b>Appropriate Behaviour</b>					
• answers and actions are planned and controlled (thinks before acting)					
• understands that the right answer is better than a fast answer					
• uses systematic investigational strategies (not trial and error)					
• works through all incoming information carefully and systematically					
• does not manifest inappropriate behaviour (clowning, shouting out)					
• both verbal and written responses are correct (no discrepancy between the two)					
• verbal responses are thought out and appropriate					

(Adapted and compiled by CD Coosner from Feuerstein et al. 1979; 1988 and Skuy (Ed), 1991.)

## CHAPTER 5

### SUMMARY OF FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

#### 5.1 FINDINGS AND CONCLUSIONS

The findings and conclusions of this research are as follows:

- ❖ The checklist provides the much-needed link between assessment and intervention, and gives a comprehensive description of learners in the process of learning.
- ❖ The vital link between, and paradigm shift towards, the importance of linking assessment with instruction, has been made.
- ❖ The educators found that completing the checklist increased the accuracy (and confirmed their hypotheses) of identification of learners who needed referral for more comprehensive assessment or who needed more input from them.
- ❖ The checklist helped them to differentiate learners who needed more practice from those who demonstrated more significant learning difficulties.
- ❖ It forced them to examine their practice very carefully and made them aware of what went into the learning process.
- ❖ The educators found that they could use the checklist on an ongoing basis to monitor the learners' response to their special programming efforts.

- ❖ This checklist provided an in-depth and comprehensive analysis of the learners' cognitive strengths and weaknesses. Although none of the respondents commented on its length or the time it took to fill out, one respondent did request a summary form, which could be applied to all learners at some time during the year. This comment goes directly to the consideration of brevity and/or detail and how deep or superficial the checklist should be.
- ❖ The educators found it valuable to focus on the processes that underlie learning and performance. Educators felt it provided a foundation for performance mastery.
- ❖ The educators seemed to move with ease from a judgmental role to a developmental role.
- ❖ Completing the checklist certainly enhanced and enriched the educators' knowledge and encouraged teaching and learning among educators, especially as they compared how the same learner performed in different subject areas.
- ❖ If the educator did not feel competent to do an identified intervention, they could alert another professional who could.
- ❖ As the checklist provided a positive summary of all the cognitive skills required for the learning process, educators were aware of the exact skills which the learner still needed to acquire.
- ❖ Completion of the checklist had encouraged the educators to work more collaboratively and appeared to open channels of communication.

## 5.2 EDUCATIONAL IMPLICATIONS AND RECOMMENDATIONS

One of the main challenges of assessment is to be sure that the information derived is worth the investment required to get it and that the information will be used in such a way as to result in educational and other benefits to the learner.

The educational implications and recommendations of this research are as follows:

- ❖ The checklist alerted the educators to the fact that some learners needed cognitive intervention and remediation.
- ❖ Educators developed a better understanding that cognition is to be viewed on a continuum. The learner thus was not seen as having either 'all or nothing' of the skills required for the learning process.
- ❖ A further implication of knowing what skills underlie the learning process, was that the classroom could be transformed into a laboratory of learning.
- ❖ Understanding and having knowledge of what the learner needs to acquire in order to learn effectively, can lead to maximising learning potential. Obviously, educators would not even bother completing the checklist if they were uninterested in the learner's progress and development.
- ❖ This should help learners to understand and apply cognitive processing concepts and, if used judiciously, could be a motivational factor in all learning situations.
- ❖ Cognitive strategies thus also serve a metacognitive function as they enable learners to organise and monitor their cognitive processes.

