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**The implementation of Outcomes-Based Education (OBE) in Grade 8 Natural  
Science classrooms in the Western Cape**

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A minor dissertation submitted in *partial fulfillment* of the requirements for the award of the  
degree of Master in Education

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**DECLARATION**

The dissertation contains no material that has been accepted for award of any other degree or diploma in any University or tertiary institution. To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

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## ABSTRACT

Prior to 1994, the South African education system was severely divided along racial lines. However, in 1994, South Africa saw a breakthrough towards a non-racial, democratic social order. Such a challenge required a restructuring of the curriculum and this resulted in the new curriculum, *Curriculum 2005* (C2005). However, C2005 was not without its limitations, and as a result, the Revised National Curriculum Statement (RNCS) was implemented as policy. In 2002, the National Curriculum Statement (NCS) was implemented to further build on the endeavors of the NCS. The new curriculum is based on an outcomes-based philosophy (Department of Education, 1997a, 1997b). The outcomes-based teaching approach aims to maximize students learning potential by setting outcomes to be achieved at the end of the education process (DoE, 2003).

The present study aimed to monitor the extent to which educators implement an outcomes-based environment in Grade 8 Natural Science classrooms in the Western Cape. The results from the current study in the Western Cape were compared to those collected in a matching study done by Aldridge, Laugksch, Seopa and Fraser (2006) in the Limpopo Province. The comparison is essential as it provides a general impression of the extent to which educators implement an outcomes-based learning environment in South Africa.

This study is a replication study of research conducted by Aldridge, *et al.* (2006), and makes use of a mixed-methods research approach. The nature of the study lent itself to large scale collection of quantitative data. Quantitative data were collected in the form of questionnaires. The questionnaires used, were developed by Aldridge, *et al.* (2006) and called the *Outcomes-Based Learning Environment Questionnaire* (OBLEQ). The OBLEQ was adapted for use in the Western Cape by translating the already existing questionnaire into Afrikaans and isiXhosa. The adapted instrument is referred to as the *Outcomes-Based Learning Environment Questionnaire-Western Cape* (OBLEQ-WC).

The instrument was administered to 927 students in 30 schools in four Education Management District Centers (EMDC) in the Western Cape. The quantitative data were subject to various statistical analyses. Classrooms observation as well as student and educator interviews were conducted in five classrooms. The qualitative data were used to further explain the trends in the quantitative data by providing reasons to explain the discrepancies between students' perceptions

of their actual and preferred perceptions of their classroom environment. A regression model was developed and a statistical comparison was made between the results from the Limpopo Province and the results from the Western Cape.

Generally, the findings of the study suggest that OBE is being implemented in science classes in the Western Cape, but that the dimensions which characterize an outcomes-based learning environment are implemented to varying extents. The results from the study suggest that there are discrepancies between students' actual and preferred perceptions of their outcomes-based learning environment.

In terms of key student outcomes, the results from these findings suggest five out of the six OBLEQ-WC scales (*Involvement/Investigation*, *Equity*, *Differentiation*, *Personal Relevance* and *Responsibility for own Learning*) were found to be independent predictors of student attitude at the individual level of analysis. A significant association exists between the scales of *Involvement/Investigation*, *Co-operation*, *Personal Relevance* and *Responsibility for own Learning* and the student outcome of equity. This suggests that for students to perceive fairness in their classrooms educators should encourage a co-operative learning environment among students and actively involve them in relevant class activities that foster investigation skills. Two of the OBLEQ-WC scales, namely, *Co-operation* and *Equity* are independent predictors of student achievement in science classes in the Western Cape. This implies that attempts by educators to enhance student academic achievement should integrate teaching and learning strategies measured through these critical OBE dimensions. However, there is a negative association between students' academic achievement and the environment scale of *Responsibility for Own Learning*.

In terms of the comparison between the Western Cape and Limpopo Province, it appears that educators in the Western Cape implement OBE to a greater extent than educators in the Limpopo Province. This could be due to the cast difference between the two provinces.

Based on the findings of this study, recommendations were made with respect to classroom practices and professional development programs for science educators. Educators may need to make a distinction between the classroom dimension of *Involvement* and *Investigation*. It is further suggested that educators inform students about the difference between equity and

differentiation. Finally, it is suggested that educators allow students to be active participants in their learning process.

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# Chapter 1

## INTRODUCTION

The implementation of Outcomes-Based Education (OBE) in Grade 8 Science classrooms in the Western Cape Province in South Africa is investigated in this study. The current study is a replication of the research conducted in the Limpopo Province by Aldridge, Laugksch, Seopa and Fraser (2006).

### 1.1 Background and Rationale

In the past, education policies in South Africa have been severely divided along racial lines (Department of Education [DoE], 1995). However, in the early 1990s negotiations for a democratic government took place and the 1994 democratic elections saw an important advance towards a non-racial and democratic social order (DoE, 1995). The then newly elected democratic government established that education was a key issue in the transformation of South Africa as a country (DoE, 2000).

The transformation of education policies led to curriculum reform which has been a central part of the government's long term plan to reconstruct policies. As a result, *Curriculum 2005* (C2005) was implemented as a new education policy in schools. The new curriculum aimed to encompass a theory of constructivism and the philosophy of Outcomes-Based Education (OBE) to promote a student-centered teaching approach (Botha 2002; DoE, 2002; Jansen & Christie, 1999 and Spady 2004). However, there were many shortcomings concerning the implementation of this curriculum (Chisholm, Volmink, Potenza, Muller, Vinjevold, Malan, et al. 2000). To address these problems, a process was initiated to revise the curriculum, and the Revised National Curriculum Statement (RNCS) was accepted as policy in 2002.

The curriculum reform which South Africa is experiencing is arguably one of the most adventurous educational innovations (Malcolm, 2001). South Africa is one of the many countries (e.g. Australia, [Malcolm, 2001:200; Adrick, 2002], New Zealand [Bell, Jones & Carr, 1995] and the United Kingdom [Faris, 1998]) to have implemented an innovative outcomes-based teaching approach. An assessment of the implementation of OBE underpinning this curriculum reform in South African Science learning environments is thus imperative. A field of research which can be successfully used to monitor and assess educational innovations is that of Learning Environment Research (LER) (Fraser, 1998a).

Therefore, it would be useful to use the field of LER as an approach to address the curriculum reform in South Africa.

Although the field of LER has been in existence for over 30 years, it is still in its infancy in South Africa (Fisher & Fraser, 2003). Adams (1996) used the *Science Laboratory Environment Inventory* (SLEI) to investigate students' perceptions of laboratory classroom environments in the Western Cape. Ntuli, Aldridge and Fraser (2003) conducted a study where the WIHIC was administered to 1077 primary school students in Kwa-Zulu Natal, South Africa to investigate improving primary school mathematics learning. A more recent study conducted by Aldridge, Fraser and Sebela (2004) aimed to assist mathematics educators in their daily teaching by improving their learning environments. The most recent study (Aldridge, *et al.*, 2006) aimed to explore outcomes-based learning environments in the Limpopo Province in South Africa using a newly developed *Outcomes-Based Learning Environment Questionnaire* (OBLEQ).

The Limpopo Province is different to the Western Cape in a number of respects. The Limpopo Province is one of the poorest provinces in South Africa in terms of physical infrastructure (DoE, 2003). In contrast, the Western Cape Province is one of the most prosperous of the nine provinces in South Africa (Phurutse 2005). The Limpopo Province is largely rural, with ten percent of the population being urban, while ninety percent of the Western Cape is urban (Lehohla, 2006). The Limpopo Province is characterized by a high unemployment rate. The average annual school fees in the Limpopo Province are R100 a year while the average annual fees of a school in the Western Cape are approximately R700 (Phurutse, 2005). Comparatively there are fewer students per class in the Western Cape than in the Limpopo Province (Phurutse, 2005). The student-to-educator ratio in the Western Cape is lower than that of the Limpopo Province (31:1 and 34:1, respectively) (DoE, 2006: 1).

An investigation of outcomes-based learning environments' in the Western Cape will thus provide information about a context that is different to the Limpopo Province and will therefore provide a more comprehensive perspective about South Africa as a whole. It is thus essential to provide this comparison as it should contribute to a better understanding of the extent to which Outcomes-Based Education has been implemented in South Africa in general.

## **1.2 Research Statement**

This study will use an adapted learning environment instrument (i.e., OBLEQ-WC) to ascertain the extent to which a key feature of contemporary education reform in South Africa – OBE – is being implemented in Grade 8 Natural Science classrooms in the Western Cape. The possible influence of OBE learning environments on key student outcomes will be investigated.

## **1.3 Aims and Objectives**

The present study aims to monitor the extent to which Outcomes-Based Education has been implemented in South African Natural Science classrooms in the Western Cape.

Objectives of the study are thus the following:

- a. To adapt and validate an existing questionnaire for investigating outcomes-based learning environments in science classrooms;
- b. To describe the learning environments of science classrooms in both quantitative terms (using the questionnaire) and qualitative ones (using additional classroom observations and interview data);
- c. To investigate whether outcomes-based learning environments in science promote important student outcomes; and
- d. To compare the results from the Western Cape Province study to those of the Limpopo Province.

## **1.4 Research questions**

The current study aims to answer the following primary research questions: To what extent is OBE implemented in Grade 8 Science classes in the Western Cape? The present study will seek to provide an analysis of the implementation of OBE in Grade 8 Science classrooms in the Western Cape Province in South Arica, and compare the results to those of the Limpopo Province. The main research question can be divided into four sub-research questions:

1. To what extent do educators implement an outcomes-based learning environment in Grade 8 science classes in the Western Cape? (Objectives a and b)

2. Do different levels of congruence between students experiences (i.e., actual) and preferred learning environment in selected Grade 8 classrooms in the Western Cape occur and, if so, why? (Objectives a and b)
3. What is the influence of outcomes-based learning environment in promoting student attitude towards Science, equity, and academic achievement? (Objective c)
4. How do the results from the Western Cape compare with results collected in the Limpopo Province? (Objective d)

### **1.5 Significance of the Study**

The motivation for conducting this study in the Western Cape is to provide data on outcomes-based learning environments in this province in South Africa. In the current study, data is provided on science learning environments in the Western Cape and these data are compared with data collected in a matching study in the Limpopo Province. It is essential to provide this comparison as it should contribute to a better understanding of the extent to which Outcomes-Based Education has been implemented in South Africa in general. It is expected that the results from this study will contribute to providing a clearer impression of the degree to which the education system in South Africa has been transformed in line with curriculum expectations and demands.

LER is just emerging in South Africa, despite the 30 years that the field has been in existence (Fisher & Fraser, 2003). The study is significant in a broader sense as it is expected to make a worthwhile contribution to the field of LER by providing a better understanding of learning environments in South Africa.

### **1.6 Delimitation of the research**

This study will focus on randomly selected schools from four Education Management District Centers (EMDC) areas around Cape Town, specifically EMDC Central, EMDC East, EMDC North and EMDC South. The majority of schools in the Western Cape are located in these four EMDCs (51%) (DoE, 2006), and as a result, this study will concentrate on these four EMDCs.

## **1.7 Clarification of Terms**

In this study, key concepts are defined as follows:

### *1.7.1 Learning environments*

A learning environment refers to the social, psychological and pedagogical framework in which learning occurs. The factors within this framework will affect the students' attitudes which are directly related to their Achievement score (Fraser, 1998a).

### *1.7.2 Outcomes-Based Education (OBE)*

OBE is a teaching approach that centers on educators focusing and organizing lessons around what a student needs to achieve by the end of the lesson (Spady, 1994a).

### *1.7.3 Science*

Science refers to the Natural Science learning area for Grade 8, as outlined in the Revised National Curriculum Statement (RNCS) (DoE, 2002).

## **1.8 Structure of Dissertation**

In the next chapter (Chapter 2), a detailed literature review is provided. Here, the background to the South African education system is given, Outcomes-Based Education (OBE) is defined, and the advantages and disadvantages of this curriculum feature are provided. The field of Learning Environments Research (LER) includes a number of studies that are focused on evaluating educational reforms such as OBE. As a result research involving LER will be described.

The research designs employed by this study are covered in Chapter 3. The development of the instrument used in this study is described and the adaptations made to the instrument for use in the Western Cape are made clear. The piloting and administration of the instrument to 927 students in the Western Cape is also described in this chapter.

An outline of both the quantitative and qualitative data analyses is provided in Chapter 4, and the findings from both the quantitative and qualitative data analyses are reported.

In Chapter 5, the limitations of the study are highlighted, the answers to the research questions are provided, and the implications of the findings for educators, researchers and policy makers are discussed. Finally, recommendations for classroom practice are provided.

## Chapter 2

### LITERATURE REVIEW

The birth of democracy in South Africa in 1994 saw the emergence of inevitable political and social changes. Among these changes was the reform of the school curriculum. Through the educational reform a new curriculum was established, that is *Curriculum 2005* (DoE, 1995). The field of Learning Environment Research (LER) can be used as an approach to assess the implementation of curriculum innovations such a curriculum reform (Fraser, 1998a). Research of this type provides a conceptual framework for the present study in terms of the approach used, the instruments developed, and the appropriate methods used for studying classroom environments. In this chapter, the literature on curriculum reform in South Africa is reviewed with specific emphasis on the implementation of OBE, highlighting the advantages and disadvantages of this teaching innovation. This chapter also provides an outline of the distinctive features of LER, as well as a detailed description of the most significant and contemporary learning environment instruments. Finally, the emergence of LER in South African research is described.

#### 2.1 Background to South African education system

In order to explain the current trends in the South African education system, it is imperative to examine the transformation that the education system has undergone since the birth of democracy in the early 1990s. Consequently, the South African education system before 1994 will be described with respect to the process that led up to the eradication of the Apartheid regime, and thereafter the transformation of education in post-Apartheid South Africa will be explored. This transformation led to many curriculum reforms and these reforms will be reviewed.

##### 2.1.1 The South African education system: Pre-1994

The South African education system prior to 1994 was fragmented, and discriminated with respect to language, culture, colour and creed. There were 18 different education departments, all responsible for providing education to different race groups in South Africa (Harley & Wedekind, 2004). The structure of black<sup>1</sup> education in South Africa was influenced by two

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<sup>1</sup> In this dissertation, 'black' refers to individuals who under Apartheid were classified as African, Coloured or Indian.

major policies. The first was the Bantu Education Act of 1953. The policy ensured that blacks<sup>1</sup> were allowed limited access to education and higher qualifications and as a result were forced to work in positions which did not require much skill (DoE, 2000). Bloom (cited in Mncwabe, 1990: 20) argued that, "Bantu education promoted tribalism and makes it increasingly difficult for an African to participate in the industrialised world of modern economic system as an equal with Whites in South Africa." The second policy that also played an influential role in shaping the education system in South African before 1994 was that of the National Education Policy Act of 1967. This policy sanctioned self development through the separation and segregation of race groups on the basis of cultural, language or ethnic grounds (RSA, 1996a).

In terms of the apartheid school curriculum, it was noted by van der Horst and McDonald (1997:26) that "during the Bantu Education era there was always a reliance on the textbook and authoritarian educational methods." The educator and the curriculum were regarded as the main sources of knowledge, where the educator was in charge of the learning process. The teaching approach employed by educators was educator-centred, where the educator guides the learning process. However, in the early 1990s negotiations for a democratic government took place and the 1994 democratic elections saw an important advance towards a non-racial and democratic social order (DoE, 1995). The then newly elected democratic government established that education was a key issue in the transformation of South Africa as a country (DoE, 2000).

### ***2.1.2 Transformation of South African Education System: Post-1994***

The transformation process was driven by two imperatives as indicated in DoE (2001a). The first was for the government to overcome the damage that the Apartheid regime caused. This led to curriculum reform which had been a central part of the new democratically elected government's long term plan to reconstruct the education policies of South Africa, aiming to create a system that built democracy and equality amongst South African citizens. The second imperative aimed to establish an incentive for 'lifelong learning'.

