Critical Thinking

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Intervening for Growth

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Abstract: The educational reform that have been evolving in South Africa since 1996 were intended to incorporate the principles of outcomes-based education. One of the ideals of South African outcomes-based education is to instil critical thinking abilities amongst all learners. If it is agreed that teachers should play a pivotal role in the development of learners' critical thinking abilities it not only seems reasonable to expect of teachers to change their class room practices but also to presume that teachers 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 the development and growth of critical thinking abilities. The linked purposes of this paper are: 1. to determine to what extent teachers reflect the competence in the ability to think critically by elucidating the critical thinking abilities of a group of prospective teachers; and 2. to explore ways of nurturing critical thinking abilities in educator training programmes through modeling.

Keywords: Critical Thinking, Modeling

Orientation

DRIVEN BY THE ideal to provide for the capacity to realise lifelong learning and a vision of optimising learner development, the South African government has embarked on a curriculum transformation process. The process which is aimed at the implementation of Outcomes Based education is expected to make a significant contribution to the social and economic development of the nation at large.

This process gained rapid momentum during 1995 with the passage of the South African Qualifications Act. As an immediate result, the South African Qualifications Authority (SAQA), which is an independent statutory body, was established. This body's primary responsibility was, and still is, to oversee the proper development and implementation of the National Qualification Framework (NQF). In essence the NQF can be conceived as "… a scaffolding which represents the learning pathways, locations of learning and qualifications levels which will enable learners to become part of a society of lifelong learners" (Malan, 1997:5). To realize its long term goals SAQA adopted seven Critical and five Developmental Outcomes (SAQA, 1997:7). These outcomes, collectively known as Critical Outcomes, apply to all levels of learning, are cross-curricular in nature and are intent on directing all teaching and learning. The Critical Outcomes are referred to as such, because they are regarded as being critical for the development of the capacity for lifelong learning in learners (Jacobs, 1999:137).

One prominent element that emanates from the Critical Outcomes is an emphasis on the development of critical thinking skills. With regard to critical thinking skills, it is common knowledge that many learners demonstrate thinking abilities that correspond to concrete levels of thinking to a great extent (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).

A known (but perhaps more distressful) factor, is that the poor thinking abilities of learners are nurtured (or at least in part!) by instructional techniques which emphasise rote-learning. In an attempt to address this problem, the National Department of Education (1997:30) endorsed the Critical Outcomes dealing with the development of critical thinking skills when it stated 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. There is also no uniform, clear-cut and concise definition of critical

thinking. To illustrate this statement, some brief remarks.

Inherent in the ability to think critically, are the abilities:

- to produce knowledge and to formulate an own viewpoint (Ennis, 1985:44-48);
- to evaluate, classify, analyse, draw relationships and make conclusions (Lipman, 1988:38-43);
- to solve problems through logic inquiry and evaluative decision making (National Council of Teachers of English, 1989) and
- the ability to think creatively (Moore, Mc Cann & Mc Cann1985:5).

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.

As there are several contributors to the research done on critical thinking, for the purpose of the article, attention will be paid only to the viewpoints of the leaders in the field. In this regard, some brief remarks follow.

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 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.

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 thus 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.

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.

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 questions related to our educational reality and the one which this article wishes to address is:

- Are educators able and empowered to think critically in order to initiate the cultivation of critical thinking skills among learners?
- If this is not the case how can critical thinking skills be nurtured?

Aims of the Study

This article aims, by means of an 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 is 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 the Gauteng Province where 240 prospective educators were enrolled to complete a Junior Primary, Senior Primary or Secondary Education Diploma. A sample of eighty-eight 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 form the disadvantaged community, their biographical information revealed that they represent different ethnicity-, age-, gender and socio-economic groupings. (See Table 1). This information served the purpose of 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
Zulu	22	25
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
Moderate deprivation	28	31.8
High deprivation	22	25

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 is 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 is underpinned by the fact that although the test focuses on different sections (definitions, induction, deduction etc.) they all 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 1960's and late 1970's to the early 1980's. 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 completed their schooling in English and are 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 thus 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 form 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), regarding its qualities of measurement and appropriateness and to review it for clarity. The group did not experience any difficulties in understanding what the questions requested 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 are calculated and an average percentage for the test is determined, the apparent inability of the total group of respondents to handle tasks requiring critical thinking abilities is reflected. (See Table 3).

