THE EXTENT TO WHICH TEACHERS CREATE CLASSROOM CLIMATES THAT NURTURE THE DEVELOPMENT OF CRITICAL THINKING ABILITIES

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Promoter: Prof. MM Grösser

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DECLARATION

I, ALVINE PETZER, solemnly declare that this work is original and the result of my own labour. It has never, on any previous occasion, been presented in part or whole to any institution or Board for the award of any Degree.

I further declare that all information used and quoted has been duly acknowledged by complete reference.

Petzer
Signature

8/10/2010
Date

ETHICAL CLEARANCE

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Dr. Mary Grosser

Dear Dr Grosser

21 Oktober 2008

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: Improving the critical thinking abilities of prospective teachers

Ethics number: N W U - 0 0 3 9 - 0 8 - S 2
Institution Project Number Year Status
Status: S = Stipulation, R = Re-Submission, P = Provisional Application, A = Authorisation

Approval date: 29 September 2008 **Expiry date:** 28 September 2013

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-EC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-EC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof MMJ Lowes
(chair NWU Ethics Committee)

Prof M. Monteith
(Chairman: NWU Ethics Committee:Teaching and Learning)

DECLARATION: Language Editor

TO WHOM IT MAY CONCERN

This is to certify that the undersigned has done the language editing for the following candidate:

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DEDICATION

This dissertation is dedicated to my husband, Hannes Petzer, and my two lovely daughters, Johané and Hannelie Petzer, who offered me unconditional love and support throughout the course of this study. I also dedicate this work to my mother, Alwine Naude, who supported me all the way since the beginning of my studies.

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SUMMARY

The nurturing of critical thinking skills is one of the cornerstones of Outcomes-Based Education (OBE). This study investigated to what extent teachers create classroom climates that nurture the development of critical thinking abilities.

A literature study was undertaken to highlight the importance and nature of the development of critical thinking skills, and to establish the relationship between classroom climate and the development of critical thinking abilities. The use of teaching methods and strategies, learning activities, questioning techniques, the role of the teacher and the role of the learner during teaching and learning in the classroom were explored. The literature review provided the conceptual framework for the study, as well as the framework for designing a questionnaire that was utilized to obtain the perceptions of teachers and learners regarding the opportunities provided by teachers for the development of critical thinking abilities in the classroom.

By means of quantitative, non-experimental descriptive survey research, a self-constructed questionnaire was administrated to a convenient sample of a purposively selected group of Grade 9 and Grade 11 teachers (n=241) and learners (n=403) in the Sedibeng West District of the Gauteng Department of Education.

The triangulation of learner and teacher data revealed differences and similarities in opinion related to the classroom climates that teachers create for nurturing critical thinking. In essence, the data revealed that teachers are, to some extent, creating classroom climates that nurture critical thinking through their choice of teaching methods and strategies, questioning techniques and the learning activities that they choose. However, the responses did not convincingly indicate to the researcher that the nurturing of critical thinking skills takes place on a regular and frequent basis. According to the learner responses, it appeared that teaching and learning methods and strategies that promote interactive learning, are underutilized by the teachers.

This study is concluded with recommendations to teachers on how to create classroom climates that promote the development of critical thinking skills.

Key words: cognition, cognitive development, critical thinking, classroom climate, teaching methods and strategies, learning activities, questioning techniques.

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CHAPTER ONE

INTRODUCTION AND MOTIVATION OF THE STUDY

1.1 INTRODUCTION

Much of today's classroom learning is focused on activities by which the learner acquires facts, rules and action sequences, and the majority of lessons require outcomes only at the lower levels of cognition, namely knowledge, comprehension and application (Sonn, 2000:257-265). This may explain why some national and international studies (Sonn, 2000:259; Engelbrecht, 1995:11-12; Schlechty, 1991:40; Mc Peck, 1990:42; Clough & Nixon, 1989:7; Goodlad, 1984:215) found that many learners find it problematic to think independently of the teacher and to go beyond the content in their texts and workbooks. Beye (cited by Borich, 2004:370) suggests that the manner in which most schooling occurs may not be teaching learners to become aware of their own learning, to think critically and to derive their own patterns of thought and meaning from the content presented.

To think critically is an important educational outcome in the National Curriculum Statement of South Africa (Department of Education, 1997:30; Department of Education, 2002:11). A very important aspect underlying the development of critical thinking is a positive atmosphere or climate in the classroom where the individual needs of the learners are stimulated (Lyke & Young, 2006:477-490). Research indicates that improving classroom practice will increase cognitive development, and that teachers need to be more aware of how their roles and contextual factors impact on the development of critical thinking abilities (Lyke & Young, 2006:477-490). A number of national and international studies conducted on critical thinking highlighted the important role of the teacher in nurturing critical thinking abilities and the apparent inability of teachers to nurture the development of critical thinking skills (*cf.* 2.3.2) (Abdulghani, 2003:92; Lombard & Grosser, 2004:212-216; Lombard & Grosser, 2008:561-579; Cook, 2008:144 Smith, 2009:61). Furthermore, research revealed that teachers seldom create a climate for thinking and show little appreciation for the individuality of learners (McPeck, 1990:35; Sonn, 2000:257-265; Schraw & Olafson, 2003:178-239).

Not one of the aforementioned studies established to what extent teachers create classroom climates that nurture the development of critical thinking skills in the South

African context. In order to determine if the assertion that teachers seldom create a climate for thinking holds truth, and in the absence of studies conducted in South Africa at school level to investigate the role of classroom climate in the development of critical thinking, this study wishes to make a contribution.

The researcher concurs with the viewpoint of Collins and Mangieri (1992:175) that the process of thinking must become the vehicle through which teachers teach content and the development of the intellect, learning to learn, knowledge production, meta-cognition, decision-making, creativity and problem-solving must become the subject matter of instruction.

Based on the aforementioned, the researcher formulates the purpose of the study as follows.

1.2 PURPOSE STATEMENT

The purpose of this study was to determine the extent to which Grade 9 and Grade 11 teachers in South Africa presently create classroom climates that nurture the development of learners' critical thinking abilities.

The purpose statement of the study indicates that the study had two main focus points, namely critical thinking and classroom climate. The theoretical and conceptual frameworks of the study are elucidated below.

1.3 THEORETICAL FRAMEWORK OF THE STUDY

The researcher acknowledges the fact that the context in which learning takes place can be dynamic and multi-dimensional and that a combination of learning theories should be considered in the instructional design process to provide optimal learning. In this study, however, constructivism will be regarded as the driving force behind the instructional design process in the classroom for nurturing critical thinking (Schunk, 2004:285). For this particular study in which the focus was on the development of critical thinking abilities, the assumption made by the researcher emphasizes one of the major assumptions of constructivism, namely that learning is situated in the context where it occurs. This assumption highlights the importance of the context in teaching and learning. For the development of critical thinking abilities, the classroom context should nurture the development of these abilities by engaging learners in activities where cognitive skills are applied and practiced. Other topics highly relevant to

constructivism and in particular to this research as well, are the involvement of learners in the construction of knowledge, the organization and structure of the learning environment, how work is evaluated and rewarded, how authority is established and how time is scheduled (Schunk, 2004:285). In the context of this study, the researcher focused on aspects in the questionnaire that linked the assumptions of constructivism to the use of teaching methods and strategies, the choice of learner activities, questioning strategies and the role of the teacher and learner in order to have an effect on the development of critical thinking skills in the classroom. The constructivist approach has also been linked with the application of indirect, independent and interactive teaching methods and strategies during teaching. These methods and their related strategies are regarded as effective for enhancing the critical thinking skills of learners (*cf.* 2.5.1.2).

The key concepts central to the study are *"critical thinking"* and *"classroom climate"*. They are elucidated in chapter two. For now, a brief definition is provided of how the researcher conceptualizes each in the context of the study.

1.4 CONCEPTUAL FRAMEWORK OF THE STUDY

In the context of the study, the nurturing of critical thinking abilities implies that teachers need to create opportunities for the development of cognitive skills such as analysing or evaluating information, particularly statements or propositions that are offered to people as being true. It forms a process of reflecting upon the meaning of statements, examining the offered evidence and reasoning and forming judgements about facts (Watson & Glaser, 2002:2.1, 2.2). The researcher argues that if the mentioned skills are nurtured and learners become effective in the execution of these skills, their ability to think critically will be enhanced.

In the context of the development of critical thinking, classroom climate implies the creation of a learning environment by the teacher where learners feel safe, nurtured and intellectually stimulated and challenged (Lyke & Young, 2006:477-490; Lake, 2009:14). This is achieved through the choice of teaching methods and strategies as well as teaching and learning activities through which an intellectual environment that inspires learners to explore on their own, is created (Crotty, 2002; Lake, 2009:14).

1.5 RESEARCH QUESTIONS

The following primary and secondary research questions guided the execution of the study.

Primary research question

To what extent do teachers create classroom climates that nurture the development of critical thinking abilities?

Secondary research questions:

- What does critical thinking ability entail and how can it be nurtured in the classroom?
- Which teaching methods and strategies do teachers apply in the classroom?
- Which types of learning activities do teachers create for learners to engage in ?
- Which types of questions do teachers pose to learners ?
- Investigating what role does the teacher play in the classroom
- Investigating what role does the learner play in the classroom
- To what extent do teacher and learner opinions differ regarding the creation of classroom climates that nurture the development of critical thinking abilities?

1.6 AIMS OF THE RESEARCH

The overall aim of this study was to determine to what extent teachers create classroom climates that nurture the development of critical thinking abilities. The overall aim was operationalized as follows:

- by determining what critical thinking ability entails and how it can be nurtured in the classroom;
- by determining which teaching methods and strategies teachers apply in the classroom;
- by establishing the types of learning activities that teachers create for learners to engage in;

- by identifying the types of questions that teachers pose to learners in class;
- by investigating what role the teacher plays in class;
- by investigating what role the learner plays in class; and
- by establishing to what extent teacher and learner opinions differ with regard to the classroom climate that teachers create for nurturing critical thinking abilities.

1.7 EMPIRICAL RESEARCH DESIGN

The empirical research comprised two phases, namely a literature review and an empirical study.

1.7.1 The literature study

A thorough study was made of available research articles and primary and secondary literature sources to explore the concept critical thinking and to determine the requirements of a classroom climate that nurtures the development of critical thinking abilities. In order to achieve this, data bases (both national and international) were consulted. An EBSCOHost web search was done, and the following key words and phrases were used: *cognition, critical thinking, classroom climate, learning environments, cognitive development, climate for critical thinking, teaching and learning activities, teaching methods and strategies* and *questioning*.

The following themes were identified in the literature and informed the way in which the literature review in chapter two, as well as the questionnaires were structured.

Table 1.1: Overview of literature consulted and the themes extracted

Themes	Journals	Books	Internet articles
Cognition and the place of critical thinking		Grosser, 1999 Matlin, 2002 Pintrich & Schunk, 2002 Moseley *et al.* 2005	
Cognitive actions	Van den Berg, 2004	Thornton, 2002 Monteith, 2002 Grabe & Grabe, 2004 Fisher, 2005 Bereiter, 2006 Halpern, 2007 Kok, 2007	
Cognitive strategies			
Cognitive skills	Sternberg, 2000 Elder & Paul, 2001	Matlin, 2002 Lipman, 2003 Craft, 2005 Fisher, 2005 Moseley *et al.*, 2005 Tileston, 2005 Kalantzis & Cope, 2008	Elder, 2007
Metacognitive actions	Ertmer & Newby, 1996	Grosser, 1999 Matlin, 2002 Grabe & Grabe, 2004 Woolfolk, 2004 Fisher, 2005 Moseley *et al.*, 2005	

		Halpern, 2007 Ormrod, 2008	
Critical thinking	Paul, 1993 Angelo, 1995 Bailin *et al.*, 1999 Pithers & Soden, 2000 Ennis, 2001 Watson & Glaser, 2002 Vandermensbrugghe, 2004 Blunt, 2005 Jeevanantham, 2005 Van Gelder, 2005 Facione, 2009	Bloom, 1956 McPeck, 1981 Splitter, 1999 Jones & Mules, 2001 Fisher, 2005 Tileston, 2005 Halpern, 2007	Schafersman, 1991
Importance of teaching critical thinking	Crooks, 1995 Elder & Paul, 2001 Jeevanantham, 2005 Van Gelder, 2005	Caywood, 1994 McPeck, 1990 Bassham *et al.*, 2005	
Critical thinking:the South African Scenario	Grosse & Lombard, 2004 Van den Berg, 2004 Bataineh & Zghoul, 2006 Grosser & Lombard, 2008	Department of Education,1997, 2002	
Critical thinking:the international Scenario		Smith, 2009 Cook, 2008 Abdulghani, 2003	
Factors impacting on the development of critical thinking skills	Black & Wiliam, 1998 Sonn, 2000 Stiggins, 2002 Black *et al.*, 2004 Elder & Paul, 2004	Meyers, 1986 McPeck, 1990 Paul, 1993 Nisbett *et al.*, 2001 Briggs & Sommerfeldt, 2002	McGonigal, 2005 Pratt, 2005

	Potterton, 2008	Abdulghani, 2003 Elder & Paul, 2004 Fisher, 2005 Donald *et al.*, 2006 Fraser, 2006 Gawe, 2007 Vakalisa, 2007 Kalantzis & Cope, 2008	
Classroom climate and critical thinking	Abdool & Drinkwater, 2005	Borich, 2004 Lake, 2009	Crotty, 2002 Elder, 2007
Characteristics of classroom climate	Moloi, 2005	Lipman, 2003 Schunk, 2004	McGonigal, 2005
Teaching and learning activities	Schraw, & Olafson, 2003	Bruner, 1966 Collins & Mangieri, 1992 Killen, 1998 Burden & Boyd, 2003 Walker & Diaz, 2003 Borich, 2004 Jacobs, 2007 Vakalisa, 2007 Arends, 2009 Eggen & Kauchak, 2010	Ferrando, 2001 Billington, 2010 Race, 2010
Teaching methods and strategies	Wilkinson, 2004	Killen,1998 Grosser, 2002 Burden, & Boyd, 2003 Walker & Diaz, 2003 Borich, 2004 Woolfolk, 2004 Fisher, 2005	

		Kramer, 2006 Cook, 2008 Philpott, 2009 Eggen & Kauchak, 2010 Gunter *et al.*, 2010	
Questioning techniques for nurturing critical thinking	Elder & Paul, 2001	Freseman, 1990 Jones & Mules, 2001 Borich, 2004 Meyer & Lombard, 2006	Schafersman,1991 Blanchette, 2001 Cotton, 2001 Wilson, 2002
The role of the teacher	Alazzi, 2008	Borich, 2004 Halpern, 2007	Cole & Chan, 1994 Ferrando, 2001 McGonigal, 2005
The role of the learner	Pithers & Soden, 2000 Elder & Paul, 2001 Vandermensbrugghe, 2004 Barnes, 2005 Halx & Reybold, 2005	Collins & Mangieri, 1992 Walker & Diaz, 2003 Schunk, 2004 Halpern, 2007 Mahaye & Jacobs, 2007	Cheung *et al.*, 2002
The relationship between classroom climate and critical thinking	Facione, 2009	Knight & Waxman, 1990 Seng & Kong, 2006 Halpern, 2007	Monteith, 1999 Cheung *et al.*, 2002

All research studies have to be embedded within a research framework. The next section will elucidate the research framework that was chosen for this study and how the framework informed the choice of the research design.

1.7.2 The empirical investigation

1.7.2.1 Research framework

This study was based on a positivistic research framework (Maree & Van der Westhuizen, 2007:33). A positivistic framework focuses on accurate, quantitative data by means of experiments or surveys (Maree & Van der Westhuizen, 2007:33). For positivists, knowledge about the social world can be obtained objectively. This means, what the researcher sees and hear is straightforwardly perceived and recordable without too many problems (Thomas, 2009:74). As it was the objective of the researcher to gather information about classroom climate objectively, the positivistic paradigm was seen as suitable.

1.7.2.2 Research design

Linked to the objective nature of the positivistic research framework, a quantitative research design was utilized for this research. Quantitative research is a systematic and objective investigation and quantification of phenomena and their relationships (McMillan & Schumacher, 2006:23). A quantitative design was chosen as it was the researcher's intent to establish and confirm a given situation (Leedy & Ormrod, 2005:95). A qualitative design was not used in this study as it was the intention of the researcher to determine the frequency and intensity of occurring behaviour by means of numerical data.

Linked to the quantitative research design was the choice of a quantitative research strategy.

1.7.2.3 Research strategy

A non-experimental, descriptive survey research strategy was utilized in this research. It implies that a researcher observes a phenomenon without manipulating the independent variables. The researcher simply wants to provide a summary of an existing phenomenon and to assess the nature of existing conditions (McMillan &

Schumacher, 2006:24, 215). In the context of this study, there was no manipulation of the dependent variable, critical thinking.

Survey research involves acquiring information about a large population, perhaps about peoples' opinions, attitudes and experiences by asking questions and tabulating the answers (Leedy & Ormrod, 2005:183). In the context of this study, the researcher wished to obtain information about a large population regarding the extent to which teachers nurture the development of critical thinking in class, by surveying a sample of the population.

1.7.2.4 Population and sample

All teachers and learners in South Africa comprised the population. As it was not possible to do a research among all teachers and learners in South Africa, a study population was chosen.

All the secondary schools in the Sedibeng West District of the Gauteng Department of Education, and all the teachers and learners in the Senior and Further Education and Training phase formed part of the study population. The district comprises forty six ex-Model C and Township schools in total. The focus of this research was on the Senior and Further Education and Training phases. Grade 9 and Grade 11 learners and teachers of five conveniently selected ex-Model C and Township schools respectively, were used in this research study. The reason for purposively focusing on Grade 9 and Grade 11 was based on the researcher's observations during the teaching of these learners which indicated that there are vast differences in their critical thinking abilities. It appears to the researcher that more attention is paid to the nurturing of critical thinking in Grade 9 than in Grade 11. The researcher's observation motivated the inclusion of Grades 9 and 11 in the study.

Sampling design

Due to time and logistical constraints, convenience sampling was utilized for this study regarding the choice of schools in the Sedibeng West District. Convenience sampling takes people that are readily available to participate in the study (Leedy & Ormrod, 2005:206). The five Township and five ex-Model C schools that took part in the research were conveniently available, easily accessible and willing to assist the researcher in conducting the research. Convenience sampling was also utilized to

select approximately twenty five willing learners in Grade 9 and Grade 11 respectively in each of the schools which took part in the research (n = 403). Initially 500 questionnaires were distributed, but only 403 were completed. The sampled group of learners differed from one another regarding gender, grade, ethnic group and type of school which they attended.

All the teachers in the selected schools were requested to take part in the research (n=241). A heterogeneous group of teachers comprising different genders, age groups, ethnic groups and levels of experience were used in this study.

1.7.2.5 Data collection instruments

Two self-structured, closed-ended questionnaires containing likert scale items were constructed for teachers and learners respectively, in accordance with the literature review on critical thinking and classroom climate (Maree & Pietersen, 2007a:161, 167). The aim of the questionnaires was to gather information from teachers and learners regarding the following aspects that were identified from the literature review as being important in creating a classroom climate that nurtures critical thinking:

- teachers' understanding of critical thinking (only part of the teacher questionnaire);
- teachers' utilization of different teaching methods and strategies in such a way that critical thinking is nurtured;
- the type of learning activities in which learners are involved;
- the types of questions posed during teaching and learning;
- the roles that teachers play during teaching and learning; and
- the roles that learners play during teaching and learning.

The same questions, phrased differently to suit the learners and teachers, were posed to enable the researcher to determine similarities and differences in the responses.

A pilot study was conducted with a group of learners (n=40) and teachers (n=40) from the population who were not part of the sample in order to determine the reliability and validity of the questionnaire. Cronbach alpha coefficients and inter-item correlations were calculated to determine the reliability of the questionnaire items. With regard to

validity, face, content, criterion and construct validity were considered (Pietersen & Maree, 2007d:217). How the study complied with reliability and validity criteria is discussed in detail in chapter three.

1.7.2.6 Statistical techniques

The Statistical Consultation Services of the North-West University, Vaal Triangle campus was consulted to assist with the analysis and interpretation of data. By means of descriptive statistics, the data analysis for the learner and teacher responses to the questionnaire was interpreted. The responses to the questionnaires were summarized with frequency counts, percentages and means (Pietersen & Maree, 2007c:183-196). By means of inferential statistics, the data obtained for learners and teachers were compared in order to determine similarities and differences. T-tests were utilized to determine the statistical significance of differences between the teacher and learner responses for the means obtained for the various questionnaire sections. If statistical significant differences were noted, Cohen's d was calculated to determine the effect of the difference in practice (Steyn, 2005:20).

1.8 CHAPTER SUMMARY

This chapter indicated the importance of critical thinking in the National Curriculum Statement of South Africa, as well as the role of classroom climate in nurturing the critical thinking abilities of learners at school. In order to determine to what extent classroom climates that nurture critical thinking are created, quantitative, descriptive survey research was undertaken with a conveniently selected sample of teachers (n=241) and learners (n=403) from the Sedibeng West District in the Gauteng Department of Education. Questionnaires were administered to teachers and learners in order to determine their perceptions regarding the extent to which teachers presently create classroom climates that nurture the development of learners' critical thinking abilities.

In the next chapter, a detailed literature study explores the concept critical thinking, and elucidates the role classroom climate plays in the development of critical thinking skills.

CHAPTER TWO

CRITICAL THINKING AND CLASSROOM CLIMATE

2.1 INTRODUCTION

In an effort to improve the academic success of learners, it has become necessary to examine all the components of the educational process in order to maximize the effectiveness of instruction within the classroom and how it influences the development of critical thinking skills (Gyalyam & Le Grange, 2005:239-246; Halx & Reybold, 2005:293).

The purpose of this study was to determine the extent to which classroom climate nurtures the development of critical thinking skills among learners. In order to understand how a classroom climate that nurtures critical thinking can be created, it is necessary to highlight the importance of the choice of teaching and learning activities, teaching methods and strategies, the importance of questioning and the role of the teacher and learner as contributing factors in the creation of a classroom climate that nurtures critical thinking (Crotty, 2002; Walker & Diaz, 2003:64; Borich, 2004:261, 262, 370; Fisher, 2005:207).

In this chapter, the following aspects will be highlighted:

- Critical thinking within the framework of cognition
- Critical thinking: a concept clarification
- Factors impacting on the development of critical thinking
- Classroom climate and critical thinking
- The relationship between classroom climate and critical thinking

2.2 COGNITION AND THE PLACE OF CRITICAL THINKING

2.2.1 Cognition unpacked

Trying to understand how people think and learn is, in some ways, an impossible challenge, since we can only try to understand these things by using the processes that

we do not fully understand (Moseley, Baumfield, Elliott, Gregson, Higgins, Miller, & Newton, 2005:10). According to Moseley *et al.* (2005:10), we can choose to focus on:

- measurable aspects of human behaviour rather than on lived experience;
- resort to metaphors which have personal or group appeal; or
- do what scientists have done when entering a new and complex field and look for patterns and regularities between situations.

Based on the aforementioned explanation, the researcher had to unpack the concept *"cognition"* to identify the place and role of critical thinking within the framework of cognition. Cognition, or mental activity, describes the acquisition, storage, transformation and the use of knowledge, and refers to a variety of cognitive and meta-cognitive activities (Pintrich & Schunk, 2002:225; Matlin, 2002:2). According to Grosser (1999:56), successful learning requires the execution of a range of cognitive skills and strategies, which will be briefly explained in the following sections. This is done to highlight the cognitive actions and strategies that play a role in critical thinking

2.2.2 Cognitive actions

Cognitive activities require the use of cognitive skills which can be of lower-order or higher-order. Lower-order cognitive skills refer to skills for recalling information and higher-order cognitive skills refer to skills to synthesize, anlayse and evaluate information (Thornton, 2002:102; Grabe & Grabe, 2004:62-64; Van den Berg, 2004:279-280; Fisher, 2005:94; Bereiter, 2006:14; Kok, 2007:28-30). Cognitive actions include skills and strategies that are used in decision-making, problem-solving, analysing, synthesizing, reasoning and critical thinking skills (Monteith, 2002:97; Halpern, 2007:10).

2.2.2.1 Cognitive strategies

A cognitive skill refers to the ability to apply a cognitive action with the necessary accuracy in an experienced way, for example to synthesize and to analyse (Grosser, 1999:54), and a cognitive strategy refers to complex actions which require the execution of a number of steps, like problem-solving, decision-making and conceptualizing (Monteith, 2002:97; Moseley *et al.,* 2005:237) that learners need to apply in order to complete certain learning tasks.

Matlin (2002:500) defines problem-solving as the use of strategies to reach a goal in which the solution is not immediately obvious. Humans do not passively absorb information from the environment (Matlin, 2002:361). Instead, they plan their approach to problems, choosing strategies that are likely to provide useful solutions. Moseley *et* al. (2005:144) stated that problem-solving skills are skills needed to identify and define a problem, state the goal, generate and evaluate solution paths. They identified the following steps involved in problem-solving:

- Restating the problem and the goal to consider different sorts of solution
- Recognizing the critical role of persistence
- Using a quality representation of a problem (e.g. graphs, trees, matrices and models)
- Understanding world-view constraints
- Selecting the best strategy for the type of problem
- Actively seeking analogies.

According to Matlin (2002:493) decision-making involves thought processes for assessing and choosing among several alternatives. Decision-making is also seen as an interdisciplinary field that includes concrete, realistic scenarios (Matlin, 2002:412). According to Epstein (2006:351), making a decision is making a choice and implies a choice between various options. Making decisions is no more than being very careful in constructing arguments for your choices (Epstein, 2006:351).

Moseley *et al.* (2005:144) state that decision-making skills are the skills involved in the generation and selection of alternatives and in judging among them by:

- framing a decision in several ways to consider different sorts of alternatives;
- generating alternatives;
- evaluating the consequences of various alternatives; and
- becoming aware of the effects of memory on decisions.

Conceptualizing can be seen as the learning of concepts, where concepts are the tools of thought (Jones & Idol, 1990:93). When we cluster things in terms of their similarities, we are said to have a concept of them. Analysis of concepts involves clarifying and removing ambiguities (Lipman, 2003:181). Concept formation involves organizing information into relational clusters and then analysing and clarifying them so as to expedite their employment in understanding and judging. Conceptual thinking involves the relating of concepts to one another so as to form principles, criteria, arguments and explanations (Moseley *et al.,* 2005:159). According to Kalantzis and Cope (2008:182), conceptualizing makes distinctions that are clearer, creates higher levels of precision of meaning, creates explicit definitions for the purpose of a particular knowledge-making activity and extracts meaning to identify the underlying functions of a concept.

2.2.2.2 Cognitive skills

Cognitive skills involve the application of creative and critical thinking skills as well as micro thinking skills (Sternberg, 2000:31; Fisher, 2005:3; Tileston, 2005:47).

Creative thinking skills involve creating, discovering, inventing, imagining, supposing and hypothesizing (Sternberg, 2000:31). Matlin (2002:387) and Craft (2005:20) argues that novelty or originality is a necessary component of creativity and that creativity requires finding a solution that is both novel and useful. Creative thinking implies that knowledge is taken from one context and applied in a vastly different one to solve problems, to come up with solutions, to mix and match symbolic meanings in unusual, original and creative ways and to imagine new angles or perspectives (Kalantzis & Cope, 2008:186).

Moseley *et al.* (2005:159) identify the following aspects that are typical of skills for creative thinking:

- redefining a problem and goal in several different ways;
- finding analogies across different domains of knowledge;
- brainstorming ideas without censoring or evaluation;
- generating and using a variety of solutions to problems;
- listing the positive, negative and interesting attributes of various solutions; and

- visualizing ideas from different perspectives.

Critical thinking skills include analysing, critiquing, judging, evaluating, comparing and contrasting and assessing (Sternberg, 2000:31). For Matlin (2002:121), the basic areas of critical thinking are clarity, basis, inference and interaction. Critical thinking is evaluating whether we should be convinced that some claim is true or some argument is good, as well as formulating good arguments (Epstein, 2006:5). Fisher (2005:59) identifies critical thinking as fair mindedness and argues that, in order to develop critical thinking, learners need to be encouraged to be reasonable, fair-minded and skilled thinkers. As critical thinking is the focus of this study, the researcher will discuss it in detail in a separate section (*cf.* 2.3).

Micro-thinking skills are skills related to inquiry processes, reasoning processes, information gathering, processing and organizing. For purposes of cognitive efficiency, we have to be able to interpret and organize the information we receive into meaningful clusters or units (Lipman, 2003:180). This, according to Mosely *et al.* (2005:158), implies the skill of reasoning, which is a process of ordering and coordinating information that has been discovered through inquiry. It involves finding valid ways of extending and organizing what has been discovered or invented while retaining its truth (Lipman, 2003:179). According to Elder and Paul (2001:43) and Fisher (2005:68), everyday reasoning is embedded in the ways we understand the world, which include guessing, processing information, using information to come to conclusions and using common sense and the ways in which we use language to create meaning.

2.2.3 Meta-cognitive actions

According to Matlin (2002:175; Grabe and Grabe (2004:47-49) and Woolfolk (2004:256-257), meta-cognition is **your** knowledge, awareness and control of your cognitive processes. Meta-cognition is important because our knowledge about our cognitive processes can guide us in arranging circumstances and selecting strategies to improve our future cognitive performance (Ormrod, 2008:266-277). Meta-cognitive skills help us to acquire, control and regulate our knowledge and thinking. The skills involve reflecting on ourselves as thinkers, for example on our feeling of knowing or not knowing, our mental abilities and limitations (Fisher, 2005:20).

Meta-cognitive actions regulate our cognitive processes by using three important skills, namely planning, monitoring and evaluation, also known as reflective skills (Grosser,

1999:56). According to Ertmer and Newby (1996:11-13), planning, monitoring and evaluation involve the following cognitive, motivational and environmental considerations. Planning requires setting a clear goal, selecting and sequencing strategies and/or procedures toward achieving the goal, determining whether the task requires a great deal of concentration and effort, and identifying potential obstacles to the successful attainment of the goal. Monitoring refers, *inter alia, to* the following: an awareness of what one is doing, an understanding of where it fits into the established sequence of steps, an awareness of whether the task is retaining the interest and attention and whether the learning environment is supportive enough. Evaluation includes an assessment of both the effectiveness of the process and the product after completion of a learning task in order to make changes before using the same processes with similar tasks in future. The researcher argues that equipping learners with meta-cognitive skills will assist learners in becoming self-regulated learners (Halpern, 2007:10). Moseley *et al.* (2005:235) define self-regulated learning as an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate and control their cognition, motivation and behaviour, guided and constrained by their goals and the contextual features in the environment.

In the next section, critical thinking will be explored.

2.3 CRITICAL THINKING

The theory of critical thinking began primarily with the works of Bloom's initial taxonomy (1956:120), who identified six levels within the cognitive domain, each of which related to a different level of cognitive ability.

- *Knowledge* focuses on remembering and reciting information.
- *Comprehension* focuses on relating and organizing previously learned information.
- *Application* focuses on applying information according to a rule or principle in a specific situation.
- *Analysis* is defined as critical thinking focusing on parts and their functionality in the whole.
- *Evaluation* is defined as critical thinking focusing on valuing and making judgments based on information.

The above-mentioned classification supports the view of Watson and Glaser (2002:2.1, 2.2) that critical thinking is the ability to think at a complex level and to use analysis and evaluation processes. Critical thinking involves inductive thinking skills, such as recognizing relationships, analysing open-ended problems, determining cause and effect, making inferences and extrapolating relevant data (Tileston, 2005:47), and are very difficult skills to teach and learn (Van Gelder, 2005:41-46).

The view of McPeck (1981:8), that critical thinking is "*a propensity and skill to engage in an activity with reflective skepticism",* is supported by Halpern (2007:10) and Facione (2009:5-7, 10). In addition to this, Fisher (2005:59) adds the qualities of being reasonable and fair-minded, and Paul (1993:33) suggests that critical thinking entails *"disciplined self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking".*

Bailin, Case, Coombs and Daniels (1999:298) argue that critical thinking involves the assessment of reasons and arguments, and Pithers and Soden (2000:239) concur that critical thinking should be understood in terms of attitudes and dispositions. These attitudes and dispositions refer *inter alia* to *"a spirit of inquiry",* being *"open-minded"* and determining the *"credibility"* of arguments (Facione, 2009:5-7). For Halpern (2007:10-12), critical thinking skills are cognitive in nature and involve *"problem-solving", "making decisions"* and *"formulating inferences".*

After studying a diverse number of definitions, Vandermensbrugghe (2004:417) concludes that existing definitions of critical thinking can broadly be divided into two categories. The first category refers to the ability to reason logically and cohesively, and the second category refers to the ability to question and challenge existing knowledge. In order to achieve the latter, core cognitive and meta-cognitive skills such as **interpretation, analysis, evaluation, inference, explanation** and **self-regulation** are required (Facione, 2009:5). According to Facione (2009:5-7) these skills imply the following:

- Interpretation involves the expression of the meaning or significance of experiences and situations. For this purpose sub-skills of categorization are required.

- Analysis implies the identification of relationships among concepts, information and opinions.

- Evaluation refers to the assessment of the credibility of statements and judging the strengths of arguments.

- Inference means to consider relevant information to identify consequences from data.

- Explanation is defined as being able to present one's own reasoning in a coherent way.

- Self-regulation refers to the consistent monitoring of one's own cognitive actions.

Blunt (2005:1368) regards critical thinking as a generic (applicable to all subjects fields) - rather than a technical skill. Generic skills include interpersonal skills such as communicating, questioning and listening and problem-solving skills such as analysing, organizing and making decisions.

Jones and Mules (2001:192) assert that critical thinking can be seen as the questioning, thinking about and exploring how and why things happen, contemplating and talking about what is fair and unfair, true and untrue, and identifying stereotypes and questioning their meaning .

Splitter (1999:93) expresses the view that in learning to think critically, we learn to structure our experiences in ways which are reflective and self-corrective, governed by reasons and criteria, directed towards the making of judgments about the world. Jeevanantham (2005:118-129) adds that *"critical thinking is normative thinking: a critical thinker is someone who is prepared to make reasoned judgments about the quality of what he has seen, heard or thought about".*

Ennis (2001:180) notes that thinking critically involves exposing yourself, your ideas and views and knowing they are open to discussion and disagreement and the importance of setting up a climate of mutual trust. A person who thinks critically can ask appropriate questions, gather relevant information, efficiently and creatively sort through this information, reason logically and come to reliable and trustworthy conclusions about the world to enable one to live and act successfully in it (Schafersman, 1991; Ennis, 2001:180).

Most formal definitions characterize critical thinking as intentional application of rational, higher-order thinking skills, such as analysis, synthesis, problem recognition and problem-solving, inference and evaluation (Angelo, 1995:6).

Bailin *et al.* (1999:290-295) argue that a critical thinker applies five kinds of intellectual resources, namely **background knowledge, operational knowledge of the standards of good thinking, knowledge of critical key concepts, heuristics** and **habits of mind.**

- Background knowledge includes the depth of knowledge, understanding and experience a person is able to demonstrate in a particular area, which determines the degree to which such a person is capable of thinking critically in that area.

- Operational knowledge implies the standards of good thinking and assessment that a critical thinker must learn to use. These include rules of logic, standards of practical deliberation, standards of argumentation, standards used in developing plans of action and standards governing inquiry and justification.

- A critical thinker must have knowledge of key critical concepts to be able to distinguish among different kinds of intellectual products. Acquiring critical concepts is not essentially a matter of acquiring new terminology; it is rather a matter of learning to make appropriate distinctions among concepts.

- Human beings have discovered strategies, procedures or heuristics for guiding performance in a variety of thinking tasks, for example to double-check something before it is accepted as fact, or to divide a problem into a series of sub-problems more amenable to solution.

- Having the intellectual resources necessary for critical thinking does not, by itself, make one a critical thinker. One must also have certain commitments, attitudes or habits of mind for good thinking. These include *inter alia* respect for reasons and truth, open-mindedness, fair-mindedness and independent-mindedness (Facione, 2009:10-12).

From the variety of definitions and explanations of what critical thinking constitutes, the researcher came to a conclusion that a combination of cognitive and meta-cognitive thinking skills as well as attitudes and dispositions are necessary for the development of

critical thinking. The researcher summarizes her conceptualization of critical thinking as follows:

- Critical thinking involves the development of dispositions such as open-mindedness, fair-mindedness, independent-mindedness and skepticism (Mc Peck, 1981:8; Bailin et al., 1999:290-295; Fisher, 2005:59; Halpern, 2007:10; Facione, 20 09:5).

- Critical thinking involves the application of interrelated cognitive skills such as problem-solving, formulating inferences, decision-making, reasoning, analysis, questioning, interpretation, evaluation and identifying assumptions (Ennis, 2001:5-7; Watson & Glaser, 2002:2.1, 2.2; Vandermensbrugghe, 2004:417; Blunt, 2005:1368; Tileston, 2005:41).

- Critical thinking involves the development of critical thinking habits. These habits refer, inter alia, to identifying alternative viewpoints, questioning how and why things happen and arguing about what is fair and unfair and true and untrue (Jones & Mules, 2001:192).

- The development of critical thinking abilities involves the development of meta-cognitive skills that promote self-regulated learning such as planning, monitoring and evaluation (Splitter, 1999:93; Ennis, 2001:182; Halpern, 2007:10).

In order to provide an additional motivation for conducting a study on critical thinking, apart from the fact that critical thinking is a cornerstone of the South African Outcomes-Based curriculum, the researcher investigated the importance and benefits of teaching critical thinking skills to learners.

2.3.1 The importance of teaching critical thinking skills

The need to raise young people who can think for themselves can also be seen in more dramatic terms. The news media daily carry stories of children and teens who imitate what they have seen in movies or on television, sometimes with tragic consequences. Instead of a call to develop critical thinking, the usual response is to ban the image that was imitated. The presumption is that young people cannot learn to think for themselves. Teaching the *"how"* of critical thinking should be the essence of education (Caywood, 1994:46).

In the context of teaching critical thinking skills, McGonigal (2005) argues for a transformative approach to teaching and learning that will imply that teachers change their current views about teaching and learning, which appear to be more assimilative than transformative in nature. A transformative approach involves that teachers need to move away from the view that knowledge needs to be added to existing knowledge during teaching, as this approach leads to learners being uncritical of what they learn and learners not being able to make their own interpretations. On the other hand, transformative learning will provide learners with opportunities where they are actively involved in making original interpretations, considering conflicting interpretations, learning how to justify interpretations and making choices. The researcher argues that a transformative approach, which links well with the constructivist approach to teaching and learning (*cf.* 1.3), will nurture the critical awareness of learners during teaching and learning as this approach will enable learners to act upon new knowledge and understanding.

Crooks (1995:313) argues that critical thinking is required to challenge and, ultimately, replace erroneous beliefs about concepts. By encouraging critical thinking, we teach the learner what we think is right, but we encourage the learner to scrutinize the evidence and judge independently the correctness of our claims. If we want to help learners develop as critical thinkers, we must help them to come to terms with this human power of mind, the power to create concepts through which we, and they, see and experience the world. To become a proficient critical thinker, learners must become the masters of their own conceptualizations (Elder & Paul 2001:43).

According to McPeck (1990:53), teachers do not have to learn any new subject matter, new concepts or new skills to develop the critical thinking skills of their learners. All that is required is that teachers need to change their method of presentation from a lecturing mode to a more discursive or argumentative mode of teaching.

Jeevanantham (2005:118) postulates that being a critical thinker holds numerous benefits. Critical thinking, as a personal reward, develops the mind and apparently the brain, as it is claimed that a brain which is involved in complex mental processes shows more striations than the brain which is not so engaged in mental processes. By implication then, a person becomes cleverer due to involvement in mental processes such as judging, selecting, choosing, deciding, justifying, debating, verifying, arguing, recommending, assessing, discussing, explaining and convincing. As a critical thinker,

a person is able to derive greater meaning from texts, is able to make informed choices and formulate personal responses to social stimuli, all in an informed way. Furthermore, in the classroom, learners learn a variety of critical thinking skills that can greatly improve their classroom performance. According to Bassham, Irwin, Nardone and Wallace (2005:8), these skills include:

- understanding the arguments and the beliefs of others;
- critically evaluating the arguments and beliefs of others; and
- developing and defending one's own well-supported arguments and beliefs.

In the next sections, the place of critical thinking in the South African and international teaching and learning scenarios, is highlighted.

2.3.2 Critical thinking: the South African scenario

Although critical thinking lies at the core of the National Curriculum Statement (Department of Education, 1997:30; Department of Education, 2002:11) and it has recently become of paramount importance among teachers (Bataineh & Zghoul, 2006:33), the aforementioned literature review confirms that numerous definitions can be connected to the concept *"critical thinking"*. Critical thinking lies at the core of the NCS because as a critical outcome it is a generic skill that needs to be evaluated in all learning areas and subjects. The National Curriculum Statement does not give a precise and definite definition of what critical thinking implies, and also does not stipulate the skills that need to be taught in order to enhance the development of critical thinking (Van den Berg, 2000:98). According to the researcher, this is problematic as teachers do not have any guidelines related to the *"what"* and *"how"* of teaching critical thinking skills. Research done by Lombard and Grosser (2004:212-216) and Lombard and Grosser (2008:561-579) respectively indicates that teachers are not capable of thinking critically and will therefore not be able to teach learners critical thinking skills. Moreover the critical thinking skills of Grade 12 learners are not well developed. The uncertainty that characterizes the teaching of critical thinking in the South African scenario and the gloomy results reported by the latter two studies, prompted the researcher to investigate to what extent teachers are creating classroom climates for nurturing critical thinking skills.

2.3.3 Critical thinking: the international education scenario

Research done internationally also shows that critical thinking is inexplicably complex because it is a human function and the learner may demonstrate brilliant critical thinking one day. Because of lack of engagement in a new topic, problems at home or social difficulties, the same learner may appear to be fundamentally lacking in critical thinking ability the next day (Smith, 2009:60). Smith (2009:61) also states that it requires substantial planning, research and appropriate response to classroom dynamics to teach learners to think critically. Furthermore, learners are almost always able to demonstrate critical thinking more effectively when they can vocalize their opinions or feelings rather than write about their opinions (Smith, 2009:59). It has become more evident that the effectiveness of lessons geared at encouraging critical thinking is extremely complicated and that critical thinking cannot take place unless the learner is in an environment that is optimal for him or her to think critically (Smith, 2009:63).