Due to the education policy reform in the mid to late 1990s, education became more accessible and more applicable to the lives of South Africans (Chisholm, *et al.*, 2000). The education reform process began with the execution of a new curriculum under the influence of Outcomes-Based Education (DoE, 2001b). In the next section, the curriculum advancements made between 1994 and 2008 will be described.

### ***2.1.3 Curriculum advancements made between 1994 and 2008***

*Curriculum 2005* (C2005) was introduced to schools in 1998. The curriculum aimed to provide students with knowledge as well as skills and values that aid in improving the quality of life for all citizens of the nation (DoE, 1995). In spite of this, C2005 was not without its limitations. The curriculum introduced many new terms and challenges to educators and associated education stakeholders. The smooth implementation of C2005 was hampered by under-qualified educators, large class sizes and very poor facilities, specifically in poorer African communities (DoE, 2001b). In order to address the shortcomings of C2005, as identified by the Curriculum Review Committee (Chisholm, *et al.*, 2000), a process to revise the curriculum began in 2000. The committee recommended that C2005 needed to be restructured with respect to specific outlined intentions, and a Revised National Curriculum Statement (RNCS) needed to be developed (Chisholm, *et al.*, 2000). The development of the RNCS required that the outcomes and assessment indicators would be clearly specified for each particular developmental level (i.e., Grade). It also required that the curriculum statement used clear and simple language (Chisholm, *et al.*, 2000).

Once these changes were made, the Department of Education pioneered the first draft of the Revised National Curriculum Statement (RNCS) for each learning area (i.e. subject) (DoE, 2001). The RNCS aimed to provide guidelines for implementing C2005 using an OBE-based framework (DoE, 2001). The RNCS encouraged student-centered education and aimed to promote the use of a constructivist teaching approach to complete a desired outcome (DoE, 2001). The RNCS also aimed to specify the curriculum requirements at various levels and phases. In addition, the RNCS clearly spelt out of the knowledge, skills, attitudes and values that a student needed to develop through this teaching approach (Chisholm, *et al.*, 2000). To further streamline the RNCS, the Department of Education's National Curriculum Statement (NCS) draft was introduced in 2001, and the final version of the NCS was accepted as policy in 2002 (DoE, 2002). The NCS intended to further build on the endeavours of the RNCS. In addition to the aims of the RNCS, the NCS aimed to promote a curriculum and a teaching approach that was student-centered. It also aimed to encompass the theory of constructivism and the philosophy of Outcomes-Based Education (DoE, 2002). The RNCS is currently being implemented in classrooms (Grade R- 9) around South Africa and will be explored in further detail in subsequent sections.

The above framework outlines the development of and the major curriculum reform that the South African education system has undergone since 1994. The curriculum advancements made since 1994 are underpinned by an outcomes-based teaching approach. An assessment of

the implementation of OBE in South African science classroom learning environments is thus imperative. The outcomes-based teaching approach is an educational innovation which needs to be monitored in order to assess the degree of transformation in education due to curriculum reforms (Jansen, 1999).

## **2.2 Outcomes-Based Education (OBE)**

A review the literature on OBE will be provided in the following section. Initially, the origins and definitions of OBE will be outlined. The advantages and disadvantages of the outcomes-based teaching approach are provided. Traditional models of education are explored, which provides the motivation for the shift from a traditional teaching approach to an outcomes-based teaching approach. Subsequently, the outcomes-based teaching approach is described and placed within the context of the South African education system.

### ***2.2.1 Defining OBE***

OBE is an approach to planning, delivering and evaluating instruction that requires educators and students to focus their attention and efforts on the desired results of a particular lesson or assignment (Spady, 1994a). It is a student-centered teaching approach that places emphasis on the outcomes which should be achieved by students (Botha, 2002). The outcomes become evident at the end of the learning process when students can demonstrate their understanding of the concepts by outwardly demonstrating that they have mastered these outcomes (Warren, 2003). OBE was implemented in South Africa as a teaching approach which would allow educators to prepare students' for life after school, as well as make the school curriculum relevant to the students' lives (Jansen & Christie, 1999).

OBE can be described as a global educational curriculum reform that has been adapted for the South African education system (Cross, Mungadi & Rouhani, 2002). The origins and evolution of OBE can hardly be traced back to one individual country (Cross, *et al.*, 2002) and therefore OBE does not have a single historical legacy (Jansen, 1999). South Africa is one of the many countries (e.g., Australia, [Malcolm, 2001:200; Adrick, 2002], New Zealand [Bell, Jones & Carr, 1995] and the United Kingdom [Faris, 1998]) to have implemented this innovative outcomes-based teaching approach. It is thus not surprising that the models used in these countries were influential in shaping the educational reforms which the South African education system has experienced (Dzvimbo, 1999).

### *2.2.2 Advantages and disadvantages of OBE*

At first glance, there appear to be sound reasons for curriculum reform to be based on OBE (DoE, 2001). The outcomes-based teaching approach strives to enable all students to maximize their learning potential, by setting learning outcomes to be achieved by the end of the education process (DoE, 2003: 2). These outcomes direct assessment at specific goals and indicate the subject matter worth learning in a content-heavy curriculum (Jansen, 1991). This approach also aims to improve fairness of opportunities in a multicultural and economically diverse nation by building national identity (Jansen, 1998). It intends to create more skills amongst the people of the nation by shifting the economic base from primary production to value added production. The outcomes-based teaching approach emphasizes competence, creativity and self-management rather than only knowledge acquisition (Jansen, 1998). It aspires to guide the management within a school, increasing the accountability of educators in that school (Jansen, 1998). The outcomes-based teaching approach strives for lifelong learning and better communication between schools and other education stakeholders.

Although the advantages of OBE are laudable, critics have argued that there are many disadvantages to this teaching approach (Jansen 1999). It has been thought of as constraining inquiry, disadvantaging capable students, disregarding the educators' role in the learning environment, increasing the educators' workload by individualizing each student's assessment and teaching and creating a quasi-scientific planning procedure (Brady, 1997).

Jansen (1999) outlines ten principal criticisms of OBE as a curriculum reform. One of the criticisms is that the language associated with OBE-based curriculum reform is too complex and difficult for educators to identify with. In order to understand simple terms such as 'outcomes', educators will need to be aware of a number of concepts underpinning the development of the curriculum. However many educators in South Africa do not possess the qualifications which lead to this knowledge. This leads to Jansen's second argument. He highlights outcomes-based curriculum reform as being established on flawed assumptions about the structure within schools and the qualifications of many educators in South Africa. The outcomes-based curriculum reform requires not only an application of a skill but also an understanding of the theoretical underpinnings across different contexts. In his opinion, this policy was modelled on the notion that classes are small and that educators are well qualified. This is not always the case in South Africa, and as a result hinders the effectiveness of OBE. There are also many administrative burdens that are placed on educators as a result of the management of OBE. This is disadvantageous to its implementation.

In South Africa, the movement towards outcomes-based curriculum reform was organized on a platform of outcomes. Jansen argues that there is something questionable about a focus on ends as final outcomes when much of the educational and political struggle of the 1980s valued the processes of learning and teaching as ends in themselves. He addresses the notion that OBE focuses on outcomes which students need to have achieved, however argues that OBE curriculum does not define the content with which these outcomes need to be achieved. Therefore there are many interpretations of one outcome. In Jansen's opinion, the activities which are advocated for in the OBE policy do not lend themselves to helpful outcomes. Worthwhile activities have their own "built-in outcomes and standards of excellence" (Jansen, 1999: 323). These may not be explicitly stated; however they can be evaluated according to the standards inherent in them rather than an outcome that is stated at the end of the process.

Jansen (1999) claims that the assumptions about the relationship between the curriculum and the society are problematic. OBE was implemented to change the nature of the education system as a result changing the economic growth rate in South Africa (DoE, undated). However Jansen claims that there is no evidence in curriculum history that suggests that by altering the curriculum there will be a direct change in national economies.

### **2.3 Learning Environment Research (LER)**

In the past, research in Science Education has relied heavily on the assessment of achievement scores as well as other highly valued learning outcomes. However, these assessments alone cannot give a holistic measure of an educational environment (Fraser, 1998a). As the majority of students will have spent up to 15 000 hours in the classroom once finished high school (Fraser, 1998a), their perceptions of their learning environments are significant to consider if improvements are to be made within the educational environments. In the last 30 years, there has been a considerable and growing international interest in the conceptualization, measurement and investigation of perceptions of the psychological characteristics of learning environments in primary, secondary and tertiary educational contexts (Kim, Fisher & Fraser, 1999; Fraser, 1998a; Fraser, 1998b).

The progress made over the last 30 years in conceptualizing, processing and investigating the social and psychological aspects of learning environments (Fraser, 1998) will be addressed in the subsequent sections in the literature review. To begin with, the historical perspectives on past work on Learning Environment Research (LER) are examined. This is significant as it provides a framework on which future research can be based. Recent research involves the use of practical and historically important instruments and questionnaires. The most significant

and contemporary of these instruments are described. Once the instruments have been explored, the distinctive features of LER are highlighted. Research and applications involving LER instruments will then be focussed upon. Finally, the emergence of LER in South Africa is highlighted.

### *2.3.1 Historical perspectives on past work*

Kurt Lewin in 1936 was the first researcher to recognise that interactions with the environment are determinants of behaviour in an individual (Fraser, 1998b). Lewin's formula,  $B = f(P, E)$ , explained that behaviour is considered a function of the person and their interactions with the environment (Fraser, 1998b). Murray, in 1938, proposed a Needs-Press Model which stressed the same point that Lewin had made previously. Murray introduced the terms 'alpha press' to describe an environment which can be assessed by a detached observer and 'beta press' which describes an environment as assessed by the individuals within an environment (Fraser, 1998b). He emphasized that variables in the environment will account for the degree of behavioural variance in an individual (Aldridge & Fraser, 2000). Murray's Needs-Press Model led to the development of Getzels and Thelen's theory in 1960. The theory suggested that a class is a social system and that the interaction between personalities, the environment and the expectations of students will predict their behaviour, including student outcomes (Aldridge & Fraser, 2000). The next development in the field of Learning Environment Research was Stern's Person-Environment Congruence theory in 1970. This theory was based on Murray's Needs-Press Model. Stern explored the model and came to the conclusion that the higher the degree between individuals personal needs and their interactions with the environment, the more enhanced the learning outcomes (Aldridge & Fraser, 2000). Stein and Bloom in 1956 extended the Needs-Press Model to distinguish between the view that each person has of the environment (*private* beta press) and the shared view that a group of individuals hold about the environment (*consensual* beta press) (Fraser, 1998b). These studies as described above laid the foundation on which all LER is based and lead to an important milestone in the historical development of the field of Learning Environment Research.

In 1970, Herbert Walberg and Rudolf Moos began independent research which sparked interest in LER. Walberg, as part of the research for the evaluation of the Harvard Project Physics developed the *Learning Environment Inventory* (LEI) (Walberg & Anderson, 1968:44). At the same time, Moos developed the social climate scales measuring individuals' perceptions of human environments such as psychiatric hospitals, prisons, university residences and work contexts (Moos, 1979). It is upon the work of Moos (1979) that all LER instruments are designed (Fraser, 1998a). Moos developed three classification dimensions to

assess any human environment (Moos, 1979). These three dimensions include the *Relationship* dimension which identifies the nature and intensity of the personal relationships which exist within an environment. The dimension assesses the degree to which an individual is involved in the environment, and the extent to which individuals support and help each other. The second dimension is that of *Personal Development*. This dimension assesses the extent to which individuals undergo personal growth and self enhancement. The third dimension is that of *System Maintenance and System Change*. This dimension assesses the extent to which the environment is orderly and clear in expectations. From these dimensions, Moos (1979) was able to develop an instrument to assess individuals' perceptions of an educational context. This instrument was labelled the *Classroom Environment Scale* (CES) (Aldridge & Fraser, 2000; Fraser, 1998b).

### *2.3.2 Research involving classroom environment instruments*

Past LER research has made use of instruments (i.e., questionnaires) by applying them to very specific educational contexts, which focus on 1) the associations between student outcomes and the environment, 2) evaluation of educational innovations, 3) differences between student evaluation and educators perceptions of the same classroom environment, 4) student performance in preferred classroom environments, 5) educators attempts to improve classroom environments, 6) combining quantitative and qualitative research methods, 7) applications to school psychology, 8) links between educational environments, 9) cross-national studies, 10) transition from primary to secondary school, 11) educators education, and 12) educator assessment. In order to investigate the many applications of Learning Environments Research (LER) (Fraser, 2002), this section considers three of the 12 types of past research as these are the most appropriate to the current research.

#### *2.3.2.1 Evaluation of Educational Innovations*

“Classroom environment instruments can be used to assess educational innovations such as curriculum reform and the use of technologies to mediate the learning process” (Fraser, 1998a: 18). The significance of this evaluation is that classroom environments are often perceived in a different way during the implementation of the proposed innovation. For example Maor and Fraser (1996) conducted a study that incorporated the use of a classroom environment instrument to evaluate the implementation of a computerised database. The results revealed that students' perceived their classes had become more inquiry based during the use of this innovation (Maor & Fraser, 1996).

### 2.3.2.2 Associations between student outcomes and the environment

The most solid tradition in LER has involved research into associations between student outcomes, and their perceptions' of their learning environment. A variety of classroom instruments (see Table 2.1, pg 22) have been used in a number of studies, across numerous countries and grade levels, to provide the associations between outcome measures and classroom environment perceptions (Fraser, 1994). From these studies, classroom and school environment was found to be a strong predictor of both student achievement score and attitudes (Fraser, 1998a).

### 2.3.2.3 Differences between student and educator perceptions of actual and preferred learning environments.

Fisher and Fraser (1983a) reported a study which investigated the differences between students' and educators' perceptions of their actual and preferred classroom environment. They found that students preferred a more positive classroom environment than was actually present, and educators perceived their classroom environments to be more positive than the students within that classroom environment. These results replicate a number of emerging patterns in classrooms in the USA (Moos, 1979), Israel (Hofstein & Lazarowitz, 1986) and the Netherlands (Wubbels & Levy, 1991).

The next section of the literature review will be devoted to the emergence of LER in South Africa.

### *2.3.3 Specific instruments for assessing perceptions of classroom environment*

A historical look into the field of LER over the past three decades shows that a striking feature is the accessibility of widely available, valid and economical questionnaires which act as instruments to assess students', educators' and researchers' perceptions of classroom learning environments (Aldridge & Fraser, 2000; Fraser, 1998a). Few fields can offer such a rich array of validated and "robust" instruments that have many research applications (Aldridge & Fraser, 2000). For example, specific questionnaires focus on individualized, computer assisted, constructivist, multimedia, distance education and internet learning environments (Fraser, 1998b).

The following historically important and contemporary instruments are used in LER: *Learning Environment Instrument (LEI)*; *Classroom Environment Scale (CES)*; *Individualised Classroom Environment Questionnaire (ICEQ)*; *My Class Inventory (MCI)*; *College and*

*University Classroom Environment Inventory (CUCED); Questionnaire on Educator Interaction (QTI); Science Laboratory Environment Inventory (SLEI); Constructivist Learning Environment Survey (CLES); and What Is Happening In This Class? (WIHIC).* A summary of each of the instruments is provided in Table 2.1. The table will show the name of each of the nine instruments, the level for which each instrument is suited, the number of items in each of the scales, and the classification of each of the scales according to Moos (1979) scheme for classifying human environments. In this section, only the *Constructivist Learning Environment Survey (CLES); and What Is Happening In This Class? (WIHIC)* will be described as these instruments are relevant to the developed and adapted OBLEQ.

#### 2.3.3.1 Constructivist Learning Environment Survey (CLES)

In terms of the constructivist learning theory, “learning is a cognitive process that involves a conceptual change in which individuals make sense of the world in relation to the knowledge which they have internally constructed” (Taylor, Fraser & Fisher, 1997: 296). This conceptual change involves active participation of the student, and is a student centred teaching approach (Fraser, 1998a). The CLES was developed to assist educators and researchers in recognizing the degree to which a learning environment is consistent with the constructivist epistemology (Fraser, 1998a). The CLES has five scales with 36 items (Table 2.1, pg 22). There are five response alternatives’ ranging from Almost Never to Almost Always (Kim, Fisher & Fraser, 1999).