Table 2: Frequency Distribution of Scores for the Cornell Critical Thinking Test

Score intervals out of 52	0-4	5-9	10-14	15-19	20-24 (median)	25-29	30-34	35-39	40-44	45+
N = 88	0	3	16	36	26	7	0	0	0	0

Table 3: Test Raw Score Totals and Average Percentage of Respondents

Group test total	1589
Possible test total	4576
Average percentage of respondents	34.72 %

In addition to the abovementioned, 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 latter was established by means of the Human Sciences Research Council's (HSRC's) Socio-Economic Deprivation (SED) questionnaire (1991). The respective results with regard to the mentioned variables are reflected in Table 4.

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

The results indicate 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 is thus a problem, which covers 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).

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	1144	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

When considering the total sample's average percentage obtained in each of the seven sub-tests of critical thinking, it is obvious that the respondents excelled in none of these. It is interesting to note, though, that a slightly better performance is observed in sub-test one (deduction) and in sub-test four (induction). The respondents' performance in sub-test six (definition) raises 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) are 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 does not adequately meet the language requirements necessary for thinking critically. From a language point of view, it could also point at the respondents' degree of English proficiency.

Conclusions and Recommendations

When evaluating the results from the aforementioned empirical research, the poor results indicating a deficiency with regards to critical thinking abilities amongst a group of prospective teachers, provide the rationale for the importance of accepting the challenge to develop and implement strategies for improving the critical thinking abilities of prospective teachers. As one of the cornerstones of the African Renaissance and SAQA, the inclusion of critical thinking skills in the teacher education curriculum seems to be inevitable. Be it in the form of the structure and content of specific courses, or in the methodology and evaluation procedures followed by lecturers.

Being in the process of investigating possible alternative ways for nurturing critical thinking abilities amongst prospective teachers, the diversity of viewpoints with regards to the teaching and learning of critical thinking abilities is remarkable. Those in favour of a **process approach** argues for the teaching of critical thinking as a separate discipline which can be done by means of special developed programmes (Feuerstein, 1980; Oxman & Barrell, 1983; Lipman 1985). Another approach, the **infusion approach**, views the teaching of critical thinking as an integral part of subject content. According to this view, the teaching of critical thinking skills should not be separated from subject content (McPeck, 1990:34). In relation to this, Ennis (1990:13) argues that thorough subject knowledge is required before one can exercise critical thinking in a specific subject. The **holistic approach** argues that the teaching of critical thinking should feature throughout the teaching and learning process (Sadler & Whimbey, 1985:200:202). This involves the involvement of learners in the construction of knowledge, the encouragement of communication and verbalizing thoughts, the provision of challenges to learners to apply what they have learned and the accentuation of the importance of well-considered decisions

For the purpose of this paper the focus will be on combining the infusion and holistic approaches. An exemplary didactical strategy which focuses on the social-cognitive nature of the learning process will be illustrated. This strategy is supported by the viewpoint of Lombard (1992:91) which states that the human being should be actively involved in the acquisition of new codes of behaviour. Based on the results of the study, modeling is the recommended action to develop critical thinking abilities.

Modeling

Modeling is rooted in the social cognitive theory of Albert Bandura (1969, 1971, 1977, 1986). Through the years modeling has been acknowledged as one of the most powerful means to transmit values, attitudes, patterns of thought and behaviour (Bandura, 1986:47). It also strengthens and weakens inhibitions over behaviour and thought processes.

Lombard (1992:18) views modeling as a process of perceptive and cognitive involvement of learners in order to construct a conceptual framework through which the own future oriented behaviours can be directed, after intentional exposure to modeled beha-

viour. The primary role of a model is to signal certain information and principles with regard to the execution of specific actions and skills to the learner, in order to motivate and initiate the application thereof. The behaviour of models function as prompts for similar actions, and draws the observer's attention to the object, behaviour, process or setting that are favoured (Bandura, 1986:50). As a result the observer may subsequently use the same objects, process or actions to a greater extent, although not necessarily in the same way or for the same purposes.

In relation to the topic under discussion, modeling will imply the following processes: the lecturer as model for critical thinking and students **paying attention** to the modeled actions in which attractants should be inherent. Furthermore, given behavior patterns have to be repeatedly modeled and performed for it to be **retained**, to become routinized and to be enacted smoothly and automatically. Otherwise only a fragmented sketch of the specific behaviour is acquired (Bandura, 1986:65). Learning through modeling relies on two representational systems, namely imaginal and verbal constructions (Bandura, 1986:55). Visual imagery serves as a significant retention aid for behaviour patterns that are not easily represented in words. As most of the cognitive processes that regulate behaviour are primarily conceptual rather than imaginal, retention involves coding modeled events in a verbal-conceptual form. The symbolic conception or conceptual representation of an event provides the internal model for response **production** .

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 presume 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 realizing the ideals of the African Renaissance and the sought-after critical outcomes.

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