A study conducted by Cook (2008:144) links the importance of building an optimal learning environment as essential for the development of critical thinking in the classroom. The findings of this study support the notion that learners need to feel comfortable in order to participate actively in a critical discussion with their peers (Cook, 2008:144). Teaching learners meta-cognitive strategies such as how to deal with ambiguity and discomfort rather than allowing learners simply to avoid it, can help them become more creative, productive thinkers (Cook, 2008:147). In conjunction with previous research, the results of the study done by Cook (2008:153) on strategies for nurturing critical thinking, suggest the importance of the role of the teacher as a cognitive coach in nurturing learners' critical thinking skills and that teachers can help learners become aware of their use of critical thinking skills by providing specific feedback on a consistent basis (Cook, 2008:153).

Another study done on critical thinking by Abdulghani (2003:92) also highlights the role of teachers in nurturing critical thinking in the teaching and learning environment. The roles of teachers in nurturing critical thinking skills include strategy guidance, organization of the classroom and selection and use of different tasks that should include situations that allow multiple perspectives and give learners opportunities to practise critical thinking (Abdulghani, 2003:92). Abdulghani (2003:92) emphasizes the fact that to facilitate critical thinking skills, considerable teacher involvement in formulating suitable classroom activities is required.

Although classroom climate is singled out as an important factor in the nurturing of critical thinking skills, the researcher also acknowledges the role that other factors can play in the development of critical thinking skills among learners. A number of factors will be briefly explained in the following section.

2.4 FACTORS IMPACTING ON THE DEVELOPMENT OF CRITICAL THINKING SKILLS

According to Fisher (2005:152), teaching for thinking begins in valuing the learner's own ideas. Teaching for thinking embodies the recognition that learners do not come to the learning process as *"vessels to be filled"* with knowledge (Fisher, 2005:152). There are many factors that may block the development of a learner's thinking (Fisher, 2005:198). Key elements *inter alia* include the leaner's language, culture, the teaching style of the teacher, teacher training, teaching strategies used, assessment practices of teachers, the lack of mediation in which learning and teaching take place (Fisher, 2005:201). These factors will be briefly discussed in the following sections.

2.4.1 Language

According to Elder and Paul (2004:36), critical thinking is the intellectually disciplined process of actively and skilfully conceptualizing, applying, synthesizing and evaluating information. To accomplish these critical thinking skills, good language ability is crucial (Arends, 2009:422). Kalantzis and Cope (2008:104), Donald, Lazarus and Lolwana (2006:196), as well as McPeck (1990:34), assert that language, thinking and learning is intimately tied together. The researcher therefore argues that limited language proficiency could hinder active communication which may result in a passive approach to learning. Interaction in the classroom through communication is necessary to encourage learners to use critical thinking skills.

Vygotsky (in Fisher, 2005:112) argues that concepts are first acquired externally in dialogue and then gradually become internalized as ways of thought. The instruments of language and culture help promote the growth of mental structures. Teachers challenge a learner's cognitive approach to a problem and support the learners by providing a scaffolding of understanding and so extend their thinking. Language is often said to involve the four modes of listening, talking, reading and writing, and learners will think more effectively the more they become listeners, speakers, readers and writers (Fisher, 2005:156).

2.4.2 Culture

For Fisher (2005:109), a potent factor in developing a learner's cognitive abilities is the absorbing of a rich and coherent culture. Learners who have learnt one culture, he argues, usually have the capacity to learn another. Teaching learners to think means, among other things, the ability to make use of new experiences and cultural experiences provide a powerful means for human beings to interpret reality (Fisher, 2005:109).

Learners come to school already knowing a lot of things that they have learnt in an informal way from their everyday life experiences, from their families, their communities and their cultural environments (Kalantzis & Cope, 2008:93). In the classroom, learners can learn from each other's differences related to perspectives, experiences, content, knowledge and ways of thinking. If all the learners in a classroom feel they belong, irrespective of their differences, and the learning environment values and uses their different knowledge and perspectives, then the learning that takes place will be so much more powerful (Kalantzis & Cope, 2008:128).

Nisbett, Peng, Coi and Norenzayan (2001:291) argue that the cultural differences that exist among different cultures impact on the nature of their cognitive processes. In addition to this, Nisbett *et al.* (2001:293) also postulate that individuals raised in a society focusing on personal freedom, choice, criticism, debate, curiosity and diversity will be more capable of executing analytical thinking than individual raised in a society where choice, freedom and curiosity is not valued.

2.4.3 Teacher training

The importance of teacher expectations regarding the extent to which learners will get involved in critical thinking activities, has been confirmed by extensive research (Fisher, 2005:203). Abdulghani (2003:94) and Lombard and Grosser (2004:215) highlights the fact that teachers should be trained in order to be able to teach critical thinking. Furthermore, teachers' lack of training in critical thinking or the lack of critical thinking ability among teachers themselves, account for a lack of critical thinking activities in their classroom.

The lack of training in general teaching skills only exacerbates an isolation of new teachers from their colleagues, making teachers feel ill-equipped to face the challenges

of teaching critical thinking and reluctant to share their misgivings and feelings of inadequacy with others (Meyers, 1986:101). According to Gawe (2007:214), it is important that teachers provide interaction during teaching and learning in order to improve the critical thinking skills of learners. In this regard, Potterton (2008:15), Elder and Paul (2004:36) and Sonn (2000:257-265) assert that teachers still focus on activities where learners are expected to recall facts and the outcomes of the activities focus on lower order cognitive skills such as knowledge and understanding, with very little focus on construction and application of knowledge.

The aforementioned authors clearly indicate that teacher training is faced with the challenge to equip teachers better with knowledge and skills to enable them to nurture critical thinking among learners.

2.4.4 Choice of teaching methods and strategies

Teaching styles can be executed in structured ways to achieve specific learning outcomes. These structured ways are referred to as teaching methods and strategies. Teachers are the prime sources for creating invitations and opportunities for learners to think critically (Fisher, 2005:199). The way learners will respond to these opportunities will mainly depend on the attitudes and the teaching methods and strategies that the teacher adopts (Fisher, 2005:199). The classroom where thinking is fostered is one where enquiry and investigation are valued (Fisher, 2005:205).

Teaching methods and strategies that engage learners in the construction of knowledge and allow learners to take ownership of their own learning are regarded as effective for the nurturing of critical thinking skills (Vakalisa, 2007:3; McGonigal, 2005; Pratt, 2005). According to these authors, learners should be given the opportunity to engage critically with subject content, solve problems, discuss subject content and undertake projects. The effective use of higher order questions that encourage learners to move to complex thought processes is regarded by Pratt (2005) as a valuable teaching strategy for the nurturing of critical thinking.

McGonigal (2005) and Briggs and Sommerfeldt (2002:54-56) argue for the use of a transformative approach to teaching and learning as opposed to an assimilative approach (*cf.* 2.3.1). The transformative approach implies that teachers create an environment where intellectual openness is encouraged and rewarded.

2.4.5 Choice of assessment practices

Black and Wiliam (1998:141) and Black, Harrison, Lee, Marshall and Wiliam (2004:9) are of the opinion that the assessment practices of teachers are not conducive to the development of critical thinking. The reason being that teachers emphasize competition rather than personal improvement, and provide feedback on assessment by focusing on informing learners about the skills that they do not have and that they cannot learn.

The ability to evaluate is fundamental to critical thinking. This involves the evaluation of ideas, evidence, arguments, actions and solutions. The process of evaluation involves developing and using criteria of judgment (Fisher, 2005:60). In this regard, the importance of assessment for learning is highlighted by Stiggins (2002:761). Assessment for learning promotes learners' critical thinking skills, as this approach to assessment places learners in control of their own learning; they learn to plan, monitor and evaluate their own successes and make their own decisions on how to improve their performance (Stiggins, 2002:764).

2.4.6 Lack of mediation of critical thinking skills

Basic thinking skills are built up by teachers through mediated learning experiences (Fisher, 2005:110) where the mediator intentionally transforms, reorders, organizes and groups the learning stimuli in the direction of the specifically intended goal. Feuerstein (in Fisher, 2005:111), argues that one of the greatest causes of deficient cognitive skills, inability to benefit from everyday opportunities for learning and failure at school can be attributed to the fact that many teachers remain neutral towards the learning material they transmit to learners. The role of the mediator is to organize learning so that learners are equipped with the cognitive structures that will enable them how to distinguish between relevant and irrelevant information to solve problems with self confidence in an analytical and planned manner (Fraser, 2006:9).

To gain a better understanding of how teachers can create classroom climates that nurture the development of critical thinking skills, classroom climate and its relation to the development of critical thinking is examined in the next section.

2.5 CLASSROOM CLIMATE AND CRITICAL THINKING

Classroom climate is described as the quality of the atmosphere, tone, ethos or ambience of the class as influenced primarily, not only by the interactions between

teacher and learners, but also by managerial, physical, psychosocial and teaching-learning aspects of that class (Abdool & Drinkwater, 2005:363-372; Borich, 2004:370). Classroom climate is created by the manner and degree to which authority is exercised, warmth and support are shown, competitiveness or cooperation is encouraged and opportunities are allowed for independent judgment and choice (Borich, 2004:370).

According to Elder (2007) and Crotty (2002), a safe learning environment has to be created by the teacher where diversity of opinions, learning styles and modes of thinking are accepted and learners are encouraged to explore on their own on a frequent basis. Classroom climates need to give the learners the opportunity to think on their own, explain their thoughts and compare their thoughts to the thoughts of their peers. Furthermore, according to Elder (2007) and Abdool and Drinkwater (2005:363-372) teachers need to create classroom climates that invite and support intellectual openness by nurturing a climate of trust and respect so that the learners will feel comfortable, motivated and willing to share their ideas with others, challenge the ideas of others and explain their strategies for problem-solving.

According to Lake (2009:4) and Crotty (2002), teachers have to consider a number of factors in order to create a classroom climate that will support intellectual openness, namely the choice of teaching methods and strategies, the choice of learner activities, the way in which questions are posed to learners, the role that the learner plays in the classroom and the role that the teacher plays in the classroom. In order to understand the role of classroom climate in the development of critical thinking, it is necessary to elaborate on the aforementioned factors.

2.5.1 Characteristics of a classroom climate for the development of critical thinking skills.

According to Lipman (2003:208), learners would think better if they could be provided with conditions that would encourage the application of their thinking to the world in which they live. To the researcher this implies an authentic approach to teaching and learning. Furthermore, a surface approach to learning or assimilative learning, as indicated by McGonigal (2005), leads to reproductive learning that leads to reliance on the routine memorization of materials. Deeper approaches to learning or transformative learning appear to be more successful for nurturing critical thinking skills as this approach to teaching focuses on the application of knowledge and prompts learners to

make connections between new learning material and previous knowledge or with different aspects of that knowledge (McGonigal, 2005).

Schunk (2004:321) asserts that the teacher should not always be the centre of instruction if critical thinking skills need to be developed. Learning environments should rather be designed so that learners have an active role in learning; mentally, physically, socially and emotionally. Another common feature is the use of diverse teaching methods and strategies (Schunk, 2004:323). The environment should provide multiple representations of content. In other words, as indicated by Moloi (2005:77), teaching and learning environments should be characterized by flexibility, open discussion, support, inspiration and motivation (Moloi, 2005:77).

In the context of the study the researcher argues that teachers *inter alia* have to pay special attention to the choice of teaching methods and strategies and the choice of learning activities in order to create a classroom climate that is conducive to the development of critical thinking. In order to determine how intellectual openness can be created through the choice of teaching methods and strategies and learning activities, the role of the teacher and learning in relation to the aforementioned is explored in the following sections.

2.5.1.1 Teaching and learning activities for nurturing critical thinking skills

Research into learning has demonstrated conclusively that when learners are actively involved in their own learning, the process and its effects become more effective. Learners can learn more effectively when they are asked to learn in a deeper, contextualized and often practical, real-life way (Billington, 2010; Race, 2010). The development of critical thinking abilities will become evident as learners actively deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions, and engage in learning activities that challenge the intellect and imagination (Killen, 1998:31; Burden & Boyd, 2003:319; Schraw & Olafson, 2003:178-239; Borich, 2004:334; Arends, 2009:422; Eggen & Kauchak, 2010:419). It is clear that such activities require the acquisition, comprehension and application of new knowledge and will activate the need for perseverance, research and increasingly complex forms of problem-solving. Classroom activities which involve discussions provide practice in the application of critical thinking

skills. Learners should be encouraged to use discussion to learn and to practise and improve their thinking processes when working with other learners (Walker & Diaz, 2003:64). Thinking aloud provides learners with the opportunity to listen to their own thinking and to learn how to monitor their own thinking processes (Arends, 2009:423).

Getting learners to think, solve problems and discover things for themselves are not new goals for education. Bruner (1966) emphasizes the importance of discovery learning and how teachers could help learners become builders of their own knowledge. Arends (2009:423) indicates that discussion provides opportunities not only for engagement in thinking but also for sharing experience and conversation.

Problem-based learning which focuses on self-directed learning is an approach to both teaching and learning that actively engages learners in the learning process to acquire higher-order critical thinking skills (Arends, 2009:386-388). Self-directed learning can be facilitated through discussions, decision-making, problem-solving, generating hypotheses and exploring activities (Ferrando, 2001). Arends (2009:387) indicates that self-directed learning helps learners to construct their own understanding and meaning, and helps them to reason, do problem-solving and think critically about subject content.

According to Collins and Mangieri (1992:176), Jacobs (2007:97) and Arends (2009:390) the development of critical thinking abilities will become evident as learners deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions. Literature highlights the need to create learning activities that will assist learners to improve in skills such as evaluating ideas for problem-solving and judging the appropriateness of prediction (Collins & Mangieri, 1992:169; Arends, 2009:389, 390). Learning activities should *inter alia* make room for discussion, the shared creation of knowledge, argumentation, independent thinking, self-evaluation and reflection in order to enhance critical thinking (Vakalisa, 2007:2-32).

2.5.1.2 Teaching methods and strategies for nurturing critical thinking skills

Teachers can either adopt a **teacher-centred** or a **learner-centred** teaching style (Woolfolk, 2004:442). A teaching style refers to the overarching characteristics of the way in which a teacher plans and presents teaching and learning activities (Killen,

1998:2). According to Killen (1998:2), the teacher-centred style is appropriate for learning facts, concepts and principles, and is characterized by the following:

- The learning outcomes are clearly stated.
- The teacher is in charge of the sequence in which learning activities take place.
- There is a strong focus on the transmission and memorization of knowledge.

In contrast to the teacher-centred style, the learner-centred style aims at actively involving the learner in all facets of teaching and learning, and to allow them to explore independently (Burden & Boyd, 2003:139). The learners thus take a central role with the teacher acting as a facilitator of learning.

Each of the above-mentioned teaching styles can be executed in structured ways to achieve specific learning outcomes. These structured ways are referred to as teaching methods and strategies. According to Kramer (2006:101-106), four distinct teaching methods with linked strategies can be distinguished.

Direct teaching methods and strategies

The use of direct teaching methods links with the use of the teacher-centred style of teaching where teachers are in control and learners are passive recipients of information (Gunter, Estes & Mintz, 2010:70). Direct teaching can be conducted by means of a variety of teaching strategies such as lectures, presentations, questioning, drill and practice, guided work sheets and demonstrations (Kramer, 2006:101; Arends, 2009:291-316).

Indirect teaching methods and strategies

The use of indirect teaching methods links well with the use of the learner-centred style of teaching, and has a high potential for building higher order thinking skills, personal values and individual responsibility for learning (Killen, 1998:27; Grosser, 2002:26, 27 Borich, 2004:22). The teacher acts as a facilitator and manager of the learning process. Indirect teaching can be conducted by means of a variety of teaching strategies such as concept maps, case studies, role plays, design and make activities, group projects, field trips, investigations and experiments and debates (Kramer, 2006:102).

Independent teaching methods and strategies

The application of independent teaching methods and strategies also link with the use of the learner-centred style of teaching. The utilization of this method implies a stronger focus on the learner who undertakes a learning task by himself, with the teacher only fulfilling a directing and helping role (Philpott, 2009:38; Grosser, 2002:36, 37). It is clear that independent teaching methods even enhance learner independence and responsibility for learning to a greater extent than the use of indirect teaching methods. A variety of teaching strategies can be used as part of independent teaching, namely research projects, homework, assignments and one-on-one debates (Kramer, 2006:104).

Interactive teaching methods and strategies

Interactive teaching methods and strategies focus on individualized learning where teachers and learners cooperate in the learning adventure (Arends, 2009:345). The focus is on thinking, processing information, language skills and logical reasoning (Grosser, 2002:46). Interactive learning emphasizes social interaction during learning as a mechanism to encourage cognitive development (Eggen & Kauchak, 2010:419). The following are examples of strategies that could be utilized as part of interactive teaching and learning: cooperative learning, group assignments, brain-storming activities, peer-teaching, group presentations and projects (Kramer, 2006:105-106).

The researcher is of the opinion that in the context of nurturing critical thinking skills indirect, independent and interactive methods hold potential for learners to be involved in opportunities where they can develop their critical thinking skills. This viewpoint is supported by Walker and Diaz (2003:64) who argue that, to encourage critical thinking, teachers should expose learners to various teaching methods and strategies so that they have the opportunity to practise the skill. These methods and strategies range from the traditional lecture to simulated experience and debates, and include the following: case studies generated from texts or created by the teacher, questions posed, classroom discussions of concepts, current and controversial topics using different questioning methods to promote the analysis, synthesis and evaluation levels of Bloom's taxonomy, classroom debates and written assignments. If learners are expected to think critically, they must be allowed the opportunity to practise critical

thinking under guided instruction so that they can improve their skills over time (Walker & Diaz, 2003:64).

It is important to include instructional and cognitive features in teaching and learning material over and above the subject matter, in order to help learners actively plan their study experiences. Teaching and learning material should offer flexible guidelines so that the learners take the initiative, choosing between diverse methods, using technologies and persevering individually, within their own timeframes to reach appropriate standards. Learners should develop problem-solving skills, which can be applied in complex domains (Fisher, 2005:217).

Wilkinson (2004:89-90) mentions some useful strategies to follow to promote an active learning culture in the classroom. These include *inter alia* feedback on the teachers' lesson presentations, cooperative learning, role play and case studies where learners wander into the world of problem-solving and decision-making by exposing them to situations where their reasoning ability is ultimately tested.

Cook (2008:150) emphasizes the importance of cognitive modelling by teachers and peers. With effective cognitive coaching, learners should improve their critical thinking level over time. This is supported by Fisher (2005:157) who assert that, when teachers and peers explain their cognitive processes aloud while trying to solve shared problems, their ability to think is enhanced. Evidence suggests that getting learners to talk about what they are doing, before, during and after working on a task, enhances their ability to think about it. Talking about thinking, using inner and outer speech, encourages more thinking (Fisher, 2005:157).

Every subject or learning area discipline is best known by the questions it generates and the way it goes about setting those questions. To think well within a certain discipline, a teacher must be able to raise and answer important questions within it. The next section will highlight the importance of questioning in the classroom for critical thinking.

2.5.1.3 Using questioning to develop critical thinking skills

One possible way to nurture critical thinking is the stimulation of the thinking processes by means of questioning (Meyer & Lombard, 2006:9).

According to Cotton (2001) the use of questioning relates positively to learner achievement. Furthermore, Cotton (2001) and Freseman (1990:26) argue that in both school settings and in the world outside of school, it is essential for people to have skills in questioning, analysing, comparing, contrasting, and evaluating so that they will not have to accept everything that they are told to think and what to do.

Classroom researchers have studied the effects of convergent and divergent questions on learner achievement. According to Borich (2004:261, 262), most rationales for using higher-level divergent type questions include the promotion of thinking, formation of concepts and abstractions, and the encouragement of analysis-synthesis evaluations.

Elder and Paul (2001:36) argue that thinking is not driven by answers, but by questions. Had no questions been asked by those who laid the foundation for a field, for example, physics or biology, the field would never have been developed in the first place. To think through or rethink anything, one must ask questions that stimulate thought. Questions define tasks, express problems and delineate issues. To develop as thinkers, learners need to become adept at questioning, and they need to formulate questions actively as they study.

Enhancement of critical thinking can be accomplished during lectures by periodically stopping and asking learners searching and thoughtful questions about the material the teacher has just presented, and then waiting an appropriate time for them to respond (Schafersman, 1991). Critical thinking in an educational context requires a reflective and questioning approach *"to expose those values, beliefs and practices that underpin our work and perpetuate inequalities"* (Jones & Mules 2001:192).

According to Blanchette (2001) certain questions have special significance for the critical thinking classroom. Effective questioning strategies guide discussions and promote critical interaction. Blanchette (2001) asserts that higher level cognitive and affective questions encourage learners to interpret, analyse, evaluate and explain. According to Cotton (2001) and Wilson (2002) there are four types of questioning strategies that encourage learners to use higher levels of cognitive or affective processes for critical thinking. They are convergent, divergent, evaluative and Socratic questioning strategies.

- **Convergent questioning strategies** expect of learners to analyse issues and their personal awareness of issues. Furthermore, convergent questioning strategies call

for understanding by asking learners to identify content information or interpret information in a new way.

- **Divergent questioning strategies** require that learners explore different possibilities, variations and alternative answers or scenarios to problems. Divergent questions often challenge learners to synthesize information through creative and original thinking.

- **Evaluative questioning strategies** focus on comparative analysis from different perspectives before learners can synthesize information and reach conclusions. Evaluative questions promote critical thinking in discussions by providing reflective opportunities. Learners evaluate issues by assessing, appraising and defending information according to a set of criteria and justification of their beliefs.

- **Socratic questioning strategies** are the best known teaching strategies for promoting thinking, since they highlight the need for using clarity and logical consistency. Socratic-questions encourage critical thinking when learners look deeply into assumptions, points of views, perspectives and evidence to analyse assumptions and examine reasons, concepts and consequences. Socratic questions challenge assumptions, expose contradictions, and lead to new knowledge and wisdom (Cotton, 2001).

2.5.1.4 The role of teachers in nurturing critical thinking skills

Linked to the discussion of the teaching styles that teachers can adopt in their classrooms, is a discussion of the teacher's role in fostering critical thinking which has to start with creating a platform to help a learner to think critically (Borich, 2004:294). This refers *inter alia* to the following: to provide information to learners about when and how to use thinking skills and strategies for learning and to illustrate explicitly how to use these skills and strategies to think through solutions to real-world problems. This links well with the notion that thinking skills can be effectively acquired through modelling by teachers and peers (*cf.* 2.5.1.1). Teachers must encourage learners to become actively involved in subject matter by going beyond the information given and requesting them to restructure it in their own way. Teachers must gradually shift the responsibility for learning to their learners through practice exercises, question and answer dialogues and discussions that engage them in increasingly complex thought pattern (Borich, 2004:294).

Ferrando (2001), Halpern (2007:10) and Alazzi (2008:245) highlight the importance of developing meta-cognitive thinking skills to enhance critical thinking. Costa and Marzana (cited by Cole & Chan, 1994) and Cole and Chan (1994) provide some useful suggestions about ways teachers can use language to enhance meta-cognitive processing by learners. The idea is that teachers can encourage learners to be aware of their own thought processes and to engage actively in appropriate thinking as follows:

- Teachers should use and teach learners specific vocabulary that will show them exactly what thinking skills to employ.

- Teachers should pose questions that force learners to examine their behaviour, consider the consequences of that behaviour and make rational decisions.

- Teachers should provide data as input for learners to process and make their own decisions, thus encouraging them to act more autonomously. Instead of giving directions, ask questions that require learners to think. When setting tasks for learners, instead of telling them what to do, ask questions that will force learners to analyse the task.

- To encourage careful thinking, teachers should get learners to define terms, be specific about actions, make precise comparisons and use accurate descriptors. Ask learners to describe what is going on *"inside their heads"* to make them more aware of their thinking processes. Having learners analyse the logic of language can foster more effective thinking.

In addition to these suggestions, McGonigal (2005) asserts that teachers should take cognizance of the following if they wish to enhance and nurture the development of critical thinking skills. Teachers have to:

- create an environment that is intellectually open;

- assist learners to identify their own limitations by providing conflicting viewpoints for discussion;

- let learners explain underlying assumptions in their approaches to learning, let learners explain their reasoning and problem-solving strategies and let them evaluate current positions or solutions towards the solving of problems;

- encourage critical self-reflection by providing questions to guide self-reflection, for example: *" What surprised you?" " Why?";*

- encourage critical discourse by making time for discussion, debate and group projects; and

- provide opportunities for problem-solving from multiple perspectives.

The next section examines the role of the learner in creating a classroom climate for nurturing critical thinking.

2.5.1.5 The role of the learner in nurturing critical thinking skills

Higher-order thinking occurs only when learners are faced with questions or tasks that demand analysis, interpretation or manipulation of information. In other words, non-routine mental work (Pithers & Soden, 2000:239; Cheung, Rudowicz, Kwan & Due, 2002; Vandermensbrugghe, 2004:412; Barnes, 2005:42,43; Halx & Reybold, 2005:296; Halpern, 2007:10-12).

Learners must be faced with the challenge of how to use prior knowledge to gain new knowledge. Beyond offering answers, learners must also be able to produce explanations and reasons to support their conclusions (Collins & Mangieri, 1992:180). They should also be involved in problem-solving, strategic reasoning, decision-making, setting goals and establishing plans and setting priorities (Schunk, 2004:317; Collins & Mangieri, 1992:113,114).

Active learning is important for the development of critical thinking. Learners who experience active learning are required to consider and carefully evaluate the arguments of both their teachers and peers and, eventually, the arguments of their own construction. In addition to this, active learning will enable learners to more readily understand what they are learning and thus retain the knowledge to a greater degree than when merely having information presented to them by another (Mahaye & Jacobs, 2007:200).

Elder and Paul (2001:42-44) also emphasize the fact that if critical thinking is valued by learners, they should imagine the classroom content as a form of thinking. Telling learners that they are expected to practise critical thinking skills during class and outside of class, helps prepare them for future challenges, as well as communicating

expectations of the teacher. Learners should know that they will be expected to analyse issues and problems methodically, weigh options and look at assumptions and interferences made when forming a decision.

Classroom activities and discussions are a means of practising and improving critical thinking skills. Learners should be encouraged to use them, not only to learn classroom material but also to practise and improve their thinking processes by working with other learners (Walker & Diaz, 2003:64). According to the authors, these activities can also have positive benefits for learners. Learners will become better monitors of their own learning. They may find the need to alter their study skills to improve their success in the course.

Based on the aforementioned discussion of the characteristics of a classroom climate for the development of critical thinking skills, the researcher explains the relationship between classroom climate and critical thinking in the following section.

2.5.2 The relationship between classroom climate and critical thinking

Nurturing critical thinking is a kind of shorthand for a wide range of activities designed to promote cognitive development. It is important to note, however, that classroom activities for teaching thinking are unlikely to be successful unless the teacher establishes an appropriate classroom climate. Learners will not feel safe to engage in the process and motivated to do so as a safe learning environment that accepts diversity in terms of opinions, learning styles and ways of thinking, are prerequisites for executing critical thinking (Monteith, 1999).

Knight and Waxman (1990:1-12) found that learners' perceptions of classroom involvement were positively related to critical thinking. Learners perceiving affiliation-oriented classroom environments characterized by mutually supportive assistance among classmates are encouraged to utilize their academic ability to think critically. Knight and Waxman (1990:8) formulated their hypothesis that learners' perceptions of classroom social climate are positively related to critical thinking by using Murray's (in Knight & Waxmann, 1990:10). needs-press theory as theoretical underpinning. This theory was developed as a means of explaining the relationship between environmental influences and human behaviour. The needs-press theory holds that people have needs for human fulfilment that include the learners' needs for classroom involvement and classroom affiliation. Theoretically, learners who perceive that they are benefiting

from the classroom involvement opportunities and from classroom affiliation opportunities offered by their classroom environments tend to be environmentally influenced toward positive learning outcomes that include positive academic self-concepts and critical thinking.

Teachers have a responsibility to teach learners how to use their minds as well as to impart subject knowledge. This is not simply a matter of impersonal instruction in thinking skills. It also involves feelings, values, attitudes and motivation. This implies that learners can only take ownership of critical thinking skills if they are motivated by their teachers to do so (Cheung *et al.,* 2002; Seng & Kong, 2006:58;Halpern, 2007:10; Facione, 2009:5-7, 10).

2.6 CHAPTER SUMMARY

In this section, the researcher summarizes the gist of the chapter which focused on an elucidation of the concepts central to the study, namely critical thinking and classroom climate.

Critical thinking is an important skill required for academic success (Gyalyam & Le Grange, 2005:239-246; Halx and Reybold, 2005:293) to make informed choices (Jeevanantham, 2005:118) and to evaluate beliefs and arguments (Bassham *et al.,* 2005:8) (*cf.*2.1; 2.3.1).

Critical thinking involves the development of dispositions and attitudes (Mc Peck, 1981:8; Bailin *et al.,* 1999:290-295; Fisher, 2005:59; Halpern, 2007:10; Facione, 2009:5) (*cf.*2.3). Furthermore, it involves the application of interrelated cognitive skills (Halpern, 2009:6; Watson & Glaser, 2002:2.1, 2.2; Vandermensbrugghe, 2004:417; Blunt, 2005:1368; Tileston, 2005:41) (*cf.* 2.3) and the development of critical thinking habits. These habits refer *inter alia* to identifying alternative viewpoints, questioning how and why things happen, arguing about what is fair and unfair and true and untrue (Jones & Mules, 2001:192) (*cf.* 2.3). Lastly, the development of critical thinking abilities involves the development of meta-cognitive skills that promote self-regulated learning such as planning, monitoring and evaluation (Halpern, 2007:10) (*cf.*2.3). In the context of the research, the researcher mainly wanted to determine to what extent opportunities for the nurturing of the interrelated cognitive skills are provided.

The chapter also explored a number of factors that contribute to deficient critical thinking abilities (*cf.* 2.4). Good language ability is crucial for executing critical thinking (Kalantzis & Cope, 2008:104) (*cf.* 2.4.1). Culture also impacts on the cognitive processes of a learner. Learners who are raised in cultures that focus on analytic thinking are regarded as being more capable of executing critical thinking (Nisbett *et al.,* 2001:291) (*cf.* 2.4.2). Teacher training appears to be inadequate to equip teachers with the knowledge and skills to nurture critical thinking at school (Potterton, 2008:15; Elder & Paul, 2004:36) (*cf.* 2.4.3). It is argued by Vakalisa (2007:3), McGonigal (2005) and Pratt (2005) that a transformative approach to teaching that focuses on active learner involvement and knowledge construction during teaching, holds merits for the development of critical thinking skills (*cf.* 2.4.4). Finally, teachers can also nurture the development of learners' critical thinking skills by utilizing assessment approaches which focus on assessment for learning which place learners at the centre of their own learning and assessment (Stiggins, 2002:761) (*cf.*2.4.5). The researcher acknowledges that all of these factors can contribute to deficient critical thinking skills. However, in the context of the study, it was mainly teachers' approach to teaching and learning in the classroom that was the focus of this study.

Finally, the chapter explored factors related to classroom teaching and learning that are of importance for the development of critical thinking skills (*cf.*2.5). The important role that the teacher plays in nurturing critical thinking by creating favourable classroom conditions were highlighted by Crotty (2002), Abdulghani (2003:92), Walker and Diaz (2003:64), Cook (2008:183) and Smith (2009:63) (*cf.*2.2; 2.3.3). Favourable classroom conditions imply that teachers should utilize indirect, independent and interactive teaching methods that involve learners in the construction of knowledge (Walker & Diaz; 2003:64; Kramer, 2006:101-106; Arends, 2009:345) (*cf.* 2.5.1.2). Furthermore teachers should make use of teaching strategies, such as problem-solving, role play and discussions to nurture critical thinking skills (Wilkinson, 2004:90) (*cf.*2.5.1.2). Questioning is highlighted as a very important strategy for the nurturing of critical thinking. Cotton (2001) and Wilson (2002) suggest that teachers make use of convergent, divergent, evaluative and Socratic questions in order to nurture critical thinking (*cf.* 2.5.1.3). In their choice of learning activities, teachers should favour the use of activities in which learners get the opportunity to explore, take part in discussions, get the opportunity to generate questions and formulate hypotheses (Borich, 2003:334; Walker & Diaz, 2003:64) (*cf.*2.5.1.1).

Teachers should model critical thinking skills to learners and create a classroom climate that invites intellectual openness and promotes the development of meta-cognitive skills where learners plan, monitor and evaluate their own work (Halpern, 2007:10, Borich, 2004:294) (*cf.* 2.5). Learners should be involved in tasks that demand analysis and non-routine mental work (Barnes, 2005:42-57; Pithers & Soden, 2000:239).

The next chapter elaborates on the empirical research design that was utilized to determine the extent to which teachers create classroom climates that nurture the development of critical thinking skills.

CHAPTER THREE

EMPIRICAL RESEARCH DESIGN

3.1 INTRODUCTION

In chapter two, research indicated that much of today's classroom learning is focused on activities by which the learner acquires facts, rules and action sequences, and the majority of lessons require outcomes only at the lower levels of cognition: knowledge, comprehension and application (Sonn, 2000:257-265). This implies that the development of cognitive capacity does not have prominence in classrooms. With this study, the researcher investigated to what extent the classroom climates that teachers create, afford learners the opportunity of becoming critical thinkers; learners who are capable of and derive their own patterns of thought and meaning from the content presented. This was done by determining the perceptions of teachers and learners by means of a questionnaire.

The following aspects are addressed in this chapter:

- The research paradigm
- Research aims and objectives
- Research method
- Research design
- Data collection instrument
- Population and sample
- Research participants
- Data analysis

3.2 RESEARCH PARADIGM

Research paradigms represent a distillation of what we think about the world but cannot prove (Lincoln & Guba, 1985:25). Henning, Van Rensburg and Smit (2004:15) explain a research paradigm as a theory or hypothesis that fundamentally influences how you

see the world, determines your perspective and shapes your understanding of how things are connected.

Holding a particular world view or set of beliefs about the world, influences your personal behaviour, your professional practice and, ultimately, the position you take with regard to the subject of your research.

Creswell (2009:5-11) state that the basic beliefs that define a particular research paradigm may be summarized by the responses given to the important research paradigms:

- Positivism
- Post positivism
- Interpretivism/Social constructivism
- Advocacy participatory/Critical theory
- Pragmatism

It was necessary for the researcher to examine each of the above-mentioned paradigms in order to identify a paradigm that would guide the present research. In Table 3.1, the above-mentioned paradigms with their basic assumptions are briefly summarized (Maree & Van der Westhuizen, 2007:33-34; Creswell, 2009:5-11; Thomas, 2009:78).

Table 3.1: The research paradigms and their basic assumptions

Positivism	**Post-positivism**	**Interpretivism/Social Constructivism**	**Critical Theory**	**Pragmatism**
An objective, true reality exists. Knowledge is accurate and certain. Quantitative, descriptive, statistical studies are used. Concerned with numerical data. Knowledge is objective and generalisable.	Objectivity is an ideal that can never be achieved. Human behaviour and actions cannot only be studied objectively. Numeric measures as well as observations of behaviours.	The world is complex and dynamic and is constructed, interpreted by people in their interactions with one another. Reality is subjective. Knowledge is about the way in which people make meaning in their lives.	Governed by conflicting, underlying structures – social, political, cultural, economic, ethic, gender People can design and reconstruct their own world through action and critical reflection. Knowledge is constituted by the lived experience and the social relations that structure these experiences. Events are understood with social and economic contexts. Raising consciousness for change and empowerment.	There is a concern with applications and solutions to problems. Emphasize the research problem and use all approaches available to understand the problem. To provide a complete picture of a problem.

A Positivistic framework acquires quantitative data by means of experiments or surveys (Maree & Van der Westhuizen, 2007:33). This paradigm suggests that scientific knowledge can be described in a systematic and objective way, whereas, in an interpretivistic paradigm, knowledge is based on subjective beliefs, values, reasons and understanding. The critical theory paradigm advocates for social change and empowerment, and the pragmatic paradigm seeks holistic and complete information regarding a research problem by making use of multiple methods of data collection. A Positivistic research paradigm was seen as suitable, as this study wanted to determine the perceptions of teachers and learners quantitatively and objectively by means of a questionnaire in order to report the data collected as frequencies, means and percentages.

3.3 AIM AND OBJECTIVES OF THE STUDY

The overall aim of this study was to determine to what extent teachers create classroom climates that nurture the development of critical thinking abilities. The overall aim was operationalized as follows:

- by determining what critical thinking ability entails and how it can be nurtured in the classroom;
- by determining which teaching methods and strategies teachers apply in the classroom;
- by establishing the types of learning activities that teachers create for learners to engage in;
- by identifying the types of questions that teachers pose to learners in the classroom;
- by investigating what role the teacher plays in the classroom;
- by investigating what role the learner plays in the classroom; and

- by establishing to what extent teacher and learner opinions differ with regard to the classroom climate that teachers create for nurturing critical thinking abilities.

3.4 EMPIRICAL RESEARCH

The empirical research comprised two phases, namely a literature review and an empirical investigation.

3.4.1 Literature review

A thorough study was made of available research articles and primary and secondary literature sources to explore the concept critical thinking and to determine the requirements for classroom climate in order to nurture the development of critical thinking abilities. In order to achieve this, data bases (both national and international) were consulted. An EBSCOHost web search was done, and the following key words and phrases were used: *critical thinking, classroom climate, learning environments, cognitive development, climate for cri*tical *thinking, teaching and learning activities, teaching methods and strategies* and *questioning*. A brief explanation of the key concepts was discussed in chapter one. The purpose of the literature review was to elucidate the concepts central to the study and to provide a framework for the construction of the questionnaire items.

3.4.2 Research design

A research design is an approach to address a research question or problem (Anderson, 1998:85). A research design refers to the way in which one collects and analyses research data (McMillan & Schumacher, 2001:9-11). Research designs encompass the techniques used to gather and analyse the data in the course of the research investigation. In this regard, three types of research designs can be distinguished, namely qualitative, quantitative and mixed-methods. Each method will be briefly explained so as to indicate how the researcher decided on an applicable design for the study.

- **Qualitative research**

The aim of qualitative research is to describe, explain, discover and interpret data to build a theory. It is suitable for smaller surveys where data collection is structured informally (Leedy & Ormrod, 2005:96). Qualitative research is context-specific with the researcher's role being one of inclusion in the situation. As Creswell (2009:4) indicates, qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participant's setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data. Qualitative researchers emphasize a holistic interpretation of data (Wiersma, 2000:12). Qualitative research presents data as a narration with words and the researcher is the instrument through which the data is subjecitvely collected (McMillan & Schumacher, 2001:15; Maree & Van der Westhuizen, 2007:33).

- **Quantitative research**

Quantitative research is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures (Creswell, 2009:4). Quantitative research techniques deal with numbers and anything that is measurable. Statistics, tables and graphs are often used to present the results of these methods (McMillan & Schumacher, 2001:15). In quantitative research it is essential to explain in simple terms the statistical procedures that will be carried out to investigate the research questions, for example, frequencies, means and standard deviations and inferential statistics (Pietersen & Maree, 2007a:3).

- **Mixed methods**

Mixed methods research is defined as a procedure for collecting, analysing and *"mixing"* both quantitative and qualitative data at some stage of the research process within a single study to understand a research problem more completely (Ivankova, Creswell, & Plano Clark, 2007:260; Creswell,

2009:203-224). Mixed methods research is an approach to inquiry that combines or associates both qualitative and quantitative forms. It involves philosophical assumptions, the use of qualitative and quantitative approaches, and then mixing approaches in the study so that the overall strength of a study is greater (Creswell, 2009:213).

Seen against the background of the positivistic framework, a quantitative research method was utilized for this research. A quantitative approach was chosen as it was the researcher's intent to establish and confirm a given situation in the classroom (Leedy & Ormrod, 2005:95).

Before the research was conducted, the researcher determined whether the choice of a quantitative research design could be regarded as valid for the study.

3.4.2.1 Validity of quantitative research

Validity and its measurement play an important part in determining the appropriate research design to employ. Validity refers to the accuracy of research data (Burton & Bartlett, 2005:27). For the purpose of this research, criteria for internal, external, construct and statistical conclusion validity were considered (McMillan & Schumacher, 2006:134-142; Maree & Pietersen, 2007c:151,152).

- **Internal validity**

Internal validity of a research study is the extent to which its design and the data it yields allow the researcher to draw accurate conclusions about cause-and-effect and other relationships within the data (Leedy & Ormrod, 2005:97). According to McMillan and Schumacher (2006:186), internal validity refers to the extent to which control over variables is exercised in order to control for possible sources of error.

In the context of this study, the internal validity was supported by the fact that the survey research could be regarded as suitable and appropriate to collect information about perceptions and opinions.

- **External validity**

External validity refers to the extent to which the conclusions drawn can be generalized to other contexts (Leedy & Ormrod, 2005:99). For quantitative designs there are two general categories of external validity, namely population external validity and ecological external validity (McMillan & Schumacher, 2001:193).

The external validity of this study was enhanced by the fact that the study was conducted in a real life setting with a representative sample being selected (Leedy & Ormrod, 2005:99). A limitation related to external validity is evident in the study, as the sample was not randomly selected and therefore the researcher cannot generalize to other people in the population (McMillan & Schumacher, 2001:193).

- **Construct validity**

Construct validity *inter alia* refers to the use of more than one method of data collection. The use of a questionnaire also limits the generalizability of the research findings (McMillan & Schumacher, 2006:141). The researcher acknowledges that by adding a qualitative component to the research, a clearer understanding of the research problem could have been obtained.

- **Statistical conclusion validity**

In the context of the study, the researcher is of the opinion that threats to statistical conclusion validity were avoided as appropriate statistical tests were utilized by the Statistical Consultation Services of the North-West University, Vaal Triangle Campus to analyse the data obtained from the questionnaires (McMillan & Schumacher, 2006:134) (*cf.* 3.3.6).