**Table 2.1** Overview of the most historically important and contemporary environment instruments (LEI, CES, ICEQ, MCI, CUCEI, QTI, SLEI, CLES, WIHIC) (Fraser, 1998a: 10).

<i>Instrument</i>	<i>Level</i>	<i>Items per scale</i>	<i>Relationship dimension</i>	<i>Personal Development dimensions</i>	<i>System Maintenance and Change dimensions</i>
<i>Learning Environment Inventory (LEI)</i> (Walberg & Anderson, 1968; Fraser, 1998a)	Secondary	7	Cohesiveness Friction Favouritism Cliquesness Satisfaction Apathy	Speed Difficulty Competitiveness	Diversity Formality Material environment Goal direction Disorganization Democracy
<i>Classroom Environment Scale (CES)</i> (Moos, 1974; Fraser, 1998a)	Secondary	10	Affiliation Educator support	Task orientation Competition	Order and organisation Rule Clarity Educator control Innovation
<i>Individualized Classroom Environment Questionnaire (ICEQ)</i> (Fraser 1998a)	Secondary	10	Personalisation Participation	Independence Investigation	Differentiation
<i>My Class Inventory (MCI)</i> (Fraser, 1998a)	Elementary	6-9	Cohesiveness Friction Satisfaction	Difficulty Competitiveness	
<i>College and University Classroom Environment Inventory (CUCEI)</i> (Fraser, 1998a)	Higher Education	7	Personalisation Involvement Student cohesiveness Satisfaction	Task Orientation	Innovation Individualization
<i>Questionnaire in Educator Interaction (QTI)</i> (Wubbels & Levy, 1993; Fraser, 1998a)	Secondary/ Primary	8-10	Helpful/ friendly Understanding Dissatisfied Admonishing		Leadership Student responsibility and freedom Uncertain Strict
<i>Science Laboratory Environment Inventory (SLEI)</i> (Fraser & McRobbie, 1995; Fraser 1998a)	Upper Secondary/ Higher Education	7	Student cohesiveness	Open-Endedness Integration	Rule clarity Material environment
<i>Constructivist Learning Environment Survey (CLES)</i> (Taylor, Fraser & Fisher, 1997; Fraser 1998a)	Secondary	7	Personal relevance Uncertainty	Critical voice Shared control	Student negotiation
<i>What Is Happening In This Classroom (WIHIC)</i> (Dorman, 2003; Fraser, 1998a)	Secondary	8	Student cohesiveness Educator support Involvement	Investigation Task orientation Cooperation	Equity

### 2.3.3.2 What is Happening In This Class (WIHIC) Questionnaire

“The WIHIC questionnaire brings a degree of parsimony to the field of classroom Learning Environment Research” (Fraser, 1998a: 22). It is a questionnaire which combines the most salient scales from the wide range of historically important questionnaires. Additional scales have been added to incorporate some of the more contemporary educational concerns such as constructivism and equity (Fraser, 1998a). The original 90 item, nine scale questionnaire was refined by statistical analysis of the data after the questionnaire had been completed by junior school students. The questionnaire was further developed by extensive interviewing of students about their views of their science classroom environments (Fraser, 2002). The final published version contains 54 items within seven scales (Table 2.1, pg 22). These scales include; Student cohesiveness, Educator Support, Involvement, Investigation, Task Orientation, Cooperation and Equity (Fraser, 2002). Each item used a five point frequency response format (viz. Almost Never, Seldom, Sometimes, Often, Almost Always) ( Dorman, 2003).

The WIHIC is a newly developed instrument; however the use of this instrument in Asia has been frequent. It has been translated into several different Asian Languages (e.g. Brunei, Darussalam [Khine & Fisher, 2001; Riah & Fraser, 1998], Singapore [Fraser & Chionh, 2000; Khoo & Fraser, 1998], Taiwan [Aldridge & Fraser, 2000; Aldridge, Fraser & Huang, 1999], China [Chua, Wong & Chen 2001], Korea [Kim, Fisher & Fraser, 2000] and Indonesia [Margianti, Fraser & Aldridge 2001].

### ***2.3.4 Distinctive features of Learning Environment Research***

One of the distinctive features of many of the instruments described in the above section is that they not only provide a measure of the students perceptions of their ‘actual’ learning environments, but the instruments also provide a measure of the students’ perceptions of their ‘preferred’ various learning environments (Fraser, 1998a). Although item wording is similar for actual and preferred forms, slightly different instructions for answering each are used (Fraser, 1998a). The ‘actual’ measure of students’ perceptions refers to the students’ concrete experiences of their learning environment. The ‘preferred’ measure of the students’ perceptions refers to the way which students would like their learning environments to be (Fraser, 1998a).

Another striking feature of LER is the growth in the use of both quantitative and qualitative methods in a combined research design (Fraser, 1998b). Once a study using quantitative methods has been completed, the findings can be contextualized with a description of the observations and verbal accounts from the participants (Tobin & Fraser, 1998). The qualitative data can be used to explicate the trends apparent in the quantitative data (Tobin & Fraser, 1998).

### *2.3.5 Emergence of LER in South Africa*

Although Learning Environment Research has been existence for over 30 years, it is still considered to be in its infancy in South Africa. However, there has been an increasing amount of interest in this field of research (Fisher & Fraser, 2003). The most prominent studies that have been carried out in South Africa in this field are described next.

The earliest study conducted in South Africa on Learning Environment Research was carried out in 1996. Adams (1996) administered the SLEI to 264 science and biology students in 16 classes throughout the Western Cape Province. The aim of this study was to investigate students' perceptions of laboratory classroom environments. The study showed that there were significant differences between students' perceptions of their actual and preferred classroom laboratory environment. It also showed that students within a class perceive a laboratory classroom environment similarly.

In a study by Ntuli, Aldridge and Fraser (2003), the WIHIC was administered to 1077 primary school students in rural Kwa-Zulu Natal to investigate the learning environment assessment for improving primary school mathematics teaching. The study examined the feasibility of distance educators using learning environment instruments to assess their own teaching practice and assisting educators to become involved in action research aimed at improving their teaching practice in primary schools. The study examined students' perceptions of their actual and preferred classroom environment in the classes of educators attending a distance course, as well as examining the extent to which learning environment questionnaires can guide educator improvement of classroom environments (Ntuli, Aldridge & Fraser, 2003).

A study carried out by Aldridge, Fraser and Sebela (2004) aimed to use educator action research to promote constructivist learning environments in South Africa. The study involved the collection of a combination of quantitative and qualitative data. The first phase involved the collection of the quantitative data. The CLES was administered to assess students' perceptions' on constructivism in the classroom environment. The survey was administered to

1864 students in 43 classes and analyzed to determine if the CLES was valid and reliable for use in South Africa (Aldridge, Fraser & Sebela, 2004). Graphical representations of students' perceptions of their actual and preferred learning environments were generated from the results from the CLES. In the second phase of the research, a 12-week intervention enabled educators to use the graphical profiles to develop strategies which aimed to improve the constructivist learning environment. The educators were able to implement their strategies and were required to keep a reflective journal. At the end of the 12-weeks, the CLES was re-administered to determine how students' perceptions of their constructivist learning environment had changed (Aldridge, Fraser & Sebela, 2004). This study aimed to investigate whether educators were able to make use of students' responses to the CLES and use these responses to improve the learning environment (Aldridge, Fraser & Sebela, 2004).

Aldridge, Laugksch and Fraser (2006) developed and validated a questionnaire which aimed to assess educators' perceptions of their actual and preferred school level environment (*School Level Environment Questionnaire*). This questionnaire aimed to investigate whether educators involved in Outcomes-Based Education (OBE) perceive their school-level environment differently to educators not involved with OBE. The *School Level Environment Questionnaire* (SLEQ) was modified and adapted to make it suitable for assessing the school-level environment in South Africa. Quantitative data was collected from administering the SLEQ to 403 educators in 54 schools in the Limpopo Province. Schools were selected from a rural area, a township environment and an urban area (Aldridge, Laugksch & Fraser, 2006). The SLEQ consisted of nine scales (Parental involvement, Student Support, Affiliation, Professional interest, OBE familiarity, Staff Freedom, Innovation, Resource Adequacy and Work Pressure). Educators were required to respond to items of the SLEQ using a five point response format of Almost Never, Seldom, Sometimes, Often and Almost Always (Aldridge, Laugksch & Fraser, 2006). The study showed that educators involved in OBE perceived their school-level environments differently to educators not involved with OBE (Aldridge, Laugksch & Fraser, 2006).

The most recently published study on LER within a South African context was conducted by Aldridge, Laugksch, Seopa and Fraser (2006). Outcomes-based learning environments in the Limpopo Province in South Africa were explored in this study. A combination of quantitative and qualitative data was collected. The quantitative data were collected by administering a newly developed *Outcomes-Based Learning Environments Questionnaire* (OBLEQ) to 2638 Grade 8 Science students from 50 schools in the Limpopo Province. The schools were located in a rural environment, a township environment and an urban environment. The qualitative data was subjected to statistical analyses (Aldridge, Laugksch, Seopa & Fraser, 2006). The

study showed that there were statistically significant differences between students' perceptions of their actual and preferred learning environments (Aldridge, *et al.*, 2006). The qualitative data were collected by conducting interviews with educators and students. The instrument developed in this study captures the important aspects of an outcomes-based learning environment. The environment instrument and research designs in the study conducted by Aldridge, *et al.*, (2006) were replicated in the current study for use in the Western Cape.

An investigation of the implementation of OBE in Grade 8 Science classrooms in the Western Cape Province in South Africa is provided in the present study. A description of the research design and data collection methods is provided in the following chapter.



## Chapter 3

### METHODOLOGY

This study incorporates both a quantitative and qualitative research design—that is, a mixed-methods approach. The features of each research approach are explained. The research proceeded in phases, starting with the development of the instrument, piloting and administering the instrument, and statistical analyses of the quantitative results. These quantitative results were used to guide the qualitative data collection and analysis.

#### 3.1 Research Design

In this replication study, multiple research paradigms were drawn upon in order to examine Grade 8 students' perceptions of their Natural Science classroom learning environments.

##### *3.1.1 Main attributes of and reasons for a replication study*

A replication study can be defined as “conducting an investigation with comparable subjects and conditions so as to achieve what would be expected to be similar results” (Schneider, 2004:1472). Replication studies are essential to conduct in academic research as it allows more generalisability between more people and settings than are represented by a single study (Schneider, 2004).

Replication studies are very rare in educational research, and this undermines the community's ability to accumulate knowledge (Schneider, 2004). Due to rarity of replications in educational research, the generalisability of the research is questionable (Schneider, 2004). Therefore replicating studies in education strengthens research results (Mouton, 1996).

The current study is a replication of research conducted by Aldridge, et al. (2006) the *Outcomes-Based Learning Environments Questionnaire* (OBLEQ) for use in the Western Cape Province in South Africa. The research methods for the quantitative and qualitative data collection and analyses were replicated from the Aldridge, *et al.*(2006) study which used a mixed-methods approach.

### *3.1.2 Mixed-Methods Approach – Combining Quantitative and Qualitative Research Methods*

As the name suggests, mixed-methods approach refers to a practice whereby the researcher combines quantitative and qualitative methods in one study (Johnson & Onwuegbuzie, 2004:21). The mixed-methods approach evolved from the concept of triangulating information from different data sources. It is only recently that this approach has been adopted in a learning environments context (Henderson & Reid, 2000).

The mixed-methods approach draws on the strengths of both quantitative and qualitative research paradigms. However, it requires complementarity of the two research paradigms. One of the major purposes for employing a mixed-methods research approach is to ensure greater creditability of the results in the study (Johnson & Onwuegbuzie, 2004). The mixed-methods approach intends to triangulate the quantitative research findings against the qualitative data. Olsen (2004) defines triangulation as exploring a phenomenon within a study using different research method so that different viewpoints can be highlighted. Triangulation of the data also ensures that any weakness from a single method will be compensated for using the other method. Therefore, it provides a sound basis upon which the results can be validated and this enables the researcher to provide stronger inferences (Tashakkori & Teddlie, 2003). Combining qualitative and quantitative methods is an expansive way of conducting research in that it does not limit the researcher (Fraser & Tobin, 1991). In addition, the mixed-methods approach is superior to a single research approach in that it a) answers questions which other methodologies cannot, b) provides better and stringer inferences about the data that has been collected, and c) provides the researcher with an chance to present a greater diversity of views (Tashakkori & Teddlie, 2003). Combining both qualitative and quantitative research methods aims to present a study that is holistic and comprehensive with respect to the research findings.

In this study, the OBLEQ-WC was administered to 927 Grade 8 Natural Science students to gather data about their perceptions of their actual and preferred outcomes-based learning environments. These quantitative data, once statistically analysed, were triangulated against qualitative data. The collection of the qualitative was guided by the results from the quantitative data. Classroom observations as well as interviews were conducted with both educators and students. The main purpose of the classroom observations and interviews was to understand the reasons which would be used to explain the discrepancies, if any, between students' perceptions of their actual and preferred learning environment. Thus the qualitative

results were intended to be able to validate and confirm the trends observed from the quantitative data analysis.

### **3.2 Research Methods**

The phases involved in the data collection and analyses will be addressed in this section.

#### ***3.2.1 Development of the original OBLEQ***

As outlined earlier Aldridge , *et al.*, (2006) developed an environment questionnaire which is able to assess students' perceptions of their outcomes-based learning environment in the Limpopo Province. This questionnaire was adapted for use in Grade 8 science classrooms in the Western Cape. However, it is important to acknowledge the steps involved in the development of the original environment questionnaire. This description is based on Aldridge , *et al.*, (2006).

##### **3.2.1.1. Review of policy documents**

Department of Education policy documents and the national and international literature on OBE were reviewed to identify the dimensions or scales which are central to the educational philosophy of OBE, C2005 and the NCS which have been explained in the previous chapter (Chapter 2, p 11).

##### **3.2.1.2 Validity and Salience of the dimensions identified**

The validity and salience of the identified dimensions were established in the next step of the development of the instrument. In order to ascertain which educational dimensions were most appropriate, independent interviews were held with eight Grade 8 science educators and 12 science curriculum advisors. The seven dimensions used in the final OBLEQ are given below:

- i. *Involvement*: This dimension measures the extent to which the student is an active participant in the classroom environment.
- ii. *Investigation*: Students need to be able to carry out their own investigations and report to the class their findings. Therefore this dimension measures the emphasis that is placed on the skills and process of inquiry.
- iii. *Co-operation*: This dimension measures the extent to which students' co-operate and help one another, rather than competing with one another.

- iv. *Equity*: This dimension of the instrument measures the extent to which each student in the class is treated fairly and equally by the educator.
- v. *Differentiation*: This dimension of the questionnaire measures the extent to which educator caters for students with different learning abilities.
- vi. *Personal Relevance*: This dimension measures the extent to which a educator relates the content to a real world context.
- vii. *Responsibility for own Learning*: This dimension measures the extent to which students feel responsible for their own learning process.

#### 3.2.1.3. Consistency of the selected scales with Moos' scheme of classification

The scales selected from the literature were checked for consistency within Moos' (1974) scheme of classification. Moos (1974) identified three dimensions into which all human environments can be classified. These three dimensions include the *Relationship* dimension which identifies the nature and intensity of personal relationships; the dimension of *Personal Development* which identifies an individual's personal growth and self enhancement; and the third dimension is that of *System Maintenance and System Change* which assess the extent to which the individuals' response to an adjustment in the physical environment (Moos, 1974).