- ❖ Once educators know how a learner learns, they can generate specific, individualised prescriptions which will directly address the learner's needs.
- ❖ Thus using the results of the checklist dynamically in the class can positively affect the quality of instruction the learner receives.
- ❖ Educators should therefore also use the checklist dynamically to monitor the learners' growth and the efficacy of their intervention.
- ❖ Using the checklist dynamically will also give educators valuable information about the learners' responsiveness to opportunities to learn new strategies and concepts, as well as providing appropriate teaching activities for individual learners.
- ❖ The results of the assessment can also result in a shift in the conceptualisation of the locus of failure, from the learner to the instructional technique. This is especially evident when the learner displays learning potential in some areas/subjects, but not in others. This is an important first step towards changing the focus of the educational assessment and the delivery system.
- ❖ The educator can identify and mediate effective alternatives in terms of learning styles and strategies. Learners are encouraged to use these tactics and strategies elsewhere, with informed support. The involvement and commitment of the educator is crucial as an ongoing log of successful and unsuccessful attempts to modify styles and strategies needs to be kept. Burden (1992: 106) sees assessment 'as a form of empowerment rather than enslavement'. The researcher of this study project applauds this notion and envisages that by using the proposed checklist, educators will empower both themselves and the learners.

- ❖ It would further benefit the learner if a caring, supportive educator mediates the checklist to him/her, in a spirit of sensitivity and optimism, so that he/she could rise to the challenge. This should be done with a blank checklist first, so that the learner understands the parameters of the checklist.
- ❖ To carry this point even further, and taking the above mediation into account, it could be very valuable for learners (depending on their insight and reflective ability) to evaluate themselves and then discuss the evaluation fully.
- ❖ The checklist could be used in consultation with both learners and parents, to communicate the learners' areas of strength and weakness.
- ❖ Another major implication is the early identification of 'at risk' learners and the provision of intervention strategies, once the educator knows where the cognitive dysfunction is located.

### **5.3 SHORTCOMINGS OF THE STUDY**

The following are some of the evident shortcomings of the study:

- ❖ Although the purposefully selected sample size was small (10), it generated productive and crucial information. In order for this checklist to be accessible to all, it should be piloted amongst a bigger, more representative sample of educators.
- ❖ A major shortcoming was that each respondent should have been formally interviewed, once they had completed the checklist and questionnaire. The researcher was fortunate that, as these respondents took the task so seriously, they wrote up their experiences with the checklist and

questionnaire very fully. The researcher had some informal feedback, but more structure would have been appreciated, both by the researcher and the educators.

- ❖ This lack of communication was especially evident as one of the educators had picked up that there were “repetitions” of sub-skills in the different learning phases. This was not a repetition *per se*, but simply the fact that some of the same skills are used again in the different learning phases. It would have been beneficial for us to discuss this.
- ❖ It would have been a good idea to have had a ‘round-table conference’ with all the respondents so that they could have pooled their experiences and collaborated more. Each assessment, thus, was quite subject specific as the researcher had ensured that each educator was responsible for the teaching of a different subject in the school. It would have been worthwhile to understand how that specific learner achieved in other subjects.
- ❖ Two respondents wrote that 6 (in Hebrew) and 9 (in Mathematics) of the sub-skill components (there are 150 of these) were not applicable to their subject. It was only in conversation with them that they realised how literal they were being and that, in fact, the components were applicable. Obviously though, the perceived lack of subject specificity by two of the educators is a shortcoming which will need to be solved.
- ❖ The idea of a ‘not applicable’ column in the rating scale was something that the supervisor had queried, and would obviously have been used by the above-mentioned two respondents. For the purpose of the pilot-study, the researcher still feels strongly that not having this option ‘forced’ the educators to explain themselves, rather than just ticking a column. As these respondents only accounted for two of the of the total sample size

of ten educators, and their queries only accounted for 10% of the sub-skill components (150), the researcher would rather look to reformulating these sub-skills, than putting in a 'not applicable' column.

- ❖ The checklist does not sufficiently distinguish between efficiency, of using the repertoire of information and skills, and the capacity to do so. This is seen as a source of error in this checklist and in assessment as a whole. A confusion of capacity/efficiency could result in faulty labelling and thus an erroneous prognosis could be made, based on the observed low level of efficiency.