3.4.3 Research strategy

The research strategy provides the overall structure for the procedures the researcher follows, the data the researcher collects, and the data analyses the researcher conducts (Leedy & Ormrod, 2005:85).

Non-experimental, descriptive survey research was utilized in this research. This type of research requires that the researcher observes a phenomenon without manipulating or influencing the independent variables (Leedy & Ormrod, 2005:179). As there was no manipulation of the independent variable in the study, this approach was seen as appropriate and suitable. Descriptive research helps to identify problems in current practice with a view to improving practice outcomes. This type of research is also useful for descriptive purposes when a first exploratory investigation is done. In this study, the researcher conducted an initial exploration and simply wanted to provide a summary of an existing phenomenon, namely the extent to which classroom climate nurtures the development of critical thinking skills, thus to assess the nature of existing conditions (McMillan & Schumacher, 2006:24, 215).

Survey research is normally used in descriptive studies to acquire information about a large population; perhaps about opinions, attitudes and experiences (McMillan & Schumacher, 2001:304; Leedy & Ormrod, 2005:183). The researcher poses a series of questions to willing participants; summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes; and then draws inferences about a particular population from the responses of the sample (Leedy & Ormrod, 2005:184). In the context of this study, the researcher wished to obtain information about a large population by conducting a survey with a sample of the population.

3.4.4 Data collection instruments

A data collection instrument is a specific mechanism or strategy the researcher uses to collect, manipulate or interpret data (Leedy & Ormrod, 2005:12). Quantitative research instruments emphasize some categories to collect data in the form of numbers. The goal is to provide statistical descriptions, relationships and explanations. Quantitative techniques are used with experimental, descriptive and correlational designs as a way to summarize a large number of observations and to indicate numerically the amount of error in collecting and reporting the data (McMillan & Schumacher,

2001:40). In the context of this research, a questionnaire was used and seen as suitable to determine the perceptions of the research participants.

One of the distinguishing characteristics among surveys is the method of data collection and certainly the questionnaire is commonly used for data collection. Questionnaires are used for local surveys such as a community survey for a school system. The researcher chooses or constructs a set of appropriate questions. This is a very common technique for collecting data in educational research and most survey research uses questionnaires (Mc Millan & Schumacher, 2001:40).

3.4.4.1 Questionnaire

A questionnaire is simply a list of questions that the participants answer. It is a useful method, if carefully planned, for gathering responses from a large number of people relatively quickly. As such, questionnaires may be seen as a useful means of obtaining quantitative data (Burton & Bartlett, 2005:100).

The number of advantages for using questionnaires, according to Maree and Pietersen (2007a:157), outweighs the number of disadvantages, and convinced the researcher that data could be collected effectively in this manner. The following advantages guided the use of questionnaires:

- Many participants can complete the questionnaire in a short space of time.
- This method is relatively cheap and easy to do.
- Participants can be reached across long distances.
- Opinions of participants can be determined for a wide range of aspects.
- The administrator can immediately assist with issues in questionnaires which are not clear to the participants.

The disadvantages of this method, according to Maree and Pietersen (2007a:157), are specifically directed to a situation where the researcher self does not administer the questionnaire. It could lead to:

- different responses being obtained;
- the researcher having limited control over what happens in the field; and
- the conditions in which the questionnaire is administered, not being controlled by the researcher.

Group administration of questionnaires

The data collection from the learners was done with group administration (Maree & Pietersen, 2007a:157). In this study, the researcher administered the questionnaires for completion by the learners from the Township schools during break time. This was necessary as the questionnaire was not translated into the home language of the learners, and the researcher wanted to be present if any uncertainties should arise. Learners from the ex-Model C schools completed the questionnaires under supervision of their own teachers during times that were convenient for the teachers and learners, avoiding completion of the questionnaires during academic time. Prior to the completion of the questionnaires, the responsible teachers were informed by the researcher about the procedure for completing the questionnaire and given time to pose questions about uncertainties in the questionnaire items. The researcher collected the completed questionnaires on a date arranged with the responsible teachers. The teachers of both the ex-Model C schools and Townships schools completed the questionnaires in their own time and these were collected again by the researcher on a specific date arranged with the teachers. The return rate for the questionnaires is reported in chapter 4 (*cf.* 4.3)

Questionnaire design

When a questionnaire is designed, a researcher has to keep in mind what type of data will be generated by the questions and the statistical techniques that will be used to analyse it (Maree & Pietersen, 2007a:158). Furthermore, the following aspects highlighted by Maree and Pietersen (2007a:159) concerning the appearance of the questionnaire, the completion of the

questionnaire, question sequence and the types of questions should be adhered to.

Appearance of questionnaire

The researcher incorporated all the aspects as suggested by Cohen, Manion and Morrison (2007:338) and Maree and Pietersen (2007a: 159) to make the questionnaire user-friendly. The printing was namely done neatly, the font not too small, clear instructions were given and the purpose for compiling the questionnaire was indicated (*cf.* Appendix A & B).

Completion of questionnaire

According to Maree and Pietersen (2007a:159), learners should be able to complete a questionnaire in less than thirty minutes and adults in less than twenty minutes. In the context of this study, both teachers and learners used less than the time indicated. The learners took approximately fifteen minutes to complete the questionnaire and the teachers completed the questionnaire in their own time.

Question sequence

The questions in the questionnaire were formulated as statements and the statements were ordered logically into different sections so as not to confuse the participants. The questions in each section only dealt with one specific topic (Maree & Pietersen 2007a 159). The researcher also concentrated on the correct wording of the questions to ensure that the items were understood and meaningful. Some of the guidelines suggested by Cohen *et al.* (2007:334) and Maree and Pietersen (2007a:160) were applied:

- Clear, unambiguous language was used.
- Statements were clear and to the point.
- Double-barrelled and vague statements were avoided.
- No sensitive aspect, that might have offended participants, were addressed in the statements.

The two self-structured, closed questionnaires for teachers and learners respectively, were developed in accordance with the literature review on critical thinking and classroom climate. The aim of the questionnaires was to gather information from teachers and learners regarding aspects that are important in creating a classroom climate that nurtures critical thinking. The questionnaire thus comprised the following sections and the researcher cross references to the sections in the literature review that informed the construction of the questionnaire items.

- Section A: biographic information.
- Section B: teachers' utilization of different teaching methods and strategies to nurture critical thinking:general principles (*cf.* 2.5.1.2).
- Section C: the type of learning activities in which learners are involved:general principles (*cf.* 2.5.1.1).
- Section D: the questions posed during teaching and learning:general principles (*cf.* 2.5.1.3).
- Section E: the roles that teachers play during teaching and learning (*cf.* 2.5.1.4).
- Section F: the roles that learners play during teaching and learning (*cf.* 2.5.1.5).
- Section G: teaching methods and strategies:practical application (*cf.* 2.4.4; 2.5.1.2).
- Section H: learning activities:practical application (*cf.* 2.5.1.1).
- Section I: types of questions:practical application (*cf.* 2.5.1.3).

Types of questions

Questions can be divided into open (unstructured) or closed (structured) questions (Bell in Maree & Pietersen, 2007a:160; Cohen *et al.,* 2007:321). Open-ended questions do not suggest any response to the set question. They permit participants to answer in their own frame of reference. A closed question provides for a set of responses from which the participant has to choose one or more than one response (Maree & Pietersen, 2007a:161). Data obtained from closed questions is easier to analyse. Bell (in Maree & Pietersen, 2007a:162) distinguishes between different types of closed questions: list, ranking, category, quantity, grid and scale. For the purpose of this study, scale questions were used.

Scales are very common and useful in survey research to measure how participants feel or think about something by using scales (Maree and Pietersen 2007a:167). According to Bell (in Maree and Pietersen, 2007a:167), scales are intended to help researchers discover strength of feeling or attitude. The response options are set up in such a way that the variables measured can be expressed as numerical scores that are of either an ordinal, interval or ratio type (Maree & Pietersen, 2007a:167).

In this study, the Likert scale, which provides an ordinal measure of the participant's perceptions, was utilized in the questionnaire (Cohen *et al.,* 2007:326). Two four-point Likert scales were used in the study. The first type indicated the strength of the participants' opinions, namely:

1 = strongly agree

2 = agree

3 = disagree

4 = strongly disagree

The second scale characterized the frequency according to which certain actions in the classroom were taking place, namely:

1 = almost always

2 = often

3 = sometimes

3 = never

3.4.4.2 The pilot study

Before the questionnaire was administered, the researcher had to determine whether the questionnaire complied with validity and reliability criteria (Cohen *et al.,* 2007:341). There are a number of different types of validity, namely face, content, construct and criterion validity. In the context of this study content, face and construct validity were considered.

Content-related validity is defined by (Leedy & Ormrod, 2005:92) as *"the extent to which a measurement instrument is a representative sample of the content area being measured".* The questionnaire reflected the various parts of the content domain, as mentioned above, in appropriate proportions. This was verified with the study leader and in discussions with colleagues who were knowledgeable in the field of study and compared to what the literature revealed.

The questionnaire complied with the criteria for **face validity** as the instrument truly measured what the researcher wanted to measure (Leedy & Ormrod, 2005:92). All the sections of the questionnaire measured the aspects regarding classroom climate as identified by the literature review.

Construct validity is needed for standardization (Pietersen & Maree, 2007c:217) and is the extent to which an instrument measures a characteristic that cannot be directly observed, but must instead be inferred from patterns in people's behaviour (Leedy & Ormrod, 2005:92). The researcher verified the items included in the questionnaire with the study leader to make sure the items measured what they were supposed to. Furthermore, inter-item correlations were calculated and indicated that the items in each of the

questionnaire sections truly measured the construct in question (*cf.* Tables 4.3, 4.4).

Reliability of the questionnaire

Leedy and Ormrod (2005:93) describe reliability of a data collection instrument as *"the extent to which it yields consistent results when the characteristic being measured hasn't changed"*. An instrument is reliable if it accurately reflects the true score of the attribute under investigation. A pilot study was conducted with a group of learners (n=40) and teachers (n=40) from the population who were not part of the sample, in order to determine the reliability of the questionnaire. A Cronbach alpha coefficient was calculated to determine the reliability of the questionnaire. The procedure was repeated after the research participants completed the questionnaire. The results for the pilot study and actual study are reported in chapter four (*cf.*4.2)

Inter-item correlations were also determined for the various items listed in the various sections of the questionnaire. An inter-item correlation is used to judge the reliability of the instrument by estimating how well the items that reflect the same construct yield similar results (Trochim, 2006). The results for the pilot study and the actual study are reported in chapter four (*cf.* 4.2).

3.4.5 Population and sample

3.4.5.1 Introduction

One of the first steps in designing quantitative research is to choose the research participants from who the data will be collected (McMillan & Schumacher, 2006:119). In order to do this, the researcher had to get acquainted with the theory of choosing a sample in quantitative research.

A population is a group of elements or cases, whether individuals, objects or events, that conform to specific criteria and to which we intend to generalize the results of the research (McMillan & Schumacher, 2006:119). This group is also referred to as the target population or universe. The target population is often different from the list of elements from which the sample is actually

selected, which is termed the survey population or sampling frame (McMillan & Schumacher, 2001:169). According to Wiersma (2000:269) a sample is a subset of the population to which the researcher intends to generalize the results.

3.4.5.2 Sampling designs

Different sampling designs may be more or less appropriate in different situations. A discussion of different approaches to sampling, which fall into two major categories, namely probability sampling and nonprobability sampling, will be discussed below (Leedy & Ormrod, 2005:199).

Probability sampling

In probability sampling, each element in the population has a known, non-zero probability of being selected (Maree & Pietersen, 2007b:172) and the researcher can specify in advance that each segment of the population will be represented in the sample (Leedy & Ormrod, 2005:199).

The following table gives examples of this type of sampling and a description of each (Leedy & Ormrod, 2005:199-205; Maree & Pietersen, 2007b:172-178).

Table 3.2: Probability sampling

Sampling	Description
Simple random sampling	Every member of the population has an equal chance of being selected.
Systematic sampling	The population size is not known and the population elements arrive at a certain location over time.
Stratified random sampling	Population is divided into a number of homogeneous groups, called strata. The researcher samples equally from each

	one of the layers in the overall population, guaranteeing equal representation of each of the identified strata.
Cluster sampling	Subdivides an expansive area into smaller units. Population is divided into a number of overlapping groups, called clusters. The clusters that are formed should be heterogeneous. A subset of the identical clusters is randomly selected.
Proportional stratified sampling	The sample is chosen in accordance with the proportions of certain groups. People are not obviously segregated into the different strata.

Nonprobability sampling

In nonprobability sampling, the researcher has no way of forecasting or there is no guarantee that each element of the population will be represented in the sample (Leedy & Ormrod, 2005:199) and these methods do not make use of random selection of population elements. It would therefore be dangerous to draw important conclusions about the population (Maree & Pietersen, 2007b:176)

The following table gives examples of this type of sampling and a description of each (Leedy & Ormrod, 2005:199-205; Maree &Pietersen, 2007b:172-178).

Table 3.3: Non-probability sampling

Sampling	Description
Convenience sampling	It makes no pretence of identifying a representative subset of a population; it takes people that are readily available.
Quota sampling	It selects participants in the same proportions that they are found in the different categories of the general population, not in a random fashion. Identifies categories of people that need to be in the sample and the required number (quotas) in these categories. Uses convenience sampling until the quotas have been reached.
Purposive sampling	People are chosen for a particular purpose and the researcher should always provide a rationale explaining why the particular participants have been selected.
Snowball sampling	It is used where the population is difficult to find or where the research interest is in an interconnected group of people. Making contact with one or more people of the population who assist the researcher in identifying similar participants to get more information.

By using this information about population and sampling, the researcher first identified the population and study population and then selected the sample of participants who took part in the study.

3.4.5.3 Population, study population and sampling in the context of the study

The population for this study comprised all teachers and learners in South Africa. As it was not possible to conduct research with all of these participants, a study population was determined. All the secondary schools in the Sedibeng West District of the Gauteng Department of Education and all the teachers and learners in the Senior and Further Education and Training phase formed part of the study population. The district comprises forty six ex-Model C schools and Township schools in total.

The focus for this research was, however, placed on the Senior and Further Education and Training Phase. Grade 9 and Grade 11 learners and teachers of five ex-Model C schools and five Township schools were purposively selected to take part in the study. The reason for focusing on Grades 9 and 11 was based on the researcher's observations during the teaching of these learners which indicated that there are vast differences in the critical thinking abilities of these learners. It appears to the researcher that more attention is paid to the nurturing of critical thinking in Grade 9 than in Grade 11. The researcher's observation motivated the inclusion of Grades 9 and 11 in the study.

Due to time and logistical constraints, convenience sampling was utilized for this study regarding the choice of schools. Convenience sampling takes people that are readily available to participate in the study (Leedy & Ormrod, 2005:206). The five Township and five ex-Model C schools that took part in the research were conveniently available, easily accessible and willing to assist the researcher in conducting the research. Convenience sampling was utilized to select approximately twenty five learners in Grades 9 and 11 respectively in each of the schools that took part in the research (n = 403). The identified grades and the group of learners differed with regard to gender, grade, ethnic group and the type of school attended. All the teachers in the selected schools were requested to take part in the research (n = 241). A heterogeneous group of teachers comprising different genders, age groups, ethnic groups and levels of experience took part in this study.

3.4.6 Data analysis

3.4.6.1 Quantitative data analysis

In quantitative research, researchers try to make better sense of the world by using numbers. Researchers summarize and interpret the numbers by using statistics (Leedy & Ormrod, 2005:245). Descriptive and inferential statistical procedures can be utilized to analyse quantitative data. Descriptive statistics summarize the general nature of the data obtained and inferential statistics help the researcher to make decisions about the data (Leedy & Ormrod, 2005:30).

Descriptive statistics is a collective name for a number of statistical methods that are used to organize and summarize data in a meaningful way (Pietersen & Maree, 2007a:183). For this study, the Statistical Consultation Services of the North-West University, Vaal Triangle campus was consulted to assist with the capturing, analysis and interpretation of data. By means of descriptive statistics the data for the learners' and teachers' responses to the questionnaire were analysed. The responses to the questionnaires were summarized with frequency counts, percentages and means, and inferences were drawn.

Inferential statistics are used when a researcher wants to interpret results and go beyond summarizing and describing data (Pietersen & Maree, 2007c:198). Inferential statistics were utilized to interpret differences between the teachers and learners' responses in order to determine statistical significance and effect in practice. T-tests were utilized for these purposes. P-values smaller than 0.5 were regarded as statistically significant and values larger than 0.5 as non-significant (Pietesen & Maree, 2007b:230).

If statistical significant differences were noted, Cohen's d was calculated to determine the effect in practice. Small, medium and large effects in practice were reported.

The following interpretations were allocated to Cohen's d:

- 0.2: small effect in practice
- 0.5: medium effect in practice
- 0.8: large effect in practice (Steyn, 2005:20)

An ANOVA and a *post hoc test,* Tukey's HSD (Honestly Significance Difference) test was run to explore more deeply the impact of the biographic variables on the responses received for the various sections of the questionnaire for both learners and teachers (McMillan & Schumacher, 2006:301,302) (*cf.*4.5.1).

According to Pietersen and Maree (2007b:229) and McMillan and Schumacher (2006:301), an ANOVA is conducted where two or more samples' means are compared on one independent variable and allows for testing differences between all groups related to an independent variable.

3.4.7 Ethical considerations

The researcher complied with the following ethical guidelines during the research.

During the identification of the research problem, it is important to identify a problem that will benefit individuals being studied (Creswell, 2009:88). The researcher felt that both teachers and learners could benefit from this study. By identifying problematic aspects regarding classroom climate and the development of critical thinking, teachers could be made aware of how to adjust their teaching practice to benefit the learners.

In developing the purpose statement and questions for the study, researchers need to convey the purpose of the study to the participants (Creswell, 2009:88). All the teachers and learners at the various schools were informed about the purpose of the study before the questionnaires were distributed during an information session. During this session, the researcher orally obtained consent from the participants for the completion of the questionnaire. It was clearly explained to participants that participation is voluntary, that they

have the freedom to withdraw at any time if they wish to and that questionnaires would be completed anonymously. Participants were identified by numbers.

As researchers anticipate data collection, they need to respect the participants and the sites for research (Creswell, 2009:89). The researcher first obtained permission from the Gauteng Department of Education before approaching the principals of the various schools at which the research was conducted to obtain permission to involve the learners and teachers in the research. The questionnaires were accompanied by a covering letter assuring participants of the confidentiality with which their responses would be handled. The participants were assured that only the researcher, the study leader and the Statistical Consultation Services had access to the data.

An application to conduct this research as part of a project on critical thinking at the North-West University, Vaal Triangle Campus, was submitted to the Ethical Committee of the North-West University for approval. Ethical clearance was granted to conduct the research.

As indicated by Creswell (2009:88), the researcher intends to share the findings of the research with the participants after the examination of the dissertation.

3.5 CHAPTER SUMMARY

This chapter described the research design and methodology. In this study, quantitative data were collected by means of descriptive survey research, from a purposively selected sample of Grade 9 and Grade 11 teachers (n = 241) and learners (n = 403) by means of a structured closed-ended questionnaire. The aim of this research was to determine the extent to which teachers presently create classroom climates that nurture the development of learners' critical thinking abilities by gauging the perceptions of teachers and learners.

The responses to the questionnaires were summarized with frequency counts, percentages and means and inferences were drawn. The data obtained for learners and teachers were compared in order to determine similarities and

differences. Inferential statistics were utilized to interpret differences between the teachers and learners' responses in order to determine statistical significance and effect in practice.

In the next chapter, a detailed data analysis and an interpretation of the data in relation to the nurturing of critical thinking will follow.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

This chapter presents the statistical analyses and the interpretations of the responses obtained from the teacher and learner participants in order to determine the extent to which teachers create the classroom climates that nurture the development of critical thinking skills.

The data analyses and interpretations will be dealt with in the following sequence:

- Reliability of the questionnaire for the pilot study and the actual study
- Biographic information of the participants
- Data analysis and interpretation: teacher and learner responses
- Data analysis and interpretation: a comparison between the learner and teacher responses
- Triangulation of the teacher and learner responses

The next section reports on the reliability of the questionnaire for the pilot study and actual study

4.2 RELIABILITY OF THE QUESTIONNAIRE

Table 4.1 indicates the Cronbach alpha coefficients that were calculated for the various constructs in the teacher and learner questionnaires for the pilot study.

Table 4.1: Cronbach alpha coefficients: pilot study

Questionnaire constructs	Pilot study: Learners	Pilot study: Teachers
Teaching methods and strategies:general principles	0.55	0.60
Learning activities:general principles	0.68	0.60
Questioning techniques:general principles	0.52	0.68
Role of the teacher	0.84	0.89
Role of the learner	0.84	0.89
Methods of teaching:practical application	0.79	0.66
Learning activities:practical application	0.74	0.55
Types of questions:practical application	0.78	0.58

Table 4.2 reflects the Cronbach alpha coefficients for the actual study.

Table 4.2: Cronbach alpha coefficients: actual study

Questionnaire constructs	Pilot study: Learners	Pilot study: Teachers
Teaching methods and strategies:general principles	0.65	0.61
Learning activities:general principles	0.61	0.72
Questioning techniques:general principles	0.62	0.76
Role of the teacher	0.83	0.90
Role of the learner	0.81	0.90
Methods of teaching:practical application	0.72	0.60
Learning activities:practical application	0.63	0.77
Types of questions:practical application	0.72	0.79

The Cronbach alpha coefficient was calculated to determine the internal consistency of the various questionnaire sections. The Cronbach alpha is a reliability coefficient that calculates the extent to which items, such as found in a questionnaire, are correlated positively with one another (Akbaba, 2006:183).

A Cronbach alpha coefficient measures consistency among individual items in a scale (Simon, 2008). Sekaran (2000) points out that the internal consistency reliability becomes higher as the Cronbach alpha moves closer to 1.

In most Social Sciences, a Cronbach alpha coefficient between 0.7 and 0.8 is yielded as acceptable when working with a set of items to be considered on a scale, but some use 0.75 or 0.80 while others are lenient and accept 0.60 (Simon, 2008). According to Simon (2008) and Garson (2008), 0.60 could be seen as in order for an exploratory study. As this study was an exploratory study, it is clear from Table 4.2 that the questionnaire for learners and teachers complied with reliability criteria.

An inter-item correlation was also determined for the various items listed in the various sections of the questionnaire. An inter-item correlation is used to judge the reliability of the instrument by estimating how well the items that reflect the same construct yield similar results (Trochim, 2006). The following results were revealed for the various questionnaire constructs. Table 4.3 reports the inter-item correlations for the pilot study.

Table 4.3: Inter-item correlation: pilot study

Questionnaire constructs	Pilot study: Learners	Pilot study: Teachers
Teaching methods and strategies:general principles	0.29	0.26
Learning activities:general principles	0.23	0.18
Questioning techniques:general principles	0.18	0.29
Role of the teacher	0.17	0.26
Role of the learner	0.25	0.36
Methods of teaching:practical application	0.35	0.19
Learning activities:practical application	0.42	0.24
Types of questions:practical application	0.33	0.17

Table 4.4 reflects the results for the inter-item correlations for the actual study.

Table 4.4: Inter-item correlation: actual study

Questionnaire constructs	Pilot study: Learners	Pilot study: Teachers
Teaching methods and strategies:general principles	0.21	0.33
Learning activities:general principles	0.18	0.28
Questioning techniques:general principles	0.25	0.38
Role of the teacher	0.17	0.28
Role of the learner	0.21	0.37
Methods of teaching:practical application	0.27	0.18
Learning activities:practical application	0.30	0.46
Types of questions:practical application	0.27	0.36

According to Trochim (2006), an inter-item correlation of between 0.15 and 0.5 yields an acceptable value. Both questionnaires complied with these criteria for acceptable inter-item correlations for the pilot study and the actual study.

The next section focuses on the biographic information of the participants who took part in the study. Data is displayed in tables and graphs. The data in the graphs were rounded off to the nearest integer.

4.3 BIOGRAPHIC INFORMATION OF THE PARTICIPANTS

The researcher distributed 300 questionnaires to teachers and 500 questionnaires to learners. Of the 300 and 500 questionnaires distributed, 241 (80.3%) and 403 (80.6%) were returned for teachers and learners respectively.

4.3.1 Biographic information of learners

In Table 4.5, the biographic information of the learners related to the ethnic groups that they represented is indicated.

Table 4.5: Ethnic groups of learners

Ethnic group	f	%
Black	354	87.8
White	30	7.4
Asian	1	0.2
Coloured	13	3.2
Other	2	0.5
Missing	3	0.7
Total	403	100.0

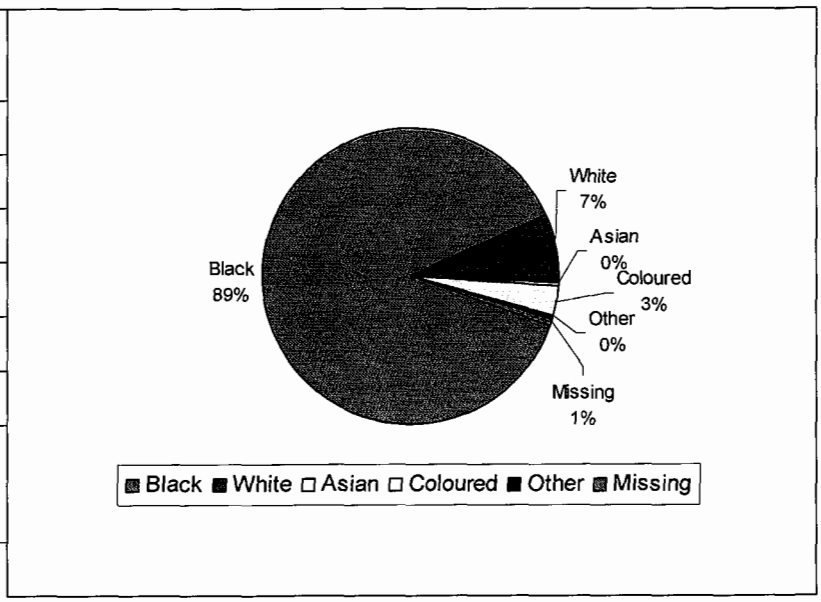


Table 4.5 indicates that the group of learners who took part in the study comprised a mixed ethnic group. The majority of the learners who participated in the study were Black learners (n=354).

The data was used to check whether there were differences in the perceptions of the learners from different ethnic groups regarding the classroom climates that their teachers create (*cf.* 4.5.2.2).

Table 4.6 presents the biographic information of the learners related to their gender.

Table 4.6: Gender of learners

Gender	f	%
Male	158	39.2
Female	244	60.5
Missing	1	0.7
Total	403	100.0

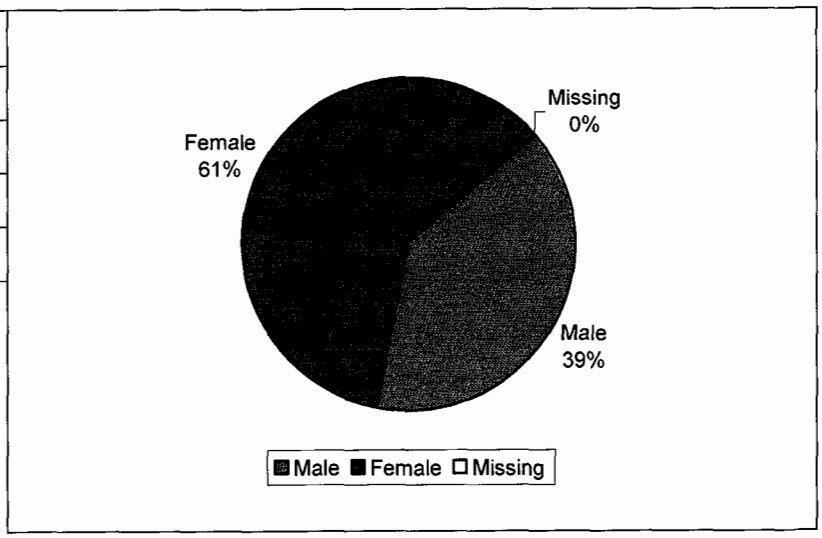


Table 4.6 indicates that more females (n=244) than male learners (n=158) participated in the research.

The data was used to check whether there were differences in the perceptions of the learners from different gender groups regarding the classroom climates that their teachers create (*cf.* 4.5.2.2).

Table 4.7: Type of school of learners

Type of school	f	%
Ex-Model C school	215	53.3
Township school	188	46.7
Total	403	100.0

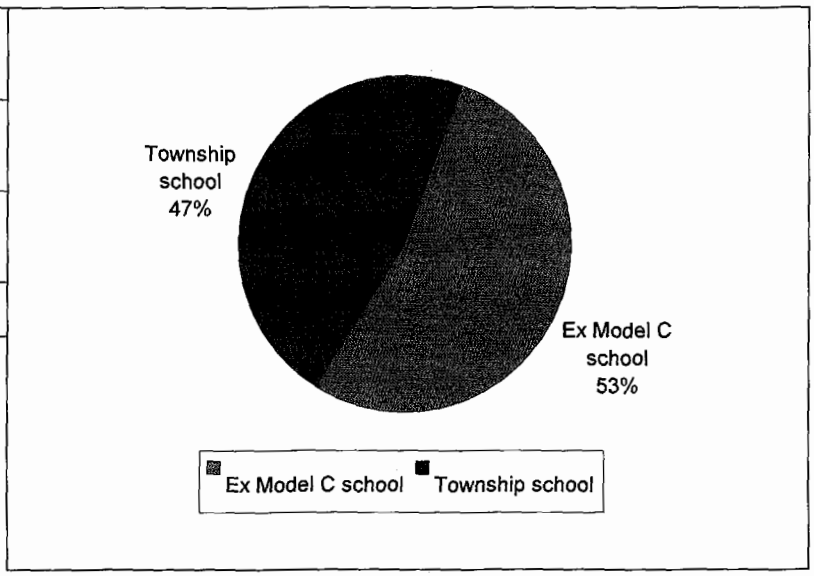


Table 4.7 indicates that more or less an equal number of learners from ex-Model C schools (n=215) and Township schools (n=188) participated in the research.

The data was used to check whether there were differences in the perceptions of the learners from different types of schools regarding the classroom climates that their teachers create (*cf.* 4.5.2.2).

Table 4.8 presents the biographic information of the learners related to their grade at the school.

Table 4.8: Grade of learners

Grade	f	%
Grade 9	199	49.4
Grade 11	204	50.6
Total	403	100.0

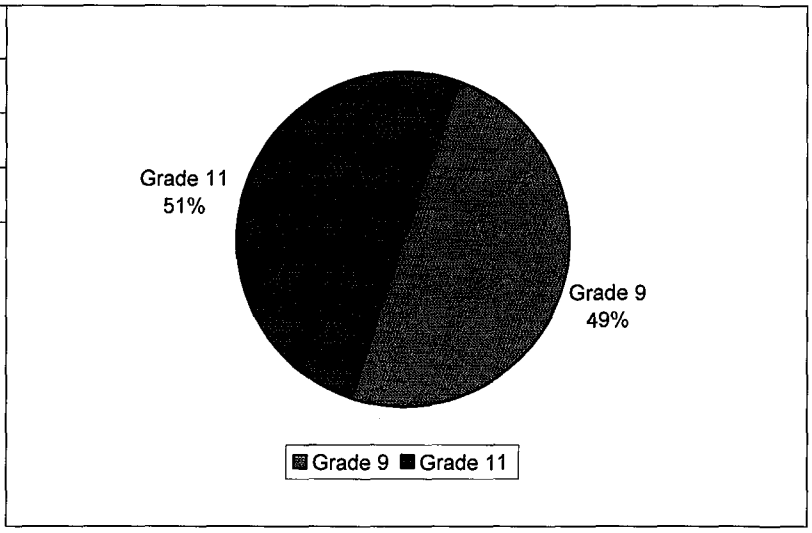


Table 4.8 indicates that more or less an equal number of learners from Grade 9 (n=199) and Grade 11 (n=204) participated in the research.

The data was used to check whether there were differences in the perceptions of the learners from different grade levels regarding the classroom climates that their teachers create (*cf.* 4.5.2.2).

The next section presents the biographic information of the teachers who took part in the research.

4.3.2 Biographic information of teachers

In Table 4.9 the biographic information of the teachers related to their different age groups is indicated.

Table 4.9: Age of teachers

Age	f	%
21-25	23	9.5
26-30	19	7.9
31-40	77	32.0
41-50	72	29.9
51+	46	19.1
Missing	4	1.7
Total	241	100.0

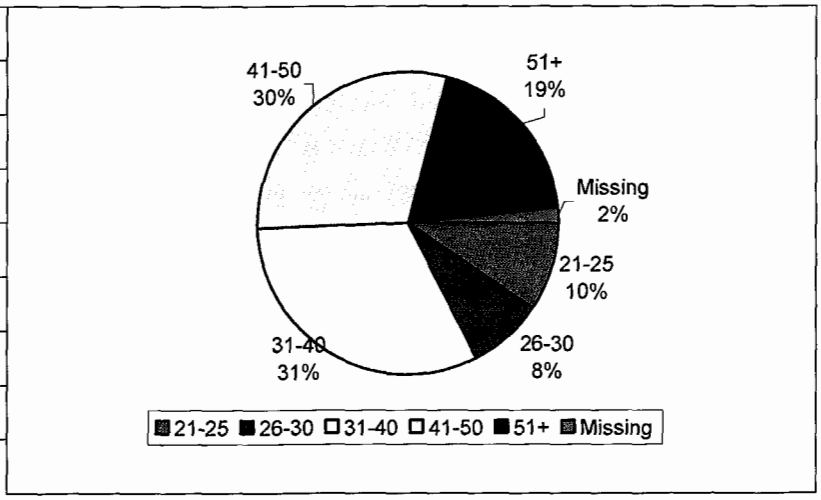


Table 4.9 indicates that the majority of the teachers who participated in the study were between the ages of 31 and 40 (n=77), followed by those teachers between 41 and 50 years of age (n=72). The teacher sample comprised mainly mature teachers.

The data was used to check whether there were differences in the perceptions of the teachers from different age groups regarding the classroom climates that they create for the learners (*cf.* 4.5.2.1).

In Table 4.10 the biographic information of the teachers related to their gender is indicated.

Table 4.10: Gender of teachers

Gender	f	%
Male	67	27.8
Female	171	71.0
Missing	3	1.2
Total	241	100.0

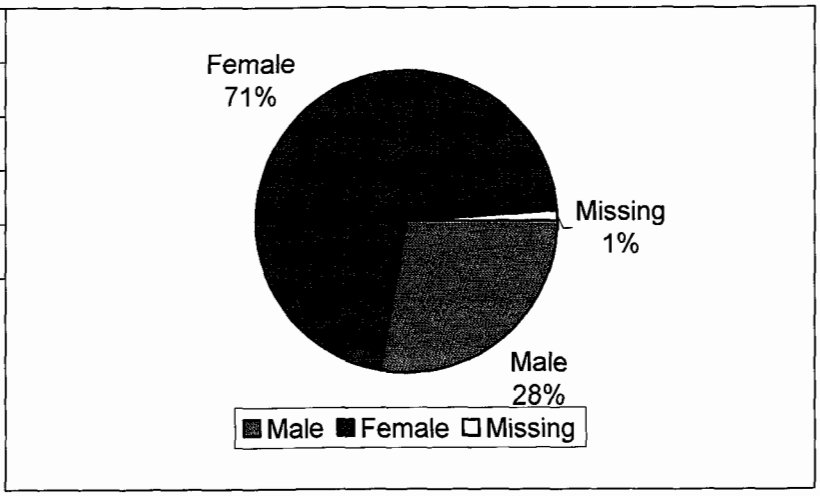


Table 4.10 indicates that the majority of the teachers who participated in the study were female teachers (n=171).

The data were used to check whether there were differences in the perceptions of the teachers from different gender groups regarding the classroom climates that they create for the learners (*cf.* 4.5.2.1).

Table 4.11 presents the biographic information of the teachers related to their type of school.

Table 4.11: Type of school in which teachers teach

Type of school	f	%
Ex-Model C school	111	46.1
Township school	130	53.9
Total	241	100.0

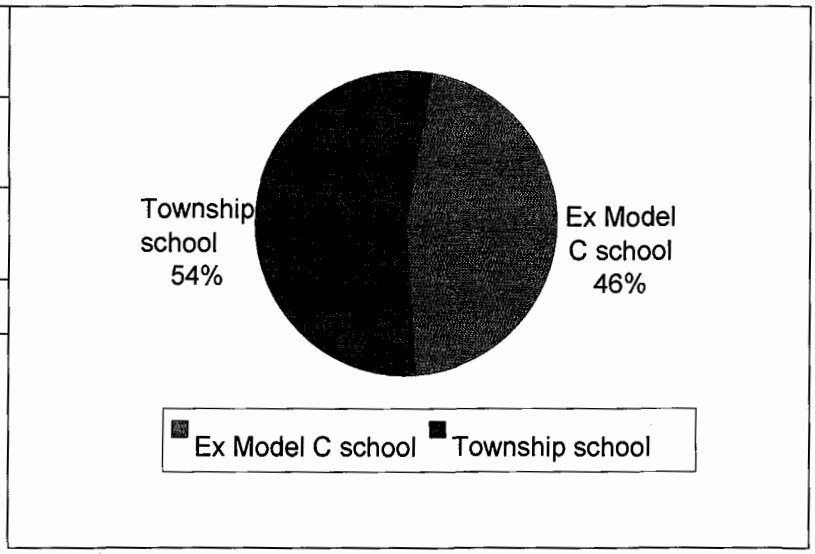


Table 4.11 indicates that more or less an equal number of teachers from ex-Model C schools (n=111) and Township schools (n=130) participated in the research.

The data was used to check whether there were differences in the perceptions of the teachers from different types of schools regarding the classroom climates that they create for the learners (*cf.* 4.5.2.1).

In Table 4.12 the biographic information of the teachers related to the ethnic groups that they represented, is indicated.

Table 4.12: Ethnic groups of teachers

Ethnic group	f	%
Black	114	47.3
White	110	45.6
Asian	5	2.1
Coloured	4	1.7
Other	2	0.8
Missing	6	2.5
Total	241	100.0

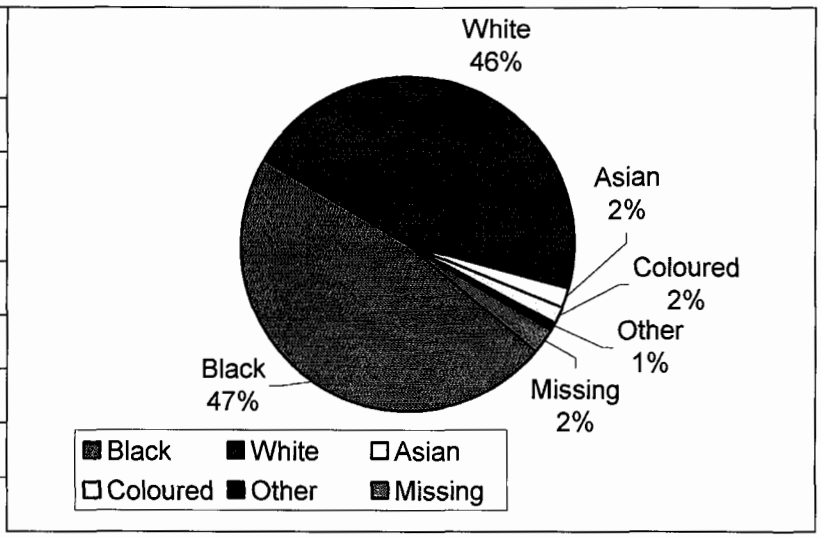


Table 4.12 indicates that the teachers who took part in the study comprised a mixed ethnic group. The majority of the teachers who participated in the study were Black teachers (n=114), followed by White teachers (n=110).

The data was used to check whether there were differences in the perceptions of the teachers from different ethnic groups regarding the classroom climates that they create for the learners (*cf.* 4.5.2.1).

In Table 4.13 the biographic information of the teachers related to their teaching experience, is indicated.

Table 4.13: Years experience in teaching

Experience	f	%
0-5	40	16.6
6-10	56	23.2
11-20	71	29.5
20+	70	29.0
Missing	4	1.7
Total	241	100.0

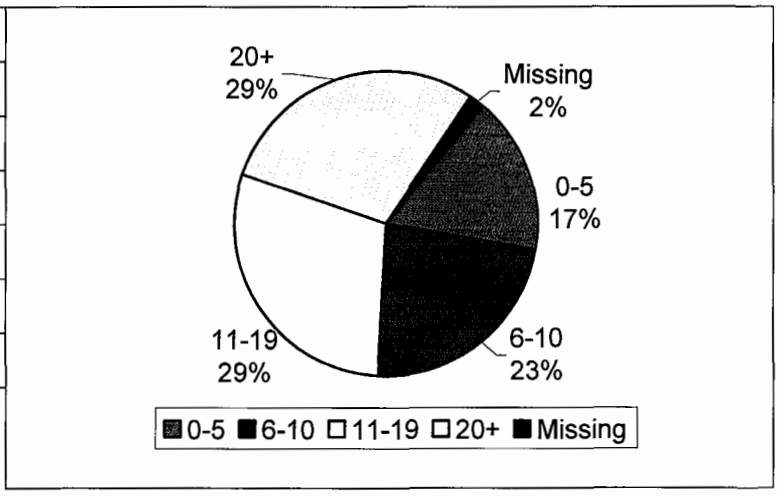


Table 4.13 indicates that the group of teachers who took part in the study comprised of mixed years of experience. The majority of the teachers who participated in the study were teachers with 11 to 20 years of experience (n=71) followed by the teachers with 20 and more years of experience (n=70).

The data were used to check whether there were differences in the perceptions of the teachers with different years of experience regarding the classroom climates that they create for the learners (*cf.* 4.5.2.1).

In the next section, the analysis and interpretation of data obtained from the teacher and learner responses to the questionnaire items are presented.

4.4 DATA ANALYSIS: TEACHER AND LEARNER RESPONSES

By means of descriptive statistics, data was organized and summarized to promote an understanding of the data characteristics (Pietersen & Maree, 2007a:195).