#### 3.2.1.4. Use of other Learning Environment Research (LER) instruments

Once salient dimensions had been identified, appropriate scales needed to be identified that assessed each of the dimensions. Hence, relevant scales were adopted and adapted from various, widely used LER instruments. In particular, the *What is Happening in This Class?* (WIHIC) questionnaire proved to be most useful as it encompasses contemporary educational concerns such as equity (Fraser, 2002; Aldridge & Fraser, 2000). In addition, the scales in the *Constructivist Learning Environment Survey* (CLES) proved to be valuable as they assess the degree to which a classroom environment is consistent with constructivist epistemology (Aldridge, et al., 2000; Fraser, 2002).

**Table 3.1** The table provides the origin and description of each of the dimensions of the OBLEQ-WC (Aldridge, et al., 2006: 17). It also shows the relevance of each of the developed scales to an outcomes-based educational philosophy.

<b>Dimension within Questionnaire</b>	<b>Origin of the scale</b>	<b>Description of the scale (The extent to which...)</b>	<b>Relevance to an outcomes-based educational philosophy</b>	<b>Examples of OBE research literature which refer to the same scale</b>
<b>Involvement</b>	WIHIC	Students have attentive interest in discussions, do the work and enjoy the class.	Students need to be active participants in the learning process.	Schlebusch & Thobedi (2004); Spady (1998); Steyne & Wilkinson (1998).
<b>Investigation</b>	WIHIC	Emphasis is placed on the skills and processes of inquiry and their use in problem solving and investigation.	Instruction should be student-centered. Students need to be actively involved in their own investigations while the educator acts as the facilitator of learning.	Harley & Wedekind (2004); Steyne & Wilkinson (1998).
<b>Co operation</b>	WIHIC	Students cooperate rather than compete with one another on learning tasks.	Students should collaborate in learning rather than compete. They should co-operate and work together as a group.	Malan (2000); Spady (1994).
<b>Equity</b>	WIHIC	Students are treated fairly by their educator.	All students (irrespective of race) are to be treated fairly and in the same way.	Steyne & Wilkinson (1998).
<b>Differentiation</b>	ICEQ	Educators cater for students differently on the basis of ability, rates of learning or interests.	All students can learn to succeed but not at the same time and the same place. Students' demonstrate achievement of outcomes over time and according to their ability.	Harley & Wedekind (2004); Malan (2000).
<b>Personal Relevance</b>	CLES	Educators relate the concepts learnt in the science classroom to out-of-school experiences.	Learning must be meaningful to the students; this is possible if it is seen to be relevant to their everyday life experiences.	Both (2002); Steyne & Wilkinson (1998).
<b>Responsibility for own Learning</b>	Developed by Aldridge, Fraser, Laugksch and Seopa (2006).	Students perceive themselves as being in charge of their learning process, motivated by constant feedback and affirmation.	Accountability for learning rests with the student.	Botha (2002); Malan (2000); van Niekerk & Killen (2000).

### 3.2.1.5. Format of the developed instrument used in the study conducted in the Limpopo Province

One of the distinctive features of the instruments used in LER is that they provide a measure of students' perceptions of their 'actual' learning environments, in addition to providing a 'preferred' measure of students' perceptions of their learning environment (Fraser, 1998a). Although the item wording is similar for both actual and preferred forms, slightly different instructions for answering each are used (Fraser, 1998a: 15). A parallel preferred form of the developed instrument mirrors the actual form. This enables the researcher to not only assess students' actual perceptions of their classroom learning environment with respect to the scales that have been selected, but it also assesses students' preferred perceptions of their learning environment. This dual format was used by Aldridge, *et al.* (2006) for the OBLEQ.

### 3.2.2.3 Development of the attitude scale

Promotion of positive attitudes towards Science is considered to be the major aim of science education (Henderson & Reid, 2000). Positive attitudes towards science enhance academic achievement (DoE, 2002b). The attitude scale was used initially by Aldridge, *et al.* (2006) and was based on the *Test of Science Related Attitude (TOSRA)*; Fraser, 1981). The attitude scale was integrated into the OBLEQ in order to assess students' attitudes towards their science lessons. Students responded to the attitude items using the same response format as the rest of the OBLEQ items (Aldridge, *et al.*, 2006).

### 3.2.2.4 Development of the Achievement test

To assess the possible influence that an outcomes-based science learning environment has on students' achievement score, a science achievement test was adopted and adapted by Aldridge, *et al.* (2006) from one of the common assessment tasks for Grade 8 Natural Science students' (DoE, 2001b). This test (Appendix 1, pg.93) was used to examine students' understanding of scientific concepts and investigations, which supports Learning Outcome 1 for Grade 8 in the RNCS for Natural Sciences (DoE, 2002c). Aldridge, *et al.* (2006) adapted the context to include a market scenario as well as other variables such as length and thickness of the candles in order to assess the students on their investigation skills.

### *3.2.2 Phase I: Adaptation of the OBLEQ to the context of the Western Cape*

In the Western Cape English is the medium of instruction but it is not the first language of many of the students. Fifty-five percent of the Western Cape population speaks Afrikaans, twenty-four percent speak isiXhosa and nineteen percent speak English (Lehohla, 2004). To assist the students in understanding the items on the questionnaire, it was imperative to provide students with the Afrikaans and isiXhosa equivalent of the English questionnaire. Thus the instrument was translated Afrikaans and isiXhosa.

The instrument used in the Western Cape study was translated using a rigorous process of translations and back-translations (Brislin, 1970). The translation process involved a researcher fluent in Afrikaans to translate the English version of the OBLEQ-WC into Afrikaans. A second researcher, fluent in Afrikaans and English, back-translated the items from Afrikaans into English. The two English versions were compared for accuracy. This process was repeated for both Afrikaans and isiXhosa. The instrument used in the Western Cape was called *the Outcomes Based Learning Environment Questionnaire-Western Cape* (OBLEQ-WC).

#### *3.2.2.1 Format of the adapted instrument (OBLEQ-WC)*

In the OBLEQ-WC, the scales were translated into both Afrikaans and isiXhosa for both the actual and preferred version on the same questionnaire and each translation was placed underneath each other on the instrument (Appendix 1, pg.93). The actual and preferred versions were placed next to each other on the same page as the scales, so that it was more economical to administer and easier to complete by the Grade 8 students'. Beneath each English scale, in a slightly different font, the Afrikaans and isiXhosa translation is given. This is shown below:

I discuss ideas in class.

Ek bespreek idees in die klas.

*Ndixoxa izimvo eklasini*

Each scale required two responses on the same line. The first response required the students to answer 'How it is' in their science classroom. This refers to ACTUAL version of the OBLEQ-WC. The second response required the students to answer 'How I want it' which refers to the

PREFERRED version of the OBLEQ-WC. The questionnaire response format comprises of five scales: (1) Never, (2) Seldom, (3) Sometimes, (4) Often and (5) Always. The students indicate their response under two columns: Actual and Preferred.

The OBLEQ-WC instrument used the Western Cape contains seven scales which are relevant and important in assessing an outcome-based classroom learning environment , as does the original OBLEQ (Aldridge , *et al.*, 2006).

### ***3.2.3 Phase II: Pilot testing of the OBLEQ-WC***

The OBLEQ-WC questionnaire, once translated into Afrikaans and English, was piloted in four Grade 8 classes in secondary schools in the Western Cape. These schools were selected, at random, from the four main Education Management District Centers (EMDC) areas around the Western Cape. The aim of the pilot study was to identify whether if the students encountered any problems with the instrument. These problems may include:

1. A misunderstanding of the words or terms used in the questionnaire
2. A misinterpretation of the phrases that are used or the questions that are asked
3. Difficulty understanding the format of the instrument.

The students were asked to indicate any possible misunderstanding by underlining unfamiliar words or phrases used in the items. After the completion of the OBLEQ-WC, students from the selected schools were chosen at random and interviewed. These interviews were aimed at understanding the difficulties that students may have had with the instructions and the items on the questionnaire. They were asked questions pertaining to the response format, as well as to what extent the translation helped them to understand the questionnaire.

It was found that the students understood the instructions. This could be attributed to the fact that the questionnaire was explained in English, isiXhosa or Afrikaans before the students began. The response format was also explained thoroughly and it was ensured that each student understood the instructions of the questionnaire. This was done by explaining the response format to the students and then walking around the classroom helping each individual. Once the pilot study had been completed, a few modifications were considered necessary in terms of the wording of the questionnaire. It was required that six items be re-worded, as it was found that students thought these items to be ambiguous. After these minor changes were made, the final instrument was ready to be administered to the larger sample. The final instrument is given in Appendix 2 (pg.117).

### 3.2.4 Phase III: Administration of the OBLEQ-WC

In order to administer the OBLEQ-WC to schools in the Western Cape, a list of schools from four selected EMDCs was obtained from the Western Cape Education Department (WCED). The schools were selected from four of the eight EMDCs, as these four EMDCs are representative with respect to the metropolitan schools in the Western Cape (EMDC Central, EMDC East, EMDC North and EMDC South) (Table 3.2). The majority of schools within the Western Cape are located in these four EMDCs (51%) (DoE, 2006).

The schools in these four EMDCs were selected using proportional stratified random sampling, as recommended by Leedy (1997). The four EMDCs were used as a single stratum in the sampling process. This sampling design was used because each of the four EMDCs contains a different number of schools and the number of schools selected needed to represent that EMDC. As a result, the number of schools selected in each specific EMDC had to be in a proportion ratio in terms of the numbers of schools in every other EMDC (Leedy, 1997). Using the number of schools in each of the four EMDCs, the number of schools that are required for this study can be calculated. This is indicated in Table 3.2.

**Table 3.2** The number of schools in each of the selected four EMDCs in the Western Cape (DoE, 2006)

<i>EMDC</i>	<i>Number of schools with Grade 8 classes</i>	<i>Percentage of schools with Grade 8 classes</i>	<i>Proportion of schools used in current study</i>
South	90	33.0	9
North	68	25.0	8
East	57	21.0	7
Central	57	21.0	6
<b>Total</b>	<b>272</b>	<b>100.0</b>	<b>30</b>

Prior to the administration of the questionnaire in the schools, permission was obtained from the Western Cape Education Department (WCED) to involve the selected schools (Appendix-3, pg.141). After the written permission had been obtained, each school was contacted and invited to participate in the research. This was done by submitting a formal letter explaining the purpose of the research, as well as a reply sheet. The reply sheet requested the principals' signature, the Head of the Natural Science Departments' signature, in addition to a 'liaison' educator who could be contacted (Appendix 4, pg.145 ). If the schools agreed to participate, the appropriate arrangements were made. In other words, a Grade 8 Natural Science class was

randomly selected, and a specific date and time was arranged with the liaison educator. Administration of the OBLEQ-WC proceeded in the following way. Before the students would start the questionnaire, the instructions were read and explained in English and Afrikaans by the researcher. For the students that were isiXhosa speaking, the questionnaire was explained to them in isiXhosa by their educator. The general information required such as *Student Name, Surname, School Name, Class, Age and Gender*, was explained, as well as the importance of this information. During the administration of the questionnaire, the items and the response format was made clear to each class. This was done by explaining the response format for each item on the questionnaire and how a response was required under both the Actual and Preferred columns of the questionnaire. An example was used to highlight the difference (*e.g., Tom eats ice cream once a year [ACTUAL] but would like to eat ice-cream everyday [PREFERRED]*).

### **3.2.5 Phase IV: Capturing and cleaning the data**

All students that were invited to participate in this study responded. Data were gathered from 927 students from 30 schools on students' responses to each of the items on the OBLEQ-WC questionnaire. These data were captured in an electronic file and analyzed using the *Statistical Package for Social Science – Version 16.0 (SPSS)*. The data from the questionnaire were already in a numeric form. Therefore, the coding was a direct transfer from the questionnaire into the file. Acknowledging the probability of possible mistakes during the manual capture, the data were checked and cleaned appropriately. A verification process was done to check that the data had been transferred from the questionnaires to the electronic file correctly. Once this verification had been done, the dataset was cleaned. The cleaning process consisted of two types of operations (Miller, Acton, Fullerton & Maltby, 2002), namely,

- 1) Carrying out validation or consistency checks to remove or control errors and missing information in the dataset, and
- 2) Tagging missing data or invalid codes with special labels so that these incorrect codes are not mixed in with the valid values when the analyses were being carried out.

Subsequent data cleaning entailed inspection of the frequencies of responses for each category per item. Furthermore the data cleaning process involved checking for logic in the captured data by determining the frequency analysis per variable, as well as checking for apparent irregularities compared to the response on the OBLEQ-WC. For those responses that were found to be outside the expected range, the original was checked and corrections were made in the data file. At the end of this process, 11 forms were declared invalid due to students not

completing the questionnaire. The students that could not complete the form were illiterate and/or could not write. This was verified by the educators of those specific students. The educator or the researcher was required to help them to complete the form. This constitutes 1.2% of the total, final number of 938 survey forms received.

### ***3.2.6 Phase V: Analysis of quantitative data***

Data collected from 927 students in 30 schools were used initially to examine the reliability and validity of the OBLEQ-WC. This involved performing a number of statistical analyses. A principle component factor analysis was performed, followed by a varimax rotation. This was done to observe the reliability and validity of the OBLEQ-WC, and is standard practice in LER. Cronbach's alpha reliability coefficient was used as an index of internal consistency within the environment scales in the questionnaire. To ensure that each of the dimensions or scales within the questionnaire is separate and provide distinct measurements, a discriminate validity index was used. This measurement aimed to provide a mean correlation of a scale with other scales. Analysis of Variance (ANOVA) was used to determine the ability of the questionnaire to make a distinction between students' perceptions in each of the different classrooms.

Simple and multiple regression analyses were conducted to investigate whether associations exist between the students' perceptions of a learning environment and the key performance indicators such as *Equity*, *Attitude towards Science* and achievement scores. These analyses were conducted using the individual and the class mean as the unit of analysis. Using the individual as the unit of analysis is essential in providing a between-student analysis of the data which is used to draw conclusions about the students' individual perception of their science classroom. Using the class mean as the unit of analysis provides information about the average classroom environment perception of all the students' in a particular class (Aldridge & Fraser, 2000). A simple correlation analysis was then carried out. This was used to obtain information about the bivariate relationship between the attitude scale and each individual classroom environment scale. Multiple regression analysis was used to describe the relationship between each attitude scale and each of the other OBLEQ-WC scales. A person-environment fit perspective should give an indication of the correlation between the responses for actual and preferred learning environments. Both the individual and the class were used as a unit of analysis. The data collected through the OBLEQ-WC was analysed using descriptive statistics. The average number of items on each scale varied; therefore, the average item mean (i.e., scale mean divided by the number of items in the scale) was calculated. This was used as the basis of comparison for items between different scales. A one way MANOVA was

performed with the OBLEQ-WC scales as dependant variables and the actual or preferred form as the independent variable. This was computed for both the actual and preferred forms of the OBLEQ-WC.

Gender differences were also examined with respect to the classroom environment perceptions, *Attitude towards Science* and Achievement score using a one way MANOVA.

Comparisons were made between the results from the Limpopo Province and the Western Cape Province with respect to the students' perceptions of their actual and preferred outcomes-based learning environments in Science. This was done by designing a regression model which took into account the differences between the two provinces, the differences between genders and the interaction between the two variables. Both the regression coefficient and the associated t-statistic were reported. In addition, the differences in each of the mean scale scores between male and females were compared between the two provinces.

The number of items within each scale varied. As a result, the average item mean for each scale was calculated by dividing the scale mean by the number of items in the scale. This generated class mean scores. Class mean scores were determined for both actual and preferred students' perceptions for each of the classes. The class mean scores were used to form graphical classroom profiles for each of the 30 schools. Each of the classroom profiles was studied in order to determine the general pattern between students' perceptions of their actual and preferred learning environments. Those classrooms with high absolute mean scores and a narrow gap between the students' perceptions of their actual and preferred learning environments were identified, as well as classrooms with a wide gap between the students' perceptions of their actual and preferred learning environments. Classrooms with low absolute mean scores and a narrow gap between the students' actual and preferred perceptions were identified, as well as classrooms with a wide gap between the actual and preferred perceptions. Classrooms with low mean scores and wide gap between students' perceptions of their actual and preferred classroom environments were considered unsatisfactory OBE classrooms. Using the above selection criteria, the researcher selected a sub-sample of five classrooms from the sample group of 30 classrooms in five classrooms.

