# DEMOCRATISING INTELLIGENCE TOWARDS LIFE-LONG LEARNING: A PRACTICAL STRATEGY FOR PRIMARY SCHOOL EDUCATORS IN SOUTH AFRICA

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# **DECLARATION**

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

Date:  ............29...October...1999

# SUMMARY

In post apartheid South Africa, the democratic government has prioritised the provision of an effective education for all South African children. This is envisioned as an education system whereby learners are empowered and encouraged to take responsibility for their own learning. Such a system would seek to promote analytical, creative and practical thinking, which is anticipated to create an inner drive and an ongoing desire towards new knowledge.

One of the great challenges facing the new South Africa is finding employment for all its people, a vital component of ensuring economic resiliency. Increasingly, young learners demand that schools equip them for the job market, and hence the re-evaluation and restructuring of the education process.

The purpose of this study is to research how democratising intelligence may lead a way for learners towards life-long learning. This has far reaching implications for the economic wellbeing of South Africa, its educators, learners and society at large.

The following are the main findings of the study:

- Educators and Learners need to make a paradigm shift towards viewing themselves as active participants of the education process.

- All role-players in education will need to, amongst others, understand the theories of Gardner and Sternberg, in order to gain an understanding of how these theories lead to their cognitive development and a sharing of a common vision towards becoming a life-long learner.

- By educators superimposing the Triarchic Theory and the Theory of Multiple Intelligences, learners are able to develop their intelligences, facilitating their growth towards life-long learning.

- Educators will need ongoing direction and support in carrying out the practical strategies needed to implement the theories of both Gardner and Sternberg, in addition to those of the new outcomes-based education process.

# SAMEVATTING

In post-apartheid Suid-Afrika het die demokratiese regering die voorsiening van doeltreffende opvoeding vir alle Suid-Afrikaanse kinders as 'n prioriteit gestel. Dit word gesien as 'n opvoedingstelsel waardeur leerders in staat gestel word en aangemoedig word om self verantwoordelikheid te aanvaar vir wat hulle leer. So 'n stelsel sal poog om analitiese, kreatiwe en praktiese denke te bevorder, wat na verwagting 'n innerlike dryfkrag en voortdurende begeerte na nuwe kennis sal skep.

Een van die groot uitdagings wat die nuwe Suid-Afrika in die gesig staar is om werk te vind vir al die mense, wat 'n lewensbelangrike komponent vir die versekering van ekonomiese lewenskragtigheid is. Jong leerders dring toenemend daarop aan dat skole hulle vir die arbeidsmark moet voorberei, al dus die herevaluering en herstrukturering van die opvoedingsproses.

Die doel van hierdie studie is om ondersoek in te stel na hoe die demokratisering van intelligensie leerders op die weg na lewenslange leer kan lei. Dit het verreikende implikasies vir die ekonomiese welstand van Suid-Afrika sowel as vir die opvoeders, die leerders en die breë gemeenskap.

Die hoofbevindings van hierdie studie is as volg:

- Opvoeders en leerders moet 'n paradigma-verskuiwing maak om hulleself as aktiewe deelnemers aan die opvoedingsproses te beskou.

- Elkeen wat 'n rol in opvoeding speel, sal die teorieë van Gardner en Sternberg, onder andere, moet kan verstaan om 'n begrip te verkry van hoe hierdie teorieë tot hulle kognitiewe ontwikkeling lei en hoe hulle deel kan hê in 'n algemene visie om lewenslange leerders te word.

- Die superponering van die Triargiese Teorie en die Teorie van Meervoudige Intelligensie deur opvoeders, stel leerders in staat om hul intelligensie te ontwikkel en fasiliteer hulle groei tot lewenslange leer.

- Opvoeders sal voortgesette leiding en ondersteuning benodig vir die uitvoering van die praktiese strategieë wat nodig is om die teorieë van beide Gardner en Sternberg, tesame met die van die nuwe uitkoms-gebaseerde opvoedingsproses, te implementeer.

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# CHAPTER ONE

## Orientation and Statement of the Problem

## 1.1.   Introduction, motivation for and relevance of the proposed research

The researcher has been involved in primary education for several years, having taught both in the mainstream and in special education. During this time it became progressively evident that mainstream learners were not being adequately equipped to deal with "real life" challenges.  For the most part they were unable to transfer or apply the knowledge learned at school into daily life and much of the content taught and problems presented, were isolated and distinct from the context of the learners' experience.

A general lack of intrinsic motivation for learning appeared wide spread, reflected in learners apparently being solely dependent on educators for their learning. The researcher did, however, note that when content and problems were taught in context, facilitating learners to experience the relevance of their learning, they became more enthusiastic about learning.

While completing her B.Ed degree, the researcher gained further insight into the role and purpose of cognitive education. This, in turn, led to the belief that a primary reason for the lack of life-long learning could be attributed to learners not being adequately equipped with appropriate skills, which would empower them to become independent learners.

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The M.Ed degree in Educational Psychology lead to further questioning, particularly scrutinizing the notion of intelligence (specifically Sternberg's Triarchic Theory) and Gardner's view of Multiple Intelligences. The researcher then began speculating whether the process of democratising intelligence could not be utilized as a vehicle towards life-long learning.

In an attempt to explicate and consider the purpose of education, the researcher noted a spectrum of definitions and notions proposed by various bodies of research. Perkins (1992:7) is of the belief that there are three goals for education; namely retention, understanding and the active use of knowledge, in order to bring about thoughtful learning. Freier (1985:xxiv) also emphasises that education should represent a form of action, whereby both action and critical reflection is seen to be a fundamental part of a social project, that not only engages forms of oppression but also develops a deep and abiding faith in the struggle to humanise life itself.

Rogers (1969:4&105) highlights the need for material to be of personal value to the learner and that the ultimate aim of education should be the facilitation of learning. He is of the belief that learning should be seen as a process. Akin to Rogers, Botha (1996:229) describes education as a process by which learners are supported, guided and influenced, in order to reach higher levels of maturity and general functioning within a specific cultural context.

Extracted from this body of research, a common perception appears to be that education should set about teaching learners how to learn, as opposed to simply absorbing knowledge. This practice should recognise both the process and the

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product, which in turn encourages the learner to be actively involved in their own learning, becoming proactive, independent and self-motivated.

Historically, education in South Africa has been based on conservative, authoritarian values, which in turn encouraged authoritarian teaching styles. This has been characterised by an emphasis on rote learning and memorizing of prescribed material, on teaching rather than learning. This pervasive pattern of educating has resulted in passive learning, which in turn has culminated in learners becoming disempowered. Learners, having been given information, have experienced great difficulty in transforming it into meaningful knowledge and in applying it effectively. This painful process often leads to resentment and a sense of failure, rather than the acquisition of an intrinsic drive and desire for new knowledge, and these feelings have continued into adult life, inhibiting continuing learning and growth (Longworth & Davis, 1996:39; Naudé & van der Westhuizen, 1996:160; Drucker, 1990:238; Freier, 1983:58,68).

A tangible result of historical apartheid policies in South Africa is the unfortunate legacy of a broad majority of teachers not being adequately qualified. In turn, this has led to teachers feeling disempowered, of having been caught up in an education system that was essentially disempowering. They have become the implementers of the curriculum, rather than its contributing creators. Both learners and teachers took on passive roles within the system. In the words of Paolo Freier (1983:24), "the oppressed, who have adapted to the structure of domination in which they are immersed, and have become resigned to it, are inhibited from waging the struggle for freedom so long as they are incapable of running the risks it requires" (Naudé & van der Westhuizen, 1996:159).

Since 1995 South Africa has been in the process of constructing a new curriculum (Curriculum 2005, April 1997; White Paper of Education and Training, March 1995) in an attempt to reduce the disparity in education. Greater emphasis has been placed on learners to become active and to take responsibility for their learning and for educators to become action researchers in order to facilitate the process of learning.

As a country, South Africa is still in the throes of transition. The newly entrenched political democracy and freedom must also manifest itself in all facets of life and learning. If one looks at education, both internationally and domestically, focus has been on content, rather than on skills which allow self-direction and empowerment (Drucker, 1990:224&225).

Due to our world undergoing constant change, content taught today is highly likely to be obsolete tomorrow. Placed against this framework, it is therefore of paramount importance that learners are empowered with the knowledge of "teaching how to learn," rather than teaching a limited and obsolete "fixed content" (Dreyden & Vos,1994:100; Drucker,1990:228; Fisher,1990:vii).

South Africa is part of a global economy, and it requires us to be able to compete with other countries for a share of the world market. It is therefore imperative that the new political democracy should translate into an economic wellbeing and resilience. The demand is for young school leavers to be equipped to mount a sound challenge in the job market. To this end, education and training should contribute to and be regarded as, a life-long evolution and process.

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One of the fundamental approaches towards life-long learning is to empower learners, by revealing to them that intelligence is not a fixed notion or concept. In substantiation of this statement, the science of learnable intelligence has shown that we can grow intelligence, therefore creating a platform for perpetual expansion (Jensen, 1998:15; Feuerstein et al,1980:9; Vygotsky,1978:88&89).

## 1.2. Research problem

The research problem flows directly from the above statements:

Although the government and the educational authorities of South Africa realise

the relevance of life-long learning, as reflected in curriculum 2005, at present there

is no explicit strategy available to deliberately democratise intelligence towards

life-long learning.

## 1.3. Research objective

The objective of the proposed research is to develop a practical strategy for educators, which would lead to democratising intelligence towards life-long learning in South African primary schools.