This section presents the responses obtained from the teachers and learners for each of the sections in the questionnaire. Each section focused on a specific construct in relation to the development of critical thinking and classroom climate. Although the learner and teacher questionnaires focused on the same issues, the questions were phrased differently to suit the respective group.

The responses of the participants are classified simultaneously in a two-way frequency table, in order to explore different response patterns between teachers and learners (Pietersen & Maree, 2007a:185). The data for the responses will be summarized with frequencies and percentages. Graphical representations will serve the purpose of visually highlighting the prominent characteristics that emanated from the responses (Pietersen & Maree, 2007a:185). The tables reflect only data of participants who responded.

4.4.1 Teacher and learner responses: Section B

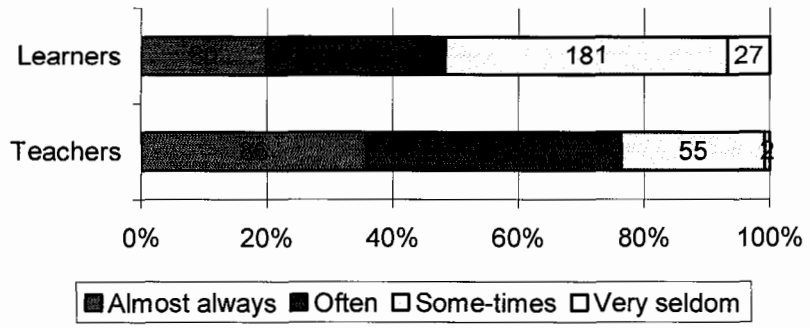
The purpose of this section was to evaluate the classroom practice of teachers in order to determine to what extent the general principles that inform

the choice of teaching methods and strategies are applied to nurture the development of critical thinking. Table 4.14 classifies the responses obtained for learners and teachers.

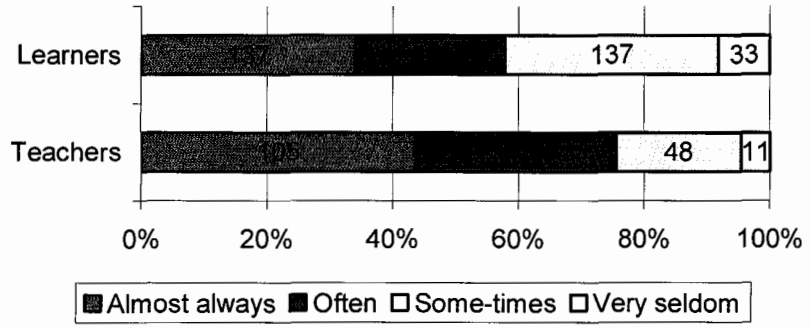
The researcher wishes to emphasize the following principle that was taken into account in the interpretation of the responses. In order to nurture critical thinking skills, which are regarded as very difficult skills to teach and learn (Van Gelder, 2005:41-46), frequent opportunities have to be created for learners to practise and apply these skills. The researcher was therefore particularly interested in the *"almost always"* and *"strongly agree"* responses. The researcher argues that no matter what the content or activities are that teachers need to teach or want to implement, the nurturing of critical thinking should be linked to teaching and learning on a daily basis. It is for this reason that the *"almost always"* and *"often"* and the *"strongly agree"* and *"agree"* responses were not clustered together in the interpretation of the data. The researcher is therefore aware of the fact that the clustering of the *"almost always"* and *"often"* responses will provide a different picture of the classroom situation.

Table 4.14: Teacher and learner responses: Teaching methods and strategies: general principles

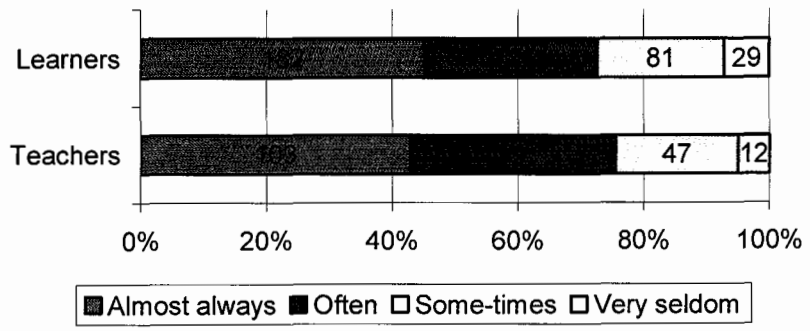
Question		Almost always	Often	Some-times	Very seldom
1. When presenting lessons in class, the teachers make use of different teaching methods	Teachers	86 35.7%	98 40.7%	55 22.8%	2 0.8%
	Learners	80 19.9%	115 28.5%	181 44.9%	27 6.7%



2. During class discussions learners can voice their opinions	Teachers	105	77	48	11
		43.6%	32.0%	19.9%	4.6%
	Learners	137	96	137	33
		34.0%	23.8%	34.0%	8.2%



3. The discussions in the class provide opportunities for learners to think for themselves	Teachers	103	79	47	12
		42.7%	32.8%	19.5%	5.0%
	Learners	182	111	81	29
		45.2%	27.5%	20.1%	7.2%



The literature review strongly emphasizes that teachers need to use a variety of teaching methods and strategies in order to nurture learners' critical thinking skills. In this regard, Kramer (2006:104-105) and Philpott (2009:88)

(*cf.* 2.5.1.2) in particular refer to the use of indirect, independent and interactive teaching methods and strategies. Research has shown that to encourage critical thinking, teachers should expose learners to various teaching strategies so that they have the opportunity to practice critical thinking skills (Walker & Diaz, 2003:64). These strategies range from traditional lectures to simulated experience and debates and include the following: case studies, classroom discussions that involve current and controversial topics, and using different questioning strategies to promote the analysis, synthesis and evaluation of information (Briggs & Sommerfeldt, 2002:54-56) McGonigal, 2005; Pratt, 2005) (*cf.* 2.4.4). If learners are expected to think critically, they must be allowed the opportunity to practise critical thinking under guided instruction so that they can improve their skills over time (Walker & Diaz, 2003:64) (*cf.* 2.5.1.2).

From the data obtained, it appears that the majority of the teachers often use different teaching methods (40.7%) and some almost always (35.7%) use a variety of teaching methods. This response is a good indication that teachers do not use only one specific method of teaching. According to the learners' responses it seems according to the majority of the learners, that teachers only sometimes use different methods (44.9%) in the classroom and learners are of the opinion that only 19,9% of the teachers use a variety of different teaching methods on a frequent basis.

If the teachers who took part in the study want to help their learners to develop as critical thinkers, they must realize the importance of critical thinking and help their learners to come to terms with this human power of the mind, the power to create concepts through which learners, and they, see and experience the world on a more frequent basis (Jeevanantham, 2005:118-129; McGonigal, 2005) (*cf.* 2.3.1).

In the classroom, learners learn a variety of critical thinking skills that can greatly improve their classroom performance. According to Bassham *et al.* (2005:8) (*cf.* 2.3.1), these skills include: understanding the arguments and the beliefs of others, critically evaluating those arguments and beliefs and developing and defending one's own well-supported arguments and beliefs.

In support of learners expressing their own opinions during discussions, the teachers' responses indicated that they almost always (43.6%) allow learners to voice their own opinions. It appears that the majority of learners felt that their teachers almost always (34.0%) and sometimes (34.0%) allow them to voice their opinions.

According to Ferrando (2001), Borich (2004:294) and Halpern (2007:10) (*cf.* 2.5.1.4) to help a learner to think critically requires a teacher to perform several unique teaching functions to nurture the development of critical thinking skills. These include *inter alia* the following: to provide information about when and how to use mental strategies for learning and explicitly illustrate how to use these strategies to think through solutions to real-world problems. Teachers must encourage learners to become actively involved in subject matter by going beyond the information given, restructure it in their own way of thinking and prior understanding. They should expand their repertoire of instructional skills and strategies to develop a wide range of reasoning, creative and cooperative abilities in learners in order to provide opportunities for learners to think for themselves (Jeevanantham, 2005:115-129; McGonigal, 2005) (*cf.* 2.3.1). According to the data obtained in Table 4.14, the majority of both the teachers (42.7%) and the learners (45.2%) indicated that this happens almost always. To the researcher this is disconcerting as it appears that there are teachers who apparently do not regard the fact that learners always have to think for themselves as important for the development of critical thinking.

From the responses obtained for this section, the researcher is of the opinion that there is evidence that teachers do make an effort to apply the principles of teaching and learning related to the development of critical thinking, but more needs to be done by the teachers to apply these principles on a more frequent basis.

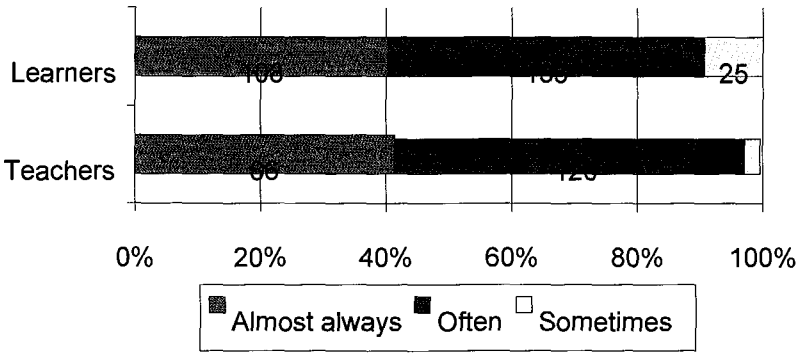
4.4.2 Teacher and learner responses: Section C

The purpose of this section was to evaluate the classroom practice of teachers in order to determine to what extent the general principles for the

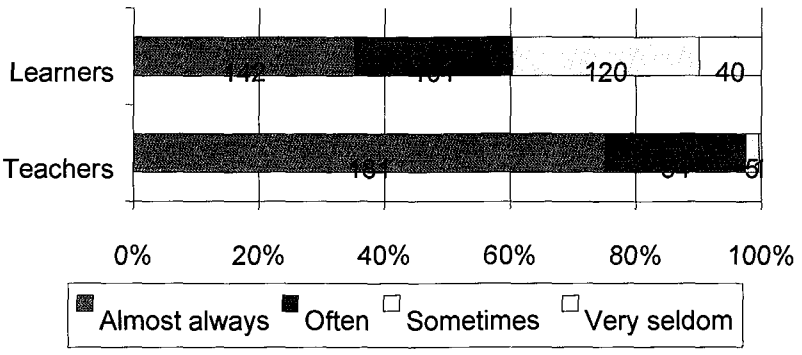
choice of learning activities that nurture the development of critical thinking, are applied. Table 4.15 classifies the responses obtained for learners and teachers.

Table 4.15: Teacher and learner responses: Learning activities: general principles

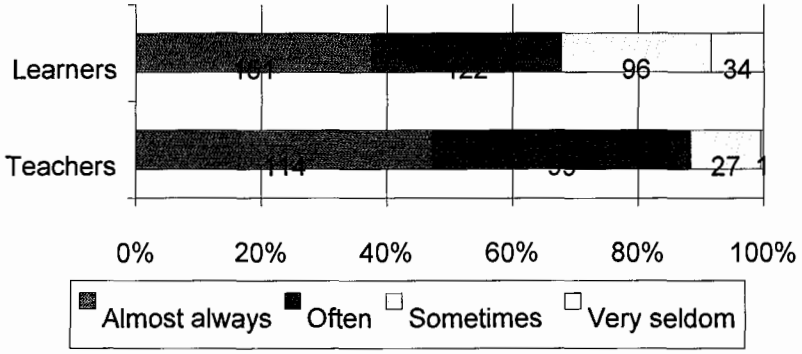
Question		Almost always	Often	Some-times	Very seldom
1. The activities chosen by the teacher lead to the curiosity of the learner.	Teachers	86 35.7%	120 49.8%	33 13.7%	2 0.8%
	Learners	108 26.8%	135 33.5%	135 33.5%	25 6.2%



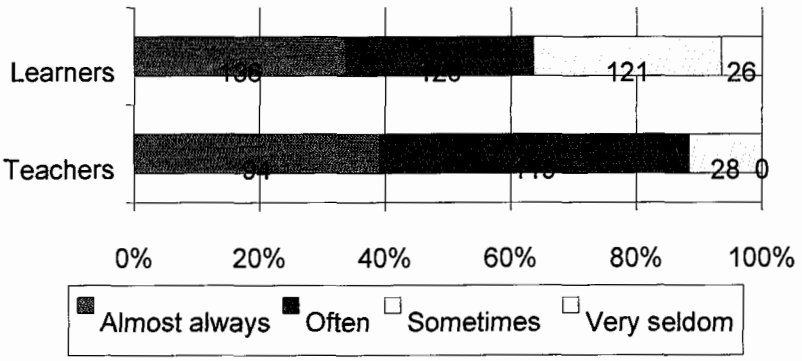
2. An atmosphere of mutual respect exists in the class.	Teachers	181 75.1%	54 22.4%	5 2.1%	1 0.4%
	Learners	142 35.2%	101 25.1%	120 29.8%	40 9.9%



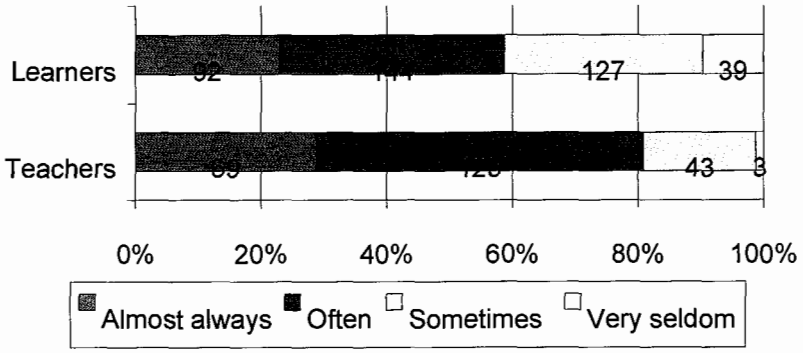
3. The way activities are done in class focus on satisfying the learner's needs.	Teachers	114 47.3%	99 41.1%	27 11.2%	1 0.4%
	Learners	151 37.5%	122 30.3%	96 23.8%	34 8.4%



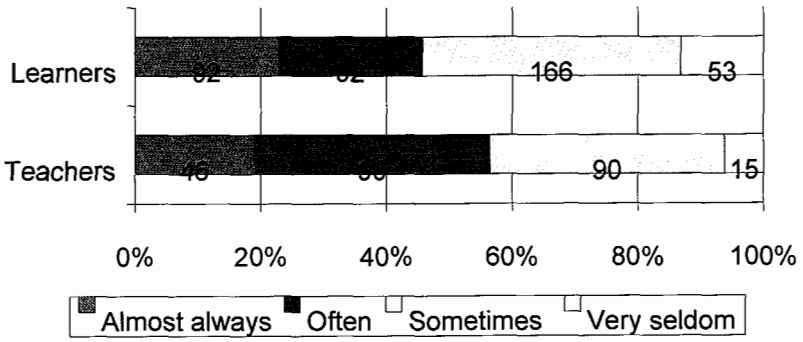
4. The activities in class challenge learners' intellect.	Teachers	94 39.0%	119 49.4%	28 11.6%	0 0%
	Learners	136 33.7%	120 29.8%	121 30.0%	26 6.5%



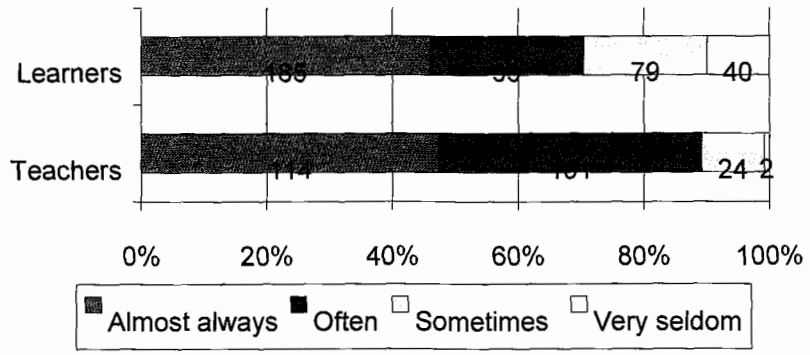
5. The activities in class stimulate imagination. Missing: Teachers 1 (0.4%) Learners 1 (0,2%)	Teachers	69 28.6%	125 51.9%	43 17.8%	3 1.2%
	Learners	92 22.8%	144 35.7%	127 31.5%	39 9.7%



6. Classmates provide one another with assistance.	Teachers	46 19.1%	90 37.3%	90 37.3%	15 6.2%
	Learners	92 22.8%	92 22.8%	166 41.2%	53 13.2%



7. Learners are encouraged to question things.	Teachers	114 47.3%	101 41.9%	24 10.0%	2 0.8%
	Learners	185 45.9%	99 24.6%	79 19.6%	40 9.9%



In the literature review, the important role that the teacher plays in creating an enabling environment for the nurturing of critical thinking is highlighted (Borich, 2004:370; Abdool & Drinkwater, 2005:363-372) (*cf.* 2.5). Such a learning environment is characterized by flexibility, open discussion, support, inspiration and motivation, and promotes curiosity, exploration, spontaneity and interest (Moloi, 2005:77) (*cf.* 2.5.1). Table 4.15 indicates that only 35.7% of the teachers who were involved in the study almost always choose activities that lead to the curiosity of the learners. The data obtained from the learners also indicated that teachers often (33.5%) and sometimes (33.5%) choose activities that make them curious. The researcher is however concerned that it appears as if a large number of teachers do not regard the nurturing of learners as important.

Literature specifically emphasizes that the classroom environment should foster psychological safety and respect for intellectual freedom within a structure where individuals respect one another as persons of unconditional worth (Crotty, 2002; Elder, 2007) (*cf.* 2.5). From the data in Table 4.15, it is very encouraging that the teachers indicated that they almost always (75.1%) try to create this environment of mutual respect. However, only 35.2% of the learners shared this feeling.

Teachers need to create a positive classroom climate which allows for learners' basic needs of physical and mental health to be met. Both physical and mental needs must be met in order for learners to be happy, emotionally healthy and successful people (Crotty, 2002) (*cf.* 2.5). From the data obtained, the majority of the teachers (47.3%) and the learners (37.5%) indicated that the way activities are handled in class almost always focus on satisfying the learners' needs.

It is important to include cognitive features in learning material over and above the subject matter, in order to challenge learners to plan their study experiences actively. Learners should develop problem-solving skills and engage in learning activities that challenge the intellect and imagination. Such activities require the acquisition, comprehension and application of new knowledge and activate the need for perseverance, research and increasingly complex forms of problem-solving (Elder & Paul, 2001:42-44; Wilson, 2002; Borich, 2004:261-262) (*cf.* 2.3). Very similar responses were received by the learners and teachers for challenging the intellect during teaching and learning. According to the responses of the learners, only 33.7% indicated that they are always challenged intellectually with the activities developed by the teachers. This response corresponded well with the 39.0% of the teachers who indicated that they almost always challenge the learners' intellect during teaching. Linked to the unfavourable response regarding the challenging of the learners' intellect, is the fact that only 28.6% of the teachers and 22.8% of the learners indicated that imagination is almost always challenged during teaching.

The literature strongly emphasizes that classroom activities and discussions should be used as a means for learners to practise and improve their critical thinking skills (Burden & Boyd, 2003:139; Walker & Diaz, 2003:64) (*cf.* 2.5.1.1). According to Table 4.15, it seems that not many teachers always allow the learners to provide assistance to one another (19.1%). The responses of the teachers were supported by the learners (22.8%), who also indicated that learners do not always support one another. The majority of the teachers (37.3%) and learners (41.2%) respectively indicated that this only

happens often or sometimes. Fisher (2005:157) and Cook (2008:150) (*cf.* 2.5.1.2), indicate that learners gain by working in pairs or groups and by thinking out loud while trying to solve shared problems. The aforementioned authors argue that getting learners to talk about what they are doing, before, during and after working on a task enhances their ability to think critically about the task at hand. The researcher argues that the teachers who took part in the study should utilize the support that peers can give to one another on a more frequent basis.

According to Burden and Boyd (2003:139), Walker and Diaz (2003:60), Arends (2009:389, 390) and Eggen and Kauchak (2020:419) (*cf.* 2.5.1.1), the development of critical thinking abilities will become evident as learners deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions. In Table 4.15 it is evident that both the majority of the learners (45.9%) and teachers (47.3%) indicate that questioning things said by the teacher is almost always encouraged.

Although all of the responses to the questionnaire items in this section indicated that the choice of learning activities nurture the development of critical thinking skills to a certain extent, the researcher concludes that the low percentages obtained for the responses belonging to the *"almost always"* category highlight the need for improving learner involvement in activities that nurture critical thinking skills on a more frequent basis. Especially with regard to providing challenges for imaginative work, stimulating curiosity and questioning, which are activities that lie at the core of the development of critical thinking, it appears that extra efforts are needed.

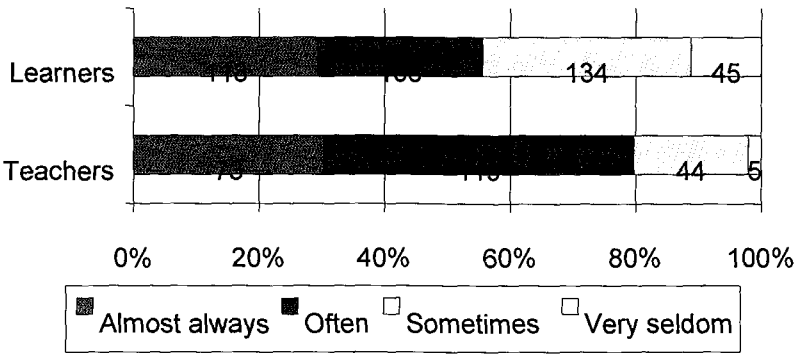
4.4.3 Teacher and learner responses: Section D

The purpose of this section was to evaluate the classroom practice of teachers in order to determine to what extent the general principles for utilizing questioning techniques that nurture the development of critical

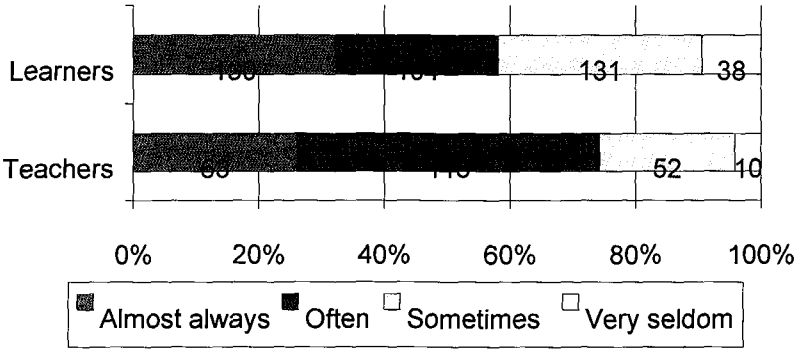
thinking are utilized in the classrooms that took part in the research. Table 4.16 classifies the responses obtained for learners and teachers.

Table 4.16: Teacher and learner responses: Questioning techniques: general principles

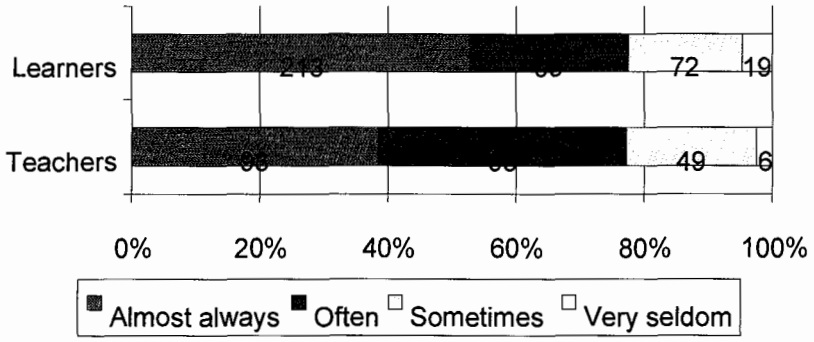
Question		Almost always	Often	Some-times	Very seldom
1. The teachers allow more than one correct answer to a question.	Teachers	73 30.3%	119 49.4%	44 18.3%	5 2.1%
	Learners	118 29.3%	106 26.3%	134 33.3%	45 11.2%



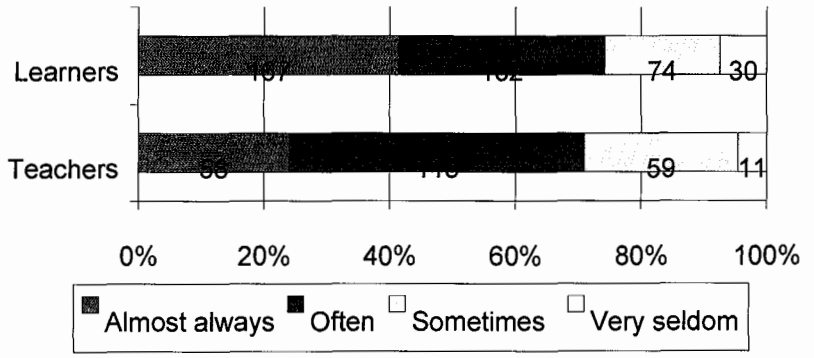
2. The teachers expect learners to make their own conclusions.	Teachers	63 26.1%	116 48.1%	52 21.6%	10 4.1%
	Learners	130 32.3%	104 25.8%	131 32.5%	38 9.4%



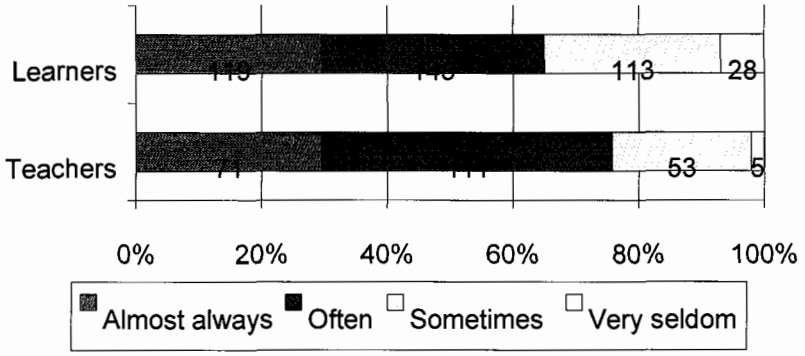
3. The teachers expect learners to motivate their answers.	Teachers	93 38.6%	93 38.6%	49 20.3%	6 2.5%
	Learners	213 52.9%	99 24.6%	72 17.9%	19 4.7%



4. Learners have to analyse information.	Teachers	58 24.1%	113 46.9%	59 24.5%	11 4.6%
	Learners	167 41.4%	132 32.8%	74 18.4%	30 7.4%



5. Learners have to interpret information Missing: Teachers 1 (0.4%)	Teachers	71 29.5%	111 46.1%	53 22.0%	5 2.1%
	Learners	119 29.5%	143 35.5%	113 28.0%	28 6.9%



In order to nurture critical thinking, the literature review strongly emphasizes the importance of a comparative analysis from different perspectives before learners can synthesize information and reach conclusions (Elder, 2007; Crotty, 2002) (*cf.* 2.5). In the context of this study it appears that teachers do not always allow more that one correct answer to a question, as only 30.3% of the teachers and 29.3% of the learners indicated that this almost always happens. It is important that learners evaluate, appraise and defend information according to a set of criteria and justification of their beliefs (Elder & Paul, 2001:42-44; Wilson, 2002) (*cf.* 2.5.1.3).

The learners' responses to the question whether their teachers expect them to make their own conclusions are not convincing. Only some of the learners (32.3%) indicated that they are almost always allowed to make their own conclusions. The teachers on the other hand indicated that they almost always (26.1%) and often (48.1%) allow learners to make their own conclusions. It appears to the researcher that the teachers could focus more on the use of evaluative questioning strategies (*cf.* 2.5.1.3) where learners get the opportunity to compare different answers before coming to a conclusion (Crotty, 2002; Wilson, 2002).

In the context of nurturing critical thinking skills, it is required that learners go beyond their answers and explain how they arrived at their answers (Schunk,

2004:319) (*cf.* 2.5.1.5). It is clear from the data in Table 4.16 that the teachers almost always (38.6%) and often (38.6%) expect the learners to motivate their answers to the questions asked. Although the learners indicated with 52.9% that their teacher almost always expects them to motivate their answers, it is disconcerting that it appears that there are still teachers who do not expect learners to motivate their answers. This could imply that some of the teachers who took part in the study might still be too trapped in teacher-centred teaching styles that focus on passive learning and non-routine mental work (Pithers & Soden, 2000:239; Barnes, 2005:42-57) (*cf.* 2.5.1.5).

Having learners analyse the logic of language can foster more effective thinking (Cole & Chan, 1994; Ferrando, 2001; Halpern, 2007:10; Alazzi, 2008:245) (*cf.* 2.5.1.4). From the data obtained, teachers' responses showed that they often (46.9%) encourage learners to analyse and often (46.1%) to interpret information. A large number of learners indicated that teachers almost always (41.4%) encourage them to almost always analyse information and often (35.5%) allow them to interpret information in the classroom. It is interesting to note that both the teachers and the learners respectively indicated with only 29.5% that learners are almost always expected to interpret information. Analysis and interpretation are two of the core cognitive skills required for a critical thinker (Facione, 2009:15). According to the responses, it is clear that more opportunities should be created for learners to apply these skills.

Classroom researchers have studied the effects of convergent and divergent questions on learner achievement. Most rationales for using higher-level divergent type questions include promotion of thinking, formation of concepts and abstractions, and the encouragement of analysis-synthesis evaluations (Elder & Paul, 2001:42-44) (*cf.* 2.5.1.5). One of the reasons for asking questions is to encourage higher-level thought processes (Borich, 2004:261, 262) (*cf.* 2.5.1.3). According to Wilson (2002), there are four types of questions that encourage learners to use higher levels of cognitive or affective processes for critical thinking. They are convergent, divergent, evaluative and Socratic questions. Divergent questions, which normally ask learners to

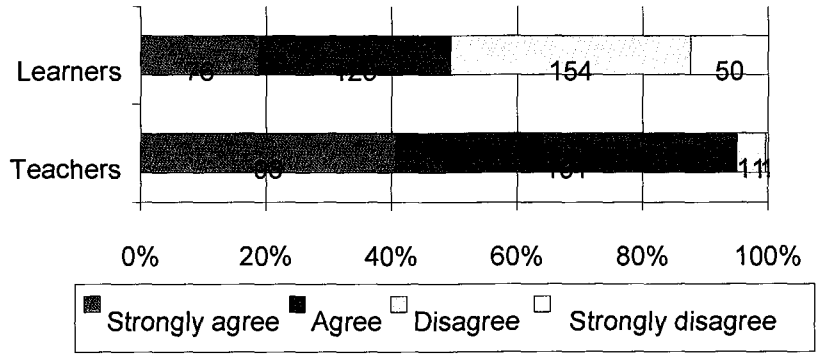
analyse issues, are regarded as effective for nurturing critical thinking skills (Borich, 2004:261-262) (*cf.* 2.5.1.3). Divergent questions appear to be underutilized in the classrooms that took part in the research.

4.4.4 Teacher and learner responses: Section E

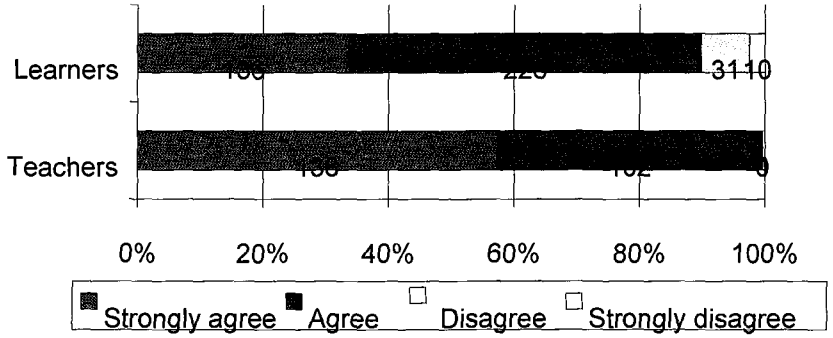
The purpose of this section was to examine the role of the teacher in the classroom in relation to the nurturing of the development of critical thinking. Table 4.17 classifies the responses obtained for learners and teachers.

Table 4.17: Teacher and learner responses: Role of the teacher

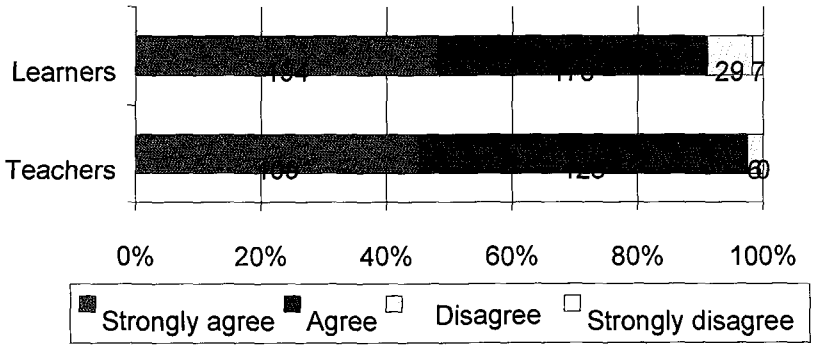
Question		Strongly agree	Agree	Dis-agree	Strongly disagree
1. It is the responsibility of the teachers to teach learners how to use their minds.	Teachers	98 40.7%	131 54.4%	11 4.6%	1 0.4%
	Learners	76 18.9%	123 30.5%	154 38.2%	50 12.4%



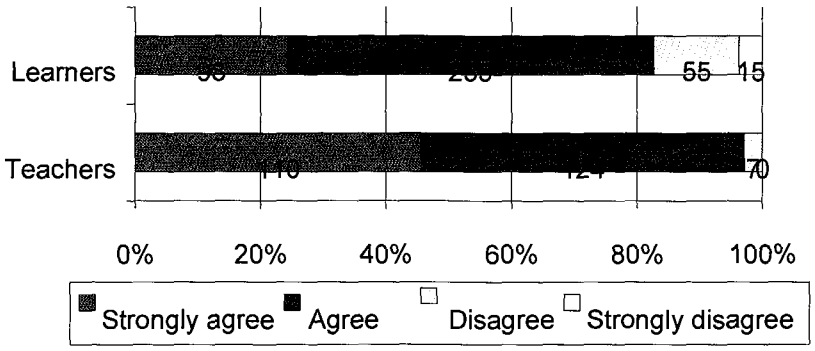
2. When the teachers present a lesson, they motivate learners to think for themselves.	Teachers	138 57.3%	102 42.3%	0	1 0.4%
	Learners	136 33.7%	226 56.1%	31 7.7%	10 2.5%



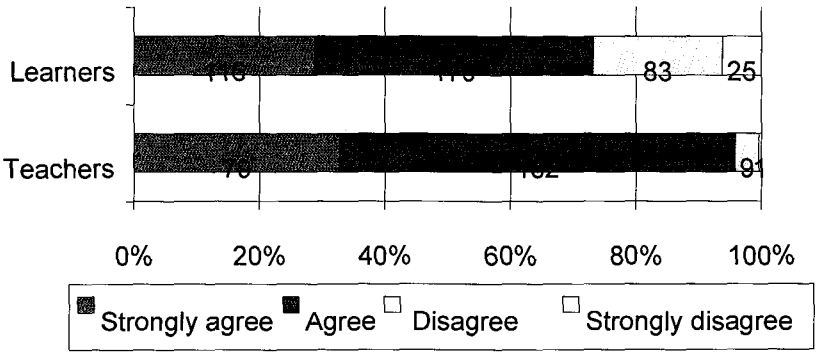
3. The teachers create opportunities for learners to succeed.	Teachers	109 45.2%	126 52.3%	6 2.5%	0
	Learners	194 48.1%	173 42.9%	29 7.2%	7 1.7%



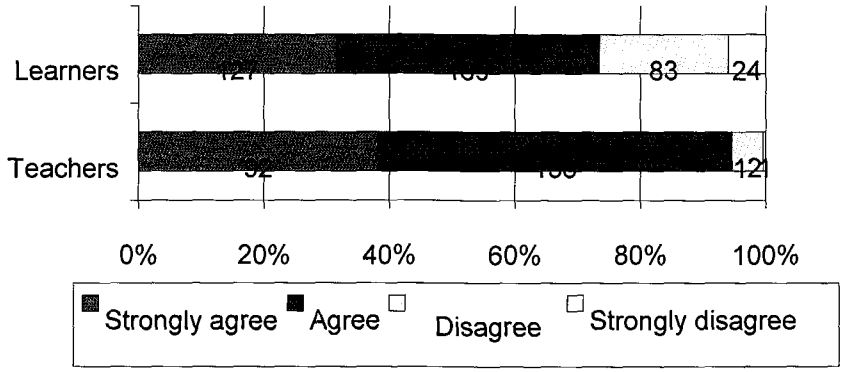
4. The teachers are consistent in class.	Teachers	110 45.6%	124 51.5%	7 2.9%	0
	Learners	98 24.3%	235 58.3%	55 13.6%	15 3.7%



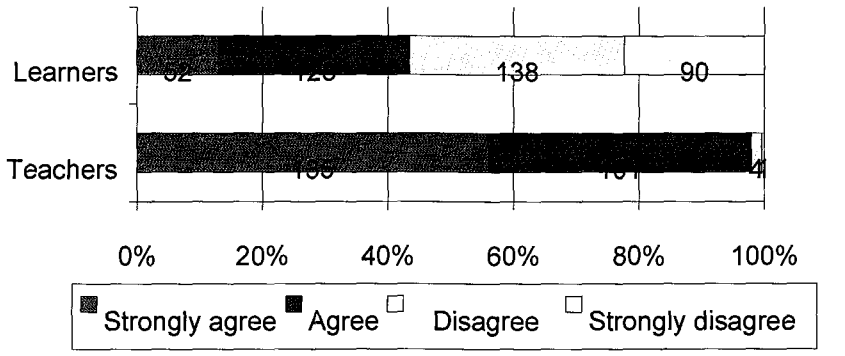
5. The teachers are patient with learners in class.	Teachers	79 32.8%	152 63.1%	9 3.7%	1 0.4%
	Learners	116 28.8%	179 44.4%	83 20.6%	25 6.2%



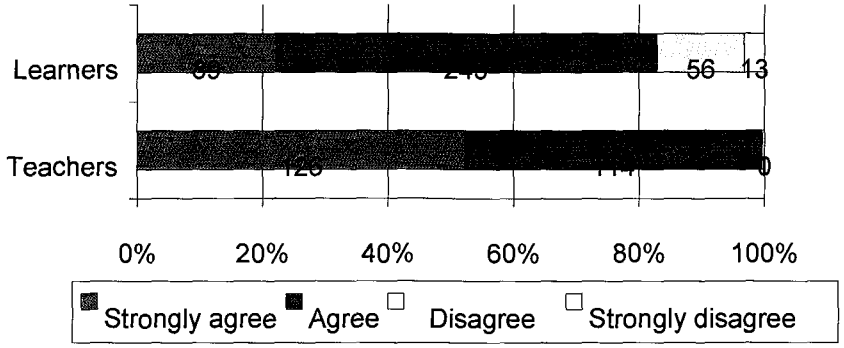
6. Teachers reward learners if their performance is good.	Teachers	92 38.2%	136 56.4%	12 5.0%	1 0.4%
	Learners	127 31.5%	169 41.9%	83 20.6%	24 6.0%



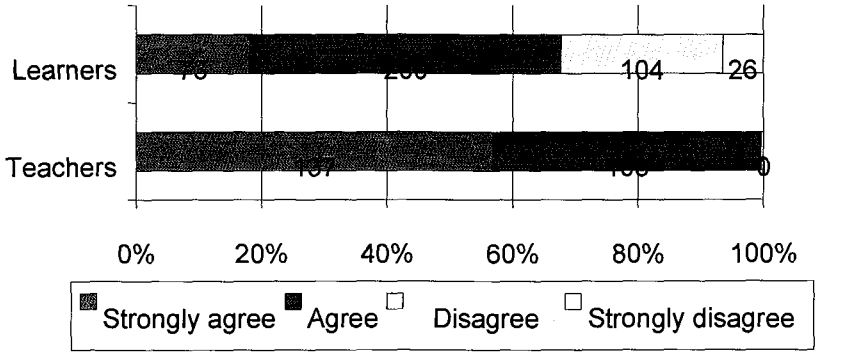
7. Learners do not have to accept everything the teachers say in class.	Teachers	135 56.0%	101 41.9%	4 1.7%	1 0.4%
	Learners	52 12.9%	123 30.5%	138 34.2%	90 22.3%



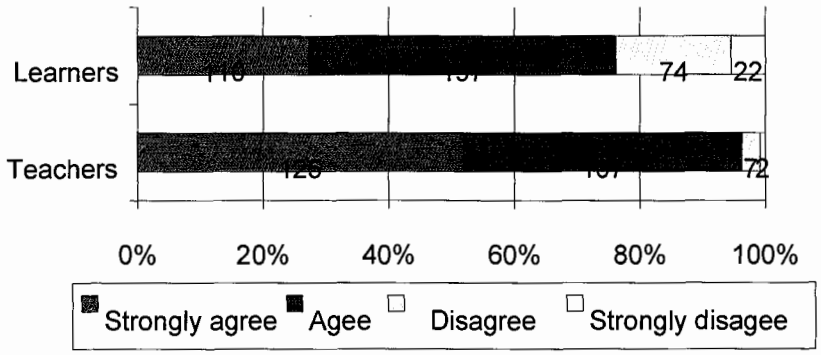
8. The teachers allow learners to reason logically.	Teachers	126 52.3%	114 47.3%	1 0.4%	0
	Learners	89 22.1%	245 60.8%	56 13.9%	13 3.2%