### ***3.2.7 Phase VI: Qualitative data collection***

Class mean scores were used to generate graphical classroom profiles that were used as a point of departure for qualitative data collection. To guide the collection of the qualitative data, the concept of 'grain size' was explored (Fraser, 1999). 'Grain size' refers to the

different levels between the researchers' observations (e.g., level of the individual student, average classroom environment of one class, a large comparison of classes) and student perceptions based on the actual and preferred forms. The idea of 'grain size' has been used effectively in previous Learning Environment Research studies that made use of the mixed methods research approach (Fraser & Tobin, 1991; Tobin & Fraser, 1998). In keeping with the tradition in the field of Learning Environment Research (e.g., Aldridge, et al., 2000), qualitative data were gathered using classroom observation as well as educator and student interviews. The main purpose for the qualitative data collection was to triangulate the quantitative data, and in so doing provide possible explanations for the observed trends.

Prior to the observations and interviews, arrangements were made with the liaison educators of the selected schools in order to arrive at a common understanding for the purpose and importance of the lesson observations for this study. The need for conducting classroom observations and interviews with both the students and educators was highlighted. The classroom profile was then revealed to each educator's from the five selected schools. Educators showed enthusiasm and willingness to be observed and interviewed. They willingly shared their timetables with the researcher and common dates were agreed upon. A minimum of three lessons per educator were observed, as this ensured that instances that were relevant to OBLEQ-WC scales would be identified. The science educator was interviewed immediately after each lesson had been observed, while a focus group of six students (three boys and three girls, if the school was co-educational) were selected randomly and interviewed once per class.

#### 3.2.7.1. Classroom observations

Fraser and Wubbels (1995) provided three approaches to studying classroom learning environment. These include systematic observation, case studies and assessment of students and educators perceptions. This study employed two of the above mentioned approaches; students' perceptions were assessed using the OBLEQ-WC and classroom observation and educator and student and educator interviews were used to triangulate and validate the quantitative data (Fraser & Wubbels, 1995). The second approach refers to the assessment of students and educators perceptions of their learning environment and is considered to be an exceptionally powerful research tool in enabling the researcher to understand the environment from the student's perspective (Aldridge, et al., 2004; Lincoln & Guba, 1985; Tobin & Fraser, 1998). As a result, this approach is used in the current study to understand students' perceptions of their learning environment.

### 3.2.7.2 Educator and student interviews

Interviews provide a powerful tool for gathering qualitative data for research studies. It is widely acceptable practice that for a researcher to understand and gain in-depth insight about the research participants, it is imperative to interact with them in their own environment. After observing the research participants actions and culture, interviews provide a tool to explain their perceptions of their environment (Kvale, 1996).

The interviews with educators focused on their classroom practices using the OBLEQ-WC environment scales as guidance. An unstructured interview approach was used as each of the specific classes was different. The main purpose of the educator interviews was to gain insight into the reasons why educators conducted their lessons in the manner they did. These reasons would be used to further explain students' perceptions of their science classroom environments.

Student interviews were conducted with focus groups of six students. During the student interviews, reasons were sought to explain their perceptions of their outcomes-based science classroom with respect to the scales within the OBLEQ-WC. The interview schedule was unstructured and open-ended, as classroom profiles varied between schools. The proceedings of the interviews were tape-recorded, and reviewed and transcribed for analysis (Kvale, 1996). The transcriptions highlighted important comments made by either the educator or the students with respect to the scales within the OBLEQ-WC.

### *3.2.8 Phase VII: Qualitative data analysis*

To analyze the data gathered from the classroom observations and interviews, a thematic approach was applied. OBLEQ-WC dimensions were used as themes, as recommended by Phillips (1994), which aimed to guide the search for common patterns of outcomes-based classroom practices. During the analysis of the classroom observations and the educator and student interviews, the researcher was looking for educators' classroom practices that influenced the students' responses' to the OBLEQ-WC. Classroom observations were made using the eight OBLEQ-WC dimensions as a guide. The reports from the classroom observations are representative of a typical classroom lesson. Reports were conducted for five classrooms. The statements from the participants were condensed in order to give general impressions from the interviews, as suggested by Kvale (1996).

### ***3.2.9 Phase VIII: Conclusion to data collection phase***

Once data had been collected, letters of thanks were written to all the schools that had participated in the study. Their classroom profiles were included in the letter as well as a description of this profile i.e. the significance of each of the scales on the OBLEQ-WC. A copy of the OBLEQ-WC was also given to each school.

### **3.3 Summary**

The following summary outlines how each of the research questions are answered. To answer Research Question 1, an adapted questionnaire (OBLEQ) was administered to Grade 8 Science learners in the Western Cape. The statistical procedures used to establish reliability and validity of the OBLEQ-WC included a principle component factor analysis performed using a Varimax rotation. This was followed by Cronbach's reliability coefficient  $\alpha$ , which was used as an index of internal consistency reliability within the scales. An ANOVA was conducted to make distinctions between students' perceptions of an outcomes-based learning environment. Simple and multiple regression analyses were performed to investigate associations which exist between the students' perceptions of learning environments and the key performance indicators. The average item mean (scale mean divided by the number of items in the scale) was calculated. This was used as the basis of comparison for items between different scales. A MANOVA was performed to establish the statistically significant differences between students' perceptions of their actual and preferred learning environments.

Research Question 2 is answered using the class mean as a unit of analysis to establish class profiles for the OBLEQ. Qualitative data were collected in the form of interviews and classroom observations to explain the trends that have been established by the quantitative data. The interviews and classroom observations aim to provide insight into classroom practices in order to explain the variations between learners preferred perceptions of outcomes-based Science learning environments in relation to the specific dimensions of the OBLEQ.

Research Question 3 requires a simple and multiple regression analysis to examine the associations between the students' perception of learning environment scales and the student outcomes specifically attitude towards Science, equity and academic achievement.

Research Question 4 will be answered by comparing with respect to students' perceptions of their actual and preferred outcomes-based learning environments was made between the

Limpopo Province and the Western Cape Province Grade 8 Science classrooms. This was done by designing a regression model that which took into account the differences between students' perceptions of their actual and preferred learning environments between the two provinces, and the differences between the genders. This model also assessed the interaction between these two variables.

## Chapter 4

### RESULTS

The findings from both the quantitative and the qualitative data collection phases are reported in this chapter. The results from the quantitative data analysis are reported first, after which the results from the qualitative data analysis are described. Finally, a comparison of the results from a matching study conducted in the Limpopo Province was undertaken.

#### 4.1 Findings from the Quantitative Data Analysis

The reliability and the validity of the OBLEQ-WC scales was examined. To ensure that each of the dimensions or scales in the OBLEQ-WC provides a distinct measurement, a discriminate validity index was used. ANOVA was used to determine the ability of the questionnaire to make a distinction between students' perceptions of their learning environments in each classroom. Simple and multiple regression analysis were conducted to investigate whether associations exist between students' perceptions of their learning environment and key students outcomes. Gender differences are examined with respect to classroom environment dimensions and key student outcomes. Finally a comparison is made between the results from the Limpopo Province and the Western Cape Province.

##### *4.1.1 Reliability and validity of the OBLEQ-WC scales*

The quantitative data collected from 927 students in 30 schools around the Western Cape Province were used to examine the reliability and validity of the actual scales within the OBLEQ-WC. In keeping with Learning Environments Research tradition, the data were used initially to perform a Principle Component Analysis which was followed by a Varimax rotation. Factor loadings of less than 0.30 have been omitted in the rotated component matrix (Table 4.1). Iterative analyses were run in order to maximise the hypothesised fit between items and factors. Problematic factors (i.e., items that loaded onto more than one factor) were omitted from the final analysis. These deleted items are item 24 from the scale of *Cooperation*, item 33 from the scale of *Differentiation*, item 35 from the scale of *Differentiation*, item 54 from the scale of *Personal Relevance*, and item 61 from the scale of *Responsibility for own Learning*. During the factor analysis, items from scales of *Involvement* and *Investigation* loaded together on the same component (Table 4.1) suggesting that student's perceptions of these two scales were very similar. All other scales loaded separately onto

distinct components. The eigenvalues ranged from 1.7 to 8.8 for the different scales. The percentage variance ranged from 3.4% to 17.3% for the different scales, with the total variance accounted for being 41.2% (Table 4.1). These findings thus support the factorial validity of the scales and items within the OBLEQ-WC. Moreover, these findings correspond with other validation studies (e.g. Aldridge, Fraser & Huang, 1999).

Table 4.2 includes the Cronbach alpha coefficient for the actual and preferred versions of the OBLEQ-WC environment scales (with the exception of *Attitude towards Science*). Cronbach alpha produces a coefficient which can be used as a point of reference for assuming significant internal consistency or homogeneity for series of values (Gliem & Gliem, 2003: 87). The coefficient ranges from 0 to 1. The closer Cronbach alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale (Gliem & Gliem, 2003: 87).

In this study, Cronbach alpha reliability for the actual and preferred versions of the OBLEQ-WC scales was analysed first using the individual as the unit of analysis. For the actual version, the values range from 0.62 (for the *Differentiation* scale) to 0.86 (for the *Responsibility for own Learning* scale). For the preferred version of the OBLEQ-WC, the values for alpha reliability lie between 0.74 (for the *Differentiation* scale) and 0.90 (for the *Involvement and Investigation* scale) (Table 4.2). These results indicate that the internal consistency for both actual and preferred versions of the OBLEQ-WC is substantial.

The discriminant validity (Table 4.2) was used to establish the mean correlation of one scale with the other environment scales in the OBLEQ-WC. This was done for both the actual and preferred versions of the OBLEQ-WC for six of the seven scales. Both the individual and the class mean were used as the unit of analysis. For the actual version, with the individual as the unit of analysis, the values ranged from 0.22 (for the *Differentiation* scale) to 0.46 (for the *Responsibility for own Learning* scale). With the class mean as the unit of analysis, the values ranged from 0.20 (for the *Co-operation* scale) to 0.28 (for the *Personal Relevance* scale) with a very small negative, statistically not significant value for *Differentiation*. These values compare favourably with those of past LER studies (Aldridge, Fraser & Sebela, 2004) with the exception of *Differentiation*, which is negatively correlated with other scales. For the preferred version of the OBLEQ-WC, with the individual as the unit of analysis, the values for discriminant validity range from 0.31 (for the *Personal Relevance* scale) to 0.42 (for the *Responsibility for own Learning* scale). With the class mean as the unit of analysis, the values range from 0.12 (for the *Differentiation* scale) to 0.39 (for the *Co-operation* scale).

**Table 4.1** Rotated component matrix for the Principle Component Analysis done for the OBLEQ-WC.

Item	Factor Loading					
	Involvement/ Investigation	Co- operation	Equity	Differentiation	Personal Relevance	Responsibility for own Learning
1	0.58					
2	0.51					
3	0.44					
4	0.56					
5	0.35					
6	0.46					
7	0.50					
8	0.57					
9	0.58					
10	0.54					
11	0.64					
12	0.54					
13	0.56					
14	0.61					
15	0.59					
16	0.55					
17		0.66				
18		0.65				
19		0.37				
20		0.58				
21		0.60				
22		0.62				
23		0.58				
25			0.53			
26			0.67			
27			0.61			
28			0.70			
29			0.65			
30			0.66			
31			0.58			
32			0.60			
34				0.42		
36				0.61		
37				0.37		
38				0.64		
39				0.66		
40				0.66		
49					0.68	
50					0.47	
51					0.57	
52					0.70	
53					0.72	
55					0.52	
56					0.48	
57						0.67
58						0.76
59						0.69
60						0.64
62						0.73
63						0.73
64						0.65
<b>Initial Eigen-values</b>	8.8	2.5	2.8	1.7	1.9	3.3
<b>% Variance</b>	17.3	4.8	5.6	3.4	3.8	6.4

**Table 4.2** The index of internal consistency and reliability (Cronbach alpha coefficient), the discriminate validity (mean correlation of a scale with other scales) and the ability to differentiate between different classrooms (ANOVA) using different units of analysis.

Scale	Unit of analysis	No. of items	Alpha Reliability		Mean Correlation with other scales		ANOVA (for actual version of the OBLEQ scales)	
			Actual	Preferred	Actual	Preferred	F statistic	$\eta^2$
Involvement/ Investigation	Individual	16	0.85	0.90	0.26	0.36	4.92**	0.14
	Class mean				0.26	0.35		
Co-operation	Individual	7	0.73	0.79	0.28	0.36	4.74**	0.13
	Class mean				0.20	0.39		
Equity	Individual	8	0.81	0.82	0.36	0.39	3.02**	0.09
	Class mean				0.25	0.35		
Differentiation	Individual	6	0.62	0.74	0.22	0.32	4.04**	0.12
	Class mean				-0.02	0.12		
Personal Relevance	Individual	7	0.75	0.76	0.30	0.31	3.58**	0.10
	Class mean				0.28	0.39		
Responsibility for own Learning	Individual	7	0.86	0.83	0.46	0.42	5.51**	0.15
	Class mean				0.22	0.32		

\*p<0.05

\*\* p<0.01

The sample consists of 927 students in 30 classes in the Western Cape Province in South Africa

The  $\eta^2$  statistic (a ratio of between and total sums of squares) represents the proportion of variance explained by class membership

The results reported in Table 4.2 suggest that the scales in the actual version of the OBLEQ-WC assess distinct constructs although there is a degree of overlap within the scales. The results for the preferred version of the OBLEQ-WC suggest that the raw scores assess overlapping aspects of a Science outcomes-based learning environment. However, an exception lies once more with the scale of *Differentiation* where the mean correlation is 0.12 at the level of the class mean. Nevertheless, the factor analysis is a method to determine the dimensionality of a scale (Gliem & Gliem, 2003:87), and these results (i.e, Table 4.1) confirm the independence of factor scores on the actual form of the OBLEQ-WC.

The analysis of variance (ANOVA) was used to determine whether the actual version of each environment scale was able to distinguish between students' perceptions of their classroom environments in different classes. Class membership was used as the independent variable with the OBLEQ-WC scales being used as the dependant variables. This statistical test was done to establish the validity of the assumption that each of these scales within the OBLEQ-WC measure distinct dimensions, and that the OBLEQ-WC is able to distinguish between students' perceptions of their classroom environments in different classes. The results reported in Table 4.2 show the F-statistic as well as the eta<sup>2</sup> ( $\eta^2$ ) statistic. The effect size ( $\eta^2$ ) is

an indication of the magnitudes of the differences between actual and preferred responses expressed as a standard deviation. This statistic represents the proportion of variance explained by class membership. The results indicate that the each OBLEQ-WC scale was statistically significantly ( $p < 0.01$ ). Overall, the results suggest that OBLEQ-WC was valid and reliable for use in outcomes-based science classrooms in South Africa, and therefore can be used with confidence by educators and researchers in South Africa in the future.

#### ***4.1.2 Reliability of the attitude scale***

To assess student's *Attitude towards Science*, an attitude scale was developed from the *Test of Science Related Attitudes Instrument* (TSORA) (Fraser, 1981). This scale was adapted and modified to suit an outcomes-based learning environment (Chapter 3, pg.10). The results from the reliability analysis were used to examine the reliability of the attitude scale. Cronbach alpha reliability coefficient was used as an index of internal reliability for the actual and preferred versions of this environment scale in the OBLEQ-WC (Table 4.2). The coefficient for the actual and preferred version of the attitude scale was 0.87 and 0.76 respectively. Both of these values for the attitude scale compare favourably with past LER studies (e.g., Nair & Fischer, 2001). These results indicate that the attitude scale was reliable and can be used by educators and researchers in the future.