#### **5.4 RECOMMENDATIONS FOR FURTHER RESEARCH**

The following research recommendations flow from the study:

- ❖ In order for this study project to be meaningful within the South African context, it needs to be piloted with a representative sample of educators.
- ❖ Further research would also reveal if components could be subsumed into one another in order to make the checklist shorter.
- ❖ The rating scales could be converted to a number scale. Scores falling below a certain number would alert the educator to the level of risk the learner faced.
- ❖ There could be a total score for each phase of the learning process and a range showing where, on a continuum of the learning process, the learner was placed.
- ❖ This checklist could be augmented by a list of activities which could enhance each of the components of the particular learning phase.



- ❖ The effectiveness of any assessment should be examined for a variety of subject populations, particularly with those for whom traditional measures are of limited value. The assessment would have to be culture-free and preferably non-verbal.
  
- ❖ Researchers need to look at the extent to which assessment measures can predict performance in classroom tasks, learning in a classroom environment and learning in response to interventions generated by the assessment. This needs to be done under laboratory conditions.
  
- ❖ Another aspect to investigate is the extent to which the learner transferred newly acquired skills to other activities and to what extent these strategies were spontaneously applied in novel situations.

## **5.5 CLOSING PERSPECTIVE**

It is this researcher's belief that OBE can only be carried out successfully in an environment where the educator has embraced a transformatory paradigm regarding learning and assessment, and has committed him/herself to the principles of lifelong learning and being a reflective practitioner.

Within this paradigm it will be vital to access and assess how learners learn in order to make their educational experience the richest it can be.

It is hoped that this checklist will aid the educator to understand and develop those processes which will help to maximize each learner's potential.

The researcher is convinced that a further refined checklist of cognitive skills is a vital component in an educators' repertoire of assessment techniques.

'Efforts to relate theories of cognitive functioning to actual task solution tend to involve two approaches: first, the determination of basic, prerequisite cognitive functions and second, determination of differences between successful and unsuccessful problem-solvers' (Lidz, 1987:444).

It is believed that the checklist that has been designed as a part of this study fulfills both these functions in a user-friendly and easily implementable manner.

## REFERENCES

Askew, S. & Carnell, E. (1998). Transforming learning: Individual and global change. London: Cassel.

Assessment in an outcomes-based education and training system: An overview. SAQA Bulletin. 2 (3), January, 1999.

Baine, D. (1996). Guide to assessment and instruction. Canada: Vector.

Brown, F. (January, 1986). Functional assessment. Tash Newsletter, pp 2-3.

Burden, R. (1996). Meaningful questions or meaningful answers: Worthwhile assessment in a changing world. In Engelbrecht, P., Kriegler, S. & Booysen, M.I. (Eds). Perspectives on learning difficulties. International concerns and South African realities. Pretoria: J L van Schaik.

Cilliers, C.D. (1999). Educational psychology (cognitive education). Stellenbosch: National Private Colleges.

Cilliers, C.D., Park, T., & Thiar, D. (1999). The need for and relevance of cognitive education in the new millennium: A South African perspective. International Journal of Special Education.

Coosner, C.D. (1999). Dynamic assessment – a practical strategy for school educators. University of Stellenbosch: Unpublished study project.

Department of Education. (July 2001). Education white paper 6. Pretoria: Department of Education.

Engelbrecht, P., Green, L., Naicker, S., & Engelbrecht, L. (Eds). (1999). Inclusive education in action in South Africa. Pretoria: JL van Schaik.

Engelbrecht, P. (1997). Discussion Document: Task group 4 NCSNET/NCESS. Identification and assessment in South Africa: A research report. Stellenbosch: The University of Stellenbosch.

Feuerstein, R., Rand, Y., & Hoffman, M.B. (1979). The dynamic assessment of retarded performers. The learning potential device, theory, instruments and techniques. Baltimore: University Park Press.