## 1.4. Definitions of the relevant terms

### 1.4.1 Democratising intelligence

The purpose of this study is not to define the term intelligence, although this will be dealt with briefly in chapter two. It is rather to focus on the term **democratising intelligence**. This term is used to link up with the ideas of, amongst others, Freier

(1983:13), who encourages all learners to deal critically and creatively with reality and to participate in the transformation of their world; and Machado (1980:9), who states: "Life is essentially dynamic. Man is different from animals, because of what he can become not because of what he is". Based on the aforementioned, and for the purpose of this study, democratising intelligence is defined as empowering learners with the realisation that they have unlimited potential and equipping them with the skills to operationalise this potential. It is to create the realisation that they are free to manage their own mental functioning by recognising and using their cognitive strengths and weaknesses in order to develop their own unique potential.

## 1.4.2 Life-long learning

The Collins Concise Dictionary defines "life-long" and "learning" separately as follows: life-long meaning to last a lifetime, and learning meaning to gain knowledge of, or skill in something, by study, experience, or being taught; or to become aware of something by receiving information or observing it; it could mean to commit to memory; it also means to receive instruction (Collins Concise Dictionary, 1990:277& 281).

When combining these two definitions, the outcome would require that whatever knowledge and skills are gained, and in whatever way they are gained, it must ensure that they are to last throughout ones lifetime.

In addition, life-long learning has been described by researchers in a variety of ways:

Pan (1997:35) defines life-long learning as "the habit of continuously learning

throughout ones life, a mode of behavior. It is intrinsic, demand orientated and heavily dependent on learner motivation and ability".

Longworth and Davies (1996:21-23) further define life-long learning as: "the development of human potential through a continuous supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetime and to apply them with confidence, creativity and enjoyment in all roles, circumstances and environments".

Mezirow (1995:126&126) suggests that the task of educators is to help learners critically examine and reflect on their sources and the consequences of their own perspectives and interpretations. He further proposes that, whereas it may appear that some learners are inherently incapable of becoming critically reflective, their capacity to think in this way, could be enhanced through teaching.

The National Qualifications Framework (NQF), the new approach to education and training in South Africa, sees life-long learning as providing opportunities for one to learn regardless of age, circumstances and the level of education and training one may have previously had. It allows the individual to learn in an ongoing manner (Isaacman, 1996:6).

Based on the above, and for the purpose of this study, a life-long learner is defined as being a self-directed, independent learner, a critical, creative and reflective thinker, who is able to make sense of everyday experience and to apply knowledge previously acquired.

### 1.4.3  A practical strategy

For the purpose of this study, the practical strategy will look at a strategic planning framework,  illustrating what is needed in order to successfully implement Sternberg and Gardner's theories into primary schools, so that education may promote life-long learning.

This integrated planning process, as described by Below et al  (Morrisey, 1995:47; Below, Morrisey & Acomb, 1987:5) has been used successfully in the corporate environment and the researcher has thus chosen to use this model as a guide for implementing the proposed education plan.

The model is divided into three components; the Strategic Plan addresses the 'what', the Operational Plan deals with the 'how' and the Result Management Plan monitors the on-going assessment to ensure the direct outcome. According to Below (Below, Morrisey & Acomb, 1987:5), many organisations have attempted to do strategic and operational planning simultaneously - however, this approach has been found to be less successful.

Based on the above, the term practical strategy will focus on the first component of the Below, Morrisey, Acomb model, namely the Strategic Plan.

### 1.4.4  Primary School

In South African schools, primary school education begins at grade one, with

learners turning seven years of age in their grade one year and having an exit point at the end of grade seven.

## 1.5. Research design

### 1.5.1 Nature of research

The research to follow is a literature study, focusing on the concepts and strategies required to facilitate democracy of intelligence, towards life-long learning, (vide pp 11-33).

### 1.5.2 Research method

In order to realise the earlier objective, an extended literature study will be undertaken, covering the following facets:

- The definition of life-long learning will be discussed in greater depth, together with paradigm shifts needed.

- The definition of intelligence, as postulated by three rival theories, will be discussed.

- The function of the human brain will be discussed briefly, with specific reference made to democratising intelligence.

- The Triarchic Theory of Intelligence and the theory of Multiple Intelligences will be discussed separately and then superimposed, to show how these theories can contribute towards the requirements of life-long learning as referred to previously in this study.

### 1.5.3  Structure of presentation

**Chapter Two**: (vide pp 11-33) Literature study on democratising intelligence

towards life-long learning.

**Chapter Three**: (vide pp 34-49) A practical strategy for primary school educators

in South Africa.

**Chapter Four**: (vide pp 50-54) Conclusions, shortcomings and recommendations.

# CHAPTER TWO

## Literature Study on Democratising Intelligence Towards Life-long Learning

## 2.1. Introduction

In this chapter the researcher will discuss both the concept of life-long learning, as defined for the purpose of this study, together with the necessary paradigm shifts needed in order for this to come about. The researcher will further discuss the debates surrounding the notion of intelligence and the current understanding of how the cultivation of human intelligence would facilitate individuals becoming better learners.

Subsequently, the theories of Robert Sternberg and Howard Gardner will be discussed, first as two separate theories and then as an integrated theory. Both theories challenge the conventional models of schooling and the traditional views of intelligence - both seek to promote the democracy of intelligence towards life-long learning.

## 2.2.    Role players essential to a paradigm shift

As discussed in chapter one (vide p 3), the old South African education system has left educators and learners with the belief that they are passive transmitters and receptors of knowledge. A shift within this belief framework would need to take place in order for each individual to begin to recognise their role and contribution

towards the realisation of life-long learning.

Butler and Hope (1995:13) suggest two principles that could help individuals begin to bridge the mental gap, namely by valuing oneself and recognising that one is able to change. The researcher suggests that these two principles be seen as practical building blocks on which learners and educators can base their new approach towards themselves as learners and their role as educators, in order to begin the paradigm shift towards one of life-long learning.

Educators need to be assisted in order to see and be shown how, they can make a difference both within the classroom and within the system. They need to recognise that as change agents they can challenge learners to become questioning, critical, independent, self-motivated learners (Naudé & van der Westhuizen, 1996:164; Hester, 1994:vii; Freier, 1983:53).

In the words of Paulo Freier: "It is only the oppressed who, by freeing themselves, can free their oppressors".  If teachers feel valued and empowered, learners will surely reflect this in their learning and both the reality of educator and student will be able to shift in order for them to become proactive agents - "Liberating education can change our understanding of reality. But this is not the same as changing reality itself" (Freier & Shor, 1987:175;  Freier, 1983:42).

Learners too, need to develop a belief in themselves and to take comfort in the knowledge that they are not a mere reflection of their IQ score.
Machado (1980:16) points out: "whenever man is involved, no process is irreversible, he can make and remake his own destiny."

They need to value their capacity to think, and that this can be developed in order to facilitate the growth of intelligence (Sternberg, 1996:19&20; Dryden & Vos, 1994:273; Fisher, 1990:vi,vii & ix).

## 2.3.    Definition of life-long learning

Once both educators and learners understand their new role, the notion of life-long learning, as defined in chapter one (vide pp 6&7), and as discussed in greater depth here, will become clearer.

### 2.3.1  Self-directed, independent learners

Being a self-directed learner implies that learners take responsibility for managing their own learning through self initiation, knowing the direction in which to proceed in search of knowledge, knowing which strategies to use once it is found, as opposed to waiting on others to direct their learning (McNair, 1996:237&238; Montieth, 1996:208; Sternberg, 1996:251-254).

Independent not only implies that learners are able to move forward on their own, holding their own views and insights, but in addition, that they tend to exhibit independent thinking.

For independent life-long learning, learners need to develop an inquiring mind that will prompt them to question and research, as well as processing skills which will enable them to synthesise, evaluate, adapt and apply the knowledge they acquire (Pan, 1997:38; Machado, 1980:23).

Brookfield (1985:29,38&39) suggests that the role of educators in promoting self-

directed learning, is to help learners become aware of cultural contradictions, to build confidence, to examine action alternatives, to anticipate consequences and assess relevant experiences - in addition to fostering participation.  However, he also adds that not every educator, in every situation, can assume responsibility for learning, but that they have a responsibility to respect the individual learner's real needs.

Self-directed independent learners demonstrate a sense of self, which enables them to make decisions and take corresponding action. These processes can be instilled at a very early age.

Wasserman (1990:9-12) describes three conditions which establish the growing ground for empowered children, over and above the provision of physical and emotional nurturance. Firstly, learners should be given opportunities to exercise their own choices - a process which communicates respect for their right to function independently, as a separate person. Secondly, opportunities need to be created which actively engage learners in challenging tasks, and finally, there should always be opportunities for creative and investigative play.

## 2.3.2  Critical, creative thinkers

Thinking critically and creatively are important characteristics of a productive society, emphasising that individuals are capable of being innovative and not merely repeating old patterns. Critical thinking is an active process, whereby assumptions are identified and challenged. This means that the importance of contextual awareness must be acknowledged. In addition, it implies exploring and imagining alternatives and recognising that alternatives to current ways of thinking

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exist. Sternberg points out that there is a lack of congruency between what is required for critical thinking in adulthood and what is taught in school programs intended to develop critical thinking (Hester, 1994:vii; Brookfield, 1987:15-23; Sternberg, 1985:194).

Learners using metacognitive activities (knowing how you know things and the processes by which you think) are encouraged to examine not only the process of critical thinking, but also to discover the role of socio-cultural and individual subjectivity within the thinking process (Hester, 1994:35; Fisher, 1990:120).

Brookfield (1987:x) states that thinking critically and reflecting on the assumptions underlying one's own and others' ideas and actions and contemplating alternative ways of thinking and living, are some of the most important ways in which we progress to adulthood.