#### ***4.1.3 Using the OBLEQ-WC to describe Science classrooms in the Western Cape***

The first objective of the present study was to use the environment scales described in the OBLEQ-WC to describe a typical science classroom in the Western Cape Province. The learning environment of science classrooms was analysed using descriptive statistics based on students' responses to the OBLEQ-WC. The average item mean was calculated as well as the average item standard deviation. The number of items within each scale varied between 6 and 16 (Table 4.3) and, as a result, the average item mean was calculated by dividing the scale mean by the number of items in the scale. The average item mean was used as the basis for a comparison between the different scales. Table 4.3 reports the results of the average item means for both the actual and preferred forms of all six of the OBLEQ-WC scales. For the actual form of the OBLEQ-WC, the results for the average item mean ranged between 2.60 (for *Differentiation*) and 3.88 (for *Equity*). For the preferred form of the OBLEQ-WC, the average item means ranged between 3.03 (for *Differentiation*) to 4.42 (for *Equity*). Figure 4.1 shows that the level of each actual OBLEQ-WC dimension is perceived to be lower than the preferred form of the same OBLEQ-WC scale.

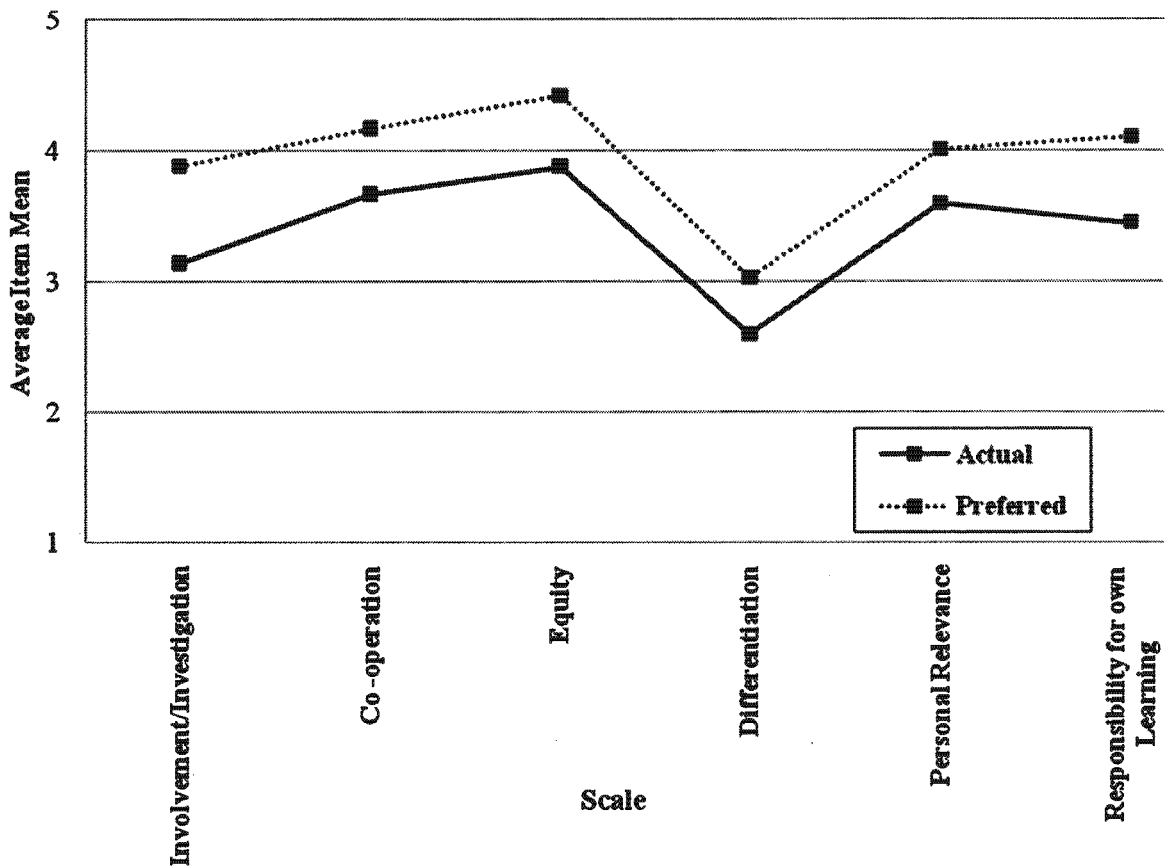


Figure 4.1 Overall differences between students' perceptions of each of the six OBLEQ-WC scales for both the actual and preferred versions of the questionnaire (n = 927).

A one way MANOVA was performed with all actual forms of the six OBLEQ-WC scales as the dependant variables and the preferred form as the independent variables. This was done in order to identify differences between the actual and preferred average item means for each of the environment scales. The multivariate test produced statistically significant results in terms of Wilks Lambda ( $p < 0.01$ ). As a result, a one-way Analysis of Variance (ANOVA) was interpreted for each of the six scales. The results from the one-way ANOVA include the effect sizes ( $\eta^2$ ) as well as the F-statistic. The results for the F-statistic are statistically significant ( $p < 0.01$ ) for all six of the environment scales. Therefore there is statistically significant difference between students' perceptions of their actual and preferred learning environment. The descriptive statistics are also represented in Table 4.3.

**Table 4.3** Average item mean, average item standard deviation and difference between actual and preferred perceptions in each OBLEQ-WC scale (effect size and MANOVA results) for the class mean as the unit of analysis.

<i>Scale</i>	<i>No. of items</i>	<i>Average Item Mean</i>		<i>Average Item Standard Deviation</i>		<i>ANOVA</i>	
		Actual	Preferred	Actual	Preferred	Effect size	F-statistic
Involvement/ Investigation	16	3.14	3.88	0.23	0.21	0.33	3.80**
Co-operation	7	3.67	4.17	0.26	0.19	0.39	14.98**
Equity	8	3.88	4.42	0.23	0.19	0.34	11.36**
Differentiation	6	2.60	3.03	0.26	0.31	0.54	28.33**
Personal Relevance	7	3.60	4.01	0.22	0.22	0.55	26.39**
Responsibility for own Learning	7	3.45	4.11	0.23	0.23	0.31	9.30**

\*\*p<0.01

The sample consists of 927 students in 30 classes in the Western Cape Province in South Africa. The average item mean is the scale mean.

#### ***4.1.4 Associations between Outcomes- Based Learning Environments, and key student outcomes.***

Another objective of the current study was to assess the possible influence that an outcomes-based learning environment may have on key student outcomes such as *Attitude towards Science, Equity* and achievement score. Statistical analyses were conducted to explore the relationship between each of the six OBLEQ-WC scales and these three key student outcomes. Simple and multiple regression analyses were used to examine whether associations exist between students' perceptions of outcomes-based learning environments and students' *Attitude towards Science* classes, *Equity* within the science classes and student achievement scores. The standardised regression coefficient ( $\beta$ ) identified the OBLEQ-WC scales which contributed uniquely and significantly to the explanation of the variance in each dependant variable, as well as identified the environment scales which make a significant contribution to explaining the variance in the attitudinal outcomes when the six OBLEQ-WC scales are mutually controlled. A simple correlation analysis was also carried out to provide information about the bivariate relationship between these key student outcomes and each individual OBLEQ-WC scale. These analyses were completed using the individual and the class mean as the unit of analysis.

#### 4.1.4.1. Associations with student Attitude towards Science

The results from a simple correlation analysis, at the level of the individual show that a statistically significant association ( $p < 0.01$ ) exists between student attitudes and five of the six OBLEQ-WC scales, namely *Investigation/Involvement*, *Co-operation*, *Equity*, *Personal Relevance* and *Responsibility for own Learning* (Table 4.4). *Differentiation* was shown to be negatively correlated to student attitudes at a statistically not significant level. For the class mean as the unit of analysis, only three OBLEQ-WC scales yielded statistically significant correlations namely, *Equity*, *Personal Relevance* and *Responsibility for own Learning*.

The standardised regression coefficients in Table 4.4 indicate that, with the individual as the unit of analysis, five out of the six OBLEQ-WC scales were statistically significant ( $p < 0.01$ ) predictors of student *Attitude towards Science*. These scales are *Involvement/Investigation*, *Equity*, *Differentiation*, *Personal Relevance* and *Responsibility for own Learning*. With the exception of *Differentiation*, all environment scales had a positive correlation with *Attitude towards Science* using the individual as the unit of analysis. Using the class mean as the level of analysis, *Responsibility for own Learning* was the only OBLEQ-WC scale that proved to be a statistically significant ( $p < 0.05$ ) independent predictor of student attitude.

The multiple correlation coefficient (R) indicating the association between students' perceptions of their outcomes-based learning environment and student attitude for both the individual and class mean as the unit of analysis is statistically significant ( $p < 0.01$ ) (Table-4.4).

#### 4.1.4.2. Associations with students' perceptions of Equity

The results from the simple correlation analysis indicate that, with the individual as the unit of analysis, a statistically significant ( $p < 0.01$ ) positive association exists between four of the five environment scales, namely, *Involvement/Investigation*, *Co-operation*, *Personal Relevance* and *Responsibility for own Learning* (Table 4.4). Zero correlation exists between the environment scales of *Equity* and *Differentiation* at the level of the individual. Using the class mean as the unit of analysis, the *Personal Relevance* is the only environment scale with a statistically significant ( $p < 0.05$ ) correlation with *Equity*.

**Table 4.4** Simple correlation and multiple regression analyses for associations between dimensions of the OBLEQ-WC and student *Attitude towards Science, Equity* and Achievement score (key student outcomes) for actual responses.

Scale	Unit of analysis	Student Attitude towards Science		Equity		Achievement scores	
		R	$\beta$	r	$\beta$	r	$\beta$
Involvement/ Investigation	Individual	0.30**	0.14**	0.35**	0.17**	-0.01	-0.08
	Class mean	0.23	0.03	0.28	0.12	-0.09	-0.18
Co-operation	Individual	0.16**	-0.05	0.31**	0.17**	0.13**	0.12*
	Class mean	-0.16	-0.03	0.25	0.08	0.44**	0.22
Equity	Individual	0.40**	0.24**	-	-	0.17**	0.21**
	Class mean	0.41	0.15	-	-	0.39**	0.42*
Differentiation	Individual	-0.03	-0.13**	0.00	-0.12**	-0.07	-0.05
	Class mean	-0.68	-0.03	-0.08	-0.06	-0.28	-0.20
Personal Relevance	Individual	0.32**	0.15**	0.32**	0.14**	0.05	0.04
	Class mean	0.49**	0.31	0.45*	0.31	0.30	0.20
Responsibility for own Learning	Individual	0.39**	0.23**	0.38**	0.26**	-0.05	-0.13**
	Class mean	0.76**	0.54*	0.33	0.16	-0.31	-0.44
Multiple Correlation (R)	Individual		0.53**		0.50**		0.25**
	Class mean		0.83**		0.51		0.72*

\*Correlation is significant at the 0.05 level (2 tailed)

\*\* Correlation is significant at the 0.01 level (2 tailed)

The sample consisted of 927 students in 30 classes in the Western Cape Province in South Africa.

The standardised regression coefficient ( $\beta$ ) indicates that, with the individual as the unit of analysis, all five of the OBLEQ-WC scales individually accounted for statistically significant ( $p < 0.01$ ) amounts of variance in the scale of *Equity* beyond that attributable to other environment scales. All the environment scales, with the exception of *Differentiation*, exhibit a positive regression coefficient. However, at the level of the class mean, the results across all five OBLEQ-WC scales proved to be statistically non-significant (Table 4.4).

The multiple correlation coefficient (R) indicating the association between students' perceptions of their outcomes-based learning environment and *Equity* is statistically significant ( $p < 0.01$ ) for both the individual and class mean as the unit of analysis (Table 4.4).

#### 4.1.4.3 Associations with Achievement score

The simple correlation analyses using the individual as the unit of analysis, indicates that a positive statistically significant association ( $p < 0.01$ ) exists between student Achievement

score and the environment scales of *Co-operation* and *Equity* (Table 4.4). Negative associations between Achievement score and the environment scales of *Involvement/Investigation* and *Differentiation* can be observed, but neither of these associations is statistically significant. At the level of the class mean, there is a statistically significant correlation ( $p < 0.01$ ) between Achievement score and the OBLEQ-WC scales of *Co-operation* and *Equity*. On examination, all statistically significant associations were found to be positive (Table 4.4).

A standardised regression coefficient ( $\beta$ ) exhibits that using the individual as the unit of analysis, the results indicate a positive statistically significant ( $p < 0.01$ ) relationship between Achievement score and *Equity*, and a statistically significant association at the  $p < 0.05$  level for *Co-operation*. The standardised regression coefficient ( $\beta$ ) is negative but statistically significant ( $p < 0.05$ ) for the environment scale of *Responsibility for own Learning*. Regression coefficients were negative for the environment scales of *Involvement/Investigation* and *Differentiation*. However these associations are statistically not significant. At the class mean level of analysis,  $\beta$  is statistically significant ( $p < 0.05$ ) for the environment scale of *Equity*. Regression coefficients were negative for the environment scales of *Involvement/Investigation*, *Differentiation* and *Responsibility for own Learning* however these associations are statistically non significant (Table 4.4).

The multiple correlation coefficient (R) indicating the association between students' perceptions of their outcomes-based learning environment and Achievement score is statistically significant ( $p < 0.01$ ) for both the individual and class mean as the unit of analysis (Table 4.4).

#### ***4.1.5. Examining Gender Differences***

A further objective of the current study was to examine the association between gender differences and key student outcomes such as students' perceptions of their science classroom learning environments, students' *Attitude towards Science* and their Achievement score. Table 4.5 shows the average item mean for each environment scale including *Attitude towards Science* and Achievement score for both forms of the OBLEQ-WC (actual and preferred) for males and females. These means were used to create a graphical profile of the average item mean scores for male and female students' perceptions of their actual and preferred learning environment (Figure 4.2).

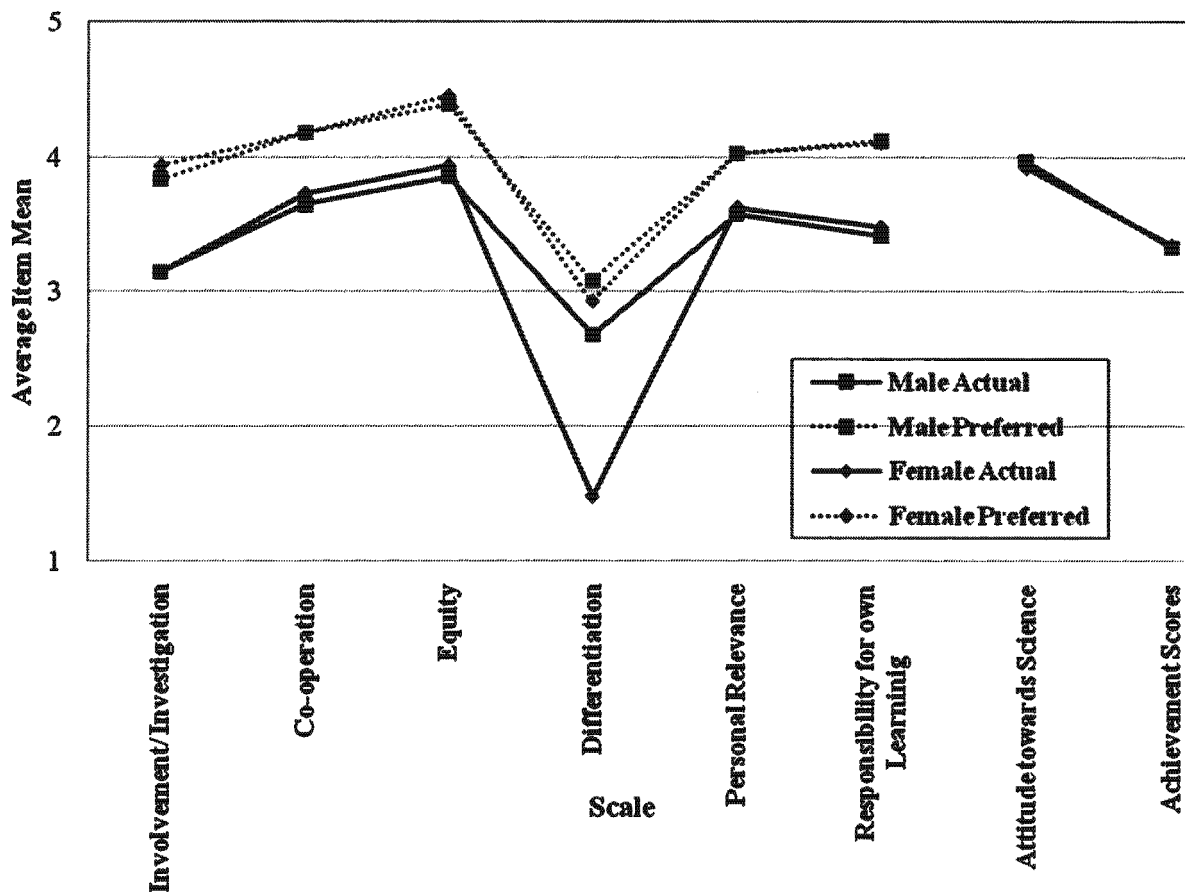


Figure 4.2 Average item mean scores for male and female students' scores on the actual and preferred OBLEQ-WC responses, Attitude towards Science and Achievement score.

