

Critical thinking abilities among prospective educators: ideals versus realities

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One of the key educational ideals of the African Renaissance is the elevation of learners to the highest level of human development. The challenge put forward to the education and training sector is to provide for the necessary capacity and conditions to ensure sustainable holistic development and growth amongst all levels of learners. Parallel to this the South African Qualifications Authority's critical cross-field outcomes should be considered. One of these outcomes states that learners should be able to think critically. Although this outcome articulates well with the cognitive domain of holistic development, it also gives rise to some concern. One area of concern deals with the cultivation of critical thinking skills among learners. Research indicates not only that these higher order thinking skills are unlikely to develop simply as a result of maturation, but also that they are notoriously difficult to teach and learn. Furthermore, if it is assumed that educators should play a pivotal role in accompanying learners to develop critical thinking skills, it is perhaps also reasonable to assume that educators themselves should possess the capacity to think critically or to apply critical thinking skills. The purpose in this article is to elucidate the critical thinking abilities of a group of prospective educators in the light of the ideals being put forward by the African Renaissance and the South African Qualifications Authority (SAQA).

Orientation

The concept "African Renaissance" has become a commonly used phrase in South African colloquial language. Yet the concept seems to be shrouded in mystery. Answers to questions such as the following provide enough reasons to become aware of the diversity of (valid?) opinions: How should one interpret the African Renaissance?; What exactly constitutes the African Renaissance?; What are its aims and objectives?; What are its implications — nationally and internationally?

Perhaps the notion of an African Renaissance can best be summarised in the words of its resuscitator, President Thabo Mbeki (1999: XVI), who stated:

Our vision of an African Renaissance must have as one of its central aims the provision of a better life for (all) ... (it) must therefore address the crucial question of sustainable development which impacts positively on the standard of living and the quality of life of all people.

When this statement is analysed it appears as though a combination of critical reflection and aspirations for recognition and self-reliance have formed the impetus for the African Renaissance ideal. Driven by these ideals, different sectors have already been participating in processes to identify and prioritise key elements for realising the expectations of an African Renaissance. Not surprisingly, one of these key elements is the cultivation of cognitive capacity among all the country's inhabitants (Nelmapius, 1999:38; Vil-Nkomo & Myburgh, 1999:39).

Parallel to the ideals of the African Renaissance, their resemblance to the South African Qualifications Authority's (SAQA's) critical cross-field outcomes is interesting to note. The cultivation of cognitive capacity is no exception. One of the critical outcomes states explicitly that all learners should be able to identify and solve problems, and make decisions by using creative and critical thinking (SAQA, 1997:7). Though in an implicit manner, the Department of Education (1997:30) also endorses the development of critical thinking skills when it states that learners should no longer be treated as "... empty vessels that have to be filled with knowledge ..."

Critical thinking: a complex ideal

Although the development of critical thinking is a noble idea and articulates well with the cognitive domain of holistic development, its complexity should not be underestimated. Angelo (1995:6), for example, remarks that critical thinking does not simply develop as a result of maturation, but involves skills which are notoriously difficult to teach and learn. There is also no uniform, clear-cut and concise definition of critical thinking. This could possibly be ascribed to the fact that critical thinking is viewed from various perspectives. As there are several contributors to the research done on critical thinking, for the purposes of this article, attention will be paid to only the viewpoints

of leaders in the field. In this regard, some brief remarks follow.

Critical thinking does not refer to intelligence. It is a skill that can and needs to be improved in everybody (Walsh & Paul, 1988:13). The reasons for this, according to Paul (1992:4), are as follows: all over the world solutions have to be found for deep rooted problems with regard to environmental damage, personal relationships, reduction of resources, global competition, personal goals and ideological conflict. Apart from this, the modern working environment is increasingly demanding from employees to cope with work, which demands effective critical thinking and problem-solving skills (Haywood, 1997:6).

Ennis (1984:6) divides critical thinking into various aspects, namely induction, deduction, value judgement, definition, observation, identification of assumptions, giving meaning and determining credibility. For Lipman (1988:38-34), critical thinking is more complex than ordinary thinking. It involves *inter alia* the following:

- careful argumentation which avoids guessing;
- making logical conclusions based on criteria;
- providing opinions substantiated by proof;
- moving away from believing to assuming; and
- moving away from assumptions to hypotheses.