Thinking creatively differs from critical thinking in that the latter seeks to assess worth in something which exists, whilst creative thinking seeks to generate something original or innovative. Gardner defines a creative individual as one who regularly solves problems or defines new questions in a domain accepted in a particular cultural setting (Hester, 1994:13&38; Gardner, 1993:35; Beyer, 1987:58).

### 2.3.3  Reflective thinkers

The concept of reflective thinking is closely related to critical thinking.

Reflection implies turning experience into learning and is the process whereby ideas are brought to the consciousness  - in order that a learner may recapture his

or her experience, think about it and evaluate it. Reflection therefore requires taking time to deliberate.

Sternberg (1988:72) stated that intelligence is not defined by speed alone, as many IQ subtests require, but rather knowing when to be quick and when to take time to reflect. Reflective learners are not only strategic about their thinking, but they also reflect on their thinking as it occurs. The response of a learner to a new learning experience is influenced by past experiences and therefore different learners may react differently, to the same incident.

Facilitators of learning are therefore encouraged to empower learners and to be sensitive to their past experiences of learning, as these reflective skills are taught. Unfortunately, very few of these steps have taken place in traditional teaching methods (Boud, Keogh & Walker, 1996:33 &36; Boud, Keogh & Walker, 1995:7; Perkins, 1992:102; Fisher, 1990:252; Sternberg, 1988:23-25; Brookfield, 1987:14).

It would seem that good quality education encourages the exploration of self-directed, alternative thinking and creative insights. It invites educators and learners to value the process of learning as much as the result of learning. As Machado (1980:15) points out, a man is not determined by the teachings he receives, nothing can be taught, rather, it is how the means of learning is provided.

## 2.4. The debate around the notion of intelligence

There have been numerous attempts to define intelligence and many different schools of thought exist around the notion of intelligence. Perkins (1995:96), in his book "Outsmarting IQ", has succeeded in identifying three basic types of theories

surrounding intelligence. The first two debates are well known and evolve around whether the origin of intelligence is due to genetic or environmental factors (the nature versus nurture debate). The third argument looks at reflective intelligence. Machado (1980:6&7) also addresses these three theories, suggesting that a child born today carries a sort of "cultural predisposition", which means that the individual is born a child of his century. He also acknowledges the environment, postulating that a child born in London, but who grows up within an aboriginal tribe, would have a different cultural orientation. Finally, he states that the continual evolvement of man is as a result of education.

Perkins (1995:96&97) first looks at a neural theory of intelligence, which states that intelligence is largely genetically determined. The emphasis lies on physical fundamentals rather than memory or decision-making strategies.

The second debate revolves around intelligence being experiential, emphasizing that the knowledge is gained through experience. It implies that acquiring intelligent behavior is a matter of rich experience and reflective thinking, in local contexts.

The third debate argues that the theory of intelligence is reflective and proceeds to look at the role of strategies used in various intellectual challenges and in metacognition, which requires learners to monitor their thinking to ensure that these strategies are used effectively. Metacognition is viewed as essential in a world that is continually changing. Being able to reflect and re-evaluate helps generate new possibilities.

Reflective intelligence particularly supports coping with novelty. Novelty usually allows the initial phases of learning to take place. Here neural intelligence can provide the raw information-processing power, managed by reflective intelligence. Reflective intelligence is also seen to play an important role in contrary thinking (Sternberg, 1997:93; Perkins, 1995:96-98; Sternberg, 1994:49).

The researcher is of the opinion that, although these perspectives can be viewed independently, seen together, they can complement each other. Neural intelligence supports initial learning and special talents, for instance, a special talent for drawing could be picked up early in a child, however mastery of a talent could also be achieved through practice, which encompasses both experience and reflection. Howard Gardner's theory of Multiple Intelligences supports this view, as will be seen when his theory is discussed later in this chapter.

## 2.5.   Democratising intelligence

The question posed is that if intelligence is genetic, experiential and reflective in nature, can intelligence in these three spheres be developed? In an attempt to answer this, there needs to be a basic understanding of the functioning of the human brain.

There are two kinds of brain cells: neurons and glial. Ninety percent of the brain cells constitute glial, which is responsible for transportation of nutrients, formation of the blood-brain barrier and regulation of the immune system. The remaining ten percent, the neurons, consist of a compact cell body, dendrites and axons. They

are responsible for information processing, and converting chemical and electrical signals back and forth, thereby constituting the brain the thinking and learning organ it is.

Recent research has shown that some areas of the brain can and do grow neurons - and that a normal functioning neuron is continuously firing, integrating and generating information (Wolfe, 1998:63).

While many dendrites extend from a neuron, each has only one axon. Most axons only connect with dendrites; normally dendrites do not connect with one another. In order to connect with thousands of other cells, the axon splits in order to subdivide itself and branches into two, repeatedly. Information is carried inside a neuron via electrical pulses and is transmitted across the synaptic gap from one neuron to another by chemicals called neurotransmitters. The latter is stored in the ends of the cell's axon, which nearly touches the dendrites of another cell. When the cell body sends an electrical discharge outward to the axon, it stimulates the release of those stored chemicals into the synaptic gap. Once in that gap, the chemical reaction triggers new electrical energy in the receptors of the contacted dendrite. The process is therefore - electrical to chemical and back to electrical. The repeated electrical stimulation fosters cell growth by way of dendrite branching (Jensen, 1998:12).

Learning is a critical function of neurons that cannot be accomplished individually- it requires groups of neurons.  With each new stimulation, experience and connection, the brain rewires itself. The end result of learning is intelligence and the key to democratising intelligence is growing more synaptic connections

between brain cells and preventing loss of existing connections. It is the connections that allow us to solve problems (Jensen, 1998:38; Lowery, 1998:26&27; Caine & Caine, 1994:4).

Proof of dendrite branching was easy to find, but evidence of synaptic plasticity is a relatively recent development. We now know that the brain modifies itself structurally as a result of experience. Research has shown that the brain will grow physiologically if stimulated by the environment and that then, in turn, increases the ability to learn (Caine & Caine, 1994:30-33; Gardner, 1983:40-41).

Learners who feel anxious or threatened, downshift their thinking and do not experience the excitement of challenges. Emotional threats to high-order thinking inhibits higher levels of learning (Pool, 1997:12).

Critical ingredients for the process of enrichment, in order to build better brainpower, is that learning be viewed as challenging, with new information or experiences and that there is a way to learn from the experience through interactive feedback (Jensen, 1998:32).

## 2.6.    Sternberg's and Gardner's theories of intelligence

The researcher is of the opinion that both these theories, superimposed, not only lend themselves to the development of intelligence, but in so doing, encourages life-long learning. Sternberg's theory emphasises novel experiences, problem solving and context, which is discussed above, (vide pp 19&22). Gardner's theory, in turn stresses learning in context, recognising an individuals' cultural background

and being sensitive to lessening threats of downshifting. The researcher wishes to explain each theory separately, so familiarise the reader with the theories, before superimposing the theories which will demonstrate how this lends itself to life-long learning.

In 1984/85, Robert Sternberg introduced his Triachic Theory of Intelligence, best thought of in terms of three primary sub-theories:

1) a componential sub-theory in which the operations of particular component processes are detailed;

2) an experiential sub-theory, which captures the capacity to deal with new situations;

3) a contextual sub-theory, in which sensitivity to the particular surrounding contexts is probed.

Sternberg believes that those individuals who are high in successful intelligences, are the ones who can translate academic success into success in the workplace. "Successfully intelligent people know both their strengths and their weaknesses. They capitalise on their strengths and compensate for, or correct their weaknesses, all of which require analytical, creative and practical intelligence" (Sternberg, 1997:12; Sternberg, 1988:59).

Around the same time (1983) Howard Gardner introduced his theory of Multiple Intelligences (MI). This theory stems from both neural science and anthropological studies which he undertook by studying individuals who had suffered from brain trauma which only affected specific areas of the brain (Gardner, 1994:15; Gardner, 1983:63).

Many of his cases showed that brain lesions seem to have selectively impaired one intelligence while leaving all the other intelligences intact. Based on these studies, Gardner maintains that normal individuals posses all eight intelligences, but the strength of each intelligence, and the way in which the intelligences interact to solve problems or fashion products, may differ greatly across individuals and across cultures. Gardner and his colleagues also demonstrated that these intelligences may be partially independent from each other, for instance music and linguistic capacities (Gardner, 1994:301; Gardner, 1993:7; Gardner, 1991:205-210; Gardner, 1986:73&74).

Both definitions recognise the need for strategies to process information independently and effectively and both emphasise the importance of different environments or contexts. Both stress that one of the main tasks of the education system is to assist individuals in their development towards a field where their talents best suit and satisfy them, to encourage them to develop a full range of abilities on which they can draw, in order to ensure life success and to recognise an environment where they are able to make a difference (Sternberg, 1997:24; Goleman, 1995:37; Gardner, 1993:87).

### 2.6.1  The Triarchic Theory of Intelligence

This theory specifies that three aspects of abilities are of particular importance, namely analytical, creative and practical; and comprises three sub-theories:

The Componential sub-theory, or the analytical aspect of intelligence, looks at three specific kinds of information-processing components when faced with a problem (Sternberg, 1994:49; Sternberg, 1985:98).

The first Sternberg calls metacomponents, which are executive processes and include:

1) Recognising that a problem exists:

Sternberg is of the belief that successfully intelligent people do not wait for problems to "hit them over the head": they recognise their existence before it gets out of hand and begin a process of solving them (Sternberg, 1997:158; Sternberg, 1988:79).