Data were analysed using a one-way MANOVA for repeated measures. The class gender subgroup mean was used as a unit of analysis. Gender was the repeated measure factor and the OBLEQ-WC environment scales (including student *Attitude towards Science* and Achievement score) formed a set of dependant variables. As males and females are not found in equal numbers in each classroom, the within-class gender mean was chosen as the unit of analysis to provide a matched pair of the means—one within-class mean for males and one within-class mean for females. This multivariate test produced statistically significant ( $p < 0.01$ ) results using Wilks Lambda criterion. As a result, a one-way ANOVA for repeated measures was interpreted for each scale to examine the association between male and female perceptions of their science classroom environment, as well as associations between male and female perceptions of their *Attitude towards Science* and associations between male and female Achievement score. The results from the one-way ANOVA as well as the effect sizes ( $\eta^2$ ) are reported in Table 4.5. The effect size for each actual scale of the OBLEQ-WC was calculated to provide an estimation of the magnitude of the differences between males and females perceptions of their leaning environment. These ranged from between 0.03 (for

*Personal Relevance* and *Responsibility for own Learning*) and 0.13 (for *Differentiation*), suggesting that the differences between male and female perceptions of their actual learning environment are very small. These results between male and female perceptions of their learning environment show that there is a statistically significant ( $p < 0.01$ ) association between male and female perceptions of their actual learning environment for the scale of *Differentiation*.

#### **4.1.6 Results from the comparison between Limpopo Province and the Western Cape**

The fourth objective of the current study was to make a comparison between the results from a matching study conducted in the Limpopo Province (Aldridge, *et al.*, 2006) and the results from this study conducted in the Western Cape Province. Statistical analyses were conducted to explore the differences between the students' perceptions of their science learning environment in these two provinces in South Africa. A students' two sample *t*-test was used to determine whether there was a statistically significant difference among the actual and preferred average item means for students' from the Limpopo Province and the Western Cape (Table 4.6).

The associations between outcomes-based learning environments and key students' outcomes such as student *Attitude towards Science, Equity* and *Achievement* were compared between the two provinces and associations between gender differences were examined. A simple linear regression model was developed to compare the average item means for each of the environment scales between the two provinces. The regression model was used to examine the differences between gender differences between the two provinces.

**Table 4.5** Average item mean, average item standard deviation and difference between the actual and preferred perceptions on each of the OBLEQ-WC scales using the class mean as the unit of analysis. This includes the effect size ( $\eta^2$ ) and the F statistic from a one way ANOVA.

Scale	Unit of analysis	Average Item mean		Average Item Standard Deviation		Difference	
		Male	Female	Male	Female	Effect size	F
Involvement/ Investigation	Actual	3.15	3.15	0.61	0.61	0.04	0.02
	Preferred	3.84	3.94	0.69	0.68	0.07	4.43*
Co-operation	Actual	3.65	3.73	0.73	0.68	0.06	3.34
	Preferred	4.18	4.18	0.71	0.71	0.01	0.01
Equity	Actual	3.86	3.94	0.74	0.76	0.05	2.48
	Preferred	4.39	4.46	0.65	0.63	0.06	3.09
Differentiation	Actual	2.68	2.48	0.75	0.75	0.13	16.57**
	Preferred	2.93	2.93	0.65	0.98	0.08	5.29*
Personal Relevance	Actual	3.63	3.63	0.77	0.73	0.03	1.07
	Preferred	4.03	4.03	0.75	0.75	0.004	0.02
Responsibility for own Learning	Actual	3.48	3.48	0.93	0.87	0.03	1.07
	Preferred	4.11	4.11	0.78	0.77	0.005	0.02
Attitude towards Science	Actual	3.97	3.92	0.049	0.046	0.004	0.01
Achievement scores	Actual	3.33	3.35	0.17	0.16	0.026	0.47

\*\*p<0.01

\*p<0.05

The sample consists of 920 students in 30 classes in the Western Cape Province in South Africa.

The sample consisted of 30 matched pairs within class gender means.

#### *4.1.6.1. Using the OBLEQ-WC to describe and compare science classrooms from the Limpopo Province and the Western Cape*

Descriptive statistics were used to analyse the learning environment of science classrooms in both the Western Cape Province and Limpopo Province. The analysis was based on students' responses to the learning environment questionnaire (i.e., OBLEQ-WC and OBLEQ). The number of items within each scale in each province varied from 6 to 16. As a result, the average item mean was calculated for each province by dividing the scale mean by the number of items in the scale. The average item mean for students' actual and preferred perceptions on their learning environments for both the Limpopo Province and Western Cape. The students' two sample *t*-test was used to determine the difference between the students' actual perceptions of their learning environments among to two different provinces (Table 4.6). An identical analysis was conducted for students' preferred perceptions of their classroom environment. Figure 4.6 provides a diagrammatic description of the differences between the actual and preferred responses between the two provinces.

4.1.6.2. Examining gender differences in both the Western Cape and Limpopo Province.

A simple linear regression model was used to interpret the differences between males and females for each of the two provinces, that is the Limpopo Province and Western Cape Province. The regression analysis is used to predict the value of one variable on the basis of other variables. This linear regression model consisted of four variables, and four regression coefficients. The problem objective addressed by the model was to analyse the relationship between the dependant and independent variables. This analysis was based on students' responses to the OBLEQ-WC and OBLEQ and the average item means for each environment scale in each province for both males and females was used. The regression model is represented and described in detail below:

$$y = \beta_0 + \beta_1 (\text{Province}) + \beta_2 (\text{Gender}) + \beta_3 (\text{Gender} * \text{Province interaction})$$

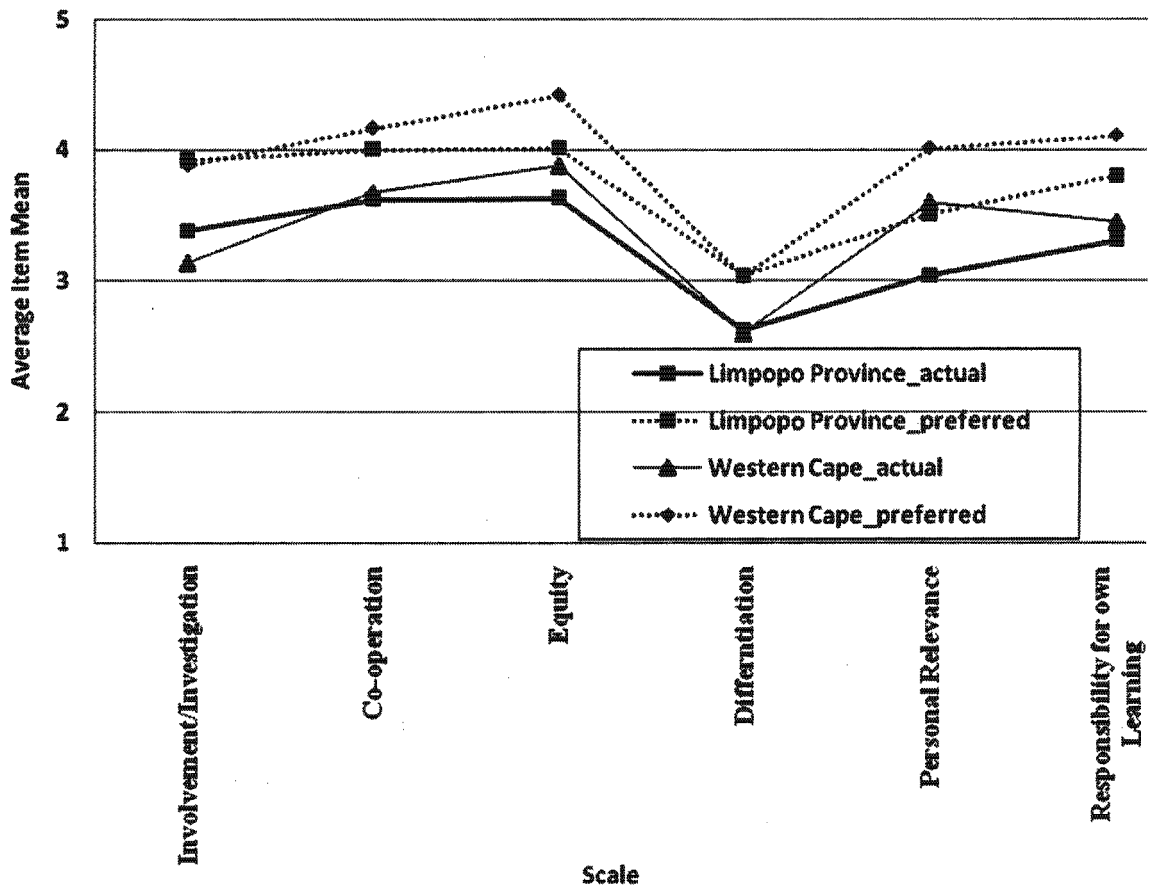


Figure 4.3 The actual and preferred responses to each of the environment scales in each of the province's compared in this study, the Limpopo Province and the Western Cape Province.

Before the regression model could be executed, both province and gender variables needed to be coded into a binary form. Province was coded as either 0 or 1 ('0' for Limpopo Province and '1' for Western Cape Province) and Gender was coded as either 0 or 1 ('0' for male and '1' for female). The OBLEQ-WC and OBLEQ scales were used as the dependant variables,  $y$ .  $\beta_0$  is the regression coefficient for the intercept and was not reported in the study but was used to estimate the other parameters in the model.  $\beta_1$  is the regression coefficient for examining differences between provinces and provides a coefficient which represents the slope of the straight line between the two provinces, Western Cape and Limpopo Province. This slope gives an indication of which province has a higher average item mean.  $\beta_2$  is the regression coefficient for examining differences between genders and provides a coefficient which represents the slope of the straight line between males and females. This slope gives an indication of the gender differences, and for which gender a higher average item mean exists.  $\beta_3$  is the regression coefficient for examining the interaction between the gender and the province. The interaction variable was calculated for each individual by multiplying the code for the province by the code for the gender. The interaction variables were then analysed to examine whether there is a statistically significant association between the gender and the province for each of the environment scales. This was done for both actual and preferred versions of the OBLEQ-WC and OBLEQ and the results of this analysis are reported on Table 4.8. The regression model produces a regression coefficient for each variable (i.e., gender, province and the interaction variable), as well as a two sample student  $t$ -statistic with an associated significance level. The regression coefficients for each variable, as well as the associated  $t$ -statistic, are reported in Table 4.6. This is reported for all eight OBLEQ scales for both the actual and preferred versions. Each significant association for each environment scale will be described in detail below.

#### 4.1.6.2.1 Involvement and Investigation

In Table 4.6, it can be observed that there is a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environments for the scale of *Involvement/Investigation* between provinces. This can be observed from the two sample student  $t$ -statistic (-6.885) reported in Table 4.6. The regression coefficient has a negative indicator (-0.214) which indicates the slope between the two provinces is negative. This implies that the students' in the Limpopo Province have a higher average item mean score for their perceptions of their actual learning environment, for this environment scale.

However, in terms of students' perceptions of their preferred learning environment, there is a statistically significant difference ( $p < 0.01$ ) between the genders as indicated by the two

sample student *t*-statistic (-4.824) reported in Table 4.6. The regression coefficient has a negative indicator (0.125) which indicates the slope between the two genders is negative. This indicates that females have a higher average item mean with regards to their perceptions of their preferred learning environment, for the environment scale of *Involvement and Investigation*.

**Table 4.6** Results from the simple linear regression model. Regression coefficients are provided for both the actual and preferred version of each environment scale for province, gender and the interaction between these two independent variables.

Scale	Unit of analysis	Regression coefficient ( $\beta$ )			T-statistic		
		Province	Gender	Interaction between variables	Province	Gender	Interaction between variables
Involvement/ Investigation	Actual	-0.214	0.025	0.024	-6.885*	-1.082	0.546
	Preferred	-0.066	-0.125	0.032	-1.849	-4.824**	0.621
Co-operation	Actual	0.037	-0.123	0.049	0.999	-4.502**	0.921
	Preferred	0.100	-0.116	0.119	2.503**	-3.962**	2.068*
Equity	Actual	0.251	-0.080	0.130	6.468**	-2.821**	0.230
	Preferred	0.362	-0.099	0.030	9.033**	-3.395**	0.521
Differentiation	Actual	0.870	0.066	0.136	2.032*	2.102*	2.200*
	Preferred	-0.106	0.032	0.144	-2.131*	0.061	2.008*
Personal Relevance	Actual	0.577	0.056	-0.104	13.062*	1.744	-1.639
	Preferred	-0.489	0.023	-0.026	-10.218*	0.659	-0.090
Responsibility for own Learning	Actual	0.135	-0.056	-0.006	3.196*	-1.814	-0.091
	Preferred	0.212	-0.114	0.125	4.954*	-3.649**	2.034*
Attitude towards Science Achievement scores		0.239	-0.057	-0.057	5.847*	1.907	1.151
		0.998	-0.100	-0.156	8.599*	-1.179	-0.932

\*p<0.01

\*p<0.05

The sample in the Western Cape consists of 927 students in 30 classrooms in South Africa

The sample in the Limpopo Province consists of 2638 students in 50 classrooms in South Africa.

#### 4.1.6.2.2 Co-operation

It can be observed that there is a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environment for the scale of *Co-operation* between the two genders. This can be observed from the two sample student *t*-statistic (-4.502) reported in Table 4.6. The regression coefficient has a negative indicator (-0.123) which indicates the slope between the two genders is negative. This implies that females have a higher average

item mean score for their perceptions of their actual learning environment with respect to this scale.

However, in terms of students' perceptions of their preferred learning environments, there is a statistically significant difference ( $p < 0.01$ ) between the two provinces. This can be observed from the two sample student  $t$ -statistic (2.503) reported in Table 4.6. The regression coefficient has a positive indicator (0.100) which indicates the slope between the two provinces is positive. This indicates that students' in the Western Cape have a higher average item mean with regards to their perceptions of their preferred learning environment with respect to the scale of *Co-operation*. There is also a statistically significant difference ( $p < 0.01$ ) between male and female's preferred perception of this environment scale. This can be observed by the two sample student  $t$ -statistic (-3.962) reported in Table 4.6. The regression coefficient associated with this  $t$ -statistic has a negative indicator (-0.116) which suggests that the slope between the two genders is negative. This indicates that females have a higher average item mean with regard to their perceptions of their preferred learning environment with respect to this environment scale.

#### 4.1.6.2.3 Equity

It can be observed that there is a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environments for the scale of *Equity* between the two provinces. This can be observed from the two sample student  $t$ -statistic (-6.468) reported in Table 4.6. The regression coefficient has a positive indicator (0.251) which indicates the slope between the two provinces is positive. This implies that the students' in the Western Cape have a higher average item mean score for their perceptions of their actual learning environment with respect to this scale. There is also a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environment with respect to the scale of *Equity* between the two genders. This can be observed from the two sample student  $t$ -statistic (-2.821) reported in Table 4.6. The regression coefficient has a negative indicator (-0.080) which suggests the slope between the two genders is negative. This implies that the females have a higher average item mean score for their perceptions of their actual learning environment with respect to this classroom environment scale.