Feuerstein, R., in collaboration with Rand, Y., Hoffmann, M.B. & Miller, R. (1980). Instrumental Enrichment. An intervention program for cognitive modifiability. Baltimore: University Park Press.

Feuerstein, R., Rand, Y., Jensen, M.R., Kaniel, S. & Tzuriel, D. (1987). Prerequisites for assessment of learning potential. The LPAD model. In Schneider Lidz, C. (Ed.). Dynamic assessment. An interactional approach to evaluating learning potential. New York: The Guilford Press.

Government Gazette no 16312. (1995). The white paper on education and training. Pretoria: Government Printers.

Gultig, J., Lubisi, C., parker, B., & Wedekind, V. (Eds). (1998). Understanding outcomes-based education. Teaching and assessment in South Africa. Cape Town: Oxford University Press.

Hanekom, A., Rossouw, W., & Engelbrecht, P. (1999). Evaluation 144. Braamfontein: College publications.

Haywood, H.C. & Tzuriel, D. (Eds). (1992). Interactive assessment. New York: Springer-Verlag.

Hedrick, T.E., Bickman, L. & Rog, D.J. (1993). Applied research design. A practical guide. London: Sage.

Herman et al. 1992. In Department of Education. (1997). Outcomes-based education in South Africa: background information for educators.

Huysamen, G.K. (1994). Methodology for the social and behavioural sciences. Johannesburg: International Thomson Publishing.

Jones, R.W. (1995). Performance and alternative assessment techniques. In Engelbrecht, P. (1997). Identification and assessment in SA: A research report. Stellenbosch: University of Stellenbosch.

Kriegler, S.M. & Skuy, M. (1996). Perspectives on psychological assessment in South African schools. In Engelbrecht, P., Kriegler, S.M., & Booyen, M.I. (Eds). Perspectives on learning difficulties: international concerns and South African realities. Pretoria: Van Schaik.

Lidz, C. & Greenberg, K.H. (1997). Criterion validity of a group dynamic assessment procedure with rural 1<sup>st</sup> grade regular education students. Journal of Cognitive Education (1997). 6 (2) pp 89-99.

Lidz, C.S. (1991). Practitioner's guide to dynamic assessment. New York: The Guilford Press.

Lidz, C. (1987). Cognitive deficiencies revisited. In Lidz, C. (Ed.). (1987). Dynamic assessment. An interactional approach to evaluating learning potential. New York: The Guilford Press.

Maykut, P. & Morehouse, R. (1994). Beginning qualitative research. London: The Falmer Press.

McCown, R., Driscoll, M., & Roop, P.G. (1996). Educational psychology: A learning-centered approach to classroom practice (2<sup>nd</sup> edition). Boston: Allyn and Bacon.

Meadows, S. (1993). The child as thinker: The development and acquisition of cognition in childhood. London: Routledge.

Naicker, S.M. (1999). Curriculum 2005. A space for all. An introduction to inclusive education. Cape Town: Renaissance.

Naicker, S. (1995). The need for a radical restructuring of specialised education in South Africa. British Journal of Special Education, 22 (4), pp 152-154.

National Commission on Special Needs in Education and Training (NCSNET) and the National Committee on Education Support Services (NCESS). (1997). Quality education for all. Overcoming barriers to learning and development. Pretoria: Department of Education.

Park, T. & Cilliers, C.D. (1998). The teaching of thinking in a post-apartheid South African education system. International Journal of Special Education, 13 (1), pp 46-59.

Poplin, M.S. (1998). Holistic/constructivist principles in the teaching/learning process: Implications for the field of learning disabilities. Journal of learning disabilities. August/September 1988: 21 (7) pp 401-415.

Royer, J.M., Cisero, C.A. & Carlo, M.S. (1993). Techniques and procedures for assessing cognitive skills. Review of educational research. Summer 1993, 63 (2), pp 201-243.