Robert Sternberg (1984:38-48) classifies critical thinking as the ability to:

- identify the nature of a problem and decide on the processes necessary to solve the problem;
- monitor and evaluate a problem-solving process;
- make conclusions;
- react effectively to new tasks and situations; and
- process information effectively, which involves the ability to classify, compare, categorise, analyse and evaluate.

For McPeck (1990) and Ennis (1990), critical thinking furthermore implies specific measurable skills, which can function within or apart from subject content. All critical thinking does not always relate to subject content. Therefore, in the teaching of critical thinking, focus should be placed on teaching learners the utilisation of critical thinking skills within subject content as well as in general daily scenarios.

In addition to this, McPeck (1990:34,35) further states that effective critical thinking comprises of three important components. Firstly, there is a critical component, which refers to the ability to reflect, question and judge information effectively. Secondly, in order to facilitate critical thinking, a strong knowledge base in the specific subject area where the critical thinking skills are to be utilised is a prerequisite. Thirdly, the capacity to use language is essential to execute critical thinking. A fourth important aspect, according to McPeck (1990:42), is that critical thinking also requires willingness on the part of the learner to become involved in problem situations where reflective scepticism is required.

Although the definitions are sometimes diverse, Beyer (1985:

270-276) is of the opinion that all these definitions imply the ability to collect and utilise information effectively. When the various cognitive actions executed during thinking are examined, two distinct categories are identified, namely cognitive strategies, which include problem-solving, decision-making and conceptualisation and cognitive skills, which include critical thinking and micro thinking skills which are necessary for information processing, namely classifying, comparing, categorising, analysing and evaluating (Beyer, 1987:18-27). Critical thinking is therefore not a cognitive strategy, but a cognitive skill. It does not imply a sequence of actions and subordinate procedures. It is rather a combination of specific actions to be utilised alone or in combination. These actions refer to the following: to distinguish between provable facts and assumptions, to distinguish between relevant and irrelevant information, to determine the accuracy and credibility of a statement, to identify ambiguity, to identify unstated assumptions, to determine prejudice and the strength of an argument or assumption. In each of these actions, analysis and evaluation processes are important.

Relation to the South African scenario

The development of thinking skills has occupied the minds of many educators and other professionals in South Africa (Skuy & Partington, 1990:149). It is common knowledge that many learners on all levels of teaching and learning demonstrate cognitive abilities that correspond to a great extent to low, concrete levels of thinking during information processing (Sonn, 2000:261). This implies that learners cannot construct their own knowledge and formulate an own viewpoint (Ennis, 1985:44-48), they cannot evaluate, classify, analyse, identify relationships and make conclusions (Lipman, 1988:38-43), they cannot solve problems through logical inquiry and evaluative decision-making (National Council of Teachers of English, 1989) and they cannot think creatively and critically (Moore, McCann & McCann, 1985:5).

In this regard it is perhaps worth mentioning that Grade 12 South African learners performed poorly in subjects like Mathematics and Physical Science (subjects which require high levels of abstract thinking) during an International Mathematics and Science Study in 1995 (Howie & Hughes, 1998:47). Although the study failed to recognise a wide range of possible contributory variables, the average Mathematics and Science scores of South African learners nevertheless proved to be a reason for concern when compared with those of ten other countries. As highlighted in the International Report, South Africa obtained a significantly lower average score (352 points) than the participating countries for which the average score was 500 from a possible score of 800 points (Howie & Hughes, 1997:47). In another, but similar, study during 1996, South African Grade 7 and 8 learners obtained last position out of the forty participating countries. Although the results were met with remarks ranging from "surprising" to "upsetting", it was acknowledged that "... (although) South Africa has some of the best education policies in the world, ... it doesn't become reality in our classrooms" (Anon., 2001:1).

Why are learners not capable of executing higher-level cognitive skills? After intensive international and national studies of various classrooms Clough, Clough and Nixon (1989:7), Goodlad (1984) McPeck (1990:42), Schlechty (1991:40), Engelbrecht (1995:11-12), Sonn (2000:259) and Schraw & Olafson (2003) concluded that the educator plays a major contributing role in the deficiency, which exists among learners with regard to the utilisation of cognitive skills. A summary of the research done by the above-named authors revealed the following problems:

- Educators dominate classroom interaction. Too much time is devoted to instruction.
- The views of educators on the nature of knowledge acquisition are limited to the memorising and recalling of facts. Very little focus is placed on the construction of knowledge and thinking skills.
- Educators are not sure how to teach thinking skills or how to evaluate them.