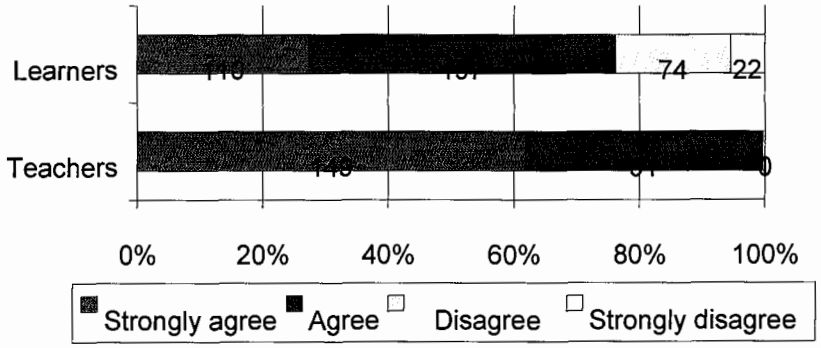
9. The teachers create a warm class atmosphere.	Teachers	137 56.8%	103 42.7%	1 0.4%	0
	Learners	73 18.1%	200 49.6%	104 25.8%	26 6.5%



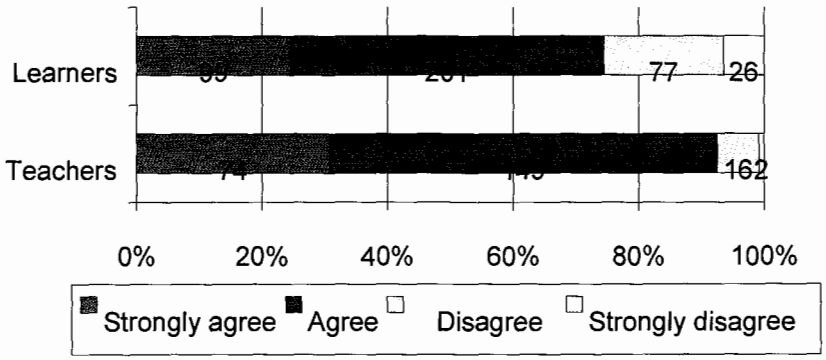
10. Cooperation among learners is encouraged by the teachers.	Teachers	125 51.9%	107 44.4%	7 2.9%	2 0.8%
	Learners	110 27.3%	197 48.9%	74 18.4%	22 5.5%



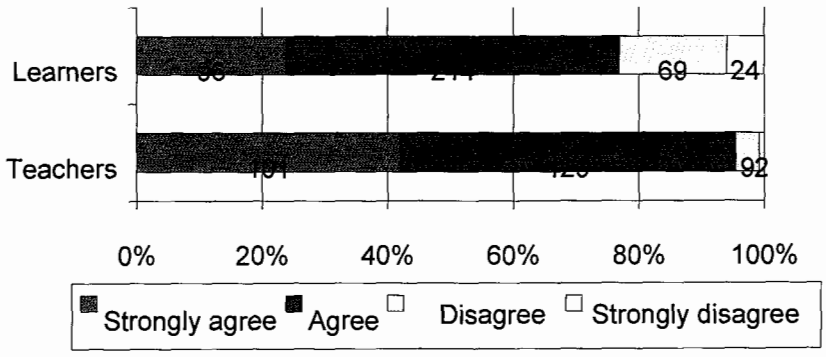
11. The teachers are supportive to learners.	Teachers	149 61.8%	91 37.8%	1 0.4%	0
	Learners	110 27.3%	197 48.9%	74 18.4%	22 5.5%



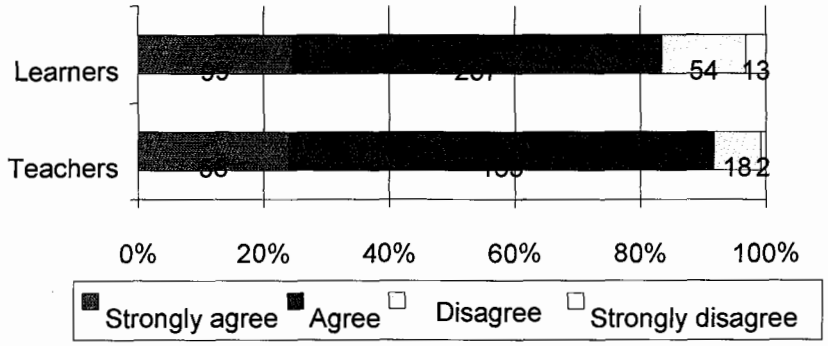
12. Teachers allow learners to make their own choices.	Teachers	74 30.7%	149 61.8%	16 6.6%	2 0.8%
	Learners	99 24.6%	201 49.9%	77 19.1%	26 6.5%



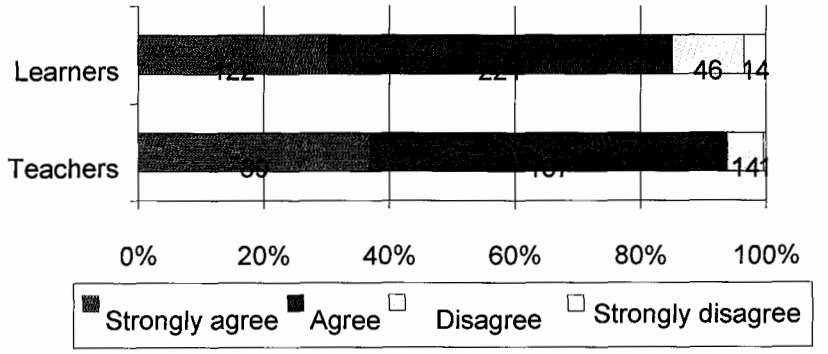
13. The teachers present lessons in various ways (e.g. visual and/or verbal).	Teachers	101 41.9%	129 53.5%	9 3.7%	2 0.8%
	Learners	96 23.8%	214 53.1%	69 17.1%	24 6.0%



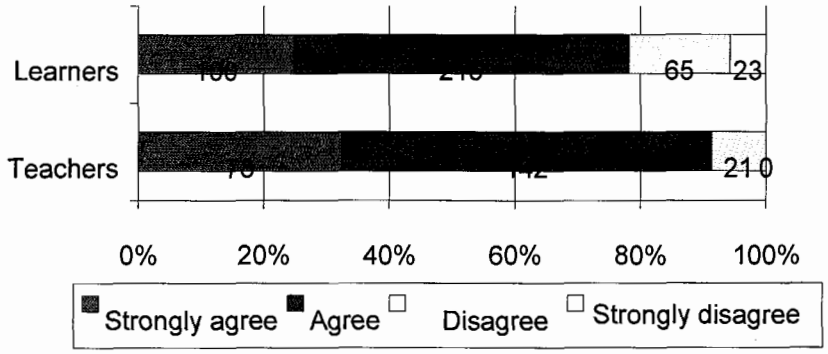
14. Teachers allow learners to construct their own understanding of the content.	Teachers	58 24.1%	163 67.6%	18 7.5%	2 0.8%
	Learners	99 24.6%	237 58.8%	54 13.4%	13 3.2%



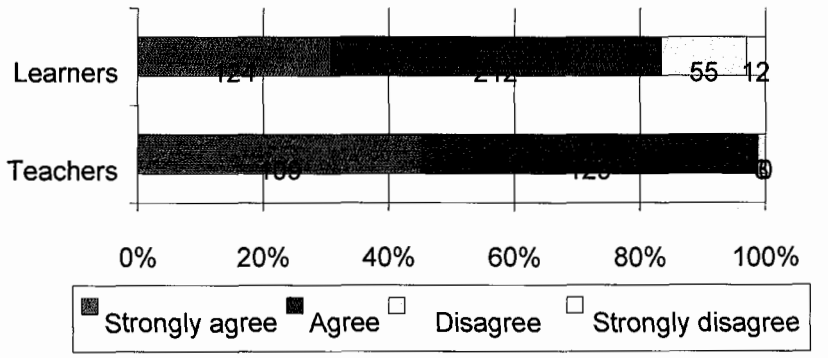
15. Teachers use specific vocabulary to teach thinking skills in class.	Teachers	89 36.9%	137 56.8%	14 5.8%	1 0.4%
	Learners	122 30.3%	221 54.8%	46 11.4%	14 3.5%



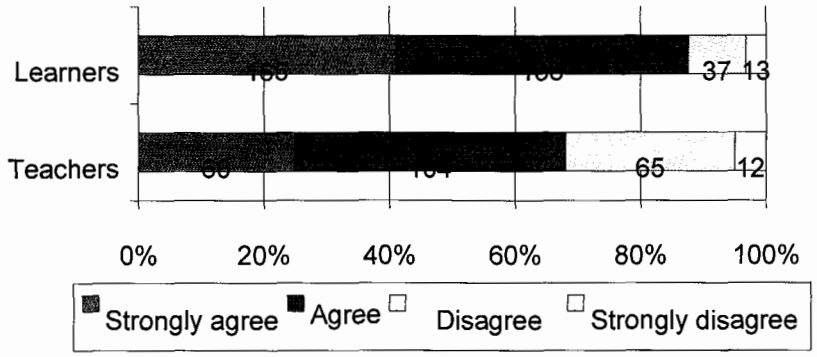
16. The teachers encourage learners to make their own decisions.	Teachers	78 32.4%	142 58.9%	21 8.7%	0
	Learners	100 24.8%	215 53.3%	65 16.1%	23 5.7%



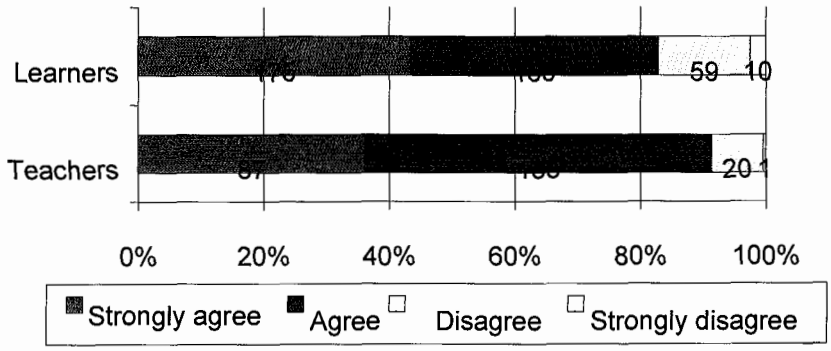
17. Teachers encourage learners to describe the process they followed to come to an answer.	Teachers	109 45.2%	129 53.5%	3 1.2%	0
	Learners	124 30.8%	212 52.6%	55 13.6%	12 3.0%



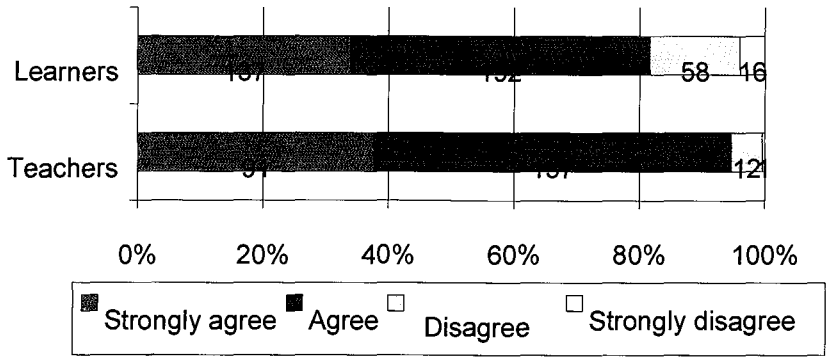
18. The teachers encourage learners to explain things in their own words.	Teachers	60 24.9%	104 43.2%	65 27.0%	12 5.0%
	Learners	165 40.9%	188 46.7%	37 9.2%	13 3.2%



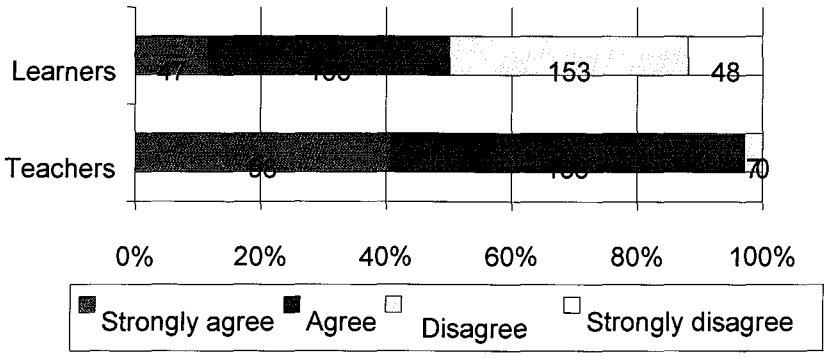
19. The teachers teach learners how to be creative.	Teachers	87 36.1%	133 55.2%	20 8.3%	1 0.4%
	Learners	175 43.4%	159 39.5%	59 14.6%	10 2.5%



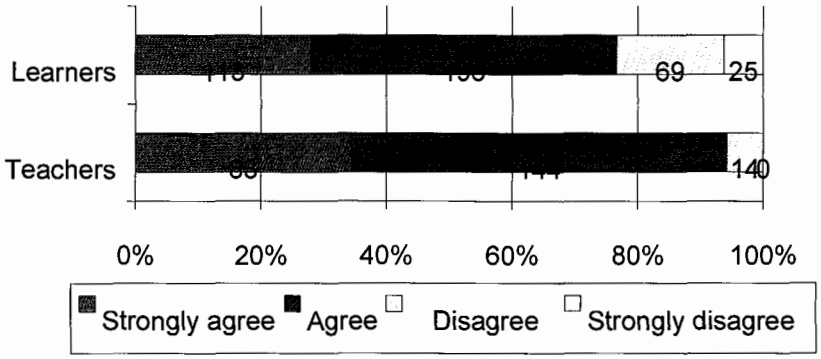
20. The teachers teach learners how to work with others.	Teachers	91 37.8%	137 56.8%	12 5.0%	1 0.4%
	Learners	137 34.0%	192 47.6%	58 14.4%	16 4.0%



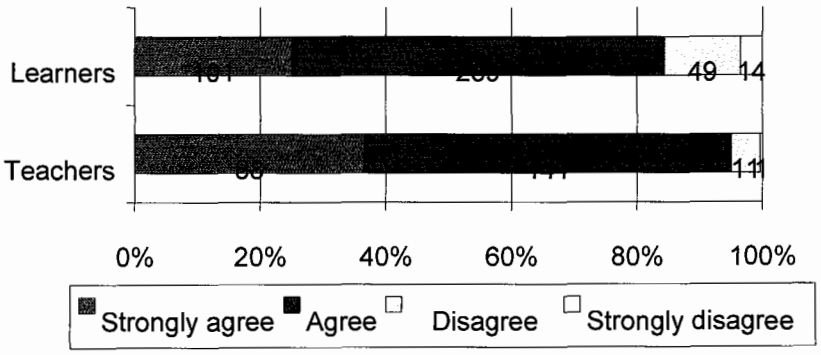
21. Teachers motivate learners in class to judge things.	Teachers	98 40.7%	136 56.4%	7 2.9%	0
	Learners	47 11.7%	155 38.5%	153 38.0%	48 11.9%



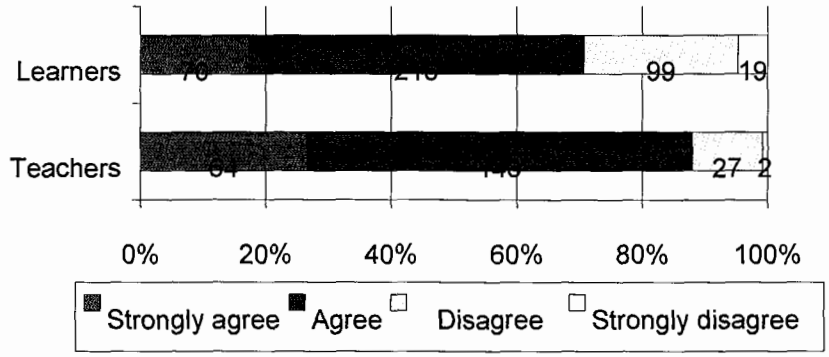
22. Learners are challenged in class to come up with original ideas.	Teachers	83 34.4%	144 59.8%	14 5.8%	0
	Learners	113 28.0%	196 48.6%	69 17.1%	25 6.2%



23. Teachers expect learners to formulate their own point of view.	Teachers	88 36.5%	141 58.5%	11 4.6%	1 0.4%
	Learners	101 25.1%	239 59.3%	49 12.2%	14 3.5%



24. Teachers expect learners to formulate questions.	Teachers	64 26.6%	148 61.4%	27 11.2%	2 0.8%
	Learners	70 17.4%	215 53.3%	99 24.6%	19 4.7%



In the context of nurturing critical thinking skills, the literature review strongly emphasizes the role of the teachers in creating classroom climates that invite critical thinking (Cook, 2008:114; Smith, 2009:62) (*cf.* 2.3.3). What is very interesting from the data in Table 4.17 is that it appears that the majority of the learners (38.2%) disagreed that their teachers teach them how to use their minds, whereas most of the teachers (54.4%) agreed and strongly agreed (40.7%) that they do teach learners how to use their minds.

Teachers should nurture a love and desire for learning among learners by establishing a classroom climate which is based upon mutual regard and respect for diverse opinions (Crotty, 2002; Elder, 2007) (*cf.* 2.5). Teachers must encourage learners to become actively involved in subject matter by going beyond the information given and to restructure it according to their own way of thinking and prior understanding (Borich, 2004:294) (*cf.* 2.5.1.4). What is encouraging from the responses is that the teachers strongly agreed (57.3%) and agreed (42.3%) with the statement that they motivate learners to think for themselves, and that the majority of the learners agreed (56.1%) with this. A similar response was obtained for questionnaire item B 3 where the majority of teachers (42.7% and learners (45.2%) indicated that it almost always happens that opportunities are provided for learners to think for themselves.

In an effort to improve the academic success of learners, it has become necessary to examine all the components of educational process in order to maximize the effectiveness of instruction within the classroom and how they influence the development of critical thinking skills (Gyalyam & Le Grange, 2005:239-242; Halx & Reybold, 2005:293). The majority of teachers (52.3%) agreed that they create opportunities for learners to succeed and the learners (48.1%) strongly agreed that the teachers create opportunities for them in the class to succeed.

Research done by Cook (2008:153) on strategies for nurturing critical thinking, highlights the importance of the role of the teacher as a cognitive coach who consistently develops learners' critical thinking skills. He stated that teachers can help learners become aware of their use of critical thinking skills by providing specific feedback on a constant basis (Cook, 2008:153). From the data in Table 4.17 is that it appears that the majority of the learners (58.3%) agreed that their teachers are consistent in the class, whereas most of the teachers (51.5%), agreed and strongly agreed (45.6%) that they are consistent when dealing with learners in the class.

Both the majority of learners (44.4%) and teachers (63.1%) agreed that teachers are patient with the learners in the class. This could imply that in the context of nurturing critical thinking skills, which are difficult skills to teach and learn (Van Gelder, 2005:41-46), that teachers will persist in their efforts to nurture these skills.

For the development of critical thinking, it is important that teachers establish a conducive environment and encourage the learner to consider alternative perspectives empathetically (Borich, 2004:294) (*cf.* 2.5.1.4) and to provide incentives (rewards) to encourage learners to complete the knowledge construction process (Arends, 2009:386-388) (*cf.* 2.5.1.4). It appears that rewarding learners will encourage them to perform. Both the majority of learners (41.9%) and teachers (56.4%) agreed with the statement that teachers reward learners when their performance is good. The researcher argues that in the context of the development of critical thinking skills,

teachers should reward learners when they display a willing disposition and positive attitude to become involved in tasks that require critical reflection.

A contradictory response was obtained for the questionnaire item related to whether learners have to accept everything the teachers say in class. The majority of teachers indicated with 56.0% that they strongly agree that learners do not have to accept everything they say in class. Learners had a different opinion. Only 12.9% indicated that they strongly agree that they are allowed not to accept everything the teachers say in class. This response is disconcerting, as the development of critical thinking skills is nurtured by allowing learners to be critical of what is presented to them in class (Walker & Diaz, 2003:64) (*cf.* 2.5.1.5).

The aspect of reasoning is one of the most important critical thinking skills that a teacher can develop in a learner (Vandermensbrugghe, 2004:417) (*cf.* 2.3). Vandermensbrugghe (2004:417) concludes that critical thinking can refer to the ability to develop a capacity to reason logically and cohesively, whereas the second category refers to the ability to question and challenge existing knowledge and the social order. From the data in Table 4.17, 52.3% of the teachers strongly agreed with the statement that learners need to reason logically and be allowed to do so. According to the learners' responses, 60.8% of the learners agreed to this. From the teacher and learner responses it appeared that teachers do put in an effort to create classroom opportunities for logical reasoning.

Lake (2009:4) (*cf.* 2.5) argues that critical thinking is more likely to develop in an intellectually stimulating environment. As teachers teach learners to think, become more aware of conditions that promote learner thinking and become more powerful thinkers themselves, they will demand and create school climate conditions that are intellectually growth-producing as well (Crotty, 2002; Elder, 2007) (*cf.* 2.5). Teachers strongly agreed (56.8%) and agreed (42.7%) with the idea that they have to create a warm class atmosphere. In addition to this, 61.8% strongly agreed that they are supportive to learners. The majority of the learners, however, only agreed with 49.6% respectively that teachers create a warm atmosphere and support them in the classroom.

The learners' responses indicate room for improvement regarding the creation of a warm and supportive classroom that encourages intellectual openness. This questionnaire item corresponded with item C2 where a similar issue, namely creating an atmosphere where mutual respect exists, were investigated. From the data in Table 4.15, it is very encouraging that the teachers indicated that they almost always (75.1%) try to create an environment where mutual respect exists. However, only 35.2% of the learners shared this feeling. The researcher argues that a warm atmosphere will be created in a classroom if there is mutual respect among learners and teachers. It appears that teachers realize the importance of a warm and accepting classroom atmosphere, but according to the learners they apparently do not experience the atmosphere as warm and accepting.

The data in Table 4.17 also revealed that cooperation among learners is encouraged by the teachers, where teachers (51.9%) strongly agreed and learners (48.9%) agreed to this statement. Cooperation and interaction among learners are regarded as important for the development of critical thinking skills as learners get the chance to compare their ideas with those of others and have to make decisions regarding whose ideas are the best and motivate the decision made (Fisher, 2005:157; Kramer, 2006:105; Cook, 2008:150; Eggen & Kauchak, 2010:419) (*cf.* 2.5.1.2). In section C, item 6, the majority of the learners and teachers responded to the statement as to whether classmates provide one another with assistance by indicating respectively with 41.2% and 37.3% that this only happens sometimes and often. Based on the responses for both questionnaire items, it appears that the value of cooperative learning for the development of critical thinking skills is not yet fully acknowledged by the teachers who took part in the research.

Teachers should provide data as input for learners to process and make their own decisions, thus encouraging them to act more autonomously (Schunk, 2004:317) (*cf.* 2.5.1.5). Instead of giving directions, teachers should ask questions that require learners to think. When setting tasks for learners, instead of telling them what to do, ask questions that will force learners to analyse the task (Eggen & Kauchak, 2010:419) (*cf.* 2.5.1.1). Moseley *et al.*

(2005:159) indicated that visualizing ideas from different perspectives is beneficial for the development of critical thinking abilities. The majority of teachers (53.5%) and learners (53.1%) agreed that the teachers present lessons in visual and verbal ways. Questionnaire item 1 in section B requested teachers and learners to indicate whether different teaching methods are utlized in class. The majority of the teachers indicated that they often (40.7%) and almost always (35.7%) use different teaching methods. Although the two sets of responses do not correspond, there is an indication that teachers do try and vary the ways in which lessons are presented.

The responses further revealed that 67.6% of the teachers and 58.8% of the learners agreed that teachers allow learners to construct their own understanding of content. It is clear from these responses that there are still a number of teachers who do not allow learners to construct their own meaning from subject content, which is an important prerequisite for nurturing critical thinking skills (Halx & Reybold, 2005:296) (*cf.* 2.5.1.5).

The majority of the teachers and learners respectively agreed with 56.8% and 54.8% that teachers often use specific vocabulary to teach thinking skills in class. To encourage careful thinking, teachers should get learners to define terms, be specific about actions, make precise comparisons and use accurate descriptors. Learners should be asked to describe what is going on *"inside their heads"* to make them more aware of their thinking processes (Halpern, 2007:10).

The majority of teachers (61.8%) and learners (49.9%) both agreed that learners are allowed and encouraged to make their own choices. This is supported by the responses of teachers and learners related to making decisions. The majority of the teachers and learners agreed with 58.9% and 53.3% respectively that learners are allowed to make their own decisions.

Based on the responses it appears that the teachers who took part in the study are working to make the viewpoint of Collings and Mangieri (1992:175), namely that the process of thinking (decision-making, problem-solving) must

become the vehicle through which teachers teach content, a reality in their classrooms.

Moseley *et al.* (2005:158) assert that the skill of reasoning is a process of ordering and coordinating information that has been discovered through inquiry. It involves finding valid ways of extending and organizing what has been discovered *or* invented while retaining its truth (Lipman, 2003:179). According to Elder (2001:53) and Fisher (2005:68) everyday reasoning is embedded in the ways we understand the world, which include guessing, processing information, using information to come to conclusions and using common sense to create meaning. In support of the literature, both the majority of teachers (53.5%) and learners (52.6%) agreed that the teachers encourage them to describe the process they followed to come to specific answers.

The teachers also agreed (43.2%) that they encourage learners to explain things in their own words, and the majority of the learners supported this by also agreeing (46.7%) that they are allowed to explain things in their own words. These responses are in line with what literature reveals about nurturing critical thinking by not expecting learners to get involved in routine mental work (Pithers & Soden, 2004:239, 242; Barnes, 2005:42-57) (*cf.* 2.5.1.5). However, the low response rate obtained for the *"almost always"* responses suggest that teachers might need to allow learners not to get involved in routine mental work on a more frequent basis.

Teachers need to be guided on how to infuse critical thinking into their daily lessons, be able to model good critical thinking practices and creative activities that foster critical thinking in their learners (Elder & Paul, 2004:36; Potterton, 2008:15) (*cf.* 2.4.3). From the data obtained, most of the teachers (55.2%) agreed and (36.1%) strongly agreed that they teach learners to be creative. From the responses of the learners it appeared that 43.4% strongly agreed and 39.5% agreed that teachers do teach them how to be creative. These responses however do not corroborate the finding that only 28.5% of the teachers and 22.8% of the learners indicated that imagination is almost always challenged during teaching (*cf.* 4.3.2 Section C item 5). The

researcher therefore cannot convincingly conclude that creativity is nurtured in the classrooms of the teachers who took part in the study.

Wilkinson (2004:89-90) *(cf.* 2.5.1.1) mentions useful strategies teachers could use to promote an active learning culture in the classroom that will promote the development of critical thinking. These include cooperative problem-solving and decision-making where learners are exposed to situations where their reasoning ability is ultimately tested and they have to work with others. From the responses it became clear that both the teachers (56.8%) and learners (47.6%) agreed that learners are taught how to work with others.

Jeevanantham (2005:118-120) (*cf.* 2.3) expresses the view that, in learning to think critically, we learn to structure our experiences in ways which are reflective and self-corrective, governed by reasons and criteria, directed towards the making of judgements about the world. He adds *that "critical thinking is normative thinking: a critical thinker is someone who is prepared to make reasoned judgements about the quality of what he has seen, heard or thought about"* (Jeevanantham, 2005:118-129) (*cf.* 2.3). Teachers agreed (56.4%) and strongly agreed (40.7%) that they motivate learners in the class to judge things. This was not in line with the learners' responses that indicated that 38.5% agreed and 38.0% disagreed that teachers motivate them to judge things.

Teachers increasingly need to strive to nurture the development of meta-cognitive skills during teaching and learning (Ferrando, 2001; Alazzi, 2008:243) (*cf.* 2.5.1.4). They need to expand their repertoire of instructional skills and strategies to develop a wide range of reasoning, creative and cooperative abilities in learners (Burden & Boyd, 2003:139; Walker & Diaz, 2003:64) (*cf.* 2.5.1.1). The majority of teachers (59.8%) and learners (48.6%) agreed that the learners are challenged in the classroom to come up with original ideas. This response links well with the responses to questionnaire item 19 that determined whether learners are taught to be creative. Creativity implies the use of original ideas and is an important dimension of critical thinking (*cf.* 2.2). According to the responses of the teachers, the majority indicated that they agreed (55.2%) that they should teach learners how to be

creative. The learners strongly agreed (43.4%) that teachers teach them to be creative.

According to (Bassham *et al.*, 2005:8) (*cf.* 2.3.1), critical thinking skills include: understanding the arguments and the beliefs of others, critically evaluating those arguments and beliefs and developing and defending one's own well-supported arguments, viewpoints, opinions and beliefs. Both the teachers (58.5%) and the learners (59.3%) agreed that teachers expect from them to formulate their own point of view. These responses are not in line with the responses obtained for questionnaire item B 2, where teachers and learners had to indicate if learners can voice their own opinions. The teachers' responses to this item indicated that they almost always (43.6%) allow learners to voice their own opinions. In contrast to the teachers' responses, an equal small percentage of learners (34.0%) felt that their teachers almost always and sometimes allow them to voice their viewpoints and opinions. It appears that the learners who took part in the study are not fully challenged to voice their own opinions in the classroom.

Elder and Paul (2001:42-44) (*cf.* 2.5.1.3) argue that thinking is not driven by answers but by questions. Had no questions been asked by those who laid the foundation for a field, for example, physics or biology, the field would never have been developed in the first place. To think through or rethink anything, one must ask questions that stimulate thought. Questions define tasks, express problems and delineate issues. To develop as thinkers, learners need to become adept at questioning, and they need to actively formulate questions as they study. This argument is supported by the responses of teachers and learners. The majority of the learners and teachers agreed with 53.3% and 61.4% respectively that teachers expect from learners to formulate questions. Based on the responses in this section the researcher concludes that the teacher and learner responses corroborated regarding the motivating of learners to think for themselves, learner involvement in logical reasoning as well as learner responsibility for making own choices and decisions. With regard to learners being involved in making

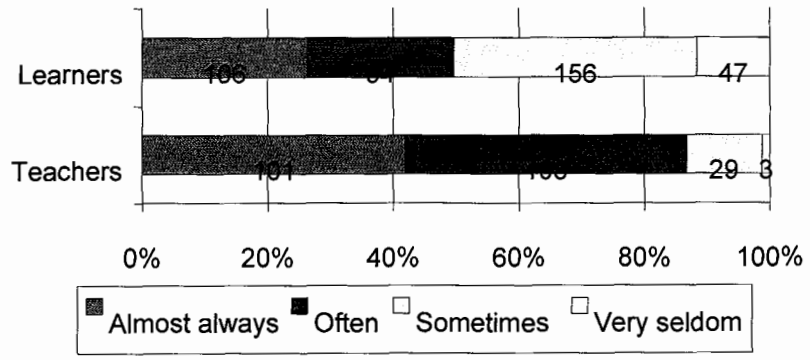
judgements and voicing their own opinions, learners and teachers had different viewpoints.

4.4.5 Teacher and learner responses: Section F

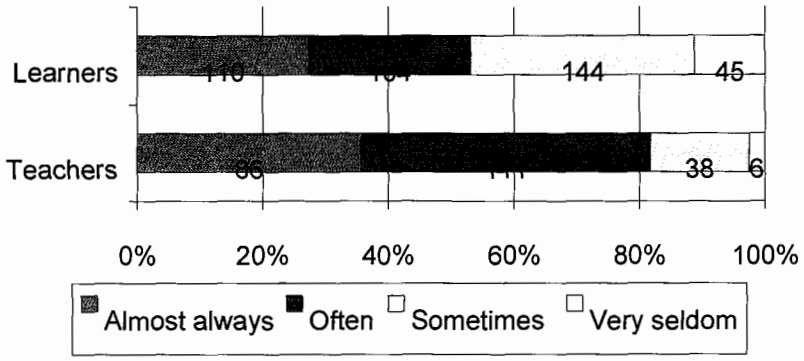
The purpose of this section was to evaluate the role of the learner in the classroom in order to determine to what extent the role that learners play in the class nurtures the development of critical thinking. Table 4.18 classifies the responses obtained for learners and teachers.

Table 4.18: Teacher and learner responses: Role of the learner

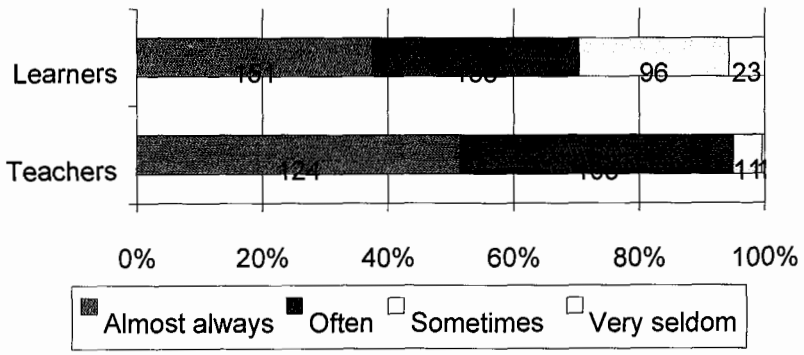
Question		Almost always	Often	Some-times	Very seldom
1. Learners can express their feelings in class.	Teachers	101 41.9%	108 44.8%	29 12.0%	3 1.2%
	Learners	106 26.3%	94 23.3%	156 38.7%	47 11.7%



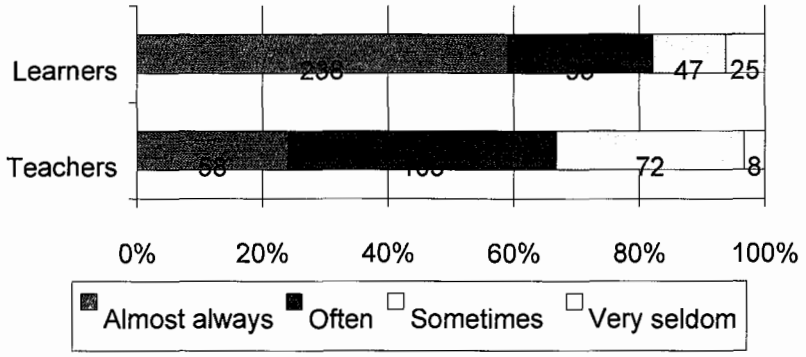
2. Learners can say what they think in class.	Teachers	86 35.7%	111 46.1%	38 15.8%	6 2.5%
	Learners	110 27.3%	104 25.8%	144 35.7%	45 11.2%



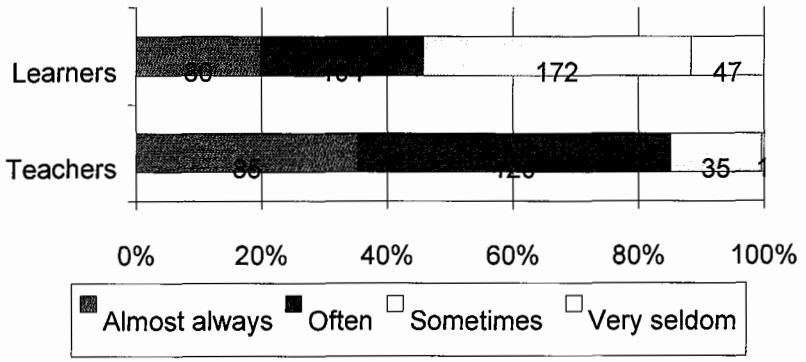
3. Learners can develop their full potential in class.	Teachers	124 51.5%	105 43.6%	11 4.6%	1 0.4%
	Learners	151 37.5%	133 33.0%	96 23.8%	23 5.7%



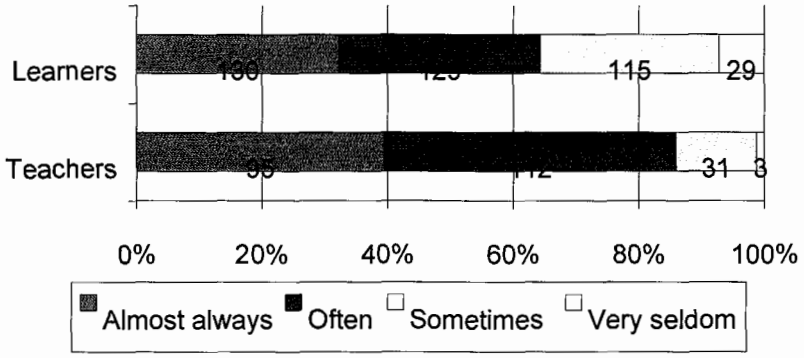
4. Learners are capable of thinking for themselves.	Teachers	58 24.1%	103 42.7%	72 29.9%	8 3.3%
	Learners	238 59.1%	93 23.1%	47 11.7%	25 6.2%



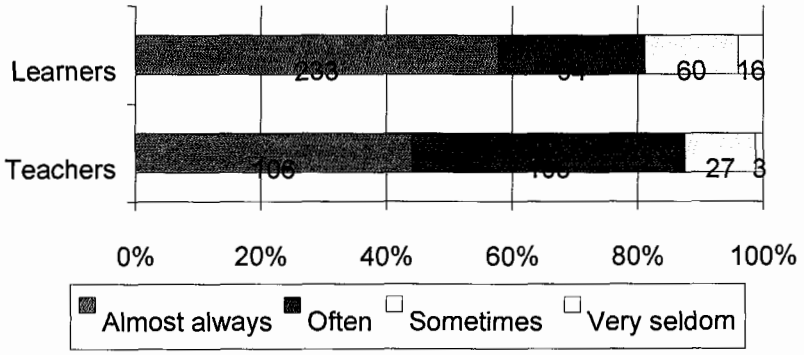
5. In class learners question what the teacher says.	Teachers	85 35.3%	120 49.8%	35 14.5%	1 0.4%
	Learners	80 19.9%	104 25.8%	172 42.7%	47 11.7%



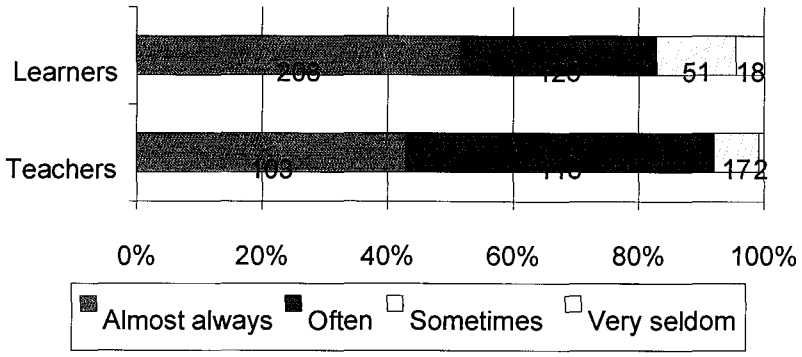
6. Learners take part actively in class discussions.	Teachers	95 39.4%	112 46.5%	31 12.9%	3 1.2%
	Learners	130 32.3%	129 32.0%	115 28.5%	29 7.2%



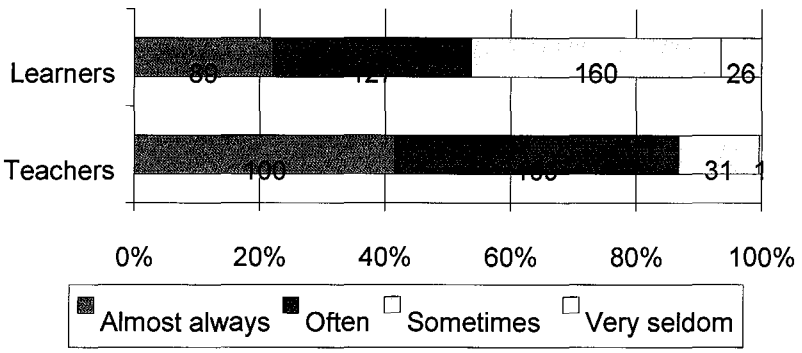
7. Learners feel responsible for their own learning in the class.	Teachers	106 44.0%	105 43.6%	27 11.2%	3 1.2%
	Learners	233 57.8%	94 23.3%	60 14.9%	16 4.0%



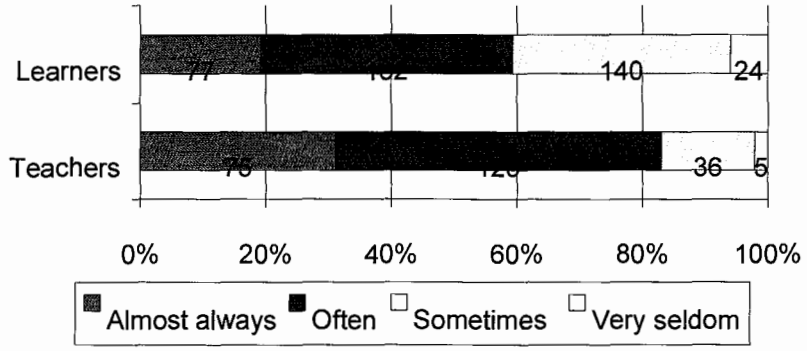
8. Learners play an active role in their own learning. Missing: Teachers 1 (0,4%)	Teachers	103 42.7%	118 49.0%	17 7.1%	2 0.8%
	Learners	208 51.6%	126 31.3%	51 12.7%	18 4.5%



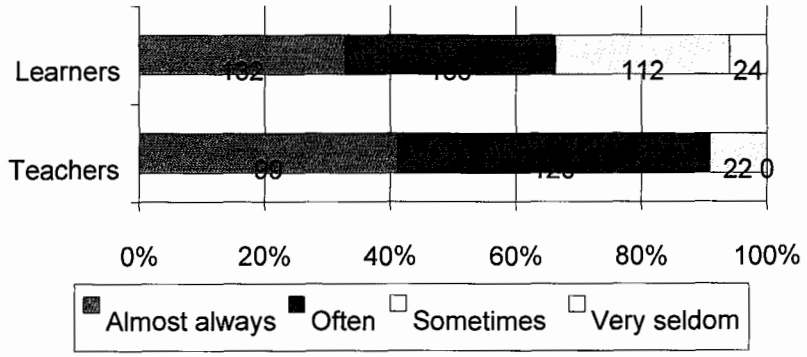
9. In class, learners solve problems on their own. Missing: Learners 1 (0,2%)	Teachers	100 41.5%	109 45.2%	31 12.9%	1 0.4%
	Learners	89 22.1%	127 31.5%	160 39.7%	26 6.5%