Schneider Lidz, C. (1987). Cognitive deficiencies revisited. In Schneider Lidz, C. (Ed.). Dynamic assessment. An interactional approach to evaluating potential. New York: The Guilford Press.

Sewell, T. (1987). Dynamic assessment as a nondiscriminatory procedure. In Schneider Lidz, C. (Ed.). Dynamic assessment. An interactional approach to evaluating learning potential. New York: The Guilford Press.

Skuy, M. (Ed.) (1991). Cognitive functions and dysfunctions. University of Witwatersrand: Cognitive Research Programme.

Sudman, S. & Bradburn, N.M. (1982). Asking questions: A practical guide to questionnaire design. California: Jossey-Bass.

Tilstone, C., Lacey, P., Porter, J., & Robertson, C. (2000). Pupils with learning difficulties in mainstream schools. London: David Fulton Publishers.

The Concise Oxford Dictionary (Sixth Edition), (1976). Oxford: The Clarendon Press.

Tzuriel, D. & Feuerstein, R. (1992). Dynamic group assessment for prescriptive teaching: Differential effects of treatment. In Haywood, H.C. & Tzuriel, D. (Eds). Interactive assessment. New York: Springer-Verlag.

Tzuriel, D. & Haywood, H.C. (1992). The development of interactive-dynamic approaches to assessment of learning potential. In Haywood, H.C. & Tzuriel, D. (Eds). Interactive assessment. New York: Springer-Verlag.

Van der Horst, H. & McDonald, R. (1997). Outcomes-based education: A teacher's manual. Pretoria: Kagiso.

WCED assessment guidelines for C2005, (Support), (1998).

Woolfolk, A. (1998). Educational psychology (7<sup>th</sup> edition). Boston: Allyn and Bacon.

## ADDENDUM 1

### PILOT STUDY OF THE CHECKLIST TO ASSESS COGNITIVE (THINKING) SKILLS

#### Background Information

This checklist focuses on 3 phases of the learning process.

- ❖ The **Input** phase is the phase where information is gathered (by the senses) in order to do a task or solve a problem. If difficulties are experienced at this level, it will affect how the task is tackled at the Elaboration phase and how the final product is expressed/presented at the Output phase.
- ❖ During the **Elaboration** phase the information is processed. This is the phase where the 'actual work' is done and is the phase where the incoming information from the Input phase is sorted, organized, analysed and tested in order to arrive at an answer or product that can be expressed at the Output phase.
- ❖ The **Output** phase is where the information that was gathered in the Input phase and was processed in the Elaboration phase, is communicated as an answer, solution or product. The quality of certain Output functions will vary with the accuracy and success of the Elaboration phase and the Input phase.

#### Instructions

- ❖ To get optimal value from the application of the checklist, only apply it to learners with whom you are well acquainted.
- ❖ Bear in mind the age-appropriateness of the abilities of the learner.

#### Explanation of rating scale:

- **always** = occurs in every instance
- **mostly** = occurs with regularity
- **sometimes** = occurs in some situations, but not others
- **rarely** = very seldom in evidence
- **never** = not in evidence at all

**PLEASE TURN OVER**



### Input phase of the learning process

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<b>□ Perception (gathering information through the senses)</b>					
• learner gathers information carefully & thoroughly (no guessing)					
• focuses on relevant details					
• learner's response is precise					
• can see the situation as a whole, not as separate units					
• can differentiate between relevant & irrelevant details					
• can use past experience to interpret new information meaningfully					
<b>□ Approach To The Learning Situation</b>					
• is organised & goal oriented in approach to work					
• can think through a task systematically & in an orderly manner					
• takes the time to gather & assess the information needed					
• can control own speed & precision when solving a problem					
• thinks carefully before responding					
• can integrate all aspects of the situation					
<b>□ Hearing And Expressive Language</b>					
• can listen & interpret the spoken language accurately					
• the learner's comprehension skills aid the understanding of the situation					
• interprets instructions & questions accurately					
• uses language as a tool for reasoning & communicating in social interaction					
• has knowledge of vocabulary, grammar and sentence construction					
<b>□ Well Developed Understanding Of Spatial Concepts</b>					
• can describe position & relationship between objects (e.g. uses 'top', 'out', 'in'.)					
• knows left from right					
• can plan & use space efficiently & appropriately					
• can understand/follow directions given to him/her					
• can place him/herself in relation to others or objects (the idea of personal space)					
<b>□ Understands Time</b>					
• can understand the sequence & order of events					
• understands & plans timetables					
• can keep to schedules					
• uses time effectively					
• understands that actions/events have outcomes					
• can delay gratification (rewards/punishment)					
• understands how actions in the present will have consequences for the future					