- Most curricula do not focus on cognitive development at all. Furthermore, educators are concerned that they will not complete the curriculum if they also have to address the development of thinking skills as well.
- Educators teach learners what to think and not how to think.
- Educators seldom create a climate for thinking and show little appreciation for the individuality and openness of learners.
- Learning is not measured in terms of the learners' competence as thinkers, but rather in terms of their competence as reproducers of facts.
- Poor cognitive abilities are also nurtured (or at least nurtured in part!) by instructional techniques, which emphasise rote learning.
- Educators themselves are products of schooling and training systems, which focused on rote learning. The majority of them lack cognitive skills and do not know what and how to teach them.

In addition to the above, educator training has also not succeeded in assisting and guiding prospective educators in the acquisition and teaching of cognitive skills (Vye & Bransford, 1981:22-28; Archer & Isaacson, 1990:63). According to Raths, Wassermann, Jonas and Rothstein (1986:xii)

... most education courses are still bogged down in professors' talk about what teachers should do, with the assumption being made that listening to and reading about educational ideals will automatically result both in understanding and in competent classroom performance. Courses that give sympathetic training in how to implement teaching for thinking are few and far between.

From the above it is clear that the quality of education impacts on the realization of the ideals of the new curriculum and that of the African Renaissance. According to Odora Hoppers (2001:1) one of the challenges of education transformation is to ensure that South Africans have the knowledge, values, skills, creativity and critical thinking required to build democracy, establish a system of lifelong learning and promote social development and economic growth in the 21st century. She continues to argue that quality education for all requires new capacities of critical thinking and conceptual imagination (*ibid.*, 2001:2). Sonn (2000:1) supports this view by stating that if learners want to be competitive in the corporate world, the teaching of thinking skills is of vital importance. Too many learners leave school without the ability to solve problems that require critical thinking.

According to Khoza (2000:1) educators' capacity and commitment play a pivotal role in the implementation of new education policies and are key ingredients in the realization of the renaissance and transformation in education. In order to improve the quality of education and to realise the ideal of learners being able to become competent thinkers who can identify and solve problems and make decisions by using creative and critical thinking, a qualitative improvement in the training of educators will have to take place. In this regard Mashile (2002:174) also states that the need for the professional development of educators to enable them to meet the constantly evolving challenges in education cannot be overemphasized (Mashile, 2002:174).

Therefore, it is essential not only to convince educators that the teaching of thinking skills (critical thinking included) is important, but they also need to be equipped to become effective thinkers themselves. They should be knowledgeable on how to teach thinking skills before they can teach learners how to become effective thinkers.

Statement of the problem

Emanating from the above, the following question is raised: To what extent are our educational ideals compatible with our educational reality? If it is argued that the most obvious place to cultivate the educational ideal of critical thinking is in the school classroom, the central question related to our educational reality and the one which we wish to address is:

Are educators able and empowered to think critically in order to initiate the cultivation of critical thinking skills among learners?

Aims of the study

This study aimed, by means of exploratory research, to establish the critical thinking abilities of a group of prospective educators in order to determine to what extent the ideal of cultivating critical thinking is compatible with the educational reality.

Method of research

A preliminary exploratory study, which was quantitative in nature, was undertaken to gain practical knowledge of and insight into the research area of critical thinking.

Population and sample

The research was conducted at a College of Education in Gauteng province where 240 prospective educators were enrolled to complete a Junior Primary, Senior Primary or Secondary Education Diploma. A sample of 88 first year students enrolled at the College for a Senior Primary Qualification (Grades 4–7) was purposively selected to participate in the research. Although all the students came from the previously disadvantaged community, their biographical information revealed that they represented different ethnicity, age, gender, and socio-economic groupings (see Table 1). This information provided independent variables in order to verify any significant differences with regard to critical thinking within the otherwise fairly homogeneous sample.