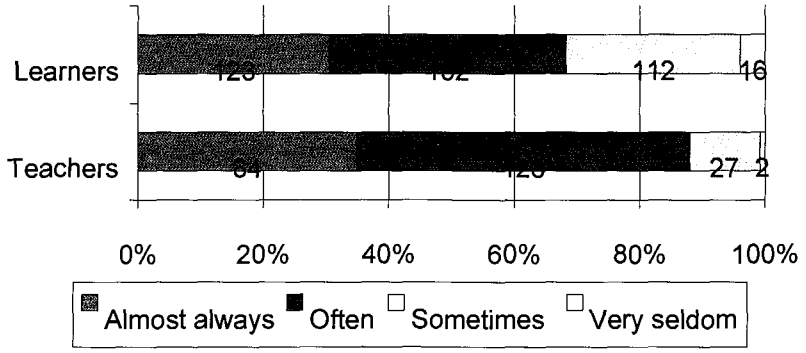
10. In class, learners think critically about the content.	Teachers	75 31.1%	125 51.9%	36 14.9%	5 2.1%
	Learners	77 19.1%	162 40.2%	140 34.7%	24 6.0%



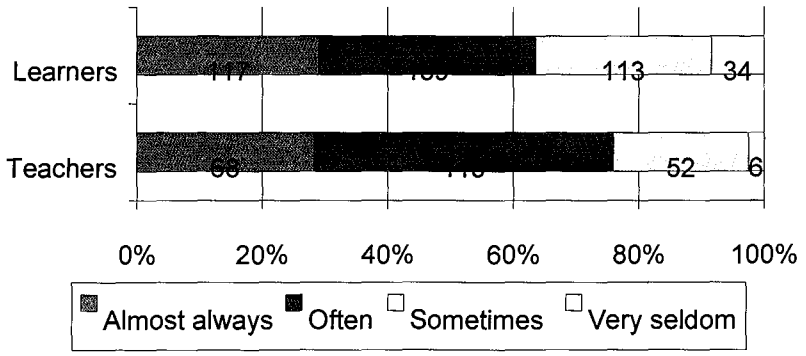
11. Learners are allowed to consider others' point of view in class.	Teachers	99 41.1%	120 49.8%	22 9.1%	0
	Learners	132 32.8%	135 33.5%	112 27.8%	24 6.0%



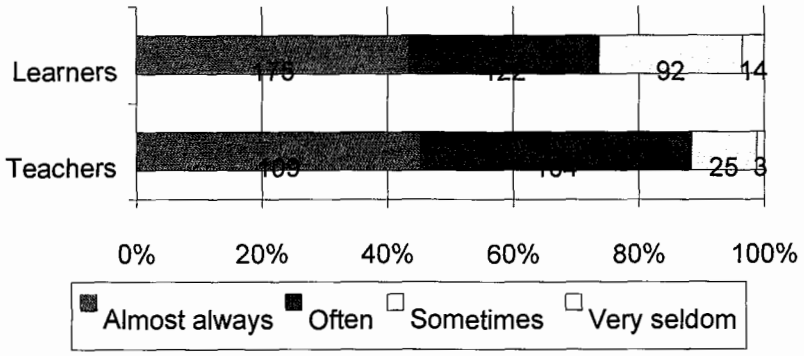
12. Learners are allowed to explore alternative answers for questions.	Teachers	84 34.9%	128 53.1%	27 11.2%	2 0.8%
	Learners	123 30.5%	152 37.7%	112 27.8%	16 4.0%



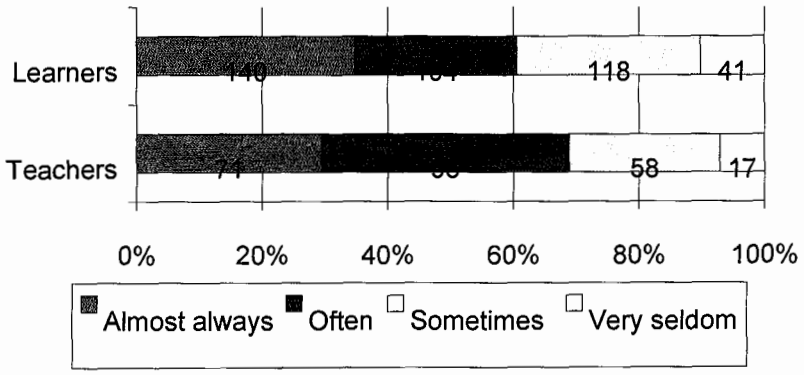
13. Learners are allowed to generate their own questions in class.	Teachers	68 28.2%	115 47.7%	52 21.6%	6 2.5%
	Learners	117 29.0%	139 34.5%	113 28.0%	34 8.4%



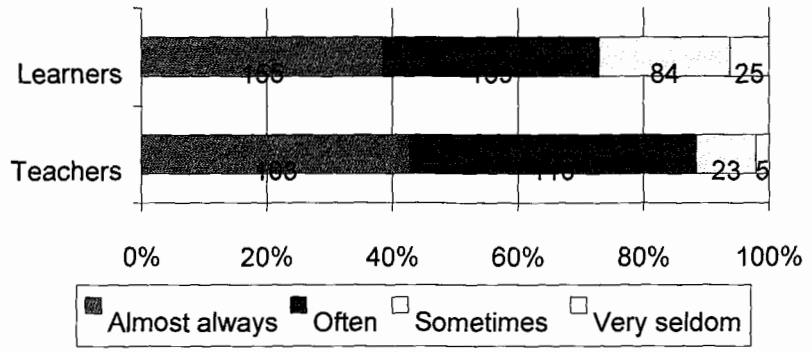
14. Learners think about the consequences of their actions.	Teachers	109 45.2%	104 43.2%	25 10.4%	3 1.2%
	Learners	175 43.4%	122 30.3%	92 22.8%	14 3.5%



15. Learners make their own summaries of the work.	Teachers	71 29.5%	95 39.4%	58 24.1%	17 7.1%
	Learners	140 34.7%	104 25.8%	118 29.3%	41 10.2%



16. Learners provide explanations (reasons) for their actions.	Teachers	103 42.7%	110 45.6%	23 9.5%	5 2.1%
	Learners	155 38.5%	139 34.5%	84 20.8%	25 6.2%



According to the teachers' responses, learners can often (44.8%) and almost always (41.9%) express their feelings in class and can often (46.1%) say what they think. However, the majority of the learners feel that they are not always allowed to express their feelings (26.3%) and can only sometimes (38.7%) say what they think in class. The researcher argues that this is not a very favourable situation for the development of critical thinking. In order to nurture critical thinking in the classroom, beyond offering answers, learners must also be able to produce explanations and reasons to support their answers (Pithers & Soden, 2000:239; Schunk, 2004:237; Barnes, 2005:42-43) (*cf.* 2.5.1.5). They should also be involved in problem-solving, strategic reasoning, decision-making, setting goals, establishing plans and setting priorities (Pithers & Soden, 2000:239; Schunk, 2004:240; Barnes, 2005:44-45) (*cf.* 2.5.1.5). Teachers should interact with learners by seeking their questions and points of view (Schunk, 2004:317) (*cf.* 2.5.1.5). If learners can express their feelings more and say what they think, they will go beyond offering answers and also produce explanations and reasons to support their conclusions, as mentioned from the literature above.

Learner and teacher responses differed regarding the extent to which learners can develop their full potential in class. The majority of teachers indicated with 51.5% that they almost always focus on the development of learners'

potential. The learners had different opinions and indicated that this almost always (37.5%) and often (33.0%) happens.

From the data it seems that 42.7% of the teachers think that learners are often capable to think for themselves, where the majority of learners (59.1%) indicated their capability to think for themselves as almost always. The learners' responses are encouraging, as independent learning is regarded as important for the nurturing of critical thinking skills (Burden & Boyd, 2003:139; Walker & Diaz, 2003:64) (*cf.* 2.5.1.1). Teachers however only indicated with 24.1% that learners are always capable to think for themselves.

Learners who experience active learning will be allowed to generate questions, consider and carefully evaluate the arguments of both the teacher and their peers and, eventually, the arguments of their own construction (Burden & Boyd, 2003:139) (*cf.* 2.5.1.1). From the data in Table 4.18, it appears that the teachers often (49.8%) give the learners the chance to question what the teacher says. The learners' responses indicate a different opinion. The learners indicate that they are not always (19.9%) or sometimes (42.7%) allowed to question what the teacher says. The responses to this item corresponds with the responses obtained for questionnaire item C 7, where only 45.9% of the learner responses indicated that they are almost always allowed to question what the teacher says. According to the researcher, these responses do not convincingly indicate that critical thinking skills are developed through the use of questions that are posed by the learners.

Classroom activities and discussions are a means of practising and improving critical thinking skills. Learners should be encouraged to use them, not only to learn classroom material, but also to practise and improve their thinking processes by working with other learners (Walker & Diaz, 2003:64) (*cf.* 2.5.1.1). It appears from the data that learners almost always (32.3%) and often (32.0%) take an active part in class discussions. In this regard only 46.5% of the teachers indicated that this happens often. In the context of nurturing critical thinking, the researcher expected that more teachers would allow active participation in discussion on a more frequent basis. The responses obtained might be an indication that classroom climates created by

the teachers who took part in the study, do not fully create an atmosphere where learners willingly engage in critical discussion (Cook, 2008:144) (*cf.* 2.3.3).

Walker and Diaz (2003:64) (*cf.* 2.5.1.5) indicate that learners need to become better monitors of their own learning; becoming more responsible for their own learning. Table 4.18 indicates that teachers believe that learners are almost always (44.0%) and often (43.6%) responsible for their own learning in the class. What is encouraging is that the majority of the learners shared this view and 57.8% indicated that they feel that they are responsible for their own learning in the classroom.

According to Elder and Paul (2001:42-44) *(cf.* 2.5.1.3), encouraging the asking and answering of critical questions is just one aspect of a larger body of educational practices called active learning that can, under certain circumstances, identify a classroom as one where critical thinking is being encouraged (Billington, 2010; Race, 2010) (*cf.* 2.5.1.1). It is encouraging from the learners' responses in Table 4.18, that the majority felt that they almost always (51.6%) feel that they play an active role in their own learning. The teachers supported this with 42.7% and 49.0% respectively, indicating that learners almost always and often play an active role in their own learning.

In order to develop critical thinking skills, learners should be expected to analyse issues and problems methodically, weigh options and look at assumptions and interferences made when forming a decision. The responses obtained from the teachers indicate that learners almost always (41.5%) and often (45.2%) solve problems on their own. The learners had a different opinion, the majority of learners indicated that they are only sometimes (39.7%) and almost always (22.1%) involved in solving their own problems.

Elder and Paul (2001:42-44) *(cf.* 2.5.1.5) also emphasize the fact that if critical thinking is valued by teachers they should imagine the classroom content as a form of thinking. Telling learners that they are expected to practise critical thinking skills during class and out of class helps prepare them for future challenges, as well as communicating expectations of the teacher. From the

data, 51.9% of the teachers indicated that learners are often expected to think critically about the content. The learners indicated with 40.2% that they are often involved in thinking critically about content.

With regard to opportunities provided to learners for considering others' point of view, teachers indicated with 49.8% that this happens often and always (41.1%). Learners however only indicated with 32.8% that this occurs almost always and often (33.5%). Moseley *et al.* (2005:159) (*cf.* 2.2.2.2) highlights the importance of considering the viewpoints of others as an important skill for executing critical thinking. The responses reveal that more opportunities should be created for learners to practise the skill of evaluating the appropriateness of different viewpoints related to an issue.

The majority of teachers indicated that they often create opportunities for learners to explore alternative answers to questions (53.1%), whereas the majority of the learners only indicated that they are often (37.7%) and almost always (30.5%) allowed to explore alternative answers to questions. The responses of the learners and teachers also support their responses to questionnaire item D 1, where only 29.3% of the learners indicated that they are almost always allowed to provide more than one correct answer to a question and the teachers indicated with 49.4% that they often allow this.

Teacher responses indicated that the majority (47.7%) of teachers often allow learners to generate own questions. A lower response rate was obtained for the learners who indicated that they are only often (34.5%) allowed to generate their own questions. These responses corresponds with he responses to questionnaire items C7 and F5 where it also appeared that teachers were more of the opinion than the learners that learners are allowed to question what the teacher says.

Thinking about the consequences of one's actions is an important meta-cognitive skill that a critical thinker needs to acquire (Facione, 2009:5-7) (*cf.* 2.3). According to the responses obtained, the researcher is of the opinion that teachers need to put in more effort to nurture meta-cognitive skills, as only 45.2% of the teachers and 43.4% of the learners indicated that learners

are almost always involved in thinking about the consequences of their actions.

The development of critical thinking abilities will become evident as learners deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions (Walker & Diaz, 2003:64) (*cf.* 2.5.1.5). This indicates *inter alia* active and independent involvement of learners during teaching and learning by saying what they think in class, thinking for themselves, exploring alternative answers, making their own summaries and providing explanations for their actions (Burden & Boyd, 2003:139; Eggen & Kauchak, 2010:419) (*cf.* 2.5.1.1).

In all of the mentioned aspects, the majority of teachers indicated that they often create opportunities for learners to make their own summaries (39.4%) and to provide explanations for their actions (45.6%). The majority of learners, on the other hand, indicated that they are almost always allowed to make their own summaries (34.7%) and almost always allowed to explain their actions (38.5%). Although it appears that teachers are, to a certain extent, creating opportunities for independent learning, the low response rates for the *"almost always"* option indicate that more purposeful opportunities should be created for learners so that independent learning can take place on a more frequent basis.

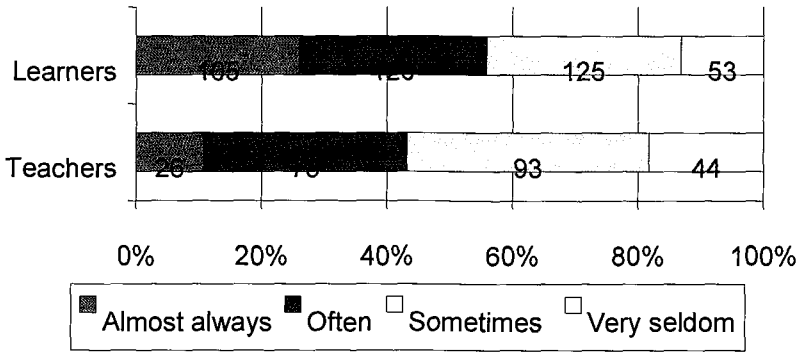
To the researcher it appears that only with regard to two aspects, namely learners taking responsibility for their own learning, and opportunities for learners to think about the consequences of their actions, teachers and learners were in accord.

4.4.6 Teacher and learner responses: Section G

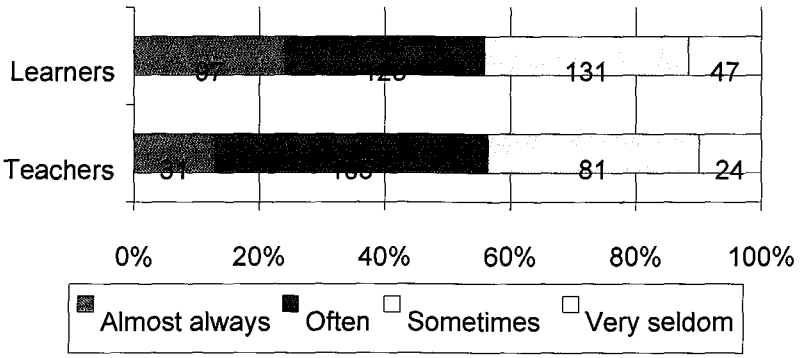
The purpose of this section was to evaluate the practical application of a few teaching methods and strategies in the classroom in order to determine to what extent the methods the teacher uses in class nurture the development of critical thinking. Table 4.19 classifies the responses obtained for learners and teachers.

Table 4.19: Teacher and learner responses: Teaching methods and strategies: practical application

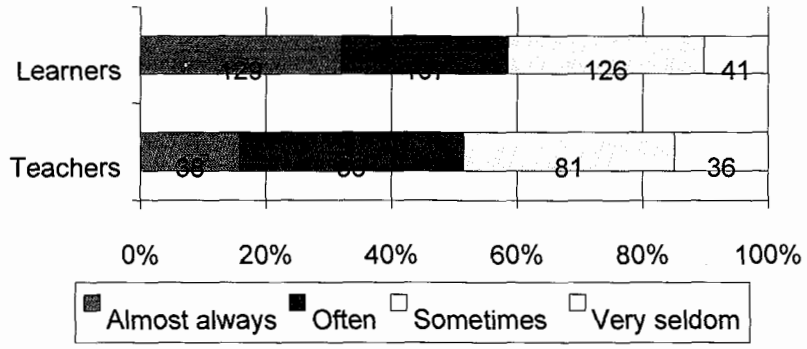
Question		Almost always	Often	Some-times	Very seldom
1. Small group activities	Teachers	26 10.8%	78 32.4%	93 38.6%	44 18.3%
	Learners	105 26.1%	120 29.8%	125 31.0%	53 13.2%



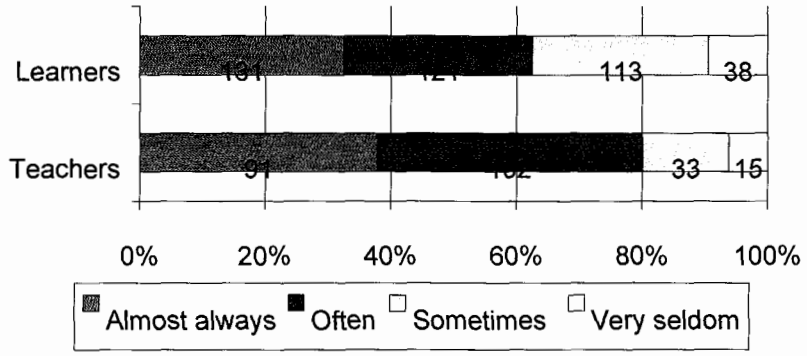
2. Peer collaboration (working with fellow learners)	Teachers	31 12.9%	105 43.6%	81 33.6%	24 10.0%
	Learners	97 24.1%	128 31.8%	131 32.5%	47 11.7%



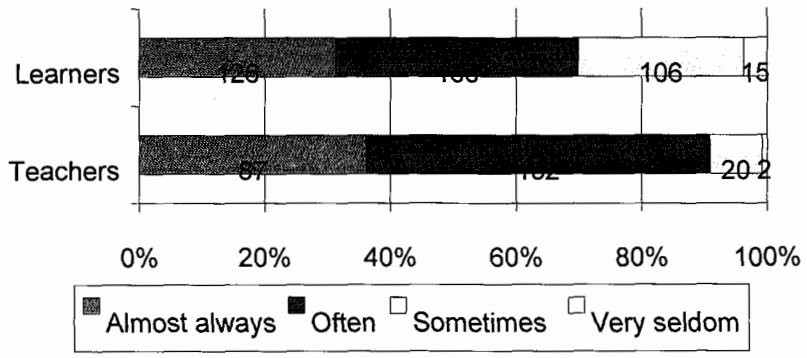
3. Co-operative learning (working in groups to achieve a goal)	Teachers	38 15.8%	86 35.7%	81 33.6%	36 14.9%
	Learners	129 32.0%	107 26.6%	126 31.3%	41 10.2%



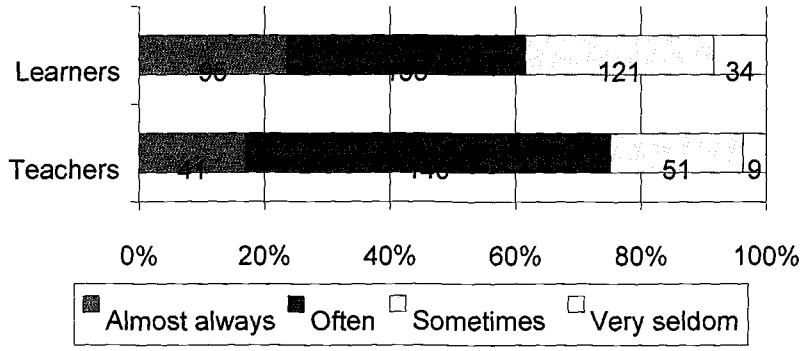
4. Direct teaching (lecturing)	Teachers	91 37.8%	102 42.3%	33 13.7%	15 6.2%
	Learners	131 32.5%	121 30.0%	113 28.0%	38 9.4%



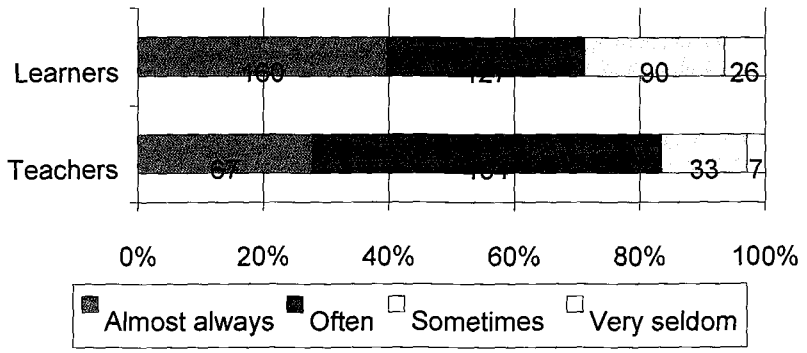
5. Problem-solving Missing: Learners 1 (0,2%)	Teachers	87 36.1%	132 54.8%	20 8.3%	2 0.8%
	Learners	126 31.3%	155 38.5%	106 26.3%	15 3.7%



6. Discovery learning	Teachers	41 17.0%	140 58.1%	51 21.2%	9 3.7%
	Learners	95 23.6%	153 38.0%	121 30.0%	34 8.4%



7. Discussion	Teachers	67 27.8%	134 55.6%	33 13.7%	7 2.9%
	Learners	160 39.7%	127 31.5%	90 22.3%	26 6.5%



Schunk (2004:321) (*cf.* 2.5.1) asserts that the teacher should not always be the centre of instruction if critical thinking skills need to be developed. Environments should rather be designed so that learners have an active role in learning. Another important aspect is the use of diverse teaching strategies, such as case studies, role plays, projects, field trips, debates and cooperative learning (Walker & Diaz, 2003:64; Wilkinson, 2004:80-90; Kramer, 2006:102) (*cf.* 2.5.1.2). Table 4.19 indicates that the learners appear to feel that teachers do not always acknowledge the application of multiple

teaching methods, like small group activities (26.1%) and peer collaboration (24,1%) in the classroom. The majority of the teachers' responses indicated that they do sometimes (38.6%) make use of methods such as small group activities and often (43.6%) let the learners work with fellow learners in class. According to these responses, it appears as if the nurturing of critical thinking skills is not adequately addressed in the classroom climate that teachers try to create. The learner responses also indicate that small group activities and peer collaboration are not used frequently as the majority of the learners (31.0%) indicated that small group activities and peer collaboration (32.5%) are seldom utilized. Classroom activities and discussions that involve collaboration between peers provide opportunities for improving critical thinking skills (Walker & Diaz, 2003: 64) *(cf.* 2.5.1.1).

Getting learners to think, solve problems and discover things for themselves are not new goals for education. Similarly, teaching strategies labelled discovery method, inquiry training or inductive teaching have long and prestigious heritages. Bruner (1966) (*cf.* 2.5.1.1) emphasized the importance of discovery learning and how teachers could help learners become constructors or builders of their own knowledge. The majority of the teachers indicated that they often (58.1%) use discovery learning as a teaching method in the classroom. From the learners' responses it seems that learners are of the opinion that they are only often (38.0%) exposed to this method. Both teacher and learner responses indicated that discovery learning is not always used in the classroom. According to the majority of the learners, direct teaching is used almost always (32.5%) and often (30.0%) in the classrooms. The teachers supported this view; 37.8% indicated that they almost always and often (42.3%) use direct teaching in their classrooms. It appears as if there is still a strong focus on teaching with the direct method which holds very little benefits for the development of critical thinking (McGonigal, 2005; Pratt, 2005; Gunter *et al.,* 2010:70-71) (*cf.* 2.5.1.2).

It is encouraging to see from the learners' responses, that the majority of learners are almost always (39.7%) and often (31.5%) exposed to discussions

in the classroom. Teachers' responses indicate that they often (55.6%) make use of discussions during teaching.

Wilkinson (2004:89-90) *(cf.* 2.5.1.2) mentions useful strategies teachers could use to promote an active learning culture in the classroom that will promote the development of critical thinking. These include cooperative problem-solving and decision-making where learners are exposed to situations in which their reasoning ability is ultimately tested. From the data in Table 4.19, it seems that many teachers often use problem-solving methods in the class (54.8%), but do not always use co-operative learning (15.8%). Only 35.7% of the teachers indicated that they often and sometimes (33.6%) use cooperative learning. From the learners' responses to these methods, they appear to have different experiences in the classrooms. Some learners indicated that teachers use co-operative learning almost always (32.0%), others often (26.6%) and some learners felt they are sometimes (31.3%) exposed to this method. In general it appears that teachers might not be aware of the cognitive advantages that cooperative learning holds for nurturing the critical thinking skills of learners (Eggen & Kauchak, 2010:419) (*cf.* 2.5.1.2). The learner responses to their involvement in problem-solving indicated low responses linked to them only being often (38.5%) and almost always (31.3%) involved in problem-solving activities.

Based on the above-mentioned results, the researcher is of the opinion that teachers need to be made more aware of what the development of critical thinking skills entail and how they could be nurtured. Teachers need to be fully convinced that critical thinking involves a transformative learning approach where learners take ownership of their learning through the use of small groups, peer collaboration and discovery learning (Vakalisa, 2007:3; McGonigal, 2005; Pratt, 2005; Burden & Boyd, 2003:139) (*cf.* 2.4.4; 2.5.1.2).

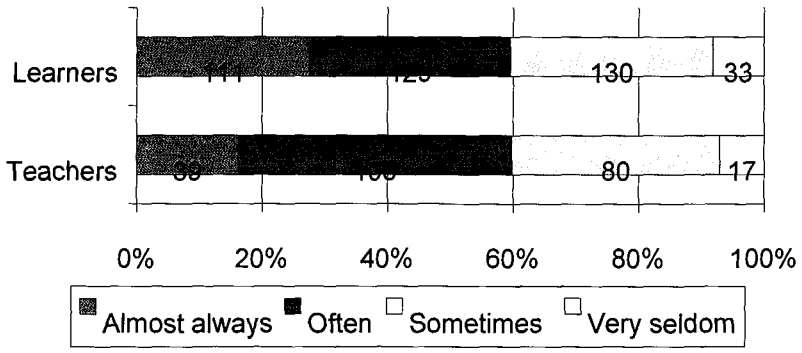
4.4.7 Teacher and learner responses: Section H

The purpose of this section was to evaluate the practical application of learning activities in the classroom in order to determine to what extent the

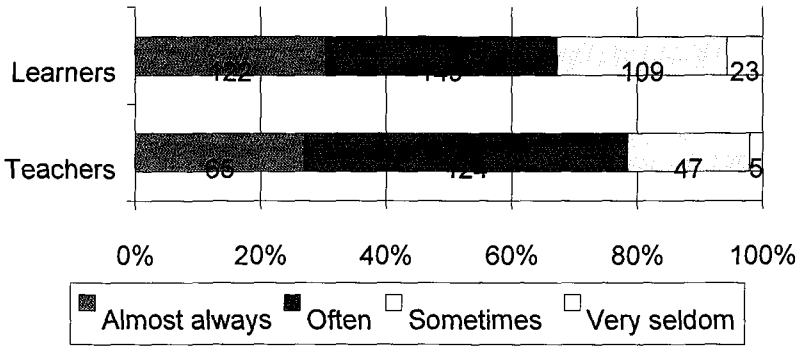
activities nurture the development of critical thinking. Table 4.20 classifies the responses obtained for learners and teachers.

Table 4.20: Teacher and learner responses: Learning activities: practical application

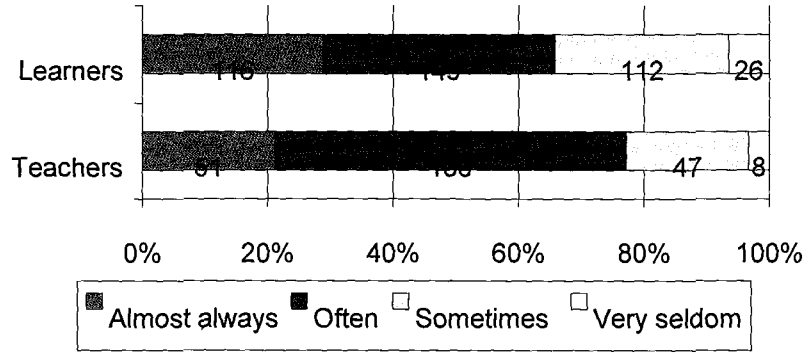
Question		Almost always	Often	Some-times	Very seldom
1. Formulate my own questions	Teachers	39 16.2%	105 43.6%	80 33.2%	17 7.1%
	Learners	111 27.5%	129 32.0%	130 32.3%	33 8.2%



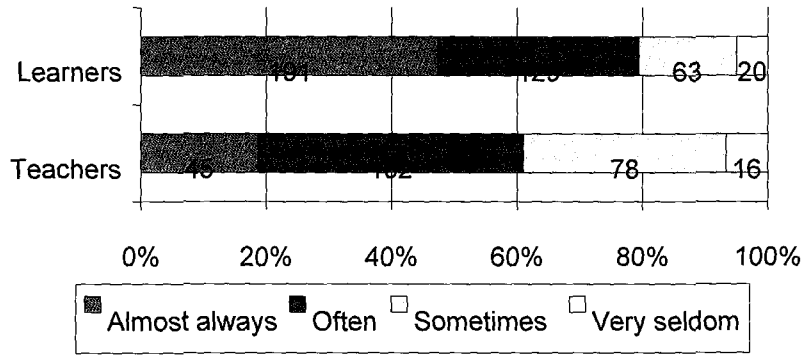
2. Explore the consequences of my actions	Teachers	65 27.0%	124 51.5%	47 19.5%	5 2.1%
	Learners	122 30.3%	149 37.0%	109 27.0%	23 5.7%



3. Explore various alternatives before making a decision	Teachers	51 21.2%	135 56.0%	47 19.5%	8 3.3%
	Learners	116 28.8%	149 37.0%	112 27.8%	26 6.5%



4. Research tasks	Teachers	45 18.7%	102 42.3%	78 32.4%	16 6.6%
	Learners	191 47.4%	129 32.0%	63 15.6%	20 5.0%



To develop as thinkers, learners need to become adept at questioning. They need to formulate questions actively as they study (Elder & Paul, 2001:42) (*cf.* 2.5.1.3). According to Table 4.20, not many of the teachers who participated in the study almost always (16.2%) allow their learners to formulate their own questions. The majority of the learners indicated that they are often (32.0%) and sometimes (32.3%) allowed to formulate own questions. Socratic-questions encourage critical thinking when learners look deeply into assumptions, points of views, perspectives and evidence to analyse

assumptions and examine reasons, concepts and consequences (Wilson, 2002) *(cf.* 2.5.1.3). The responses to this questionnaire item do not support the responses to item E 24 which indicated that the majority of the learners and teachers agreed with 53.3% and 61.4% respectively that teachers expect from learners to formulate questions.

According to Burden and Boyd (2003:139), Walker and Diaz (2003:64) and Eggen and Kauchak (2010:419) *(cf.* 2.5.1.1), the development of critical thinking abilities will become evident as learners actively deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions. As indicated in Table 4.20, it is clear that teachers often (56.0%) allow learners to explore various alternatives before they make a decision. The learners' responses indicated that learners are often (37.0%) and almost always (28.8%) given a chance to explore various alternatives before making a decision. The majority of the teachers (51.5%) indicated that opportunities to explore the consequences of actions are often provided. Based on the discrepancy between the teacher and learner responses, the researcher cannot conclude with certainty that the learners who took part in the research are provided with sufficient opportunities to explore the consequences of their actions and alternatives before making a decision.

Learners will engage in learning activities that challenge the intellect and imagination. Such activities require the acquisition, comprehension and application of new knowledge and activate the need for perseverance, research and increasingly complex forms of problem-solving (Pithers & Soden, 2000:239; Barnes, 2005:45; Halx & Reybold, 2005:296; Philpott, 2009:38) *(cf.* 2.5.1.2; 2.5.1.5). Research tasks are often (42.3%) given by the teachers as a learning activity for the learners. The majority of learners (47.4%) indicated that they are almost always exposed to research tasks in the various classrooms. To the researcher it appears that the use of research tasks which require independent thinking and is a prerequisite for the

development of critical thinking skills, is underutilized in the classrooms that took part in the research.

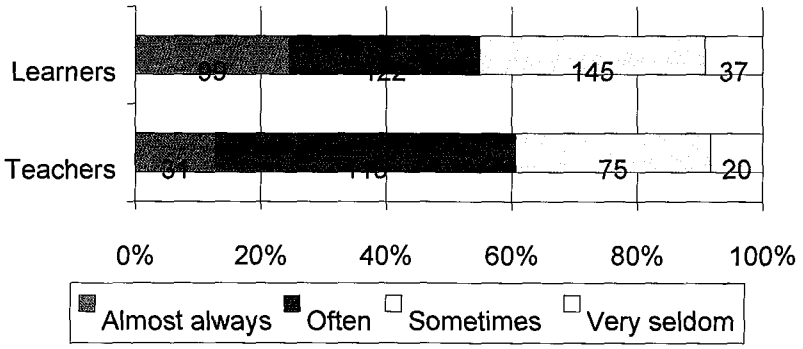
According to Burden and Boyd (2003:139), Walker and Diaz (2003:64) and Eggen and Kauchak (2010:419) (*cf.* 2.5.1.1), the development of critical thinking abilities will become evident as learners actively deliberate and persevere in their problem-solving, work to make their oral and written products more precise and accurate, consider others' point of view, generate questions and explore the alternatives and consequences of their actions. Bearing in mind that critical thinking is a difficult skill to teach and to learn and require a lot of practise (Van Gelder, 2005:41-46) (*cf.* 2.3), the researcher argues that the opportunities for the nurturing of critical thinking in the classrooms that formed part of the research are not provided on a frequent basis so that learners can practise the application of these skills.

4.4.8 Teacher and learner responses: Section I

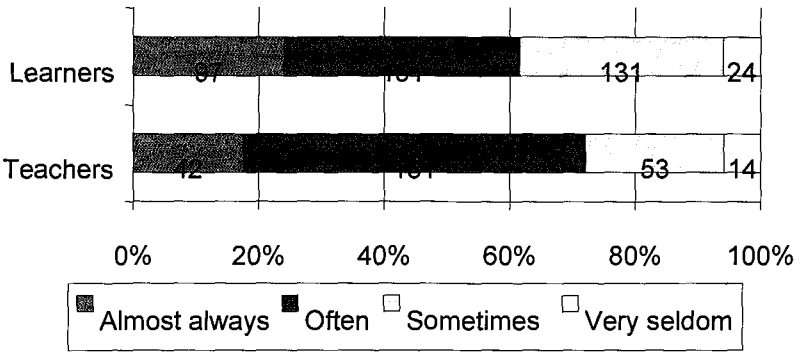
The purpose of this section was to evaluate the practical application of types of questions in the classroom in order to determine to what extent these different questions nurture the development of critical thinking. Table 4.21 classifies the responses obtained from learners and teachers.

Table 4.21: Teacher and learner responses: Questions

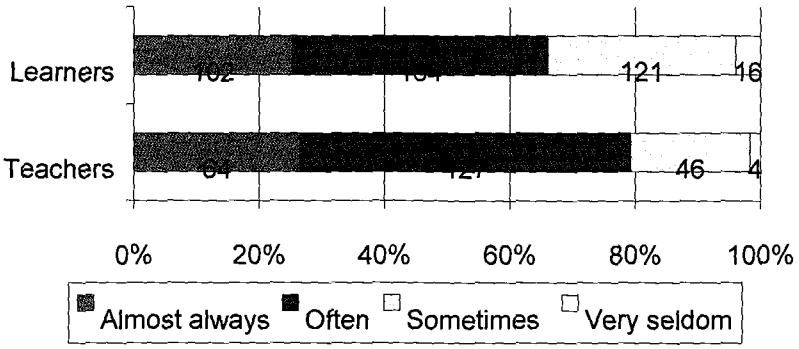
Question		Almost always	Often	Some-times	Very seldom
1. Convergent questions (only one correct answer to a question)	Teachers	31 12.9%	115 47.7%	75 31.1%	20 8.3%
	Learners	99 24.6%	122 30.3%	145 36.0%	37 9.2%



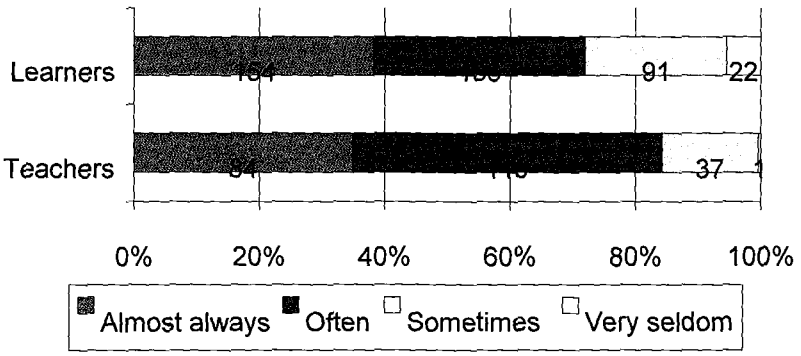
2. Divergent questions (various responses to one question) Missing: Teachers 1 (0,4%)	Teachers	42 17.4%	131 54.4%	53 22.0%	14 5.8%
	Learners	97 24.1%	151 37.5%	131 32.5%	24 6.0%



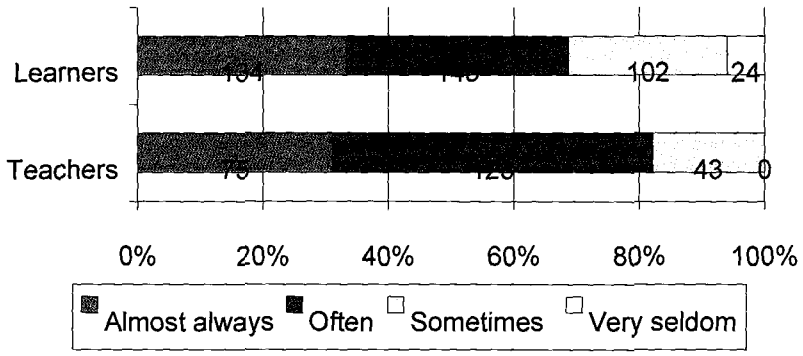
3. Questions to make comparisons	Teachers	64 26.6%	127 52.7%	46 19.1%	4 1.7%
	Learners	102 25.3%	164 40.7%	121 30.0%	16 4.0%



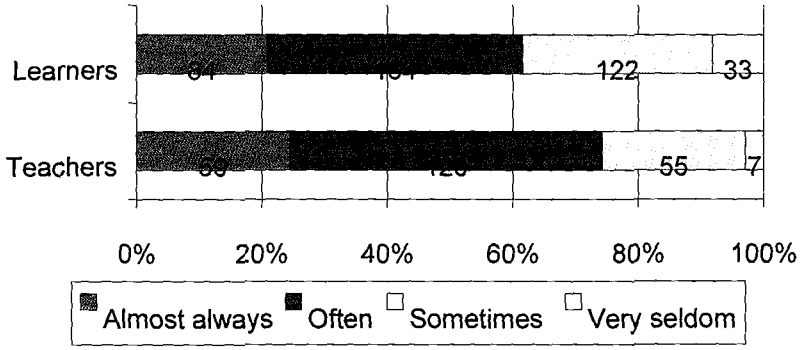
4. To analyse information	Teachers	84 34.9%	119 49.4%	37 15.4%	1 0.4%
	Learners	154 38.2%	136 33.7%	91 22.6%	22 5.5%



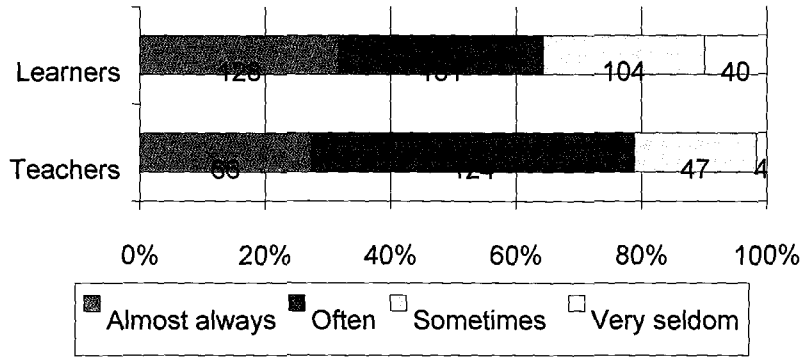
5. To evaluate information	Teachers	75 31.1%	123 51.0%	43 17.8%	0
	Learners	134 33.3%	143 35.5%	102 25.3%	24 6.0%



6. To synthesize information	Teachers	59 24.5%	120 49.8%	55 22.8%	7 2.9%
	Learners	84 20.8%	164 40.7%	122 30.3%	33 8.2%



7. To provide to the point (exact, precise) information	Teachers	66 27.4%	124 51.5%	47 19.5%	4 1.7%
	Learners	128 31.8%	131 32.5%	104 25.8%	40 9.9%



The use of higher-level divergent questions promotes critical thinking, formation of concepts and abstractions, and encourages making comparisons and analysis-synthesis evaluations (Elder & Paul, 2001:42-44; Borich, 2004:261-262) (*cf.* 2.5.1.3). According to the responses, 54.4% of the teachers indicated that they often and always (17.4%) make use of divergent questions. The learners indicated in this regard that they are often (37.5%) and almost always (24.1%) exposed to divergent questions. These responses were compared to questionnaire item F 12 where teachers and learners responded to whether learners are allowed to explore alternative answers for questions. In support of the responses received for item I 2, the majority of the teachers and learners indicated with 53.1% and 37.7% respectively that learners are often allowed to explore alternative answers for questions.