**Input phase of the learning process (continued)**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<input type="checkbox"/> <b>Understands That Some Things Remain Constant</b>					
• understands conservation & reversibility (e.g. $3+2=5=4+1=5$ ; $3 \times 5=5 \times 3$ )					
• knows that concepts are the same, despite different presentation (e.g. $A=a$ )					
• understands that size, shape, quantity remains the same if position changes					
• can apply concept to different examples (e.g. graphs in maths & science)					
<input type="checkbox"/> <b>Accurate Data Gathering</b>					
• understands importance of being accurate when gathering data					
• the learner sees that data is clearly stated, detailed & accurate in presentation					
• can work well independently					
• can evaluate when data is missing or has been distorted					
• can research & extract information from a vast set of media (books, video)					
• checks that the copying (e.g. from board) is correct					
<input type="checkbox"/> <b>Ability To Consider More Than One Source Of Information</b>					
• can think about 2 or more sources of information together (e.g. X, Y axes in graphs)					
• knows to gather data from various sources (books, video, internet)					
• considers all the information needed to complete the task					
• is able to see an issue from differing points of view					
• can remember all the facts needed for completing the task					
• can put disjointed parts together to form a meaningful whole					
• can understand & accommodate differing opinions					

### Elaboration phase of the learning process

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<input type="checkbox"/> <b>Ability To Define Problem Accurately</b>					
• can identify a problem & describe it (able to see what task requirements are)					
• has good data gathering skills					
• demonstrates insight in assessing a situation					
• is curious about problems					
• is decisive in responding to a situation (can see what has to be done and does it)					
<input type="checkbox"/> <b>Ability To Select Relevant Cues</b>					
• can summarise a text by finding the main points					
• can define the goal of the task					
• can find points to substantiate an argument					
• can eliminate irrelevant alternatives (as in MCQ and in word sums)					
• can extract the moral of the story					
• can stick to the point in an argument, discussion or debate					
• can learn large sections of work for tests & exams					
<input type="checkbox"/> <b>Ability To Compare</b>					
• is decisive in decision-making (can weigh up pros & cons)					
• spontaneously searches for similarities/differences when approaching tasks					
• can compare two objects (mentioning their connection; not one at a time)					
• uses 'similar', 'like', 'unlike', 'different' in spoken language					
• takes note of individual differences & does not make sweeping generalisations					
<input type="checkbox"/> <b>Can Process A Number Of Things Simultaneously</b>					
• is able to think abstractly					
• can argue about possibilities, future outcomes, alternative approaches					
• can recall relevant information from past experience					
• can remember details of places visited, stories read and movies seen					
• has good short term memory recall - no difficulty in remembering bits of information recently stored					
• has good long term memory - no difficulty in retrieving information stored a while ago					
• remembers facts on an ongoing basis (does not need constant reminders/clues)					
• can link information from different sources of information into a meaningful whole					
<input type="checkbox"/> <b>Seeing The World In Terms Of Numbers/Quantity</b>					
• sees necessity for quantifying things (does not respond with 'lots', 'I don't know')					
• can quantify events, ideas & materials in order to compare, evaluate & put into perspective (concern with the 'how many' of things around him/her)					