Table 1 Frequency distribution for ethnicity, age, gender, and socio-economic deprivation

Variable	N	%
Ethnicity		
Xhosa	15	17.0
Zulu	22	25.0
Southern Sotho	47	53.4
Tswana	4	4.5
Age		
17–20	7	7.9
21–25	40	45.4
26–30	32	36.3
30+	9	10.2
Gender		
Male	12	13.6
Female	76	86.3
Socio-economic deprivation		
Not deprived	38	43.0
Moderate deprivation	28	31.8
High deprivation	22	25.0

Data collection instrument

There are no comprehensive and standardised tests available in South Africa for measuring critical thinking abilities. It was therefore decided to use the Cornell Critical Thinking Test — Level X and Z (Ennis, Millman & Tomko: 1985) as it is the most recent test available and measures practically all aspects of critical thinking. As the research sample involved undergraduates, the Level Z test was selected, as this test is specifically aimed at undergraduates.

Validity was arrived at by considering both content validity and construct validity. The content validity was supported by the fact that the specific test items were constructed strictly according to the definition of each section (deduction, credibility, etc.). The construct validity was underpinned by the fact that although the test focuses on different sections (definitions, induction, deduction, etc.) all sections deal with critical thinking skills.

Earlier research done with the Cornell Critical Thinking Test — Level Z involved determining the reliability of the test. Independent administrations under comparable conditions of the test were done with eight undergraduate groups of students during the 1960s and late 1970s to early 1980s. Results indicated that the test consistently yielded similar results (Ennis, Millman & Tomko, 1985).

Furthermore, the nature and the content are such that it can be regarded as not constructed exclusively for American conditions and students. The content of the test focuses on general topics related to farming, voting and immigration. According to Ennis, Millman & Tomko (1985:1), the test can be taken by college students in any country, provided that they understand English or the test is translated into their vernacular. The researchers agreed that the degree of foreignness to our own circumstances could be regarded as minimal. As all the students involved in the research had completed their schooling in English and were expected to do their training and future teaching in English, it was decided to use the English version of the test.

The test includes 52 multiple-choice items, which must be completed in a time limit of 50 minutes. The instrument is designed to determine critical thinking abilities by using "general scenarios". It is therefore not subject-related. The test items focus on the following aspects of critical thinking:

- Deduction (Test items 1–10): The respondent must determine whether proposed conclusions, which follow from given statements, contradict them or not.
- Semantics (Test items 11–21): The respondent must show an understanding of the verbal and linguistic aspects of a given argument.
- Credibility (Test items 22–25): The respondent is expected to judge the credibility of a given statement against a given experiment.
- Induction (Test items 26–38): Given information is judged by the respondent as being supportive or against; or neither supportive nor against, the stated conclusion of a given experiment.
- Induction (Test items 39–42): The respondent must show the ability to relate possible stated predictions to a given planned experiment.
- Definition (Test items 43–46): The respondent selects the definition, that best gives the meaning of the given concept, from a list of possible given definitions.
- Assumption identification (Test items 47–52): The respondent should be able to identify unstated assumptions from a given text.

Pilot study

Before the questionnaire was administered to the sample, a pilot study was conducted with a selected number of respondents from the target population, namely, the group of second-year Senior Primary students (77 students), to determine its qualities of measurement and appropriateness and to review it for clarity. The group did not experience any difficulties in understanding what the questions required them to do. According to the authors' discretion, the instrument complied with reliability and validity criteria.

Data analysis and interpretation

By meticulously following the given instructions, the test was administered at the beginning of the particular academic year. By using the prescribed template, each respondent's test was marked. For scoring purposes, the given formula, namely, the total of all correct responses minus half a mark for each incorrect response, was applied. Raw scores were used throughout for determining individual respondents' results.

Descriptive in nature, the following results were noted with regard to the total sample's critical thinking abilities as measured on the Cornell Critical Thinking Test — Level Z.

In the first instance, it was observed that the majority of respondents tested below the median (see Table 2). When the raw score totals for the whole group were calculated and an average percentage for the test determined, the apparent inability of the total group of respondents to handle tasks requiring critical thinking abilities was reflected (see Table 3).