Although both the teacher and learner responses indicated that divergent questions are used to some extent, there is room for improving on the use of divergent questions during instruction. The researcher is of the opinion that based on these results; learners are not exposed enough to divergent questions, which are vital for the development of critical thinking skills. The responses to this question also link up with the responses indicated for item 1 and 7 that point to the provision of exact and precise information. Teachers indicated with 51.5% that they often and almost always (27.4%) ask learners

to provide precise information. In this regard, learners indicated that they are often (32.5%) and almost always (31.8%) requested to provide precise information. The responses to item 1 revealed that teachers use divergent question often (47.7%). The learners indicated with 30.3% that divergent questions are often used during teaching. The researcher argues that although both types of questions should be utilized in classrooms, stronger focus should be placed on the use of divergent questions to nurture the development of critical thinking skills.

According to Cotton (2001) and Wilson (2002) (*cf.* 2.5.1.3) evaluative questioning strategies focus on comparative analysis from different perspectives before learners can synthesize information and reach conclusions. Evaluative questions promote critical thinking in discussions by providing reflective opportunities. Learners evaluate issues by assessing, appraising and defending information according to a set of criteria and justification of their beliefs. Teacher and learner responses revealed that learners are often involved in making comparisons respectively with 52.7% and 40.7%.

Having learners analyse the logic of language can foster more effective thinking. Learners experiencing active learning consider and carefully evaluate the arguments of both the teachers and the peers and eventually the arguments of their own construction (Pithers & Soden, 2004:239) (*cf.* 2.5.1.5). The majority of the learners indicated that they are almost always (33.3%) and often (35.5%) instructed to evaluate information given by the teachers and almost always (38.2%) involved in analysing information. The majority of the teachers were of the opinion that learners are often involved in analysing information (49.4%) and often involved in the evaluation of information (51.0%).

The responses to the aforementioned questionnaire items, correspond well with the responses to item D 4, where the majority of teachers indicated that they often (46.9%) encourage learners to analyze information, and learners indicated with 41.4% that they are almost always allowed to analyze information Although it appears that evaluating and analysing information are

allowed in classrooms, the low percentages obtained for the frequency with which it happens, creates concern. The researcher argues that teachers can utilize evaluation and analysis on a more frequent basis, as all learning content presents teachers with opportunities to expect learners to evaluate and analyse what they have learned on a daily basis.

With regard to opportunities to synthesize information, the majority of the teachers indicated with 49.8% that they often create opportunities for learners to synthesize information. According to the opinions of the majority of learners (40.7%), they are often required to analyze information. According to the researcher, it appears that the teachers who took part in the study should utilize divergent questions and evaluative questioning strategies on a more frequent basis, as these questions challenge learners to synthesize information through creative and original thinking (Cotton, 2001; Wilson, 2002) (*cf.* 2.5.1.3).

4.4.9 Comparison between questionnaire sections

Section B and G in the questionnaire focussed on the general principles and practical application of teaching methods and strategies respectively. The responses to section B revealed that different teaching methods and strategies are not used on a frequent basis (*cf.* 4.4.1). These responses corresponded with the responses obtained in section G which determined that the practical application of different teaching methods and strategies do not take place on a frequent basis (*cf.* 4.4.6).

The extent to which the general principles for the application of learning activities that nurture critical thinking were applied were examined in sections C and H of the questionnaire. From the responses obtained for section C and H, the researcher concluded that it appears that learning activities that nurture the development of critical thinking skills are not utilized on a frequent basis (*cf.* 4.4.2; 4.4.7).

Low response rates were also obtained for section D and I of the questionnaire that determined the frequency with which teachers apply the

general principles for utilizing questioning to nurture critical thinking (*cf.* 4.4.3; 4.4.8).

4.5 DATA ANALYSIS AND INTERPRETATION: COMPARISON BETWEEN TEACHER AND LEARNER RESPONSES

4.5.1 Introduction

In order to determine whether there were any statistically significant differences between the teacher and the learner responses obtained from the questionnaire, the responses were compared on the mean scores for each of the questionnaire sections. T-tests were utilized to determine whether differences that occurred were statistically significant (Pietersen & Maree, 2007b:230). To determine the effect size of the statistical significant difference, Cohen's d was calculated and the effect sizes were interpreted as follows:

- 0.2: small effect size
- 0.5: medium effect size
- 0.8: large effect size (Steyn 2005:20)

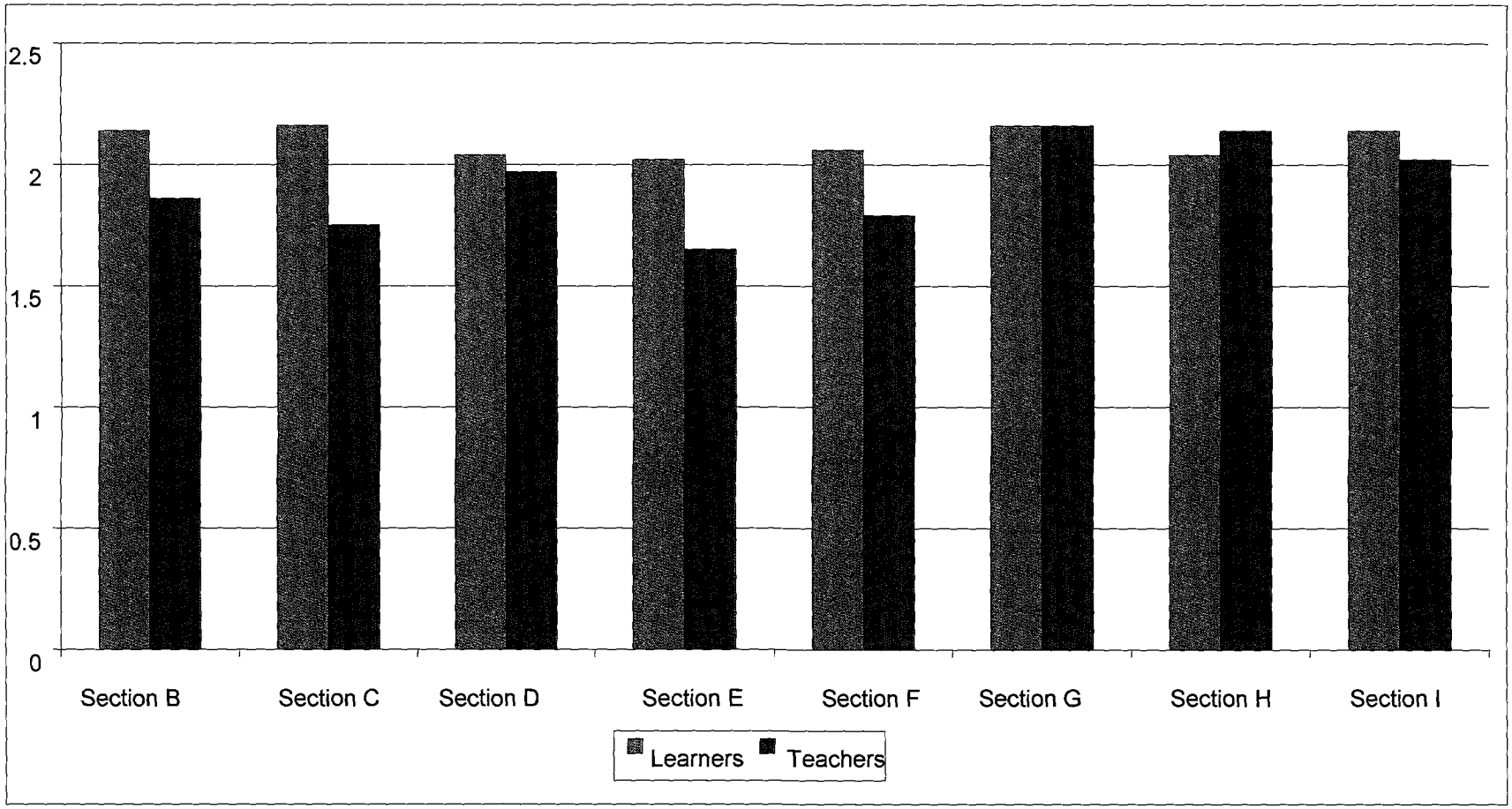
Table 4.22 reports the means, standard deviations and the statistical significance of the differences between the means, as well as the effect of the statistically significant differences in practice between the learner and teacher responses in the various sections of the questionnaire. Following the data in the table, Figure 4.1 provides a visual representation of the means obtained for the responses from the teachers and the learners for the various sections of the questionnaire.

Table 4.22: Differences between teacher and learner responses

Questionnaire section		N	Mean	Std Dev	Sig	t	Cohen's d	Effect size
Teaching methods and strategies:general principles	Teachers	241	1.86	0.64	0*	- 5.23		
	Learners	403	2.14	0.65		- 5.25	0.42	Small
Learning activities:general principles	Teachers	241	1.75	0.42	0 *	- 9.94		
	Learners	403	2.16	0.53		-10.49	0.75	Large
Questioning techniques:general principles	Teachers	241	1.97	0.56	0.14	- 1.46		
	Learners	403	2.04	0.60		- 1.49	-	
Role of the teacher	Teachers	241	1.65	0.32	0*	- 13.21		
	Learners	403	2.02	0.35		- 13.59	1.03	Large
Role of the learner	Teachers	241	1.79	0.46	0*	- 7.08		
	Learners	403	2.06	0.47		- 7.10	0.57	Medium
Teaching methods and strategies:practical application	Teachers	241	2.16	0.44	0.99	- 0.00		
	Learners	403	2.16	0.58		- 0.00	-	
Learning activities:practical application	Teachers	241	2.14	0.60	0.04*	2.01		No Effect
	Learners	403	2.04	0.62		2.02	0.16	
Types of questions:practical application	Teachers	241	2.02	0.49	0.00 *	- 2.86		
	Learners	403	2.14	0.55		- 2.95	0.22	Small

* Significance: $p<0.05$ According to the Statistical Consultation Services of the NWU (Vaal Triangle), Cohen's d is only calculated and reported when statistically significant differences occur.

Figure 4.1: Comparison of the teacher and learner means for the various questionnaire sections



Means for the various sections in the questionnaire were calculated according to the ordinal scales utilized for classifying the questionnaire responses (1= almost always/strongly agree, 2 = often/agree, 3 = sometimes/disagree, 4 = very seldom/strongly disagree). In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

The data in Table 4.22 indicates that statistically significant differences were noted between the learner and teacher responses for the section on teaching methods and strategies, learning activities as well as the practical application of these activities, the role of the teacher, the role of learner and the types of questions used in class. The teachers appeared to be more convinced than the learners that their application of the general principles for the choice of teaching methods and strategies, the general principles for the choice of learning activities, the general principles for the application of questioning techniques, their own roles and the roles of the learners during teaching and learning, the types of questions posed during teaching were providing opportunities for the nurturing of critical thinking skills. No statistical significant difference was noted for the practical application of teaching methods and strategies and the general principles for applying questioning techniques that nurture the development of critical thinking skills. For the statistically significant difference between the teachers and learners noted for the choice of learning activities (general principles) and the role of the teacher, large effect sizes were noted. For the statistical significant difference between the teachers and learners regarding the role of the learners, a medium effect was noticed. The statistical significant difference noted between teaching methods and strategies (general principles) and the types of questions (practical application), only revealed a small effect size.

The standard deviations reported for the learner and teacher responses to the various sections of the questionnaire were also very small, which indicated that the responses in both groups did not indicate a very wide dispersion and variation of responses around the mean.

4.5.2 Analysis of variance related to the classroom climate and the development of critical thinking

In the following section, the impact of the biographic variables on the teachers' responses will be examined. The biographic variables were examined to determine their influence on the participants' perceptions regarding classroom climate and the development of critical thinking. The following variables were considered:

- Type of school (Ex-Model C/Township)
- Ethnic group (Black / White). The other ethnic groups that took part in the study were too small to be considered in the statistical calculations.
- Age
- Experience in teaching
- Gender

4.5.2.1 Analysis of variance: teacher responses

An ANOVA was conducted to summarize data on the aforementioned biographic variables in relation to the various sections of the questionnaire. In the table below, Table 4.23, the data for the biographic variable, type of school, in relation to the classroom climate and development of critical thinking, are reported. The following scale guides the interpretation of the table with reference to the type of school represented in the study:

- Group 1 = Ex-Model C school
- Group 2 = Township school

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1. The interpretations focus the attention on the questionnaire sections, for which statistically significant differences related to the various biographic variables were noted.

Table 4.23: ANOVA : Type of school, classroom climate and the development of critical thinking

Question-naire section	Type of school	N	Mean	Std Dev	Sig	Cohen D	Effect size
Questioning techniques (D)	Ex-Model C Township	111 130	1.88 2.06	0.53 0.58	0.01*	0.56	Medium
Teaching methods and strategies (G)	Ex-Model C Township	111 130	2.33 2.03	0.38 0.43	0.00*	0.71	Large

*Significance $p < 0.05$

Table 4.23 indicates that there was a statistically significant difference with a medium effect size between the opinions of the teachers from the ex-Model C schools and the teachers from the Township schools regarding the questioning techniques utilized in the classrooms for the development of critical thinking skills. A statistically significant difference with a large effect was also noted between the teachers of the ex-Model C schools and teachers from the Township schools regarding the teaching methods they use in the classroom that nurture the development of critical thinking skills.

According to the above table, the ANOVA revealed that the perceptions of the teachers in the ex-Model C schools indicated a more frequent utilization of questioning techniques for the development of critical thinking, than the responses of the teachers from the Township schools indicated.

However, the responses of the teachers from the Township schools were more positive regarding the application of teaching methods and strategies for the development of critical thinking, than the responses from the teachers from the ex-Model C schools.

The standard deviations reported for the responses of the teachers from the two different schools indicated that in both groups the responses were not widely dispersed around the mean.

An ANOVA was then conducted to summarize data on the biographic variable ethnic group in relation to the various sections of the questionnaire. In the table below, Table 4.24, the data for the biographic variable ethnic group, in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the ethnic group represented in the study:

- Group 1 = Black
- Group 2 = White

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.24: ANOVA: Ethnic group, classroom climate and the development of critical thinking

Questionnaire section	Ethnic group	N	Mean	Std Dev	Sig	Cohen D	Effect size
Role of the learner (F)	Black	114	1.76	0.48	0.02*	0.06	No
	White	110	1.79	0.43			
Teaching methods and strategies (G)	Black	114	2.00	0.40	0.00*	0.87	Large
	White	110	2.35	0.39			
Types of questions (I)	Black	114	1.98	0.50	0.06	0.03	No
	White	110	2.01	0.47			

*Significance $p < 0.05$

According to Table 4.24, there was a statistically significant difference with a large effect size between the opinions of the White teachers and the Black teachers regarding the practical application of teaching methods and strategies utilized in the classrooms for the development of critical thinking skills.

The perceptions of the Black teachers indicated that they apply teaching methods and strategies and types of questions that nurture the development of critical thinking on a more frequent basis than their White colleagues. This

finding can be linked to the previous finding which indicated that teachers at Township schools, who presumably are mainly Black teachers, more frequently apply teaching methods and strategies that nurture critical thinking than their colleagues in ex-Model C schools (*cf.* Table 4.23). Furthermore, the perceptions of the Black teachers also indicated that the role that the learner plays in the classroom is more focussed on the development of critical thinking than the responses obtained from the White teachers did.

The standard deviations reported for the responses of the teachers from the two different ethnic groups indicated that in both groups the responses were not widely dispersed around the mean.

An ANOVA was also conducted to summarize data on the biographic variable age in relation to the various sections of the questionnaire. In contrast to the previous biographic variables which only comprised two groups, five groupings were made for the age groups of the teachers. This enabled the researcher to follow up the ANOVA with a *post hoc* test, Tukey's HSD (Honestly Significant Difference) test if statistical significant differences were detected for the impact of age on the various questionnaire sections. The purpose of the Tukey test was to investigate which of the age groupings displayed the statistical significant differences (McMillan & Schumacher, 2006:302).

In the table below, Table 4.25, the data for the biographic variable, age, in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the age group represented in the study.

The following 5 groupings were made for the age of the teachers:

- Group 1: 21 - 25
- Group 2: 26 - 30
- Group 3: 31 - 40
- Group 4: 41 - 50
- Group 5: 51+

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.25: ANOVA and Tukey HSD: Age of teachers, classroom climate and the development of critical thinking

Question -naire section	ANOVA Sig	Age	N	Mean	Std Dev	Sig	Cohen D	Effect size
Teaching methods and strategies (G)	0.02*	Group 3 Group 5	77 46	2.04 2.28	0.42 0.52	0.02 *	1.31	Large

*Significance $p < 0.05$

The above table highlights that the ANOVA indicated that the age of the teachers only had a statistically significant influence regarding the application of teaching methods and strategies for nurturing critical thinking.

Consequently, a *post hoc* test was conducted to determine which age groups displayed these differences. A Tukey HSD (Honesty Significant Difference) test was utilized for this purpose. This test investigated whether there were differences in the perceptions regarding the development of critical thinking skills between the five different age groups of the teachers.

A statistically significant difference with a large effect was noted between the teachers in the age group 31 - 40 years and teachers in the age group 51+ regarding the teaching methods they use in the classroom to nurture the development of critical thinking skills. The group of younger teachers more frequently apply different teaching methods and strategies for the development of critical thinking than the older teachers do.

The standard deviations reported for the responses of the teachers from the two age groups indicated that in both groups the responses were not widely dispersed around the mean.

Finally, an ANOVA was conducted to summarize data on the biographic variable teaching experience in relation to the various sections of the questionnaire. In the table below, Table 4.26, the data for the biographic variable, experience in teaching, in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the experience of teachers represented in the study:

The following 4 groupings were made for experience of the teachers:

- Group 1: 0 - 5 years
- Group 2: 6 - 10 years
- Group 3: 11 – 19 years
- Group 4: 20+ years

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.26: ANOVA and Tukey HSD: Teaching experience, classroom climate and the development of critical thinking

Question-naire section	ANOVA Sig	Expe-rience	N	Mean	Std Dev	Tukey Sig	Cohen D	Effect size
Teaching methods and strategies (G)	0.05*	Group 2 Group 4	56 70	2.08 2.28	0.43 0.47	0.04*	0.42	Small

*Significance $p < 0.05$

Table 4.26 highlights that the ANOVA indicated that the teaching experience of the teachers had a statistically significant influence only regarding the application of teaching methods and strategies for nurturing critical thinking in the classroom.

Consequently, a *post hoc* test was also conducted to determine which groups displayed these differences. A Tukey HSD test was utilized for this purpose. This test investigated whether there were differences in the perceptions regarding the development of critical thinking skills between the different years of experience levels of the teachers.

A statistically significant difference with a small effect was noted between the teachers with 6-10 years of experience in teaching and teachers with 20 years and more teaching experience, regarding the application of teaching methods and strategies to nurture the development of critical thinking skills. The teachers with 6-10 years of experience applied different teaching methods and strategies for the development of critical thinking more frequently than the teachers with 20 and more years of experience did. This finding supports the previous finding which indicated that the younger age group of teachers (31-40) applied the general principles for nurturing critical thinking by means of teaching methods and strategies, more frequently than their older colleagues (*cf.* Table 4.25).

The standard deviations reported for the responses of the teachers from the two age groups indicated that in both groups the responses were not widely dispersed around the mean.

The ANOVA did not reveal any statistically significant differences in responses for the two gender groups (female/male) regarding the different questionnaire sections. It appears that there was no statistically significant difference in the way in which male and female teachers perceived the creation of a classroom climate in relation to the nurturing of critical thinking skills.

4.5.2.2 Analysis of variance: learner responses

In the following section, the impact of the biographic variables on the learners' responses will be examined. The biographic variables were examined to determine their influence on the participants' perceptions regarding classroom climate and the development of critical thinking. The following variables were considered:

- Type of school (Ex-Model C/Township)
- Grade
- Gender
- Ethnic group (Black / White). The other ethnic groups that took part in the study were too small to be considered in the statistical calculations.

An ANOVA was conducted to summarize data on the single biographic variables in relation to the various sections of the questionnaire. In the table below, Table 4.27, the data for the biographic variable, type of school, in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the types of schools represented in the study:

- Group 1 = Ex-Model C school
- Group 2 = Township school

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.27: ANOVA – Learner variable: Type of school, classroom climate and the development of critical thinking

Question-naire section	Type of school	N	Mean	Std Dev	Sig	Cohen D	Effect size
Learning activities (C)	Ex-Model C Township	215 188	2.21 2.10	0.51 0.55	0.04*	0.27	Small
Role of the teacher (E)	Ex-Model C Township	215 188	2.06 1.98	0.34 0.37	0.04*	0.21	Small
Teaching methods and strategies of (G)	Ex-Model C Township	215 188	2.28 2.05	0.59 0.54	0.00*	0.38	Small

*Significance $p < 0.05$

Table 4.27 indicates that there was a statistically significant difference with a small effect size between the perceptions of the learners from the ex-Model C schools and the learners from the Township schools regarding the learning activities utilized in the classrooms for the development of critical thinking skills. The learners from the Township schools agreed more to the statement that their teachers' choice of learning activities nurture the development of critical thinking.

It was also interesting that a statistically significant difference with a small effect was noted between the learners of the ex-Model C schools and learners from the Township schools regarding the role of the teacher and the teaching methods and strategies used by the teacher in the classroom that nurture the development of critical thinking skills. With regard to the role of the teacher, the learners from the Township schools perceived their teachers' role more conducive to the development of critical thinking than the learners from the ex-Model C schools experienced their teachers' role. The learners from the Township schools also indicated that teaching methods as strategies to nurture the development of critical thinking were used more frequently than what the learners from the ex-Model C schools indicated regarding the teaching and learning happening in their classrooms. This finding supports the findings in the previous section that examined the impact of the teachers' biographical variables on their responses. Table 4.23 revealed that teachers in the Township schools more frequently apply teaching methods and strategies for the nurturing of critical thinking skills than teachers in ex-Model C schools. The learners from Township schools confirm this by indicating that their teachers utilize teaching methods and strategies for nurturing critical thinking on a more frequent basis than what the learners from ex-Model C schools indicated about their teachers.

The standard deviations reported for the responses of the learners from the two different school groups indicated that in both groups the responses were not widely dispersed around the mean.

An ANOVA was also conducted to summarize data on the single biographic variables in relation to the various sections of the questionnaire. In the table

below, Table 4.28, the data for the biographic variable, grade level of learners, in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the grade level of learners represented in the study:

- Group 1 = Grade 9
- Group 2 = Grade 11

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.28: ANOVA: Grade level of learners, classroom climate and the development of critical thinking

Questionnaire section	Grade	N	Mean	Std Dev	Sig	Cohen D	Effect size
Role of the teacher (E)	Grade 9	199	2.07	0.38	0.00*	0.146	No
	Grade 11	204	1.97	0.32			

*Significance $p < 0.05$

The data revealed that only with regard to one section in the questionnaire, namely the role of the teacher, grade level had a statistically significant influence with no effect in practice on the way learners perceived the role of their teacher in the classroom for the development of critical thinking skills. Grade 11 learners perceived their teachers' role in relation to the nurturing of critical thinking more favourably than what the Grade 9 learners perceived their teachers' role. It appears as if the initial observation of the researcher (*cf.* 1.7.2.4), namely that Grade 9 learners are more effective in applying critical thinking skills than learners in Grade 11, does not hold true. According to the above-mentioned finding learners in Grade 11 perceived the roles of their teachers to be more focussed on the nurturing of critical thinking skills than the Grade 9 learners indicated about their teachers.

The standard deviations reported for the responses of the learners from the two different grade groups indicated that in both groups the responses were not widely dispersed around the mean.

An ANOVA was then conducted to summarize data on the biographic variable gender in relation to the various sections of the questionnaire. In the table below, Table 4.29, the data for the biographic variable gender in relation to the classroom climate and development of critical thinking, is reported. The following scale guides the interpretation of the table with reference to the gender of learners represented in the study:

- Group 1 = Male learners
- Group 2 = Female learners

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.29: ANOVA: Gender of learners, classroom climate and the development of critical thinking

Questionnaire section	Gender	N	Mean	Std Dev	Sig	Cohen D	Effect size
Learning activities (H)	Male	158	2.19	0.50	0.04*	0.09	No
	Female	244	2.14	0.54			

*Significance $p < 0.05$

The table indicates a statistically significant difference with no practical effect between male and female learners in relation to one section of the questionnaire only, namely the practical application of learning activities to nurture critical thinking. Female learners are more of the opinion than male learners that their teachers frequently structure learning activities that nurture the development of critical thinking.

The standard deviations reported for the responses of the learners from the two different gender groups indicated that in both groups the responses were not widely dispersed around the mean.

Finally, an ANOVA was conducted to summarize data on the biographic variable ethnic group in relation to the various sections of the questionnaire. In the table below, Table 4.30, the data for the biographic variable ethnic group in relation to the classroom climate and development of critical thinking is reported. The following scale guides the interpretation of the table with reference to the ethnic groups represented in the study:

- Group 1 = Black
- Group 2 = White

In interpreting the results, it is important to note that the lower the mean, the more favourable the response, as it is closer to 1.

Table 4.30: ANOVA: Ethnic group of learners, classroom climate and the development of critical thinking

Questionnaire section	Ethnic group	N	Mean	Std Dev	Sig	Cohen D	Effect size
Role of the teacher (E)	Black	188	2.01	0.35	0.00*	0.05	No
	White	215	1.99	0.31			
Teaching methods and strategies(G)	Black	188	2.12	0.56	0.00*	0.60	Medium
	White	215	2.46	0.52			
Types of questions (I)	Black	188	2.14	0.54	0.01*	0.12	No
	White	215	2.07	0.52			

*Significance $p < 0.05$

According to Table 4.30, there was a statistically significant difference with a medium effect size between the opinions of the White learners and the Black learners regarding the methods of teaching utilized in the classrooms for the development of critical thinking skills. Statistically significant differences between the responses of Black and White learners with no practical effect were also noted for the role of the teacher and the types of questions asked during teaching.

The perceptions of the Black learners indicated a more favourable response to the teaching methods and strategies utilized by teachers in their classrooms, than the responses from the White learners indicated. This finding supports the results reported in Table 4.27, where learners from Township schools indicated that their teachers more frequently apply teaching methods and strategies for nurturing critical thinking, than what the learners from the ex-Model C schools who still had predominantly White learners indicated about their teachers.

The standard deviations reported for the responses of the learners from the two different ethnic groups indicated that in both groups the responses were not widely dispersed around the mean.

4.6 TRIANGULATION OF TEACHER AND LEARNER DATA

In order to make final conclusions, the data obtained from the learner and teacher responses were triangulated in order to obtain a better understanding of the extent to which teachers create classroom climates that nurture critical thinking. The comparisons made between the means of the responses obtained for teachers and learners for the various sections of the questionnaire, indicated that teachers in general perceived their nurturing of critical thinking more favourably than the learners did (*cf.* Table 4.22). With the exception of the application of the general prinicples for utilizing questioning techniques and the practical application of teaching methods and strategies to nurture critical thinking, statistically significant differences were noted for all the other sections of the questionnaire.

The ANOVA and the consequent *post hoc* tests, however, provided a deeper dimension to the data obtained by examining the impact of the various biographic variables on the responses.

The teachers in the ex-Model C schools indicated a more favourable approach to the questioning techniques used during teaching and learning for the development of critical thinking, than the responses of the teachers from the Township schools. However, the responses of the teachers from the Township schools were more positive regarding the application of teaching

methods and strategies for the development of critical thinking than the responses from the teachers from the ex-Model C schools (*cf.* Table 4.23). The perceptions of the Black teachers indicated that they apply teaching methods and strategies that nurture the development of critical thinking on a more frequent basis than their White colleagues (*cf.* Table 4.24). This finding can be linked to the previous finding which indicated that teachers in Township schools, who presumably are mainly Black teachers, more frequently apply teaching methods and strategies that nurture critical thinking than their colleagues in ex-Model C schools (*cf.* Table 4.23). The learners from Township schools also confirmed this by indicating that their teachers utilize teaching methods and strategies for nurturing critical thinking on a more frequent basis than what the learners from predominantly White ex-Model C schools indicated about their teachers (*cf.* Table 4.30). It appears that the teachers from the Township schools are creating learner-centred environments in which critical thinking can be nurtured, because in such environments learners will be allowed to explore, discuss, investigate and solve problems (Fisher, 2005:205; Pratt, 2005; Billington, 2010; Race, 2010) (*cf.* 2.4.4; 2.5.1.2).

The perceptions of the Black teachers also indicated that the role that the learner plays in the classroom is more focussed on the development of critical thinking, than the responses obtained from the White teachers did. This could be linked to the choice of teaching method and strategy. A learner-centred approach will obviously allow the learner to play a more active role in the classroom (Burden & Boyd, 2003:139) (*cf.* 2.5.1.1).

Teachers in the age group 31 – 40 more frequently applied different teaching methods and strategies for the development of critical thinking than the older teachers (51+) did (*cf.* Table 4.25).

Teachers with 6 - 10 years of teaching experience applied different teaching methods and strategies for the development of critical thinking more frequently than the teachers with 20 and more years of experience (*cf.* Table 4.26). This finding supports a previous finding which indicated that the younger age group of teachers (31-40) applied teaching methods and

strategies for nurturing critical thinking more frequently than their older colleagues (*cf.* Table 4.25).

Grade 11 learners perceived the roles of their teachers more focussed on the nurturing of critical thinking skills than the Grade 9 learners indicated about their teachers (*cf.* Table 4.28).

Female learners were more of the opinion than male learners that their teachers frequently structure learning activities that nurture the development of critical thinking (*cf.* Table 4.29).

The questionnaire sections on the general principles in the use of indicated that the teachers appeared to be more convinced than the '**teaching methods and strategies**' learners that the choice of teaching methods and strategies and the role that they play in the classroom, support the development of critical thinking skills (*cf.* 4.4.1.1). Teachers indicated with 40.7% that they often use different teaching methods when presenting lessons, whereas the majority of learners indicated with 44.9% that teachers only sometimes use different teaching methods (*cf.* 4.4.1.1). This is not in line with the literature that encourages critical thinking by exposing learners to various teaching methods so that they have the opportunity to practise the skill (Walker & Diaz, 2003:64) (*cf.* 4.4.1.1). Teachers also indicated with 43.6% that they almost always allow learners to voice their own opinions during classroom discussions (*cf.* 4.5.2.1), but the learners indicated with 34.0% that they are almost always allowed to voice their own opinions. Not enough opportunities are provided for learners to think for themselves. Teachers and learners only indicated with 42.7% and 45.2% respectively that this happens almost always.

With reference to the general principles for the application of **learning activities** chosen by the teachers to nurture critical thinking, Table 4.22 indicated that the teachers appeared to be more convinced than the learners that the learning activities utilized in the classroom, support the development of critical thinking skills. Responses to the following questions revealed a big difference between the learners and the teachers. The frequency according to

which an atmosphere of mutual respect is created in class, was judged by teachers and learners to be 75.1% and 35.2% respectively (*cf.* 4.4.2). Regarding the question whether learners are encouraged to query things in class, teachers and learners responded that this happens 47.3% and 45.9% almost always (*cf.* 4.5.2.2). The responses obtained for this section do not convincingly indicate that the learning activities used in the classrooms of the teachers who took part in the study, nurture the development of critical thinking skills to the full. More needs to be done to encourage all teachers to utilize activities that involve peer support, challenge the learners' intellect, nurture curiosity, imagination and questioning by the learners.

With regard to the general principles for the use of **questioning techniques** that nurture the development of critical thinking, **the** teachers appeared to be more convinced than the learners that the choice of questioning techniques supports the development of critical thinking skills. There was, however, no statistically significant difference in the responses of the teachers and the learners. It was found that the teachers and learners had different opinions with regard to the following questions:

- The majority of learners indicated that they were only sometimes (33.3%) allowed to give more than one correct answer to a question, whereas the teachers indicated that this happens often (49.4%) (*cf.* 4.4.3).

- The majority of learners indicated that the teachers only sometimes (32.5%) expect of them to make their own conclusions, whereas the teachers indicated that this happens often (48.1%) (*cf.* 4.4.3).

Although there is evidence that teachers provide opportunities to motivate their answers to questions and to analyse and interpret information through the questions posed to them, teachers need to be encouraged to increase the use of such questions as they promote the development of critical thinking (Elder & Paul, 2001:42-44; Borich, 2004:261-262) (*cf.* 2.5.1.3).

With reference to the **role of the teacher** in creating a classroom climate that nurtures critical thinking, it appeared from both the learner and teacher responses that the teacher still plays quite a dominant role in the classroom.

The majority of teachers and learners agreed that the following were allowed in the classroom: learners making choices, teachers presenting lessons in various ways, learners being allowed to construct own understanding and making their own decisions, opportunities provided to learner to describe the processes to their answers, expecting learners to provide an own point of view and to formulate own questions.

It was found that the teachers and learners had different opinions with regard to the following questions:

- The majority of learners (38.2%) indicated that they disagree that the teachers teach them how to use their minds, whereas the teachers indicated that they agreed (54.4%) to teaching learners how to use their minds (*cf.* 4.4.4).

- Learners indicated that they disagree (34.2%) with the statement that teachers allow them not to accept everything the teacher says in class, whereas the teachers indicated that they strongly agreed (56.0%) with this statement that learners do not to accept everything teachers say in class (*cf.* 4.4.4).

- Teachers strongly agreed with 56.8% to creating a warm atmosphere in the classroom. In contrast to this, only 18.1% of the learners strongly agreed to this.

The questionnaire section on the **role of the learner** indicated that the teachers appeared to be more convinced than the learners that the role that they play in class, supports the development of critical thinking skills. Teachers indicated with 44.8% that learners often get the opportunity to express their feelings in class, whereas the learners indicated with 38.7% that they only sometimes get the opportunity to express their feelings in class (*cf.* 4.4.5).

Responses to the following questions did not reveal a big difference between the learners and teachers:

- Regarding the questions whether learners get the opportunity to develop their full potential in class, think critically about the content, consider other's point of view, explore alternative answers to questions, generate own questions in class and whether learners think about the consequences of their actions, explain actions, question the teacher, and express feelings, the majority of teachers and learners responded that this happens often in class (*cf.* 4.4.5).

It was found that the teachers and learners had different opinions with regard to the following questions:

- Teacher and learner perceptions were divergent regarding the use of problem-solving. Teachers indicated that learners were often (45.2%) allowed solving problems on their own, but the learners' responses showed clearly that they are only sometimes (39.7%) involved in solving problems on their own (*cf.* 4.4.5).

- Teacher and learner perceptions were different regarding aspects like making summaries of the work, learners giving explanations for their actions and learners taking actively part in the class discussions. The majority of the learners indicated that they almost always do this, whereas the majority of the teachers indicated that learners often make summaries of the work (39.4%), give explanations for their actions (45.6%) and take active part in the class discussions 45.6.%) (*cf.* 4.4.5).

To the researcher it was disturbing that a large percentage of the teachers apparently do not involve learners in solving problems on their own, allow learners to think critically about the content and to explore others' point of view and provide learners with opportunities to explore answers to questions.

The application of **teaching methods and strategies** revealed that both the learner and teacher responses indicated that teachers often make use of different teaching methods, problem-solving, discovery learning and discussions (*cf.* 4.4.6). Teaching methods such as small group activities, peer collaboration and co-operative learning appeared not to be implemented on a frequent basis (*cf.* 4.4.6). It is a point of concern that only a small percentage

of teachers almost always utilize activities that provide opportunities fo the development of critical thinking.

With reference to the practical application of **learning activities** chosen by the teachers, it appeared from both the learner and teacher responses that they often make use of learning activities that nurture the development of critical thinking skills, by using important activities such as formulating own questions, exploring consequences of actions, exploring various alternatives and research tasks (*cf.* 4.4.7). Responses to the questions in this section did not reveal any statistically significant differences between the responses of the learners and the teachers.

Teachers appeared to be more convinced than the learners that the **types of questions** used in class, support the development of critical thinking skills. It was found that the teachers and learners had different opinions with regard to the following questions:

- The majority of the learners indicated that they were only sometimes (36.0%) exposed to convergent questions whereas the majority of the teachers indicated that learners are often (47.7%) exposed to convergent questions (*cf.* 4.4.8).

- Learners indicated that they almost always (38.2%) analyse information, whereas the teachers indicated that this happens often (49.9%) (*cf.* 4.4.8). Cognitive skills such as analysis and evaluation are important core critical thinking skills (*cf.* 2.3), and the data revealed that only a few teachers nurture these skills on a frequent basis.

4.7 CHAPTER SUMMARY

This chapter provided an analysis and interpretation of the teacher and learner data that were collected by means of questionnaires. In essence, the data revealed that teachers are, to some extent, creating classroom climates that nurture critical thinking through their choice of teaching methods and strategies, questioning techniques and the learning activities that they choose. However, the responses did not convincingly indicate to the researcher that

the nurturing of critical thinking skills takes place on a regular and frequent basis. It is disconcerting that there are still a number of learner and teacher responses with regard to all the questionnaire sections that fall in the *"sometimes/very seldom"* or *"disagree/strongly disagree"* categories. This implies that there are teachers who took part in the study who do not fully utilize all opportunities in class to nurture critical thinking among learners. As mentioned previously, Van Gelder (2005:41-46) argues that critical thinking is a hard skill to teach and learn. Critical thinking skills have to be practised to enable transfer of the skills. Therefore the researcher argues that one would expect to see that more teachers select the *"almost always"* and *"strongly disagree"* responses in indicating their continuous involvement and commitment towards the development of critical thinking skills.

CHAPTER FIVE

SUMMARY, FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

This study was conducted with the purpose of examining the extent to which teachers create classroom climates that nurture the development of critical thinking abilities. The study investigated the roles teacher play in nurturing critical thinking through the application of teaching methods and strategies, the utilization of questioning techniques and the selection of leaning activities. The objectives that were formulated at the onset of the study are revisited in this chapter, in order for the researcher to determine whether they were achieved or not.

It was important that the literature review and the data collected by means of the questionnaires to learners and teachers contributed to answering the problem question on which the study was based, and assisted the researcher to achieve the overall aim and objectives of the study. The chapter provides information regarding the following:

- An overview of the study
- Findings from the literature review
- Findings from the empirical research
- Findings in relation to the aims of the study
- Recommendations
- Limitations of the study
- Suggestions for further research

5.2 AN OVERVIEW OF THE STUDY

The overview of the study intends to provide a brief summary of the gist of the preceding chapters of the study.

5.2.1 Chapter one

The purpose of this chapter was to orientate the reader regarding the problem statement, the aims and objectives of the study and the empirical research design utilized in the study (*cf.* 1.2; 1.5; 1.7).

The problem statement, which was translated into the main aim of the study, focused on the extent to which teachers presently create classroom climates that nurture the development of learners' critical thinking abilities (*cf.* 1.2).

A quantitative research design with a descriptive survey research strategy was utilized for this research (*cf.* 1.7.2.2). A quantitative design was chosen as it was the researcher's intent to establish and confirm a given situation in the classroom and to gather data by means of a questionnaire from learners (n=403) and teachers (n=241).

The research was conducted with Grade 9 and Grade 11 teachers and learners from the Sedibeng West District of the Gauteng Department of Education. Due to time and logistical constraints, convenience sampling was utilized to select the five Township and five ex-Model C schools that took part in the research. Random sampling was utilized to select approximately twenty five learners from Grades 9 and 11 respectively at each of the schools (n = 403). All the teachers in the selected schools teaching Grades 9 and 11 were requested to take part in the research (n = 241). A heterogeneous group of teachers and learners took part in the study.

5.2.2 Chapter two

This chapter focused specifically on providing insight into the relationship between classroom climate and critical thinking. Firstly, a concept clarification was done concerning critical thinking in general terms (*cf.* 2.2). Critical thinking involves the development of dispositions and attitudes, the application

of interrelated cognitive skills, the development of meta-cognitive skills and the development of critical thinking habits (Bailin *et al.,* 1999:290-295; Watson & Glaser, 2002:2.1, 2.2; Vandermensbrugghe, 2004:417; Blunt, 2005:1368; Fisher, 2005:59; Tileston, 2005:4; Halpern, 2007:10; Facione, 2009:5) (*cf.* 2.3). In the context of the research, the researcher wanted mainly to determine to what extent opportunities for the nurturing of the interrelated cognitive skills are provided.

The chapter also explored a number of factors that contribute to deficient critical thinking abilities (*cf.* 2.4). The following factors were briefly explored: language ability, culture, teacher training, teaching methods utilized by teachers during teaching, assessment approaches used by teachers (Nisbett *et al.,* 2001:291; Stiggins, 2002:761; Elder & Paul, 2004:36; Vakalisa, 2007:3; Kalantzis & Cope, 2008:104; Potterton, 2008:15) (*cf.* 2.4.1; 2.4.2; 2.4.3; 2.4.4; 2.4.5). The researcher acknowledges that all these factors can contribute to deficient critical thinking skills. However, in the context of the study it was mainly teachers' approach to creating a climate that nurtures critical thinking that was the focus of this study.

Finally, the chapter explored factors related to classroom teaching and learning that are of importance for the development of critical thinking skills, namely the role of the teacher in creating a climate that nurtures critical thinking and the involvement of learners through the use of teaching methods and strategies, questioning techniques and the choice of learning activities (Crotty, 2002; Wilson, 2002; Abdulghani, 2003:92; Walker & Diaz, 2003:64; Borich, 2004:334; Wilkinson, 2004:90; Kramer, 2006:101-106; Cook, 2008:183; Smith, 2009:63) (*cf.*2.2; 2.3.3; 2.5; 2.5.1.1; 2.5.1.2; 2.5.1.3).

5.2.3 Chapter three

This chapter elaborated on the empirical research design used to investigate the research problem. The research method, research design and data collection instrument were discussed in detail and the implementation of quantitative descriptive survey research by means of questionnaires, was motivated. A quantitative approach was chosen as it was the researcher's

intent to establish and confirm a given situation in the classroom through the opinions of learners and teachers regarding the extent to which the classroom climate nurtures the development of critical thinking skills.