**Elaboration phase of the learning process (continued)**

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
• can apply number concepts					
• can summarise data & extract underlying concepts					
<b><input type="checkbox"/> Applies Previously Learned Skills To New Information</b>					
• can apply previously learned rules to make new associations & insights					
• is active in class, applying 'old' information to 'new' to make it meaningful					
• does not experience 'new' information as isolated & separate from 'old'					
<b><input type="checkbox"/> Need for Logical Evidence</b>					
• actively looks for explanations to problems					
• can argue logically to support his/her train of thought					
• can support judgments, arguments and responses with adequate explanation					
• does not display a passive 'so what' attitude in the face of problems					
• generally uses a consistent strategy in formulating opinions					
• responds rationally & in a mature way to situations					
• is not easily persuaded to adopt solutions of others, without thinking it through					
<b><input type="checkbox"/> Ability To Internalise Events</b>					
• can build on experience or past learning					
• is able to solve problems in 'his/her head' (no concrete aids or sensorial input is needed)					
• has no difficulty completing tasks based on previously internalised processes (e.g. knowing that multiplication is also used for long division)					
<b><input type="checkbox"/> Ability To Think Hypothetically</b>					
• can formulate a rule once given a number of examples					
• can link events & see similarities in order to make generalisations & inferences					
• engages in 'if.....then' thinking in order to generate alternatives					
• can reflect back to similar past experience to generate possible solutions					
<b><input type="checkbox"/> Uses Strategies For Hypothesis Testing</b>					
• when problem-solving, tries alternative methods rather than fixating on one					
• does not guess/estimate, but uses appropriate & systematic methods					
• uses systematic & efficient approaches in testing alternative hypotheses					
• can make suitable choices based on what it is not (i.e. in MCQ, if it is not 'a' or 'c', it must be 'b')					
<b><input type="checkbox"/> Sees Need For Planning Behaviour</b>					
• is able to delay gratification to in order to plan & invest in the long term					
• constructs & follows a plan to achieve goals or solve problems					
• can identify the specific steps involved in following a plan					

**Elaboration phase of the learning process (continued)**

	<b>ALWAYS</b>	<b>MOSTLY</b>	<b>SOMETIMES</b>	<b>RARELY</b>	<b>NEVER</b>
<ul style="list-style-type: none"> <li>• sees the need to plan (does not live in the 'here &amp; now', only solving immediate problems)</li> </ul>					
<b><input type="checkbox"/> Uses Language To Aid Thinking Skills</b>					
<ul style="list-style-type: none"> <li>• when solving a problem, is able to explain precisely what is being done</li> </ul>					
<ul style="list-style-type: none"> <li>• is able to discover, name &amp; verbalise ideas</li> </ul>					
<ul style="list-style-type: none"> <li>• can express him/herself &amp; 'think through' approach to tasks in a systematic way</li> </ul>					
<ul style="list-style-type: none"> <li>• can explain concepts in depth (good expressive vocabulary)</li> </ul>					
<ul style="list-style-type: none"> <li>• is able to apply a rule to a more difficult example</li> </ul>					
<b><input type="checkbox"/> Meaningful Grasp Of Reality</b>					
<ul style="list-style-type: none"> <li>• has a good understanding of how things are related/connected in his/her world</li> </ul>					
<ul style="list-style-type: none"> <li>• does not see things as isolated &amp; episodic (sees relationships)</li> </ul>					
<ul style="list-style-type: none"> <li>• can anticipate &amp; predict consequences ('if...then')</li> </ul>					
<ul style="list-style-type: none"> <li>• can see implications of an action</li> </ul>					
<ul style="list-style-type: none"> <li>• controls urge to react impulsively when he/she has a setback</li> </ul>					