2) Defining the nature of the problem:

Successfully intelligent people define problems correctly and thereby solve those problems that really confront them, rather than extraneous ones.  In this way, the same problems do not keep coming back into their lives. They also make the effort to decide which problems are worth solving and which are not (Sternberg, 1997:161; Sternberg, 1985:99).

3) Deciding on a strategy for solving the problem:

Successfully intelligent people carefully formulate strategies for problem-solving. In particular, they focus on long-range planning rather than rushing in and then later having to rethink their strategies (Sternberg, 1997:161; Sternberg, 1990:269).

4) Allocating resources:

Successfully intelligent people think carefully about allocating resources for both the short term and the long term. They consider the risk-reward ratios and then choose the allocation which  they believe will maximize their return (Sternberg, 1997:165-168; Sternberg, 1990:269; Sternberg, 1988:105).

5) Monitoring the actual problem as it takes place, and evaluating the problem solving after task completion:

Successfully intelligent people do not always make the correct decisions, but they monitor and evaluate their decisions and then attempt to correct their errors as they discover them (Sternberg, 1997:157-170; Sternberg, 1990:269; Sternberg, 1988:79 -114).

The second are performance components, which are non-executive processes used to carry out the instructions of the metacomponents for solving problems i.e. encoding stimuli, inferring relationships between stimuli and application of rules from one stimulus to another (Sternberg, 1990:269; Sternberg, 1988:116-159).

The third process is the knowledge-acquisition component, used to learn how to solve the problem in the first place. This includes distinguishing irrelevant information for a particular purpose, deciding how to marry different pieces of information together and selective comparison, which is used to relate newly learned information to what has been learned in the past (Sternberg, 1990:269; Sternberg, 1988:170-206).

All three processes develop critical, reflective and metacognitive strategies, which are not only essential strategies for life-long learning, but also ensure the enrichment of cognitive functioning.

Analytical thinking was encouraged and reinforced in our old education system and pupils were being rewarded for their analytical intelligence.

The dilemma generated is two-fold. Firstly, analytical skills is not a natural process for all learners, rather they need to be correctly taught. Secondly, in the real world, after school, analytical intelligence on its own, is no longer sufficient.  It is still needed, but to a lesser extent. The potential for creatively intelligent learners to make a contribution in the world is as high, if not higher than the analytically gifted learner (Sternberg, 1997:132; Sternberg, 1994:47-51).

The second sub-theory is the experiential sub-theory, or the creative aspect of intelligence. Sternberg stresses that tasks presented should be novel, but not completely outside the individuals frame of reference, as the individual will not have the necessary cognitive structures needed to carry out the task. This also applies to novel situations that require adaptation to new and challenging environmental demands and is critical for the growth of cognitive functioning. Sternberg also stresses that the smooth automatic processing is needed in many domains of life, not only to facilitate information-processing, e.g. reading, but also to allow the resources that were once devoted to these skills to be freed for other kinds of tasks. Creative intelligence therefore encourages learners to go beyond the given, see connections and to generate novel and interesting ideas (Sternberg, 1995:81; Sternberg, 1994:47-51).

Learners are either doing something already known, something automatic or are engaging in a new experience.  If an earlier learning experience is repeated, the neural pathways will in all likelihood become increasingly efficient. This is done through myelination, adding a fatty coating to axons. If it is a novel mental or motor stimulation greater electrical energy is produced (Jensen, 1998:12&13).

Finally, the contextual sub-theory, or practical intelligence, explores an individuals' tacit knowledge. Sternberg makes a clear distinction between formal academic knowledge, which is found in IQ tests and tacit knowledge. The latter he describes as action-orientated knowledge, which is usually acquired without direct help from others and allows individuals to achieve goals they personally value.

Tacit knowledge has three characteristic features: Firstly, it is about knowing how to adapt; about when to select another environment and about recognising options in dealing with or shaping the environment.  It is also relevant to the attainment of practical goals which are valued by individuals and finally it is typically acquired primarily by oneself.  Successfully intelligent people thus need to find the balance between knowing when to adapt and when to select another environment. The emphasis in practical thinking thus lies in utilizing and applying knowledge or information (Sternberg, 1997:236&246; Sternberg, 1988:213-227; Sternberg, 1985:269-278).

According to Sternberg, learners have different patterns of triarchic abilities. Some are almost equally proficient in all three, while others are much higher in one or two of these abilities. However, as most tasks require a combination of skills, to be able to function efficiently in the world, we need a degree of competence in each ability.  Sternberg believes that creativity is an attitude towards life that requires the application and balancing of all three aspects of intelligence.

An intelligent person, he stresses, is not necessarily the one who is high in all three abilities. Rather, as defined by the definition, it is the one who in everyday life has worked out where he or she excels and then capitalises on the strengths and compensates for the weaknesses.  As educators, our task is therefore to

promote the standpoint that all three of these aspects of intelligence are important (Sternberg, 1997:192; Sternberg, 1994:47-51).

Much of the focus of the triarchic theory of intelligence falls on the description of the nature and operations of the particular components involved in carrying out intellectual acts - the domains of application of process (analytical, creative, practical). In contrast, while the theory of Mulitiple Intelligences assumes component processes, it is largely descriptive, the primary emphasis falling on the particular contents, or symbolic domains of intelligence, which individuals come into contact with.

### 2.6.2  The Theory of Multiple Intelligences

Howard Gardner suggests that all human beings have *eight intelligences (Checkley, 1997:8), and that individuals do not have the same strength in each intelligence area - individuals have different compositions of intelligence. Both Gardner and Sternberg are in agreement and continually stress that we cannot treat all individuals the same. One therefore needs to evaluate the current education system and see whether it is still catering only to one profile of intelligence, the language-logic profile, or as Sternberg calls it, the analytical aspect of intelligence.

* Gardner is in the process of formulating a ninth and tenth intelligence, but these have not yet been published.

Gardner believes the roles of schools should be to develop intelligences and to help students reach vocational and non-vocational goals that are appropriate to their particular spectrum of intelligence - educators should recognise learners own unique patterns of neurological functioning (Teele, 1996:65; Armstrong, 1987:12). He argues that previous definitions of intelligence have been limited to the ability to solve problems in isolation, while the theory of Multiple Intelligences illustrates that human capacity extends to another kind of problem solving, resulting in the ability to fashion products (Bolanos, 1996:29; Gardner, 1993:9).

Gardner points out that these aptitudes could be identified within specific domains of brain functions that he defines as the eight intelligences which are discussed below.

Linguistic intelligence is the capacity to use words effectively, whether orally through storytelling or political speeches, or in writing as a poet or playwright. This intelligence includes the ability to express what is on ones mind and to understand other people. Cultural differences come into play here, as the emphasis in traditional cultures fall on oral language, rhetoric and word play - while the more Western cultures place greater emphasis on the written word. Pupils who are strong in this intelligence have a good vocabulary, spell accurately, are seen to enjoy word games, reading books and usually communicate to others in a highly verbal way. A learner therefore, with encoding or decoding difficulties, may be considered to be learning disabled in our society, but not in another society (Teele, 1996:65; Armstrong, 1987:18; Gardner, 1983:73-98).

The Logic-Mathematical Intelligence is the ability to calculate, quantify and carry out complex mathematical operations, tasks usually carried out by mathematicians and tax accountants and to reason well, as a scientist or logician would. Pupils who have a strong logic-mathematical intelligence are identified by the many questions they ask about how things work, compute mental arithmetic problems quickly, enjoy playing chess, computer games and doing brainteasers. They think on a more abstract or conceptual level than peers and have a good sense of cause-effect (Armstrong, 1987:12; Gardner, 1983:128-169).

Spatial Intelligence refers to the ability to represent the spatial world internally, in one's mind. Core capacities of this intelligence include mental imagery, spatial reasoning, image manipulation, graphic and artistic skills. Pilots, sailors, architects all exhibit spatial intelligence.

Spatial competencies are seen in all known cultures. The Eskimos have a high spatial ability, because of the need to find their way around their environment. 60% of Eskimo children score as well as 10% of American children on spatial aptitude tests. Pupils strong in this intelligence draw figures that are advanced for their age; enjoy art activities, puzzles and mazes; reads maps, charts and diagrams more easily than text, build interesting, three dimensional constructions for their age and get more from pictures than words while reading (Armstrong, 1987:17&21; Gardner, 1983:170-204).

Bodily – Kinesthetic Intelligence is the capacity to use your whole body e.g. an actor, dancer, athlete or parts of you body e.g. a surgeon or mechanic. This intelligence involves a good sense of timing, coordination, balance, tactile and haptic capacities.

Current brain, mind and body research have found significant links between movement and learning and encourage educators to be purposeful about integrating movement activities into everyday learning. They stress that the benefits of early motor stimulation do not end in primary school, but there is great value in novel motor stimulation throughout secondary school and the rest of life (Jensen, 1998:35&88; Sylvester, 1998:31-33).

Musical Intelligence is the capacity to think in music, to be able to hear patterns, recognise them, remember them and perhaps manipulate them.

It includes sensitivity to pitch or melody. One can have a figural or top – down understanding of music (global, intuitive), a formal, or bottom – up understanding (analytical, technical), or both. Research has shown that certain pieces of music are able to prime the brain's neural pathways. Music can either increase or decrease the attentional neurotransmitters of the brain and current research seems to indicate that it may be critical for later cognitive development, regardless of one's strength of musical Intelligence. Music too, may be seen as a carrier or vehicle for words and evokes emotion, which drives attention, which in turn drives learning and problem-solving (Jensen, 1998:36&37; Sylvester, 1998:35).