The aim of the questionnaires was to gather information from teachers and learners regarding the following aspects that are important in creating a classroom climate that nurtures critical thinking:

- whether teachers utilize different teaching methods and strategies in such a way that critical thinking is nurtured;
- the types of learning activities in which learners are involved;
- the types of questions posed during teaching and learning;
- the roles that teachers play during teaching and learning; and
- the roles that learners play during teaching and learning.

The same questions were posed to learners and teachers to enable the researcher to determine similarities and differences in the responses.

5.2.4 Chapter four

The data obtained from the questionnaires were analysed and interpreted in this chapter by means of descriptive and inferential statistics.

The triangulation of learner and teacher data revealed that teachers often use different teaching methods when presenting lessons, whereas the learners feel this is not always the situation (*cf.* 4.6).

With the exception of the application of the general principles for utilizing questioning techniques and the practical application of teaching methods and strategies to nurture critical thinking, statistically significant differences were noted between the teacher and learner responses for all the other sections of the questionnaire. The teachers perceived their involvement in nurturing the development of critical thinking in the classroom to be more frequent than the learners perceived the teachers' involvement (*cf.* Table 4.22).

The teachers in the ex-Model C schools indicated a more frequent use of the questioning techniques used during teaching and learning for the development of critical thinking than the teachers from the Township schools. However, the responses of the teachers from the Township schools were more positive regarding the application of teaching methods and strategies for the development of critical thinking, than the responses from the teachers from the ex-Model C schools (*cf.* Table 4.23). The perceptions of the Black teachers indicated that they apply teaching methods and strategies that nurture the development of critical thinking on a more frequent basis than their White colleagues (*cf.* Table 4.24).

The learners from Township schools confirmed the aforementioned by indicating that their teachers utilize teaching methods and strategies for nurturing critical thinking on a more frequent basis than the learners from predominantly White ex- Model C schools indicated about their teachers (*cf.* Table 4.30). It appeared that the teachers from the Township schools create learner-centred environments in which critical thinking can be nurtured where learners will be allowed to explore, discuss, investigate and solve problems on a more frequent basis than their colleagues from ex-Model C schools (Fisher, 2005:205; Pratt, 2005; Billington, 2010; Race, 2010) (*cf.* 2.4.4; 2.5.1.2).

In support of the preceding findings, the perceptions of the Black teachers also indicated that the role that the learner plays in the classroom is more focussed on the development of critical thinking, than the responses obtained from the White teachers did. This could be linked to the choice of teaching methods and strategies. A learner-centred approach will obviously allow the learner to play a more active role in the classroom (Burden & Boyd, 2003:139) (*cf.* 2.5.1.2).

Teachers in the age group 31-40 more frequently applied different teaching methods and strategies for the development of critical thinking than the older teachers (51+) did (*cf.* Table 4.25).

Teachers with 6-10 years of teaching experience applied different teaching methods and strategies for the development of critical thinking more

frequently than the teachers with 20 and more years of experience did (*cf.* Table 4.27). This finding supports a previous finding which indicated that the younger age group of teachers (31-40) applied teaching methods and strategies for nurturing critical thinking more frequently than their older colleagues (*cf.* Table 4.25).

Grade 11 learners perceived the roles of their teachers to be more focussed on the nurturing of critical thinking skills than the Grade 9 learners indicated about their teachers (*cf.* Table 4.28).

5.3 FINDINGS FROM THE LITERATURE REVIEW

A literature review was conducted to elucidate the concepts critical thinking and classroom climate. The information obtained from the literature review was utilized for the formulation of questions for the questionnaire.

Critical thinking involves the development of dispositions such as open-mindedness, fair-mindedness, independent-mindedness and skepticism (Mc Peck, 1981:8; Bailin *et al.,* 1999:290-295; Fisher, 2005:59; Halpern, 2007:10; Facione, 2009:5) (*cf.* 2.3).

Furthermore, critical thinking involves the application of interrelated cognitive skills such as problem-solving, formulating inferences, decision-making, reasoning, analysis, questioning, interpretation, evaluation and identifying assumptions (Watson & Glaser, 2002:2.1, 2.2; Vandermensbrugghe, 2004:417; Blunt, 2005:1368; Tileston, 2005:41) (*cf.* 2.3). The researcher specifically based her investigation on determining the extent to which teachers create classroom climates to nurture the interrelated cognitive skills during teaching and learning.

The development of critical thinking involves the nurturing of critical thinking habits. These habits refer *inter alia* to identifying alternative viewpoints, questioning how and why things happen, arguing about what is fair and unfair and true and untrue (Jones & Mules, 2001:192) (*cf.* 2.3).

Finally, the development of critical thinking abilities involves the development of meta-cognitive skills that promote self-regulated learning such as planning, monitoring and evaluation (Halpern, 2007:10).

An important aspect in the development of critical thinking skills is the creation of a classroom climate that will encourage critical thinking among learners in which interactions between teacher and learners take place (Borich, 2004:370; Abdool & Drinkwater, 2005:363-372) (*cf.* 2.5). According to Crotty (2002) and Elder (2007) (*cf.* 2.3), teachers have to create an environment where learners feel safe, nurtured and, very important, intellectually stimulated. In order to achieve this, teachers have to consider a number of factors such as the choice of teaching methods and strategies, the choice of learner activities, the way in which questions are posed to learners, the role that the learner plays in the classroom and the role that the teacher plays in the classroom (Ferrando, 2001; Borich, 2004:294; Alazzi, 2008:245) (*cf.* 2.5.1.4). Learners should be engaged in learning activities that challenge the intellect and imagination. Such activities require the acquisition, comprehension and application of new knowledge and activate the need for perseverance, research and increasingly complex forms of problem-solving (Borich, 2004:204; Schunk, 2004:317; Alazzi, 2008:245) (*cf.* 2.5.1.4).

To develop as thinkers, learners need to become adept at questioning. They also need to formulate questions actively as they study (Elder & Paul, 2001:42-44) (*cf.* 2.5.1.3).

Teachers have a responsibility to teach learners how to use their minds as well as to impart subject knowledge. This is not simply a matter of impersonal instruction in *"thinking skills"*. It also involves feelings, values, attitudes and motivation. Learners can only take ownership of critical thinking skills if they are motivated and provided with opportunities to do so (Van Gelder, 2005:41-46) (*cf.* 2.3).

5.4 FINDINGS FROM THE EMPIRICAL RESEARCH

The data displayed in Table 4.22 indicate that statistical significant differences were noted between the learner and teacher responses for the questionnaire

sections on teaching methods and strategies, learning activities as well as the practical application of these activities, the role of the teacher and the learner, and the types of questions used in class. The teachers appeared to be more convinced than the learners that their application of the general principles for the choice of teaching methods and strategies, the general principles for the choice of learning activities, the general principles for the application of questioning techniques, their own roles and the roles of the learners during teaching and learning, and the types of questions posed during teaching were providing opportunities for the nurturing of critical thinking skills.

No statistically significant differences were noted for the practical application of teaching methods and strategies and the general principles for applying questioning techniques that nurture the development of critical thinking skills. For the statistically significant differences noted between the teachers and learners for the choice of learning activities (general principles) and the role of the teacher, large effect sizes were revealed. For the statistical significant difference between the teachers and learners regarding the role of the learners a medium effect was indicated. The statistical significant difference noted between teaching methods and strategies (general principles) and the types of questions (practical application) only revealed a small effect size.

The questionnaire sections on the general principles concerning the use of teaching methods and strategies indicated that the teachers appeared to be more convinced than the learners that the choice of teaching methods and strategies and the role that they play in the classroom, support the development of critical thinking skills (*cf.* 4.4.1).

The responses obtained for the section on learning activities do not convincingly indicate that the learning activities used in the classrooms of the teachers who took part in the study nurture the development of critical thinking skills to the full. More needs to be done to encourage all teachers to utilize activities that nurture curiosity, imagination and questioning by the learners.

Although there is evidence that teachers provide opportunities to motivate their answers to questions and to analyse and interpret information through

the questions posed to them, teachers need to be encouraged to increase the use of such questions as they promote the development of critical thinking (Elder & Paul, 2001:42-44; Borich, 2004:261-262) (*cf.* 2.5.1.3).

With reference to the role of the teacher in creating a classroom climate that nurtures critical thinking, it appeared from both the learner and teacher responses that they mostly agree that the teacher still plays a dominant role in the classroom (*cf.* 4.4.4).

The questionnaire section on the role of the learner indicated that the teachers appeared to be more convinced than the learners that the role that they play in the classroom, supports the development of critical thinking skills (*cf.* 4.4.5).

The application of teaching methods and strategies revealed that both the learner and teacher responses indicated that teachers often make use of different teaching methods, problem-solving, discovery learning and discussions (*cf.* 4.4.6). Teaching methods such as small group activities, peer collaboration and co-operative learning appeared not to be implemented on a frequent basis (*cf.* 4.4.6).

With reference to the practical application of learning activities chosen by the teachers, it appeared from both the learner and teacher responses that they often make use of learning activities that nurture the development of critical thinking skills by using important activities such as formulating own questions, exploring consequences of actions and exploring various alternatives and research tasks (*cf.* 4.4.7). Responses to the questions in this section did not reveal any statistical significant differences between the responses of the learners and the teachers.

Teachers appeared to be more convinced than the learners that the types of questions used in the classroom support the development of critical thinking skills (*cf.* 4.4.8).

5.4.1 Additional findings

From the empirical research, additional findings that were not directly related to the literature review were also derived. The following findings were noted:

There were statistically significant differences between the teachers of the ex-Model C schools and teachers from the Township schools regarding the extent to which teaching methods and strategies are used in the classroom for the development of critical thinking. The responses for the teachers from the Township schools indicated that they utilize teaching methods and strategies for the development of critical thinking more frequently than the teachers from the ex-Model C schools (*cf.* Table 4.23).

The younger group of teachers between the age of 31 and 40 utilized different methods and strategies of teaching for the development of critical thinking on a more frequent basis than the older teachers above 50 years of age (*cf.* Table 4.25).

Teachers with 6-10 years of experience in teaching utilized different teaching methods and strategies for the development of critical thinking on a more frequent basis than the teachers with 20 and more years of experience (*cf.* Table 4.26).

With regard to the role of the teacher, the learners from the Township schools perceived their teachers' role more conducive to the development of critical thinking skills than what the learners from the ex-Model C schools perceived their teachers' roles to be. The learners from the Township schools also indicated that their teachers use teaching methods and strategies for the nurturing of critical thinking more frequently than the learners from ex-Model C schools indicated for their teachers (*cf.* Table 4.27).

Black learners were more convinced than the White learners that their teachers use teaching methods and strategies to nurture the development of critical thinking more frequently than the responses from the white learners (*cf.* Table 4.30).

5.5 FINDINGS IN RELATION TO THE AIM AND OBJECTIVES OF THE STUDY

The overall aim of this study was to determine to what extent teachers create classroom climates that nurture the development of critical thinking abilities. This study aimed at obtaining information to achieve the overall aim and objectives identified at the onset of the study (*cf.* 1.6). The researcher endeavours to revisit the aim and objectives of the study in order to ascertain whether they have been achieved.

Objective 1: Determining what critical thinking ability entails and how it can be nurtured in the classroom

This objective was achieved through a literature review that highlighted a number of aspects. It was necessary to achieve this objective prior to any of the other objectives, as the achievement of this objective determined the focus of the study and provided the framework for the compilation of the questionnaire.

Critical thinking involves the development of dispositions and attitudes , the application of interrelated cognitive skills, the development of meta-cognitive skills and the development of critical thinking habits (Bailin *et al.,* 1999:290-295; Watson & Glaser, 2002:2.1, 2.2; Vandermensbrugghe, 2004:417; Blunt, 2005:1368-1378; Fisher, 2005:59; Tileston, 2005:4; Halpern, 2007:10; Facione, 2009:5) (*cf.* 2.3). In the context of the research, the researcher wanted to determine mainly to what extent opportunities for the nurturing of the interrelated cognitive skills are provided. The researcher thus focussed the attention of the research on the extent to which teachers nurture *inter alia* the following skills: questioning, exploring, solving problems, making inferences, making judgements, reasoning, argumentation, analysis, synthesis, evaluation and decision-making (Jones & Mules, 2001:192; Blunt, 2005:1369; Tileston, 2005:41; Jeevanantham, 2005:118-129) (*cf.* 2.2.2).

With regard to the nurturing of critical thinking, the literature revealed that the teacher plays an important role in creating a classroom climate that invites critical thinking. The role of the teacher in creating a climate that nurtures

critical thinking *inter alia* entails creating opportunities for active involvement of the learners during teaching and learning through the use of teaching methods and strategies, questioning techniques and the choice of learning activities (Crotty, 2002; Wilson, 2002; Abdulghani, 2003:92; Borich, 2004:334; Walker & Diaz, 2003:64; Wilkinson, 2004:90; Kramer, 2006:101-106; Cook, 2008:183; Smith, 2009:63) (*cf.*2.3; 2.3.3; 2.5; 2.5.1.1; 2.5.1.2; 2.5.1.3).

Objective 2: Determining which teaching methods and strategies teachers apply in the classroom

This objective was achieved by analysing the data obtained from the teacher and learner responses to the questionnaire items in Sections B and G of the questionnaire.

The data revealed that teachers make use of different teaching methods, and strategies, which are a good indication that teachers do not use only one specific method of teaching (*cf.* 4.4.1). This is supportive of what the literature reveals, namely that in the context of nurturing critical thinking, teachers should utilize a variety of methods, in particular methods that promote indirect, independent and interactive learning (Burden & Boyd, 2003:139; Borich, 2004:294) (*cf.* 2.5.1.2; 2.5.1.4). However, the responses obtained from both the learners and teachers indicated that the utilization of various methods do not take place on a frequent basis (*cf.* 4.4.1).

Objective 3: Establishing the types of learning activities created for learners to engage in

This objective was achieved by analysing the data obtained from the teachers and learners responses to the questionnaire items in Sections C and H of the questionnaire that focused on the learning activities created for learners to engage in for the development of critical thinking skills.

The low response rate obtained for the *"almost always"* category indicated that, although teachers do create opportunities through learning activities to nurture critical thinking, a more purposeful effort should be made to create

opportunities for active learning that enhance curiosity, challenge the intellect and imagination of learners and the use of questioning on a more frequent basis (*cf.* 4.4.2). Literature indicates that the frequent use of active learning that awakens learners' curiosity is crucial for the development of critical thinking (Walker & Diaz, 2003:64; Schunk, 2004:321; Billington, 2010) (*cf.* 2.3; 2.5.1.1).

Objective 4: Identifying the types of questions posed to learners in the classroom

This objective was achieved by analysing the data obtained from the teacher and learner responses to the questionnaire items in Sections D and I of the questionnaire that focused on the general principles as well as the application of types of questions posed to learners to nurture the development of critical thinking.

From the data obtained, it became clear that teachers and learners were in accord that learners are only often exposed to and respond to divergent questions. The literature regards divergent questions as important to nurture critical thinking as they encourage the application of cognitive skills such as synthesis, analysis and evaluation (Elder & Paul, 2001:42-44; Borich, 2004:261,262) (*cf.* 2.5.1.3). These results indicated that there is room for improvement to increase the use of divergent questions on a more frequent basis during teaching and learning for the development of critical thinking skills. Teachers need to be encouraged to increase the use of such questions as they promote the development of critical thinking (Elder & Paul, 2001:42-44; Borich, 2004:261-262) (*cf.* 2.5.1.3).

Objective 5: Investigating what role the teacher plays in the classroom

This objective was achieved by analysing the data obtained from the teacher and learner responses to the questionnaire items in Section E of the questionnaire that focused on the role that teachers play in the classroom for nurturing the development of critical thinking. In the context of nurturing critical thinking skills, the literature review strongly emphasizes the role of the teacher in creating classroom climates that invite intellectual openness (Lake,

2009:14) (*cf.* 2.5). What is very interesting from the data obtained, is that the majority of the learners and teachers strongly agreed to the fact that the teacher still plays a dominant role in the classroom, with important aspects such as consistency in class, patience, rewards for performances, decision-making, constructing of own understanding, using specific vocabulary and the encouragement from the teachers to learners regarding own decisions and using their own words, not happening on a frequent basis (*cf.* 4.4.4). It is however evident, that the data does not completely support the view of Sonn (2000:257-265) who argue that teachers seldom create classroom climates for thinking and show little appreciation for the individuality of learners.

Objective 6: Investigating what role the learner plays in the classroom

This objective was achieved by analysing the data obtained from the teacher and learner responses to the questionnaire items in Section F that focused on the role that learners play in the classroom for the development of critical thinking. Teachers appeared to be more convinced than the learners that they frequently support the development of critical thinking skills. Teachers indicated with 44.8% that learners often get the opportunity to express their feelings in class, whereas the learners indicated with 38.7% that they only sometimes get the opportunity to express their feelings in class (*cf.* 4.4.5).

Teachers and learners were in accord that learners often get the opportunity to develop their full potential in class, think critically about the content, consider others' point of view, explore alternative answers to questions, generate own questions in class and think about the consequences of their actions (*cf.* 4.4.5).

It was found that the teachers and learners had different opinions with regard to the use of problem-solving. Teachers indicated that learners are often (45.2%) allowed to solve problems on their own, but from the learners' responses it became clear that they are only sometimes (39.7%) involved in solving problems on their own (*cf.* 4.4.5). Teacher and learner perceptions also differed regarding aspects like making summaries of the work, learners giving explanations for their actions and taking active part in the class discussions. The majority of the learners indicated that they almost always do

this, whereas the teachers indicated that learners often make summaries of the work (39.4%), give explanations for their actions (45.6%) and that learners take active part in the class discussions (45.6.%) (*cf.* 4.4.5). Literature indicates that learners need to be motivated by teachers to take part frequently in non-routine mental work that involves the application of cognitive skills such as analysis, interpretation, problem-solving, reasoning and decision-making (Schunk, 2004:317; Barnes, 2005:46; Seng & Kong, 2006:58; Facione, 2009:5-7) (*cf.* 2.5.1.5; *cf.* 2.5.2).

Objective 7: Establishing to what extent teacher and learner opinions differ with regard to the classroom climate that teachers create for nurturing critical thinking

The data revealed that teachers and learners had varied perceptions regarding the classroom climate that teachers create to nurture critical thinking abilities. The following differences were noted between the teacher and learner responses.

- Teachers indicated with 43.6% that they almost always allow learners to voice their own opinions during classroom discussions (*cf.* 4.5.2), but the learners indicated with 34.0% that they only sometimes voice their own opinions.

- The majority of learners indicated that they were only sometimes (33.3%) allowed to give more than one correct answer to a question, whereas the teachers indicated that this happens often (49.4%) (*cf.* 4.4.3).

- The majority of learners indicated that the teachers only sometimes (32.5%) expect of them to make their own conclusions, whereas the teachers indicated that this happens often (48.1%) (*cf.* 4.4.3).

- The majority of learners indicated that they disagree (38.2%) that the teachers teach them how to use their minds, whereas the teachers indicated that they agree (54.4%) to teaching learners how to use their minds (*cf.* 4.4.4).

- Learners indicated that they disagree (34.2%) with the statement that teachers allow them not to accept everything the teacher says in class, whereas the teachers indicated that they agree (56.0%) to allowing learners not to accept everything they say in class (*cf.* 4.4.4).

- Teacher and learner perceptions were divergent regarding the use of problem-solving. Teachers indicated that learners are often (45.2%) allowed solving problems on their own, but from the learners' responses it became clear that they are only sometimes (39.7%) involved in solving problems on their own (*cf* .4.4.5).

- Teacher and learner perceptions were different regarding aspects like making summaries of the work, learners giving explanations for their actions and learners taking active part in the class discussions. The majority of the learners indicated that they almost always do this, whereas the teachers indicated that learners often make summaries of the work (39.4%), give explanations for their actions (45.6%) and that learners take an active part in the class discussions (45.6.%) (*cf.* 4.4.5).

- Learners indicated that they were only sometimes (36.0%) exposed to convergent questions, whereas the teachers indicated that learners are often (47.7%) exposed to convergent questions (*cf.* 4.4.8).

- Learners indicated that they almost always (38.2%) analyse information, whereas the teachers indicated that this happens often (49.9%) (*cf.* 4.4.8).

5.6 LIMITATIONS OF THE STUDY

A number of limitations were identified for the research. Bearing these limitations in mind, the researcher acknowledges that only tentative conclusions regarding the extent to which classroom climate nurtures critical thinking skills can be formulated. The researcher identified the following limitations:

- Only a quantitative research approach was utilized. This means that the researcher only had a limited amount of data to work with. If the

researcher integrated some qualitative methods for data collection, such and interviews and observations, a more comprehensive and holistic understanding of the extent to which classroom climates nurture critical thinking could have been obtained.

- The current sample was only bounded to the one education district in the Vaal Triangle area and only five ex-Model C schools and five Township schools were used for the study. Therefore the results of this study cannot be generalized. Similar research with larger samples and in other education districts is necessary to report conclusively on the extent to which teachers create classroom climates that nurture critical thinking.

- As the researcher used convenient sampling due to time and logistical constraints, it is acknowledged that bias might have been built into the sample.

- The questionnaire did not investigate the use of assessment methods and strategies which are also important components of classroom teaching and learning for the nurturing of critical thinking.

- The researcher only focussed on the extent to which the interrelated cognitive skills that play a role in critical thinking are nurtured. It is necessary to explore learners' attitudes and dispositions towards being critical also (*cf.* 2.2.2).

- The researcher did not explore teachers' understanding of what critical thinking implies and how they think these skills should be nurtured. Determining teachers' understanding of what critical thinking implies and how it should be nurtured, could have provided valuable information with which the present teacher responses could have been understood.

- The researcher did not distinguish between the perceptions of Grade 9 and Grade 11 teachers as was the case with the learners. This could have provided information with which the difference in response between Grade 9 and Grade 11 could have been compared. Grade 11 learners perceived their teachers' role in relation to the nurturing of critical thinking more

favourably than the Grade 9 learners perceived their teachers' role (*cf.* Table 4.28).

- The questionnaires were not translated to accommodate the learners whose home language is Sesotho. This might have posed problem in clearly understanding the meaning of the questionnaire items.

5.7 RECOMMENDATIONS

In light of the findings and to assist the teachers in dealing with aspects regarding the classroom climate and the development of critical thinking, the researcher recommends the following in order to effectively nurture the classroom climate for the development of critical thinking.

- Teachers need to adapt their teaching methods and strategies from a didactic mode to a more discursive or argumentative mode of teaching. In particular, teachers should take cognizance of the merits that indirect, independent and interactive methods and strategies of teaching hold for the nurturing of critical thinking skills (Schunk, 2004:323; Kramer, 2006:102-105) (*cf.* 2.5.1.2; 2.5.1.5).

- Teachers should try not to be the centre of instruction if critical thinking skills need to be developed. Environments should rather be designed so that learners have an active role in learning; mentally, physically, socially and emotionally, by making use of diverse teaching and learning formats, namely small groups, peer collaboration and cooperative learning (Schunk, 2004:323; Billington, 2010; Race, 2010) (*cf.* 2.5.1; 2.5.1.1).

- For the development of critical thinking, learners have to learn a variety of critical thinking skills that can greatly improve their classroom performance on a frequent basis. Teachers should include skills like an understanding of the arguments and the beliefs of others, critically evaluating those arguments and beliefs and developing and defending one's own well-supported arguments and beliefs, reasoning, decision-making and problem-solving (Bassham *et al.*, 2005:8; Halx & Reybold, 2005:296) (*cf.* 2.3.1; 2.5.1.5). Learners must engage in learning activities that challenge

the intellect and imagination. Such activities require the acquisition, comprehension and application of new knowledge and activate the need for perseverance, research and increasingly complex forms of problem-solving (Walker & Diaz, 2003:64; Arends, 2009:345-387) (*cf.* 2.5.1.1, 2.5.1.2).

- A stronger focus should be placed on using different questioning techniques on a more frequent basis to promote the analysis, synthesis and evaluation levels of Bloom's taxonomy. If learners are expected to think critically, they must be allowed the opportunity to practise critical thinking under guided instruction so that they can improve their skills over time (Walker & Diaz, 2003:64) (*cf.* 2.5.1.1). Learners must be exposed more to divergent questions, which are vital for the development of critical thinking skills. As seen from the literature, divergent questions promote thinking and they encourage the application of cognitive skills such as synthesis, analysis and evaluation (Borich, 2004:261, 262) (*cf.* 2.5.1.3).

- Teachers have a responsibility to teach learners how to use their minds as well as to impart subject knowledge. This is not simply a matter of impersonal instruction in *"thinking skills"*. It also involves feelings, values, attitudes and motivation. Learners can only take ownership of critical thinking skills if they are motivated to do so (Seng & Kong, 2006:58; Facione, 2009:5-7) (*cf.* 2.5.2). This implies that teachers should also focus on nurturing the attitudes of learners so that they will be willing to engage in activities and tasks that require critical thinking.

- Teachers should accept the challenge to become knowledgeable on what critical thinking entails and how to nurture critical thinking. Learners are not capable of thinking critically themselves; critical thinking skills have to be nurtured on a frequent basis and learners need to get frequent opportunities to apply these skills (Lombard & Grosser, 2004:214-216) (*cf.* 2.3.2).

5.8 SUGGESTIONS FOR FURTHER RESEARCH

This study has made the researcher aware of the importance of the classroom climate that teachers need to create for learners to think critically. More advanced research on this topic would be beneficial. The following suggestions are made for further research:

- Further research can be done in other provinces in order to understand different perceptions of teachers and learners regarding the creation of classroom climates that nurture the development of critical thinking more widely.

- This research can be conducted with larger groups of teachers and learners, and qualitative methods of data collection such as interviews should be utilized to gauge teachers' understanding of critical thinking. Observations should be utilized to report conclusively on the extent to which teachers nurture the development of critical thinking during teaching and learning.

- A study can be conducted to determine the impact that other factors such as language and culture have on the development of critical thinking skills.

- Research should be conducted to determine the learners' attitudes and dispositions to thinking critically. It could be argued that if learners are not motivated or willing to engage in activities or tasks that demand critical reflection, they will not think critically, irrespective of the climate that is created to nurture the development of critical thinking skills.

5.9 CONCLUSIONS

The application of **teaching methods and strategies** revealed that both the learner and teacher responses indicated that teachers often make use of different teaching methods, problem-solving, discovery learning and discussions (*cf.* 4.4.6). With reference to the practical application of **learning activities** chosen by the teachers, it appeared from both the learner and teacher responses that they often make use of learning activities that nurture

the development of critical thinking skills, by using important activities such as formulating own questions, exploring consequences of actions, exploring various alternatives and research tasks (*cf.* 4.4.7). The questionnaire section on the **role of the learner** indicated that the teachers appeared to be more convinced than the learners that the role that they play in class, supports the development of critical thinking skills. With reference to the **role of the teacher** in creating a classroom climate that nurtures critical thinking, it appeared from both the learner and teacher responses that the teacher still plays quite a dominant role in the classroom. Teachers appeared to be more convinced than the learners that the **types of questions** used in class, support the development of critical thinking skills. The development of critical thinking skills and specifically the extent to which the classroom climate nurtures the development of critical thinking skills, holds many challenges for teachers. The nurturing of critical thinking skills is not an option. Critical thinking skills ought to be developed in learners so that they will be able to think for themselves, voice their own opinions, make sound judgements, critically evaluate other's opinions and make informed choices in life. Both teachers and learners have a responsibility in this regard. Teachers need to accept this challenge and create classroom climates that nurture the development of critical thinking skills. On the other hand, it is important that learners need to display a willing attitude and critical thinking behaviour to become involved in activities that require critical reflection.

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APPENDIX A

QUESTIONNAIRE TO LEARNERS

QUESTIONNAIRE TO LEARNERS

Dear learner

I am currently busy with a Masters Degree at the North-West University, Vaal Triangle Campus. My research focuses on the development of critical thinking in the classroom. I will appreciate it if you can complete the questionnaire. You will complete the questionnaire anonymously and all information will be handled with the utmost confidentiality. Thank you, your time and cooperation are valued.

Mrs V. Petzer

SECTION A BIOGRAPHIC INFORMATION

Complete the following information about yourself by making with an X in the appropriate block:

1. GENDER:

MALE	FEMALE

2. TYPE OF SCHOOL:

Ex model C	Township	Farm school

3. ETHNIC GROUP:

BLACK	WHITE	ASIAN	COLOURED	OTHER

SECTION B TEACHING METHODS AND STRATEGIES: GENERAL PRINCIPLES

Read the following statements and evaluate the classroom practice of your teachers on the numerical scale from 1-4 with an X where you feel it is applicable.

Question	Almost always	Often	Some-times	Very seldom
1. When presenting lessons in class, the teachers make use of different teaching methods	1	2	3	4
2. During class discussions I can voice my own opinion	1	2	3	4
3. The discussions in class provide opportunities for you to think for yourself	1	2	3	4

SECTION C LEARNING ACTIVITIES: GENERAL PRINCIPLES

Read the following statements and evaluate the learning activities taking place in your classrooms by indicating on the numerical scale from 1-4 with an X where you feel it is applicable

Question	Almost always	Often	Some-times	Very seldom
1. The activities chosen by the teacher lead to the curiosity of the learner	1	2	3	4
2. An atmosphere of mutual respect exists in the class	1	2	3	4
3. The way activities are done in class focus on satisfying the learner's needs	1	2	3	4
4. The activities in class challenge my intellect	1	2	3	4
5. The activities in class stimulate imagination	1	2	3	4
6. Classmates provide one another with assistance	1	2	3	4
7. Learners are encouraged to question things	1	2	3	4

SECTION D QUESTIONING TECHNIQUES:GENERAL PRINCIPLES

Read the following statements and evaluate the questioning techniques used in the classroom on the numerical scale from 1-4. Indicate with an X where you feel it is applicable

Question	Almost always	Often	Sometimes	Very seldom
1. The teachers allow more than one correct answer to a question	1	2	3	4
2. The teachers expect me to make my own conclusions	1	2	3	4
3. The teachers expect of us to motivate our answers	1	2	3	4
4. We have to analyse information	1	2	3	4
5. We have to interpret information	1	2	3	4

SECTION E ROLE OF THE TEACHER

Read the following statements regarding the role that the teachers play in the classroom and indicate the extent to which you agree or disagree with the statements. Indicate your choice on the numerical scale from 1-4 with an X.

Question	Strongly agree	Agree	Disagree	Strongly disagree
1. It is the responsibility of the teachers to teach me how to use my mind	1	2	3	4
2. When the teachers present a lesson, they motivate me to think for myself	1	2	3	4
3. The teachers create opportunities for me to succeed	1	2	3	4
4. The teachers are consistent in class	1	2	3	4
5. The teachers are patient with me in class	1	2	3	4

Question	Strongly agree	Agree	Disagree	Strongly disagree
6. Teachers reward me if my performance is good	1	2	3	4
7. I do not have to accept everything the teachers say in class	1	2	3	4
8. The teachers allow me to reason logically	1	2	3	4
9. The teachers create a warm class atmosphere	1	2	3	4
10. Cooperation among learners is encouraged by the teachers	1	2	3	4
11. The teachers are supportive to me	1	2	3	4
12. Teachers allow me to make my own choices	1	2	3	4
13. The teachers present lessons in various ways (e.g. visual and/or verbal)	1	2	3	4
14. Teachers allow me to construct my own understanding of the content	1	2	3	4
15. Teachers use specific vocabulary to teach thinking skills in class	1	2	3	4
16. The teachers encourage me to make my own decisions	1	2	3	4
17. Teachers encourage me to describe the process I followed to come to an answer	1	2	3	4
18. The teachers encourage me to explain things in my own words	1	2	3	4
19. The teachers teach me how to be creative	1	2	3	4
20. The teachers teach me how to work with others	1	2	3	4
21. Teachers motivate me in class to judge things.	1	2	3	4
22. I am challenged in the class to come up with original ideas.	1	2	3	4
23. Teachers expect of me to formulate my own point of view.	1	2	3	4
24. Teachers expect of me to formulate questions.	1	2	3	4

SECTION F ROLE OF THE LEARNER

Read the following statements regarding your role as learner in the class-room and indicate on the numerical scale from 1-4 with an X where you feel it is applicable

Question	Almost always	Often	Sometimes	Very seldom
1. I can express my feelings in class.	1	2	3	4
2. I can say what I think in class.	1	2	3	4
3. I can develop my full potential in class.	1	2	3	4
4. I am capable to think for myself.	1	2	3	4
5. In the class I question what the teacher says.	1	2	3	4
6. I take an active part in class discussions.	1	2	3	4
7. I feel responsible for my own learning in class.	1	2	3	4
8. I play an active role in my own learning.	1	2	3	4
9. In the class, I solve problems on my own.	1	2	3	4
10. In class, I think critically about the content.	1	2	3	4
11. I am allowed to consider others' point of view in class.	1	2	3	4
12. I am allowed to explore alternative answers for questions.	1	2	3	4
13. I am allowed to generate my own questions in class.	1	2	3	4
14. I think about the consequences of my actions.	1	2	3	4
15. I make my own summaries of the work.	1	2	3	4
16. I provide explanations (reasons) for my actions.	1	2	3	4

SECTION G TEACHING METHODS AND STRATEGIES: PRACTICAL APPLICATION

Indicate on the numerical scale from 1-4 with how often the following methods are utilized in your classroom. Indicate with an X where you feel it is applicable

Method	Almost always	Often	Sometimes	Very seldom
1. Small group activities	1	2	3	4
2. Peer collaboration (working with fellow learners)	1	2	3	4
3. Co-operative learning (working in groups to achieve a goal)	1	2	3	4
4. Direct teaching (lecturing)	1	2	3	4
5. Problem-solving	1	2	3	4
6. Discovery learning	1	2	3	4
7. Discussion	1	2	3	4

SECTION H LEARNING ACTIVITIES:PRACTICAL APPLICATION

Indicate on the numerical scale from 1-4 with how often you are involved in the following activities. Indicate with an X where you feel it is applicable

Learning activity	Almost always	Often	Sometimes	Very seldom
1. Formulate my own questions	1	2	3	4
2. Explore the consequences of my actions	1	2	3	4
3. Explore various alternatives before making a decision	1	2	3	4
4. Research tasks	1	2	3	4

SECTION I TYPES OF QUESTIONS: PRACTICAL APPLICATION

Indicate on the numerical scale from 1-4 how often the different types of questions are posed in your class. Mark with an X where you feel it is applicable

Type of question	Almost always	Often	Sometimes	Very seldom
1. Convergent questions (only one correct answer to a question)	1	2	3	4
2. Divergent questions (various responses to one question)	1	2	3	4
3. Questions to make comparisons	1	2	3	4
4. To analyse information	1	2	3	4
5. To evaluate information	1	2	3	4
6. To synthesize information	1	2	3	4
7. To provide to the point (exact, precise) information	1	2	3	4

APPENDIX B

QUESTIONNAIRE TO TEACHERS

QUESTIONNAIRE TO TEACHERS

Dear teacher

I am currently busy with a Masters Degree at the North-West University, Vaal Triangle Campus. My research focuses on the development of critical thinking in the classroom. I will appreciate it if you can complete the questionnaire. You will complete the questionnaire anonymously and all information will be handled with the utmost confidentiality. Please answer all questions as honestly as possible. Thank you, your time and cooperation are valued.

Mrs V. Petzer

SECTION A BIOGRAPHIC INFORMATION

Complete the following information about yourself by making with an X in the appropriate block:

1. GENDER:

MALE	FEMALE

2. AGE:

21-25	26-30	31-40	41-50	51+

3. ETHNIC GROUP:

BLACK	WHITE	ASIAN	COLOURED	OTHER

4. YEARS EXPERIENCE IN TEACHING:

0-5	6-10	11-20	20+

5. TYPE OF SCHOOL:

TOWNSHIP	Ex-Model C

SECTION B TEACHING METHODS AND STRATEGIES:GENERAL PRINCIPLES

Read the following statements and indicate on the numerical scale from 1-4 the applicability of the statement to your own classroom practice. Mark with an X where you feel it is applicable

Question	Almost always	Often	Some-times	Very seldom
1. When presenting lessons in class, I make use of different teaching methods	1	2	3	4
2. Class discussions give learners the opportunities to listen to the opinions of others	1	2	3	4
3. Class discussions provide opportunities for learners to think for themselves	1	2	3	4

SECTION C LEARNING ACTIVITIES:GENERAL PRINCIPLES

Read the following statements regarding the choice of learning activities and indicate on the numerical scale from 1-4 the applicability to your own classroom practice. Indicate with an X where you feel it is applicable

Question	Almost always	Often	Some-times	Very seldom
1. I choose activities that stimulate the curiosity of the learners	1	2	3	4
2. I create an atmosphere in the class of mutual respect	1	2	3	4
3. I focus on satisfying the learners' needs	1	2	3	4
4. The activities in my class challenge the intellect of the learners	1	2	3	4
5. The activities in my class challenge the imagination of learners	1	2	3	4
6. In my class learners assist each other	1	2	3	4
7. In my class learners are encouraged to question things	1	2	3	4

SECTION D QUESTIONING TECHNIQUES:GENERAL PRINCIPLES

Read the following statements regarding the types of questions posed in class and indicate on the numerical scale from 1-4 with an X where you feel it is applicable

Question	Almost always	Often	Some-times	Very seldom
1. I allow learners to give more than one correct answer to a question	1	2	3	4
2. When I give problems to solve I expect learners to make their own conclusions	1	2	3	4
3. When I ask questions learners need to provide reasons for their answers	1	2	3	4
4. I ask learners to analyse information	1	2	3	4
5. I ask learners to interpret information	1	2	3	4

SECTION E ROLE OF THE TEACHER

Read the following statements regarding the role that you play in class and indicate on the numerical scale from 1-4 the applicability to your classroom practice with an X where you feel it is applicable

Question	Strongly agree	Agree	Disagree	Strongly disagree
1. It is my responsibility to teach learners how to use their minds	1	2	3	4
2. I motivate learners to think for themselves	1	2	3	4
3. I create opportunities for learners to succeed	1	2	3	4
4. I am consistent with the learners in the class	1	2	3	4
5. I am patient with the learners in the class	1	2	3	4
6. I reward good performance by learners	1	2	3	4
7. I allow learners to not accept everything I say in class	1	2	3	4

Question	Strongly agree	Agree	Disagree	Strongly disagree
8. I allow learners to reason logically	1	2	3	4
9. I create a warm class atmosphere	1	2	3	4
10. I encourage cooperation among learners	1	2	3	4
11. I support learners in class	1	2	3	4
12. I allow learners to make their own choices	1	2	3	4
13. I present lessons in different ways (visual and/or verbal)	1	2	3	4
14. I allow learners to construct their own understanding of the content	1	2	3	4
15. I use specific vocabulary to teach thinking skills in the class	1	2	3	4
16. I encourage learners to make their own decisions	1	2	3	4
17. I encourage learners to explain (describe the process) how they came to a certain answer	1	2	3	4
18. I encourage learners not to memorize information (to explain things in their own words)	1	2	3	4
19. I teach learners how to be creative	1	2	3	4
20. I teach learners how to work with others	1	2	3	4
21. I motivate learners to judge things in class	1	2	3	4
22. I challenge learners in the class to come up with original ideas	1	2	3	4
23. I ask learners for their points of view	1	2	3	4
24. I provide learners with opportunities to formulate their own questions	1	2	3	4

SECTION F ROLE OF THE LEARNER

Read the following statements regarding the role learners should play in class and indicate on the numerical scale from 1-4 the applicability for your classroom with an X where you feel it is applicable

Question	Almost always	Often	Some-times	Very seldom
1. I allow learners to express their feelings	1	2	3	4
2. I allow learners to say what they think in class	1	2	3	4
3. I assist learners to develop their full potential	1	2	3	4
4. My learners are capable to think for themselves	1	2	3	4
5. I expect learners to question what I say in class	1	2	3	4
6. I make use of discussion to actively involve learners in the class	1	2	3	4
7. I make learners responsible for their own learning in the class	1	2	3	4
8. I let earners play an active role in their learning	1	2	3	4
9. I allow learners to solve problems on their own	1	2	3	4
10. I let learners be critical about the content I teach them	1	2	3	4
11. I allow learners to express their viewpoints	1	2	3	4
12. I allow learners to explore alternative answers for questions	1	2	3	4
13. I allow learners to generate their own questions in the class	1	2	3	4
14. I allow learners to think about the consequences of their actions	1	2	3	4
15. I allow learners to write their own summaries of the work done in the class	1	2	3	4
16. I allow learners to provide explanations (reasons) for their answers.	1	2	3	4

SECTION G TEACHING METHODS AND STRATEGIES:PRACTICAL APPLICATION

Indicate on the numerical scale from 1-4 how of you utilize the following teaching methods in class. Indicate with an X where you feel it is applicable

How often do you utilize the following methods?	Almost always	Often	Some-times	Very seldom
1. Small group activities	1	2	3	4
2. Peer collaboration (working with fellow learners)	1	2	3	4
3. Co-operative learning (working in groups to achieve a goal)	1	2	3	4
4. Direct teaching (lecturing)	1	2	3	4
5. Problem-solving	1	2	3	4
6. Discovery learning	1	2	3	4
7. Discussion	1	2	3	4

SECTION H LEARNING ACTIVITIES:PRACTICAL APPLICATION

Indicate how often you utilize the following learning activities on the numerical scale from 1-4. Indicate with an X where you feel it is applicable

How often do you involve learners in the following activities?	Almost always	Often	Some-times	Very seldom
1. To formulate their own questions	1	2	3	4
2. To explore the consequences of their actions	1	2	3	4
3. To explore various alternatives before taking action	1	2	3	4
4. Research tasks	1	2	3	4

SECTION I TYPES OF QUESTIONS:PRACTICAL APPLICATION

Indicate how often you utilize the following questions on the numerical scale from 1-4. Indicate with an X where you feel it is applicable.

How often do you expose learners to the following types of questions?	Almost always	Often	Some-times	Very seldom
1. Convergent questions (only one correct answer to a question)	1	2	3	4
2. Divergent questions (more than one possible answer)	1	2	3	4
3. Questions to make comparisons	1	2	3	4
4. To analyse information	1	2	3	4
5. To evaluate information	1	2	3	4
6. To synthesize information	1	2	3	4
7. To provide to the point (exact, precise) information	1	2	3	4