## Output phase of the learning process

	ALWAYS	MOSTLY	SOMETIMES	RARELY	NEVER
<b>Ability to Communicate</b>					
• written & verbal answers are clear, precise and easily understood					
• can see things from others' point of view (empathic & flexible)					
• communicates effectively on an interpersonal level when explaining viewpoints					
• listens & takes into account, the perspective of another					
• is sensitive to others' needs and responds appropriately					
• can work well in a group					
<b>Ability to Persevere</b>					
• is prepared to try again, despite previous failure					
• perseveres with difficult or unfamiliar tasks					
• can initiate a different approach/strategy when previous was unsuccessful					
• shows good motivation in solving new problems					
• shows esteem & confidence when confronted with a challenging task					
<b>Systematic Working Through Of A Task</b>					
• thinks/plans an answer carefully (not trial & error)					
• works logically & rationally through a problem					
• shows no tendency to repeat errors (i.e. learns from mistakes)					
• can learn in an unstructured learning environment					
• can impose order on what may first appear to be chaotic (bombardment of ideas)					
• can establish a goal and devise a strategy to reach it					
• when has a strategy, will stick to it					
<b>Verbal Expression</b>					
• can communicate answers clearly & effectively (precise vocabulary & language)					
• has the words to say what is meant					
• can describe the process of what is being done in a precise manner					
• selects correct words to give clear & precise descriptions of what is said					
• can use creative & descriptive language					
<b>Accurate Representation Of Data</b>					
• task is detailed & accurate (not full of careless errors & inadequate detail)					
• does not omit/distort the details/data of the collected facts					
• presents material in a meaningful way					
• responses are relevant & appropriate					
• shows a thorough grasp of the assignment/topic that was tackled					

**Output phase of the learning process (continued)**

	<b>ALWAYS</b>	<b>MOSTLY</b>	<b>SOMETIMES</b>	<b>RARELY</b>	<b>NEVER</b>
<b>☐ Visual Memory</b>					
• can reproduce visual information (from board, etc)					
• correct/accurate reproductions of original stimuli (copies picture correctly)					
• focuses on relevant information with sufficient detail (copies word/sum correctly from board)					
• good visual memory (able to carry an image in his/her head)					
<b>☐ Appropriate Behaviour</b>					
• answers & actions are planned & controlled (thinks before acting)					
• understands that the right answer is better than a fast answer					
• uses systematic investigational strategies (not trial & error)					
• works through all incoming information carefully & systematically					
• does not manifest inappropriate behaviour (clowning, shouting out)					
• both verbal & written responses are correct (no discrepancy between the two)					
• verbal responses are thought out & appropriate					

(Adapted and compiled by CD Coosner from Feuerstein et al. 1979; 1980 and Skuy (Ed), 1991.)

## ADDENDUM 2

### QUESTIONNAIRE ON YOUR EXPERIENCES WITH THE CHECKLIST TO ASSESS COGNITIVE SKILLS

1. Is the checklist clear? 

Yes	No
-----	----
  
2. Is the checklist easily understood? 

Yes	No
-----	----
  
3. Please mark any unclear questions in red on the checklist. Please make suggestions to increase clarity in the space provided below.  

---

---

---

---

---

---

---

---
  
4. Is the checklist easy to use? 

Yes	No
-----	----
  
5. Please clarify your answer to question 4  

---

---

---

---

---

---

---

---
  
6. Has completing this checklist been professionally helpful to you? 

Yes	No
-----	----
  
7. In what ways was it helpful/not helpful?  

---

---

---

---

---

---

---

---
  
8. After having completed this checklist, is it clear to you where the learners' cognitive strengths and weaknesses are? 

Yes	No
-----	----



9. Is there sufficient content in the checklist for you to be able to remediate these areas of weakness or alert others who can? (i.e. knowing what he/she cannot do).

Yes	No
-----	----

10 How can you use the knowledge you have gained, through completing the checklist, to enhance your teaching?

---

---

---

---

---

---

11 Other personal and professional comments about the checklist would be appreciated.

---

---

---

---

---

---

---

---

---

---

---

---

All responses will remain confidential.  
Many thanks for your contribution and time.