Biological studies today suggest that a solid artistic foundation builds creativity, concentration, problem-solving, self-efficacy, coordination, values attention and self-discipline (Jensen, 1998:36). Viewed against this statement, it is unfortunate that the arts have been sorely neglected in schools.

Interpersonal Intelligence is about understanding other people and interacting effectively with them.  It often involves verbal and non-verbal communication and is sensitive to moods and temperaments of others. Teachers, social workers and salespeople would be examples of those who exhibit interpersonal intelligence. These pupils enjoy socialising with peers, seem to be natural leaders, belong to clubs, committees, have two or more close friends, others seek their company and are always giving advice to friends.

Intrapersonal Intelligence is the capacity to understand oneself - one's thoughts and feelings and to use the knowledge in planning and directing one's life. It involves not only an appreciation of self, but also of the human condition and is seen in psychologists, spiritual leaders and philosophers. Pupils who display a sense of independence or a strong will, does well when left alone to play or study, has a good sense of self-direction, accurately expresses how he/she is feeling, has a high self-esteem (Gardner, 1983: 237-276).

Naturalistic Intelligence is the ability to recognise and classify plants, minerals and animals, including rocks and grass and all variety of flora and fauna. Darwin would be an example of a naturalist because he saw so deeply into the nature of living things.  It would be the child who by the age of 3 years can better recognise birds than most adults (Checkley, 1997:8&9; Hatch, 1997:29).

The theory of Multiple Intelligences makes a clear distinction between intelligences which may be thought of in neurobiological terms and domain. Individuals are born into cultures that house a large number of domains or disciples in which one can become encultured and then be assessed in terms of the level of competence one

has attained. Therefore, a person with musical intelligence is likely to be attracted to, and be successful in, the domain of music. However, the domain of musical performance requires intelligences beyond the musical, it could include bodily-kinesthetic, personal and so forth (Gardner, 1983:xvi).

Quite clearly, both theories stand in direct conflict with the overly narrow or scholastic definitions of intelligence embraced in earlier years. Here, if the student possessed the logical-mathematical and linguistic intelligences described by Gardner and the componential and metacomponential facilities as described by Sternberg, the student was considered intelligent.

## 2.7.    An integrated theory

The researcher is proposing to superimpose the three sub-theories of the Triarchic Theory on each of the eight intelligences. In so doing, the Triachic Theory may be seen as the "vehicle", which in turn "drives" the eight intelligences.

These eight intelligences may then be analysed in terms of its components, namely the metacomponents, performance components and knowledge-acquisition components - as discussed previously in chapter two, (vide pp 23&24). Secondly, the eight intelligences may also be analysed in respect of relative novelty or automation, which one could place on a novice ↔ expert continuum. For example, does the task or content (based on MI) which asks the learner to use one or more of the multiple intelligences offer the learner a novel experience, does it allow for automation and is the educator taking into account the fact that a learner who is especially strong in a certain intelligence, will address the task

differently when compared to another who does not have that particular strength, (vide pp 27&28).

Finally, educators will need to consider whether the content given to learners, using the Multiple Intelligences, exists in a context suited to the learner. This in turn is then driven by Sternberg's contextual sub-theory, which affords learners the opportunity to practically apply the knowledge gained, (vide p 27).  This will be further illustrated in chapter three, where practical examples are provided.

# CHAPTER THREE

## A Practical Strategy for Primary School Educators in South Africa

### 3.1.   Introduction

As previously stated in chapter one, this study attempts to define the practical strategic elements that should be considered when developing a strategic planning framework for education. This strategic plan will look at what would be required to ensure the successful implementation of Gardner and Sternberg's theories into primary schools.

As discussed in chapter one, (vide p 8), many organisations have attempted to do strategic and operational planning simultaneously, and have failed. The researcher has therefore elected to discuss the basic framework, detailing WHAT needs to be put into place, clearly separating this from the Operational Plan and the Results Measurement Plan and as such, this will not be discussed in this study.

Machado (1980:42) states that unless all persons participate in the process of development, development will not occur.  If all role players are to participate in the success of what is being proposed by the researcher, the strategic plan should begin with a mission or philosophy, which is shared by all role-players, whereby their roles are to be clearly defined and the necessary tools provided to ensure successful implementation. The researcher therefore proposes eight practical elements.

### 3.2.  All role-players to share a common philosophy

The researcher is of the belief that unless all role-players in education, beginning with the Department of Education, through principals and then moving down to the staff, learners and the parents, share the same vision and philosophy for education, life-long learning will not and can not be successfully realised.

### 3.2.1 All individuals are unique

The Triarchic Theory, the theory of Multiple Intelligences and outcomes-based education (OBE), (Curriculum 2005:1997) all share the belief that all learners can learn successfully and therefore that each learner possesses unique and diverse talents and has different intelligences that contribute to the school as a whole.

### 3.2.2 Success equals success

By recognising each persons uniqueness and structuring the instruction to allow for success, (which in turn leads to further success), results in learners being empowered and intrinsically motivated and desiring further learning. All decisions made by the school should therefore always strive to have the learner's best interests at heart, (vide p 12).

### 3.2.3 Promotion of process and product

Sternberg (1997:259) is of the belief that successfully intelligent people understand the importance of both process and product. This must then be applied in the classroom situation, whereby educators recognise that learners should be exposed to different learning opportunities, through which they ultimately meet the critical outcomes as laid out in Curriculum 2005 (vide pp 25&26).

### 3.2.4 Education is a shared responsibility

Outcomes-based education promotes a partnership that treats all stakeholders as significant resources for the success of every learner. As discussed in chapter two (vide pp 12-16), education is a shared responsibility and an obligation of all role-players. Assistance is therefore sought from every available resource for providing significant learning opportunities; educators facilitate the learning process and learners work to become more independent and responsible for their own learning.

### 3.3.   All role-players to promote change

### 3.3.1   Education Departments

The role of the support personnel is to initiate the training of all other role-players, by arranging workshops whereby principals and staff gain an understanding of how life-long learning may be attained.  Subject advisors would need to facilitate and assist in curriculum planning, incorporating, amongst others, the theories of Sternberg and Gardner. Circuit Managers would need to monitor the implementation of the theories and the auxiliary staff who will assist and support learners on the road to lifelong learning. In Machado's words (1980:27) " ...the state's orientation must be toward the strengthening of the educational system".

### 3.3.2   Principals

All principals are to see themselves as key educational leaders, building managers and catalysts in implementing change. They are encouraged to model team participation and thereby encourage their staff to work as a team, sharing resources and ideas. Opportunities for staff development and empowerment need to be encouraged and created by them.

### 3.3.3  Educators

Educators, through workshops organised by the department and from feedback derived from workshops organised for principals, are to be assisted in understanding their role as active participators within the newly proposed education system. This has begun through workshops around Curriculum 2005 which has required a paradigm shift from teacher-centered to learner-centered education, whereby their new role is one of facilitator and mediator.

The main purpose of further workshops would be aimed at helping educators understand the basic functioning of the human brain and how the type of instruction promoted by Gardner and Sternberg can lead to the growing of

intelligence, as discussed in chapter two (vide pp 18-27). In turn, educators, through class discussions, would then be encouraged to begin empowering their learners with this knowledge and thereby encouraging learner ownership. Educators are asked to be role models for their learners through respect and appreciation of individual differences.

### 3.3.4 Learners

Learners are encouraged to see themselves as change agents, (vide p 12), by developing a personal sense of responsibility for their own learning as they are encouraged to seek intrinsic motivation. They are to be active participators of their learning process by participating in both individualised and co-operative activities and should feel a strong sense of independence and interdependence. All learners should develop a sense of belonging and caring, as they are encouraged to share the school philosophy, respecting one another as unique individuals.

### 3.3.5 Parents

The principal and the staff are to arrange parent meetings whereby parents are to be encouraged to assist the school in helping learners meet their needs towards becoming life-long learners. The school philosophy, the Triarchic Theory and the theory of Multiple Intelligences and other relevant information, which would lead them to understand how one may become a life-long learner, is to be provided. They should be encouraged to actively participate in school activities, to volunteer in classrooms and to share their talents with the school.

A weekly newsletter, discussing the curriculum and instruction, and relevant aims for the week, should be highlighted so that parents remain involved and in turn may contribute towards motivating learners.

### 3.4. A nurturing environment to be created

As discussed in chapter two, (vide pp 20&30), cognitive and brain growth show remarkable resilience and plasticity when children learn in a nurturing environment - one where they feel emotionally safe to experience and explore new challenges

through interactions with others and their environment and where learning is challenging. If the learner is threatened by the classroom environment or engages in a task that is beyond his or her level of readiness, the brain overproduces key neurotransmitters which impedes learning and as a result, downshifting occurs. Here learning support staff play an important role in helping educators assess learner needs.

The classroom arrangements, regardless of learner numbers, should seek to foster a safe, friendly environment whereby learners are encouraged to take an active role in their learning. Process should be considered to be as important as product. The aim then is to foster an environment whereby learners feel free to explore and to take the risk of working independently - and where learning is believed to have no ceiling, (vide p 14).

In order for this to occur, educators need to present several learning options at different degrees of difficulty, in order to ensure appropriate challenges for learners at different readiness levels. Learners also need to be given choices regarding topics, modes of expression and working conditions. Wassemann (1990:13&78) suggests that in this way classrooms reflect an atmosphere where all learners can and should learn to develop a sense of their own autonomy and feelings of constant personal power. Learners are thus seen to feel free to make their own choices, which in turn leads to empowerment, processes which contribute to the practice of life-long learning.