In addition to the above, the results of the Cornell Critical Thinking Test — Level Z were also interpreted with respect to the following variables: ethnicity, age, gender, and socio-economic status. The last

Table 2 Frequency distribution of scores for the Cornell Critical Thinking Test (N = 88)

Score intervals out of 52	N
0 - 4	0
5 - 9	3
10 - 14	16
15 - 19	36
20 - 24 (median)	26
25 - 29	7
30 - 34	0
35 - 39	0
40 - 44	0
45 +	0

Table 3 Test raw score totals and average percentage of respondents

Group test total	Possible test total	Average percentage of respondents
1 589	4 576	34.72

Table 4 Average test results in comparison with ethnicity, age, gender, and socio-economic deprivation

Variable	%
Ethnicity	
Zulu	37.75
Xhosa	38.25
Southern Sotho	34.79
Tswana	34.34
Age	
17 - 20	38.75
21 - 25	36.65
26 - 30	36.00
30 +	38.05
Gender	
Male	39.64
Female	36.20
Socio-economic deprivation	
Not deprived	36.53
Moderate deprivation	36.57
High deprivation	36.79

was established by means of the Human Sciences Research Council's (HSRC) Socio-Economic Deprivation (SED) questionnaire (1991). The respective results for the above-named variables are reflected in Table 4.

The results indicated that not one of the variables had any conspicuous impact on the execution of the critical thinking abilities. In the case of this particular research group, the deficiency with regard to the execution of critical thinking skills was therefore a problem, which covered the ethnic, age, gender, and socio-economic variables.

Furthermore, a comparison was drawn between the results of the seven critical thinking aspects tested individually. The following interesting results were noted (see Table 5).

When considering the total sample's average percentage obtained in each of the seven sub-tests of critical thinking, it was obvious that the respondents excelled in none of these. It was interesting to note, though, that a slightly better performance was observed in sub-test one (deduction) and in sub-test four (induction). The respondents' performance in sub-test six (definition) raised concern about their ability to form and give meaning to concepts — a self-evident ability for any successful learning. The results of sub-test two (semantics) were also noteworthy because of the lowest average percentage obtained. This observation could, however, reveal much more than meets the eye. For example, from a critical thinking perspective, it could imply that the particular group of respondents did not adequately meet the language

Table 5 Comparison of the Cornell Critical Thinking Test — Level Z: Sub-tests

Sub-tests	Possible sub-test totals	Possible group test total (N = 88)	Actual raw score (N = 88)	Average percentage
Test 1: deduction	10	880	406	46.13
Test 2: semantics	11	968	240	24.79
Test 3: credibility	4	352	105	29.82
Test 4: induction 1	13	1 144	480	41.95
Test 5: induction 2	4	352	97	27.55
Test 6: definition	4	352	122	34.65
Test 7: assumptions	6	528	139	26.32

requirements necessary for thinking critically. From a language point of view, it could also point at the respondents' degree of English proficiency.

Conclusions

It is acknowledged that this research was only exploratory in nature. It is further acknowledged that the test in itself or variables other than those mentioned could have influenced the findings of the research. Nevertheless, when the results are evaluated, a deficiency with regard to critical thinking abilities is evident. Moreover, if it is accepted that the results provide for a fairly credible basis on which prospective educators' critical thinking abilities can be profiled, the consequences for teaching and learning in terms of the ideals of the African Renaissance and SAQA are appalling.

In the light of the above, it is imperative that:

- contextualised and standardised research instruments appropriate to South African circumstances be developed, to establish the critical thinking abilities of the South African society;
- extensive research be done to establish the critical thinking abilities of South African educators (and learners); and
- that recognised strategies and techniques be applied — and where necessary adapted to improve the critical thinking abilities of all South African educators (and learners).

In the spirit of life-long learning, the challenge to bridge the gap between ideals and realities should also be accepted with regard to the nurturing of critical thinking, especially among prospective educators. If it is argued that educators should play a pivotal role in the development of learners' critical thinking skills, it not only seems reasonable to expect of educators to change their classroom practices, but also to assume that educators themselves should reflect competence in the ability to think critically. Educator training programmes should therefore be developed to provide the necessary knowledge, skills and attitudes for ensuring sustainable holistic development and growth with the aim of producing pioneers for realising the ideals of the African Renaissance and the sought-after critical outcomes.

References

- Angelo TA 1995. Classroom Assessment for Critical Thinking. *Teaching of Psychology*, 22:6-7.
- Anon. 2001. SA Pupils are the Dunces of Africa. *Sunday Times*: July 16.
- Archer AL & Isaacson SL 1990. Teaching Others how to Teach Strategies. *Teacher Education and Special Education*, 13:63-72.
- Beyer BK 1985. Critical Thinking: What is it? *Social Education*, 49:270-276.
- Beyer BK 1987. *Practical Strategies for the Teaching of Thinking*. London: Allyn & Bacon.
- Clough E, Clough P & Nixon J (eds) 1989. *The New Learning: Contexts and Futures for Curriculum Reform*. London: Macmillan Education Limited.
- Department of Education 1997. *Curriculum 2005. Lifelong Learning for the 21st Century*. Pretoria: Department of Education: Government Printer.
- Engelbrecht P 1995. Teaching Children to think: The South African Experience. *Newsletter of the International Association for Cognitive Education*, 5:11-12.