Educators, at all times, must take cognisance of the fact that because they are role-models, they should be seen to follow the school philosophy and be consistent in working in collaboration with colleagues and support personnel - just as learners are asked to do and thereby also fostering Gardner's interpersonal intelligence in all learners.

## 3.5.    Strengths and weaknesses to be balanced

Young children often display their strengths in specific activities or roles, rather than in activities related to a particular intelligence.  By continuing to pursue those specific activities, a child could master more challenging content, gain more confidence and motivation than he or she could in other activities. However, both Sternberg and Gardner stress the importance of balance, therefore the development of specific strengths, be it analytical, practical or creative aspects of intelligence needs to be balanced with creating opportunities to develop all intelligences, but not necessarily to the same degree, (vide p 27).

One of the goals of superimposing the two theories of intelligence, (vide p 32) is so that learners are taught how to process information from their dominant intelligence to their intelligence that that is not as strong.  For instance, a learner whose strength lies in music may use the knowledge of note values to help with the understanding of fractions.  Educators must therefore remember that they are not expected to teach every child every subject in eight different ways, or that every child develops all eight intelligences to the same degree. Rather, they should aim to expose learners to a range of activities, helping them recognise their strengths and compensate for their weaknesses, (vide p 26).

This is a continual process throughout their school career and educators would need to pass on the information around each learner's strengths and weaknesses to other educators, in order for the balance to be constantly monitored. The information should not be that the learner is for instance linguistically strong, but should also include the different ways in which the learner demonstrates particular linguistic interests.

In order for the balance to be maintained it would be necessary for the curriculum to be organised around the learner and not the intelligence. Teamwork in this regard is essential and all educators who are involved with a learner should meet regularly to share ideas and to support one another.

## 3.6.   Learners to be recognised within a context

Teaching and learning must become personalised so that all learners, regardless of gender, cultural backgrounds or socioeconomic status, receive appropriate instruction so that all learners are reached, irrespective of the diversity. This is particularly significant in South Africa because of our diverse population.

Both Sternberg and Gardner's theories aim to open as many windows as possible for every learner to succeed, while at all times respecting their unique differences. In chapter two (vide pp 28-31), Gardner, in discussing his theory of Multiple Intelligences, stressed the importance of recognising the learner's cultural background and acknowledging that what is seen to be important in one culture is not always seen to be of equal importance in another culture.  An understanding of these factors and a pro-active utilisation of this, for instance placing a linguistically strong pupil with a musically strong learner, could result in a very creative product and a unique learning experience for both. A learner from a culture  which is verbally strong, could be asked to help others whose preference lies in the written, with the latter assisted in becoming more oral.

Closer to the community, learning should be connected to the community and should involve relevant authentic learning in their own backyards. For instance, organic farming or crafts whereby learners may learn how to go about setting up small businesses to sell their goods. Information could then be shared with the community, which benefits learners by empowering and motivating them to learn more and to solve problems. As discussed in chapter two, (vide p 25), Sternberg stressed that learning should be novel, but part of the learner's frame of reference. Learning support staff would need to help teachers set up activities using both Curriculum 2005 and the theories around intelligence. This is to ensure that connections may be made between new knowledge and what a learner already knows and understands, for instance, a learner's knowledge of weather patterns may help in his planning of organic farming.

### 3.7.  Reflection and critical thinking to be encouraged

Educators are encouraged to model metacognitive thinking and reflection, (vide pp 14-16). For this to take place, educators must understand the theories, including the developmental stages as one moves from grade to grade.  Therefore the school as a team would need to sit together and as active change agents, (vide pp 11&12), design methods of implementation. Frequent challenging conversations around implementation are often useful.

Projects should be designed to encourage reflection and critical thinking - processes which in turn promote self-directed learning.  Learners are taught how to ask researchable questions, to identify varied resources, to create realistic time limits, to reflect on the process, to eventually implement and bring closure to a plan. The experience is shared with the other groups, who in turn reflect on the process and share ideas on the strengths and weaknesses of the process. The continuous use of Sternberg's metacomponents, or executive processes, which were discussed in chapter two, (vide pp 23&24), could be used as a basic structure until automation is achieved.

Learners are encouraged to talk about their own learning and are active in planning and assessment of their learning process, (vide p 13). They are encouraged to engage in exploring, experimenting, creating, applying, and evaluating their ways of learning, as well as interacting actively with the content and concepts they are studying.

### 3.8.  The Triarchic Theory and the theory of Multiple Intelligences to be superimposed to create an integrated theory

Listed below are examples of what the researcher proposes when talking about superimposing the Triarchic Theory (which may be seen as the 'vehicle") onto the eight Multiple Intelligences.
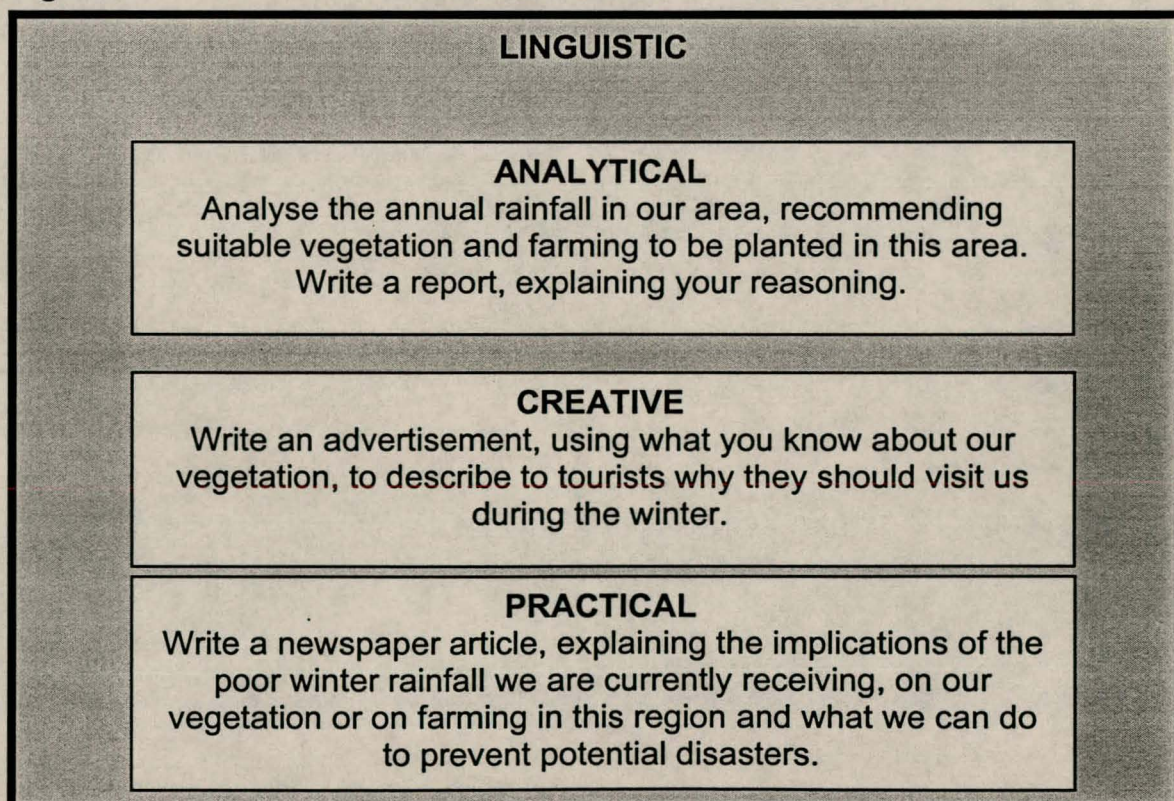
As discussed in chapter two, (vide pp 22-26), the three aspects of intelligence as described by the Triarchic Theory are –

1) **Analytical**: the ability to analyse, evaluate, compare, contrast;

2) **Creative**: the ability to create, design, invent, imagine and fall on a continuum with relative novelty on one side and automatisation on the other side and finally,

3) **Practical**: the ability to use, apply, implement, utilise, and put into practice, stressing content in context.

The chosen intelligence in this example is linguistic intelligence, and pupils may be given a choice of one or two of the three tasks provided by educators. The analytical task requires learners to recognise what is being expected of them, defining the task and deciding on a strategy. For instance, one may be able to draw on existing knowledge. Evaluation of both the strategies used, together with information gathered to help successfully complete the task. Task two draws on novel information, asking for connections to be made, so that new knowledge may be formulated. Task three requires utilisation of tacit knowledge, which asks that learners learn from the practical ideas which they generate. The examples given below all ask learners to approach the tasks as discussed above.

**Figure 1.**          **A LESSON ON VEGETATION**

---

**LINGUISTIC**

**ANALYTICAL**
Analyse the annual rainfall in our area, recommending suitable vegetation and farming to be planted in this area. Write a report, explaining your reasoning.

**CREATIVE**
Write an advertisement, using what you know about our vegetation, to describe to tourists why they should visit us during the winter.

**PRACTICAL**
Write a newspaper article, explaining the implications of the poor winter rainfall we are currently receiving, on our vegetation or on farming in this region and what we can do to prevent potential disasters.

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This is an example which may be used in Grade 3, making learners aware of the concept of the silent "G", using Gardner's bodily kinesthetic intelligence.

**Figure 2.**             **A LESSON ON THE SILENT "G"**

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### BODILY KINESTHETIC

**ANALYTICAL**
Walk around the classroom and find words which have a silent "g".
Can your group explain why the "g" is silent?

**CREATIVE**
Write words, in the sand, which have the silent "g".
Design a game which will teach others the difference between the "g" sound and the silent "g".

**PRACTICAL**
Cut out words in magazines, that contain the silent "g".
Build sentences using the words you have found. Think of a way to help you remember when you are using the silent "g".

---

The following is an example using musical intelligence to teach the learner about space.  It is important to note that more than one intelligence is often utilised,  - for instance, bodily kinesthetic intelligence could probably be included here and taking learners to the planetarium to learn about an aspect of this theme, should bring this about.

**Figure 3.**     **A LESSON AROUND THE THEME: SPACE TRAVEL**

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**MUSICAL**

**ANALYTICAL**
Find two songs or pieces of music written around the same space theme. Listen to the words of the songs or pieces of music, comparing the lyrics of each and share with each other how you feel about what has been described.

**CREATIVE**
Prepare a short rap song that names and describes something you know about planets and something new you have discovered about each other.

**PRACTICAL**
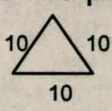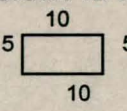Write a jingle expressing concern about the lack of care shown to "Mother Earth".

---

The following exercise is an illustration using both logo-mathematical and spatial intelligence in a mathematics lesson.

**Figure 4.**  **A LESSON AROUND AREA AND PERIMETER**



| MATHEMATICAL / SPATIAL |
| --- |

**ANALYTICAL**
Mr Tom has 2 plots the same size (m²). He wants to charge more money for one of them. Compare the size and shapes of the two plots below. Is this fair?

**CREATIVE**
You have been asked to explain the difference between the concepts of area and perimeter to Grade 4 pupils, using numbers, words and pictures. How would you do it?

**PRACTICAL**
You have decided to tile your kitchen at home. Work out how many tiles of 20X20 cm you will need to buy. If each tile costs R15.85, how much would it cost to tile your kitchen floor?

Educators are therefore required to keep their knowledge of the eight intelligences in mind as they plan curricula activities which are composed of the three principles or vehicles of intelligence.

It is suggested the a list be drawn up, whereby both pupils and teachers keep a record of which intelligences and which "vehicles" of intelligences have been used to ensure that the pupils cover all eight intelligences and the "vehicles" of intelligence, equally, during each month.

This ongoing evaluation process encourages learners to practice using all eight intelligences and all three "vehicles" of intelligence, as opposed to only their preferred dominant intelligence. This will enable them to begin to learn to

recognise their strengths, perhaps discover strengths and finally, will enable them to compensate for their weaknesses through the use of their dominant strengths.

## 3.9.  An integrated theory to support the critical outcomes

The integrated theory of intelligence should be seen as an effective vehicle to help lead learners to the outcomes as provided in the new South African curriculum, namely Curriculum 2005, which shares the philosophy as seen above.

Outcome-based education (Curriculum 2005:1997) is learner centered and designed to meet the needs of all learners in achieving outcomes of life significance.

Curriculum 2005 (1997), which promotes an outcome-based education, defines outcomes as anything that learners can show, know, can do and value, which are common to all Learning Areas and which may be seen to measure the success of Curriculum 2005. The researcher wishes to illustrate how both the seven critical outcomes and the five outcomes which support development, may be achieved by using Sternberg's Triarchic Theory as the "vehicle", (vide fig.5).

There are five outcomes which aim to make learners aware of the importance of:

- Reflecting on and exploring a variety of strategies, in order to learn more effectively.   Analytical and Creative aspects of intelligence may be used.

- Participating as responsible citizens in the life of local, national and global communities - the Practical aspect encourages implementation in context.

- Being culturally and aesthetically sensitive across a range of social contexts; Practical and Creative aspects encourage context and novelty.

- Exploring education and career opportunities, encourages the use of all three vehicles, namely the Analytical, Practical and Creative aspects of intelligence.
- Developing entrepreneurial opportunities, which encourage all three aspects of intelligence, particularly the Creative aspect of inteligence.

The following seven critical outcomes (Figure 5) have been proposed by the South African Qualifications Authority (SAQA), (Curriculum 2005:1997), in order to ensure that standards in education are maintained. This in turn, would ensure continuous education for learners who are able to interact in a global society:

**Figure 5.**          **SEVEN CRITICAL OUTCOMES**

| OUTCOME | INTELLIGENCE |
|---|---|
| 1. Indentify and solve problems in which responses display that responsible decisions using critical and creative thinking | Analytical<br>Creative |
| 2. Work effectively with others as a member of a team, group, organisation, community with interpersonal intelligence | Practical<br>Creative |
| 3. Organise and manage oneself and one's activities responsibly and effectively | Analytical<br>Practical<br>Creative |
| 4. Collect, analyse, organise and critically evaluate information | Analytical |

| | |
|---|---|
| 5.Communicate effectively using visual,mathematical and /or language skills in the modes of oral and and /or written presentation | Analytical Practical Creative |
| 6. Use science and technology effectively and critically, showing responsibility towards the environment | Analytical Practical |
| 7. Demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation | Analytical Practical |

## 3.10. Summary

Figure 6, (vide p 49), depicts a model illustrating the process as proposed in chapter two, which suggests a paradigm shift to be achieved by all role-players. In order to assist this process, knowledge will need to be provided, together with continuous reflection, in order to help gain an understanding as to why a shift is needed in helping lead learners to life-long learning. A Strategic Plan, as discussed above, (vide pp 34-46), containing the eight elements needed to help attain this objective of life-long learning, will also need to be considered.

**Figure 6. A MODEL SUMMARISING THE PROCESS PROPOSED TO ACHIEVE LIFE-LONG LEARNING.**

MODEL

OBJECTIVE: LIFE-LONG LEARNING

*PARADIGM SHIFT REQUIRED*

**ELEMENTS ON WHICH TO BASE THE PRACTICAL STRATEGIC PLAN**

- ALL ROLE PLAYERS TO SHARE A COMMON PHILOSOPHY.
- ALL ROLE PLAYERS TO PROMOTE CHANGE.
- A NURTURING ENVIROMENT TO BE CREATED.
- STRENGTHS AND WEAKNESSES TO BE BALANCED.
- LEARNERS TO BE RECOGNISED WITHIN A CONTEXT.
- REFLECTIVE AND CRITICAL THINKING TO BE ENCOURAGED.
- THE TRIARCHIC THEORY AND THE THEORY OF MULTIPLE INTELLIGENCES TO BE SUPERIMPOSED TO CREATE AN INTERGRATED THEORY.
- AN INTEGRATED THEORY TO SUPPORT THE CRITICAL OUTCOMES.

**ALL ROLE PLAYERS IN THE EDUCATION SYSTEM TO UNDERSTAND THEIR ROLES**

*HELPED BY PROVIDING KNOWLEDGE*

**KNOWLEDGE BASED ON**

- A BASIC UNDERSTANDING OF THE FUNCTIONING OF THE HUMAN BRAIN.
- AN UNDERSTANDING OF HOW NEURAL, EXPERIENTIAL AND REFLECTIVE INTELLIGENCE COMPLIMENTS EACH OTHER.
- AN UNDERSTANDING OF THE TRIARCHIC AND MULTIPLE INTELLIGENCES THEORIES.
- AN UNDERSTANDING OF THE PROPOSED INTEGRATED THEORY.

*IDENTIFY ELEMENTS ON WHICH TO BASE THE PRACTICAL STRATEGY.*

# CHAPTER FOUR

## Conclusions, Shortcomings and Recommendations

### 4.1. Conclusions

The National Department of Education is currently in the process of coordinating the changes to the education system. We are moving away from a traditional content-based style, to that of an outcomes-based approach to education. With these changes being implemented, this can provide the ideal opportunity to introduce the proposed theory, as part of the existing changes. It has a direct influence on the implementation of outcomes-based education, in that Curriculum 2005 and OBE will be strengthened by operationalising the theories of Sternberg and Gardner, in an endeavour to teach learners how to learn.

This transformation process requires all role-players in education to enact a paradigm shift. This may be a difficult task, since individuals often resist change, because they fear the unknown and seek to understand why change is necessary.

The process may be made easier if educators were provided with an understanding of the basic functioning of the brain and how this, together with their role as facilitators of the learning process, may contribute to the development of an individual's cognitive functioning.

An ecosystemic approach to in-service training is also required because learners, parents and the broader community need to make a paradigm shift with regards to their roles in the future. As with educators, this too, will only be successful if they

are shown why this is necessary in assisting individuals towards becoming life-long learners.

Both outcomes-based education and the implementation of an integrated approach of the theories of Sternberg and Gardner, strive towards creating motivated and enthusiastic life-long learners. The latter may be seen as a vehicle towards attaining this goal and facilitating changed learning experiences and environments.

## 4.2.  Recommendations for implementation

The following recommendations should be taken into account:

* For the implementation to be successful, all role-players should take hands, forming a partnership in sharing a vision towards achieving life-long learning. Congruency is essential if one hopes to achieve the authentic transformation of education.

* Educators will have to be explicitly focussed on what is required in order to help learners democratise intelligence towards life-long learning.

* Whilst teachers are being trained for OBE, it would be significantly beneficial if they were equipped with the elements suggested in chapter three, as an integrated part of this training.

* Each of the practical elements defined in chapter three will need to be discussed by all significant role-players - in order to guide them as to how they

may be successfully implemented. It must be borne in mind that different school communities are likely to have varying ideas, which are more specifically tailored to their own, specific needs.

* Educators need to be guided as to how to customise the curriculum in order to compensate for the diversity which exists between rural and urban contexts when they prepare learning material.