- Ennis RH 1984. Problems in Testing Informal Logic Critical Thinking Reasoning Ability. *Informal Logic*, 6:3-9.
- Ennis RH 1985. Logical Basis for Measuring Critical Thinking Skills. *Educational Leadership*, 43:44-48.
- Ennis RH 1990. The Extent to which Critical Thinking is subject-specific: Further clarification. *Educational Researcher*, 19:13-16.
- Ennis RH, Millman J & Tomko TN 1985. *Cornell Critical Thinking Test Level X and Z Manual*. Pacific Grove: Midwest Publications.
- Goodlad JA 1984. *A Place called School: Prospects for the Future*. New York: McGraw Hill.
- Haywood C 1997. Cognitive Education: The once and Future King. *Newsletter of the International Association for Cognitive Education*, 7:1-10.
- Howie S & Hughes C 1998. Mathematics and Science Literacy of Final Year School Students in South Africa. Pretoria: HSRC.
- Human Sciences Research Council 1991. Socio-Economic Deprivation Questionnaire. Pretoria: Human Sciences Research Council.
- Khoza MZ 2000. Teachers' Capacity and Commitment: the Key Ingredients in the Realisation of a Renaissance and Transformation in Education. Paper read at the *Annual Conference of the Southern African Society for Education and the University of Zululand*, Richards Bay, 31 Aug.-1 Sept.
- Lipman M 1988. Critical Thinking — What can it be? *Educational Leadership*, 47:38-43.
- Makgoba W 1999. *African Renaissance*. Sandton: Mafube/Tafelberg.
- Mashile EO 2002. Continuous Professional Development of Educators: the State, Professional Councils and Higher Education. *South African Journal of Education*, 16:174-182.
- Mbeki T 1999. Prologue. In: Makgoba MW (ed.) *African Renaissance*. Sandton: Mafube/Tafelberg.
- McPeck JE 1990. *Teaching Critical Thinking*. London: Routledge, Chapman and Hall, Inc.
- Moore WE, McCann H & McCann J 1985. *Creative and Critical Thinking*. 2nd edn. Boston: Houghton Mifflin Company.
- National Council of Teachers of English 1989. *How well can Students Read and Write?* Illinois: Urbana.
- Nelmapius K 1999. The Roots of the Future. Edge, 11-38.
- Odora Hoppers CA 2001. Decolonising the Curriculum, Indigenous Knowledge Systems and Globalisation. Pretoria: HSRC unpublished paper.
- Paul RW 1992. Critical Thinking. What, Why and How. *Critical Thinking: Educational Imperative, New Directions for Community Colleges*, 13-15.
- Raths LE, Wassermann SM, Jonas J & Rothstein A 1986. *Teaching for Thinking: Theory, Strategies and Activities for the Classroom*. 2nd edn. New York and Canada: Teachers College, Columbia University.
- Schlechty PC 1991. *Schools for the 21st century — Leadership Imperatives for Educational Reform*. San Francisco, Oxford: Jossey Bass Publishers.
- Schraw G & Olafson L 2003. Teachers' Epistemological World Views and Educational Practices. *Journal of Cognitive Education and Psychology*, 3:178-239.
- Skuy M & Partington H 1990. Special Education in South Africa. *International Journal of Disability, Development and Education*, 37:149-157.
- Sonn RA 2000. The Need for Different Classroom Settings for Effective Development of Thinking Skills. *Journal of Cognitive Education and Psychology*, 1:257-265.
- South African Qualifications Authority 1997. *SAQA Bulletin*, 1:7.
- Sternberg RJ 1984. How can we Teach Intelligence? *Educational Leadership*, 38-48.
- Vil-Nkomo S & Myburgh J 1999. A Call for Think-Tanks. Edge, 11-39.
- Vye NJ & Bransford JD 1981. Programs for Teaching Thinking. *Educational Leadership*, 22-28.
- Walsh D & Paul R 1988. *The Goal of Critical Thinking. From Educational Ideal to Educational Reality*. Washington, DC: American Federation of Teachers.