* Parents must be involved in the transformation process. They need to be reminded that education and the process of learning is not solely based on products, such as school grades, but that the process of learning is essential in creating independent, critical and creative thinkers. Parents' role as primary educators need to be enhanced through educational workshops to enable them to participate as equal partners in their children's learning process.

* Systemic transformation of the education system and therefore society at large rests heavily on the human resource capacity and financial resources available to education authorities. It is imperative that the implications of Curriculum 2005 is supported both financially and through human resources to provide the training and development programs (both at the pre- and in-service levels) that facilitate learning environments in which both educators and learners embark on their own respective roads towards lifelong learning.

## 4.3.    Shortcomings of the study

* The study makes the assumption that the education authorities acknowledge the need for this approach and therefore will provide the required resources to implement the Strategic Plan.

* Individual learning styles have not been considered, however it is recognised that learning styles do play an important role in the way learners assimilate and process information.

## 4.4.    Recommendations for further research

* A gap-analysis study could be undertaken by comparing the educational authorities' current Curriculum 2005 plan against the elements proposed in this study. From this it would be possible to undertake further research to narrow any "gaps" uncovered during the study.

* As suggested by Below, an Operational Plan and the Results Measurement Plan could be developed from the framework of the Strategic Planning as proposed in the study.

* As individual learning styles have no been considered, one could explore how to integrate learning styles into the model proposed in this study in an attempt to explore how they could contribute to the outcomes proposed in Curriculum 2005.

## 4.5.    Closing perspective

The reseacher is of the opinion that the theories of Gardner and Sternberg, which are a foundation of this study, often appear to be either mystified or over-simplified. The researcher has attempted throughout this study to change this perception to one rather of accessibility and balance in an attempt to promote life-long learning.

Education is seen to be one of the essential factors in improving, democratising and liberating society, particularly in underprivileged communities. The challenge, according to Freier (1983:13), is to move away from viewing education as an instrument of conformity and passivity - to one of liberation, a challenge which is particularly relevant to South Africa. Therefore, in an attempt to avoid being confronted by a disempowered society, a failed democracy and economic volatility and instability, it becomes imperative that role-players in education share the desire and vision to democratise intelligence towards life-long learning.

# BIBLIOGRAPHY

Abbot, J. (1997). To be intelligent. Educational Leadership,54(6), 7-10.

Armstrong, T. (1987). In their own way. Los Angeles: Jeremy P.Tarcher Inc.

Below, P.J., Morrisey, G.L. & Acomb, B.L. (1987). The executive guide to strategic planning. San Francisco: Jossey-Bass Inc.

Bolanos, P.M. (1996). Multiple Intelligences as a mental model: The key renaissance middle school. The Bulletin, November, 24-35.

Botha, R. ( 1996). Motivation and Learning. In P. Engelbrecht, S.M. Kriegler & M.I. Booysen (Eds.), Perspectives on learning difficulties. International concerns and South African realities. Pretoria: J.L.Schaik Publishers.

Boud, D., Keogh, R. & Walker, D. (1996). Promoting reflection in learning-A model. In R. Edwards, A. Hanson, and P. Raggatt (Eds.), Boundaries of adult learning. London: Routledge Inc.

Boud, D., Keogh, R. & Walker, D. (1985). Reflection: Turning experience into learning. London: Biddles Ltd.

Brookfield, S.D. (1988). <u>Developing critical thinking</u>. San Francisco:

 Jossey-Bass Publishers.


Brookfield, S.D. (1985). <u>Self-directed learning:From theory to practice</u>.

San Francisco: Jossey-Bass Publishers.


Butler, G. & Hope, T. (1995). <u>Managing your mind- The mental fitness guide</u>.

Oxford: Oxford University Press.


Caine, R.N. & Caine, G. (1994). <u>Making connections- Teaching and the human</u>

<u>brain</u>. New York: Innovative Learning Publications.


Checkley, K. (1997). The first seven…and the eighth. <u>Educational Leadership</u>,

55(1), 8-13.


Collins Concise Dictionary. (1990). Great Britain: William Collins Sons& Co Ltd.


Curriculum 2005. (1997). <u>Lifelong learning for the 21<sup>st</sup> century</u>. Issued by the

National Department of Education. Pretoria.


Dreyden, G. & Vos, J. (1994). <u>The learning revolution. A lifelong learning</u>

<u>programme for the world's finest computer:your amazing brain.</u> England:

The Gresham Press.


Drucker, P.F. (1990). <u>The new realities</u>. London: Octopus Publishing Group.

Feuerstein, R., R and,Y., Hoffman,M.B. &  Miller,R. (1980). Instrumental enrichment. Baltimore: University Park Press.

Fisher, R. (1990). Teaching children to think. London: T.J. Press.

Freier, P & Shor, I. (1987). A pedagogy for Liberation - Dialogues on transforming education. Hampshire: MacMillan.

Freier, P. (1985). The politics of education. Hampshire: MacMillan.

Freier, P. (1983).Pedagogy of the oppressed. New York: The continuum Publishing Corporation.

Gardner, H. (1996). Probing more deeply into the theory of Multiple Intelligences. The Bulletin, November,1-7.

Gardner, H. (1994). Creating Minds. New York: Basic Books.

Gardner, H. (1993). Multiple Intelligences- The Theory in Practice. New York: Basic Books.

Gardner, H. (1991). The unschooled mind. London: Fontana Press.

Gardner, H. (1986).The waning of intelligence tests. In R. Sternberg &

D.K.Detterman (Eds.), <u>What is intelligence?</u> New York: Ablex Publishing

Corporation.


Gardner, H. (1983). <u>Frames of the mind - The theory of Multiple Intelligence.</u>
New York: Basic Books.


Gardner, H. (1977). <u>The shattered mind</u> - <u>The person after brain damage</u>.

London: Routledge Inc.


Goleman, D. (1996). <u>Emotional Intelligence</u> - <u>Why it can matter more than IQ.</u>
London: Bloomsbury Publishing.


Hatch, T. (1997). Getting specific about Multiple Intelligences. <u>Educational

Leadership</u>,54(6), 26-29.


Hester, J.P. (1994). <u>Teaching for thinking</u>. Durham: Carolina Academic Press.


Isaacman, J. (1996). <u>Understanding the National Qualifications Framework-A

guide to lifelong learning</u>. South Africa: Interpak Books.


Jensen, E. (1998). <u>Teaching with the brain in mind</u>. Virginia: Association for

supervision and curriculum development.

Lowery, L. (1998). Curriculums reflect brain research. Educational Leadership, 56(6), 27-29.

Longworth, N. & Davies, W.K. (1996). Life-long learning. London: Kogan Page Limited.

Machado, L.A. (1980). Right to be intelligent. New York: Pergamon Press.

Mezirow, J. (1995). Towards transformative learning and emancipatory education. In S.B. Merriam (Ed), Selected writings on philosophy and adult education. Florida: Krieger Publishing Co.

McNair, S. (1996). Learner autonomy in a changing world. In R. Edwards, A. Hanson and P. Raggatt (Eds.), Boundaries of adult learning. London: Routledge Inc.

Montieth, J.L.de K. (1996). A self-regulated learning perspective on pupils with learning difficulties. In P. Engelbrecht, S.M. Kriegler & M.I. Booysen (Eds.), Perspectives on learning difficulties. International concerns and South African realities. Pretoria: J.L.Schaik Publishers.

Morrisey, G.L. (1995). A guide to strategic thinking:building your planning foundation. San Francisco: Jossey-Bass Inc.

Naudé, G.N. & van der Westhuizen, G.F. (1996). Teaching thinking: Empowering teachers for cognitive education. In P. Engelbrecht, S.M. Kriegler & M.I. Booysen (Eds.), Perspectives on learning difficulties. International concerns and South African realities. Pretoria: J.L.Schaik Publishers.

Pan. D.Y.  (1997). Lifelong learning: The whole damn cycle - A Singapore perspective. In M.J. Hatton (Ed.), Life-long learning-policies, practices, and programs. Canada: School of Media Studies.

Perkins, D. (1992). Smart schools. New York: The Free Press.

Pool, C.R. (1997). Maximizing learning - A conversation with Renate Nummela Caine. Educational Leadership,54(6), 11-15.

Rogers, C. (1969). Freedom to learn. Columbus: Charles E. Merrill Publishing Company.

Sternberg, R. (1997). What does it mean to be smart? Educational Leadership, 54(6), 21-23.

Sternberg, R. (1996). Successful intelligence. New York: Simon & Schuster.

Sternberg, R. (1995). Investing in creativity. Educational Leadership,53(4), 81.

Sternberg,R. (1994). Diversifying instruction and assessment. <u>Educational Forum</u>,59, 47-51.

Sternberg, R. (1990). <u>The psychology of human thought</u>. Cambridge: Cambridge University Press.

Sternberg, R. (1988). <u>The triarchic mind</u>. London: Penguin Group.

Sternberg, R. (1985). <u>Beyond IQ</u>. Cambridge: Cambridge University Press.

Sylwester, R. (1998). Art for the brain's sake. <u>Educational Leadership</u>, 56(3), 31-35.

Teele, S. (1996). Redesigning the educational system to enable all students to succeed. <u>The Bulletin,</u> November,65&66.

Vygotsky, L.S. (1978). <u>Mind in society - The development of higher psychological processes</u>. London: Harvard University Press.

Wolfe, P. (1998). Revisiting effective teaching. <u>Educational Leadership</u>,56(3), 61-64.

Wassemann, S. (1990). <u>Serious players in the classroom</u> - <u>Empowering children through active learning experiences</u>. New York: Harper & Row Publishers.


White Paper on Education and Training. (March 1995). Issued by the National Department of Education. Pretoria.