However, in terms of students' perceptions of their preferred learning environments, there is a statistically significant difference ( $p < 0.01$ ) between the two provinces. This can be observed from the two sample student  $t$ -statistic (9.033) reported in Table 4.6. The regression coefficient has a positive indicator (0.362) which indicates the slope between the two

provinces is positive. This indicates that students' in the Western Cape have a higher average item mean with regards to their perception of their preferred learning environment with respect to the environment scale of *Equity*. There is also a statistically significant difference ( $p < 0.01$ ) between male and female's perceptions of their preferred learning environment with respect to this environment scale. This can be observed by the two sample student *t*-statistic (-3.395) reported in Table 4.6. The regression coefficient associated with this *t*-statistic has a negative indicator (-0.099) which suggests that the slope between the two genders is negative. This indicates that females have a higher average item mean with regard to their perceptions of their preferred learning environments with respect to this environment scale.

#### 4.1.6.2.4 Differentiation

It can be observed that there is a statistically significant difference ( $p < 0.05$ ) between students' perceptions of their actual learning environments for the scale of *Differentiation* between the two provinces. This can be observed from the two sample student *t*-statistic (-2.131) reported in Table 4.6. The regression coefficient has a negative indicator (-0.870) which indicates the slope between the two provinces is negative. This implies that the students' in the Limpopo Province have a higher average item mean score for their perceptions of their actual learning environment with respect to this environment scale. There is also a statistically significant difference ( $p < 0.05$ ) between students' perceptions of their actual learning environment with respect to the scale of *Differentiation* between the two genders. This can be observed from the two sample student *t*-statistic (2.102) reported in Table 4.8. The regression coefficient has a positive indicator (0.066) which suggests the slope between the two genders is positive. This implies that the males have a higher average item mean score for their perceptions of their actual learning environment with respect to this environment scale.

However, in terms of students' perceptions of their preferred learning environment, there is a statistically significant difference ( $p < 0.05$ ) between the two provinces. This can be observed from the two sample student *t*-statistic (-2.131) reported in Table 4.6. The regression coefficient has a negative indicator (-0.106) which indicates the slope between the two provinces is negative. This indicates that students' in the Limpopo Province have a higher average item mean with regards to their perception of their preferred learning environment with respect to environment scale of *Differentiation*.

#### 4.1.6.2.5 Personal Relevance

It can be observed that there is a statistically significant difference ( $p < 0.05$ ) between students' perceptions of their actual learning environments for the scale of *Personal Relevance* between the two provinces. This can be observed from the two sample student *t*-statistic (13.062) reported in Table 4.6. The regression coefficient has a positive indicator (0.577) which indicates the slope between the two provinces is positive. This implies that the students' in the Western Cape have a higher average item mean score for their perceptions of their actual learning environment with respect to this environment scale.

However, in terms of students' perceptions of their preferred learning environment, there is a statistically significant difference ( $p < 0.01$ ) between the two provinces. This can be observed from the two sample student *t*-statistic (10.218) reported in Table 4.6. The regression coefficient has a positive indicator (0.489) which indicates the slope between the two provinces is positive. This indicates that students' in the Western Cape have a higher average item mean with regards to their perception of their preferred learning environment with respect to the scale of *Personal Relevance*.

#### 4.1.6.2.6 Responsibility for own Learning

It can be observed that there is a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environments for the scale of *Responsibility for own Learning* between the two provinces. This can be observed from the two sample student *t*-statistic (3.196) reported in Table 4.6. The regression coefficient has a positive indicator (0.135) which indicates the slope between the two provinces is positive. This implies that the students' in the Western Cape have a higher average item mean score for their perceptions of their actual learning environment with respect to this environment scale.

However, in terms of students' perceptions of their preferred learning environment, there is a statistically significant difference ( $p < 0.01$ ) between the two provinces. This can be observed from the two sample student *t*-statistic (4.954) reported in Table 4.6. The regression coefficient has a positive indicator (0.212) which indicates the slope between the two provinces is positive. This indicates that students' in the Western Cape have a higher average item mean with regards to their perception of their preferred learning environment with respect to the environment scale of *Responsibility for own Learning*. There is also a statistically significant difference ( $p < 0.01$ ) between male and female's perceptions of their preferred learning environment with respect to this environment scale. This can be observed

by the two sample student *t*-statistic (-3.649) reported in Table 4.6. The regression coefficient associated with this *t*-statistic has a negative indicator (-0.114) which suggests that the slope between the two genders is negative. This indicates that females have a higher average item mean with regard to their perceptions of their preferred learning environment with respect to this scale.

#### 4.1.6.2.7 Student Attitude towards Science

It can be observed that there is a statistically significant difference ( $p < 0.05$ ) between students' mean score in the scale of *Attitude towards Science* between the two provinces. This can be observed from the two sample student *t*-statistic (5.847) reported in Table 4.6. The regression coefficient has a positive indicator (0.239) which indicates the slope between the two provinces is positive. This implies that the students' in the Western Cape have a higher average item mean score for their perceptions of their actual learning environments for this student outcome.

#### 4.1.6.2.8 Achievement score

It can be observed that there is a statistically significant difference ( $p < 0.01$ ) between students' perceptions of their actual learning environment for the Achievement score between the two provinces. This can be observed from the two sample student *t*-statistic (8.599) reported in Table 4.6. The regression coefficient has a positive indicator (0.998) which indicates the slope between the two provinces is positive. This implies that the students' in the Western Cape have a higher average item mean score for their perceptions of their actual learning environment with respect to this student outcome.

## **4.2. Findings from the Qualitative data**

Once the quantitative data analyses were complete, the second part to the current study involved a small-scale naturalistic inquiry in the form of classroom observations followed by educator and student interviews in selected classrooms, as applied by Aldridge, *et al.* (1999). The purpose of conducting these small scale inquiries was to collect data that would validate the quantitative results through the triangulation of data (Chapter 3, pg.24). The qualitative data collection thus aimed to provide explanations for the discrepancies in as well low and high absolute values between the scales of the OBLEQ-WC between students' perceptions of their learning environments which characterise their actual and preferred science classroom environments.

Two forms of qualitative data were collected: lesson observations and educator and student interviews with respect to the dimensions of the OBLEQ-WC (Chapter 3, pg.24). The students were interviewed with respect to the dimensions on the OBLEQ-WC. The purpose of this was to gain insight into classroom practices in order to explain variations between students' perceptions of their actual and preferred Science learning environments in relation to the specific dimensions of the OBLEQ-WC.

Classroom observations were made using the six OBLEQ-WC dimensions as a guide. The lesson descriptions compiled from the classroom observations are representative of a typical lesson. Lesson descriptions were completed for five classrooms. The statements from the participants were condensed in order to give general impressions from the interviews, as suggested by Kvale (1996).

#### *4.2.1. Class A*

Class A is in a school which is situated in an poor urban area about 20km from the Cape Town city centre. It is an area marked by poverty, and borders on an informal settlement. The school is a co-educational primary school that extends from Grade 1 to Grade 8. The students' and the staff speak both English and Afrikaans, and lessons are conducted in both languages. There are about 800 students' enrolled at the school, with a total of 21 educators. All of these educators are employed by the Western Cape Education Department (WCED), and no School Governing Body (SGB) posts exist. There are approximately 40 students per class in in the school from Grade 1 to Grade 7. The Grade 8 class consists of 20 students. The parents pay R275.00 per year for school fees, if they can afford it. The educators are aware that many of the students are not fed at home and as a result, the school has established a feeding scheme. The management of the school identifies students from poor families, and part of the schools fees is used to feed these students.

In terms of the infrastructure, there is electricity as well as running water available, and flushing toilets for both the staff and students exist. There is a chalk board in each classroom and each classroom is equipped with desks and chairs. Each student has a book in which they write, and stationery to write with. There are no science laboratories and no science equipment is available. The students are taught about experiments; however, there are no resources to conduct these experiments.

A description of a typical lesson in Class A is given in Appendix 5.

After the lesson reported above, the educator was interviewed as were the students'. Interview questions were influenced by the classroom environment profile as well as the classroom observations. The average item mean for students' perceptions of their actual and preferred learning environments for each OBLEQ-WC scale for Class A is given in Figure 4.4. A striking feature of the learning environment profile for this class is the very large disparity between the students' perceptions of their actual and preferred classroom learning environments for the classroom dimension of *Involvement/Investigation*. The absolute value of the mean scores for Class A are quite low and there seems to be a large difference between actual and preferred responses. Students' perceptions of their preferred learning environment with respect to the scale of *Differentiation* is lower than the other scales. These two OBLEQ-WC scales along with *Personal Relevance* and *Responsibility for own Learning* will be discussed below.

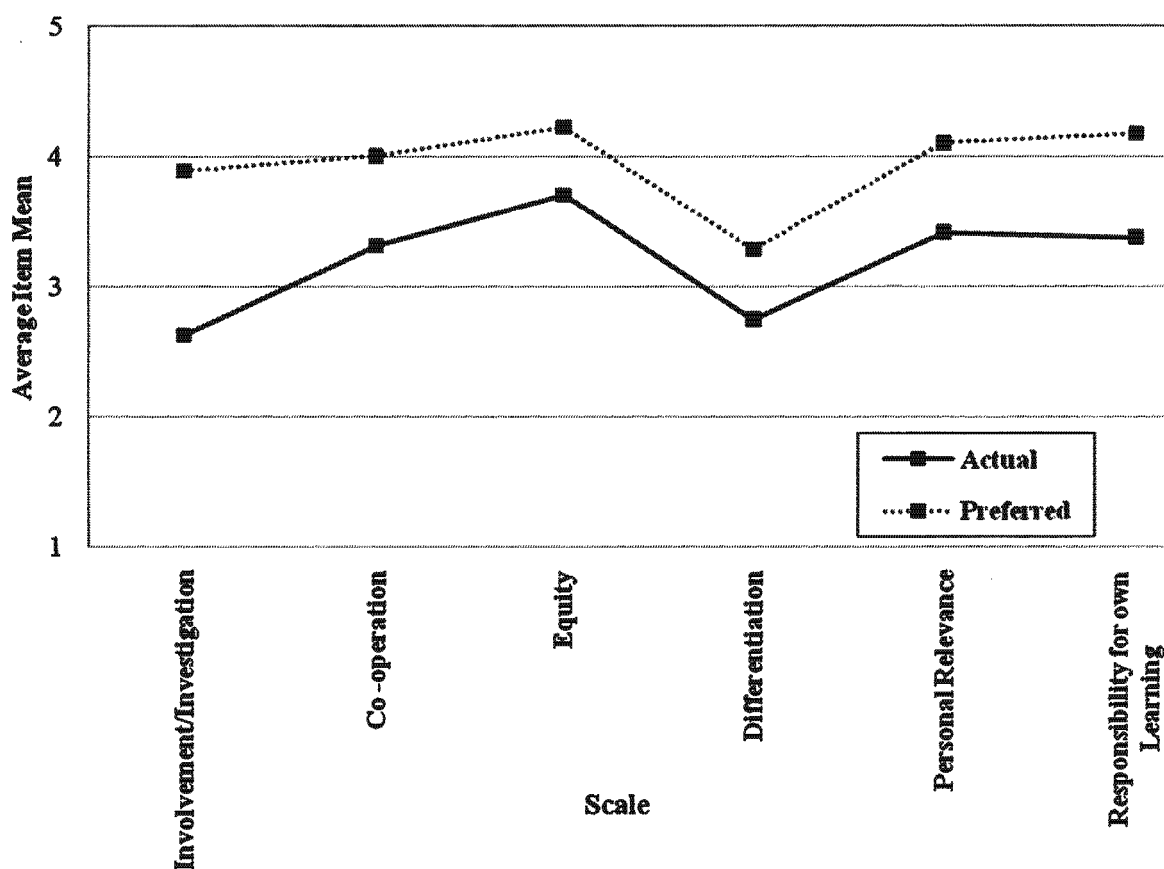


Figure 4.4 Students' perceptions of their actual and preferred Science classroom learning environment in Class A.

Each of the students' that were selected for the interview claimed that they would enjoy science more if their educator did more lessons like the one he did today. It was clear from the students' responses that this sort of lesson was out of the ordinary for the students' in this class. The large disparity between the students' perceptions of their actual classroom environment for the scale of *Investigation/Involvement* and the perceptions of their preferred classroom environment supports this statement. The educator confirmed this, and stated that although he tries to do as many investigation-type lessons as he can, it is very difficult for him to teach in this way. He also does not like to use any of the textbooks or resources that advocate OBE teaching. The educator believes that the "old system" worked well and therefore he uses resources and textbooks which were published before the curriculum reform. These textbooks do not have many investigation-type questions and therefore this is lacking in his lessons. He says, "I don't agree with the textbooks that are being produced. They are all about experiments. But I don't have time to do these experiments and so I can't use the books." He said that he can hardly ever teach this class because along with his teaching responsibilities, he also has administrative responsibilities as he is the headmaster of the school. He usually writes up notes for the student's to copy down and then explains them at a later stage. On inspection of the student's workbooks, and after asking the students' questions about the work they have covered, it is clear that there are some notes which he has not gone over. One student points out in her book which notes have covered in class and which they still had to cover. She says, "I have the notes for that section, but we haven't spoken about it in class. But I have tried to read through it on my own."

Although, not evident from this lesson, the students' claimed that they do not like it when the educator treats them differently. "Sometimes [the educator] picks on the naughty kids and it's ok, but it's not nice when he treats us differently just because he doesn't like us." This supports the low values for the scale of *Differentiation* on Class A's learning environment profile.

The educator says that he tries to make the lessons as relevant as possible to the students but he does not get to attend the lesson often and so when he does get to teach, he needs to teach content. He also does not like giving the students' too much time to themselves or encourage them to make decisions about their learning. He believes that "they will never learn anything if they are given responsibility." He further added, "These students are young and you, as a educator, need to give them strict instructions on what to do: notes on the board that they can write in their books. They need to learn." The students are required to take down notes written on the board, and when this educator has time, the notes are explained to them.

#### 4.2.2. Class B

Class B is in a school which is situated in an urban area about 20km from the Cape Town city centre, in a predominantly Afrikaans suburb. It is a co-educational secondary school which extends from Grade 8 to Grade 12. The lessons are taught in Afrikaans and English. There are 1120 students and 31 educators at this school. Twentny-one educators holds WCED posts and the balance are SGB-employed. The educator to students ratio is approximatley 1:32 in the each class in the school. The students come from middle-class backgrounds. however, after the interview with the educator it was clear that many of the parents cannot afford to pay the annual school fees of R4000 per year. The school grounds are large and a solid perimeter fence surrounds the school.

In terms of the infrastructure, electricity and running water is avaiable. There are flushing toilets for both the staff and students. All the classes are equipped with a chalk board. There is a rugby field, in addition to a well maintained swimming pool. The classrooms are large with a number of desks and chairs. The school has a computer laboratory which houses 67 computers. There is a well -eveloped science department which consists of seven educators all of whom have undergraduate degrees in Science. There is also a science laboratory which is not fully equipped but has basic equipment for the students to use.

A description of a typical lesson in Class B is given in Appendix 6.

The classroom pedagogy was student-centered, with the educator engaging students' in meaningful and relevant classroom discussions. The students' were required to explore their own ideas about a topic and share these with the rest of class, as was observed by the researcher. As a result there is more classroom dialogue represented in this account. A graphical profile of students' perceptions of this science classroom environment is given in Figure 4.5, which substantiates the classroom observations in the class. From this classroom profile, it can be observed that the discrepancies between the students' perceptions of their actual and preferred science learning environments are small, with the largest difference occurring for the scale of *Responsibility for own Learning*. The results below focuses on the environment scales of *Involvement/Investigation*, *Differentiation* and *Responsibility for own Learning*, as these are the OBLEQ-WC scales which are represented in the above lesson.

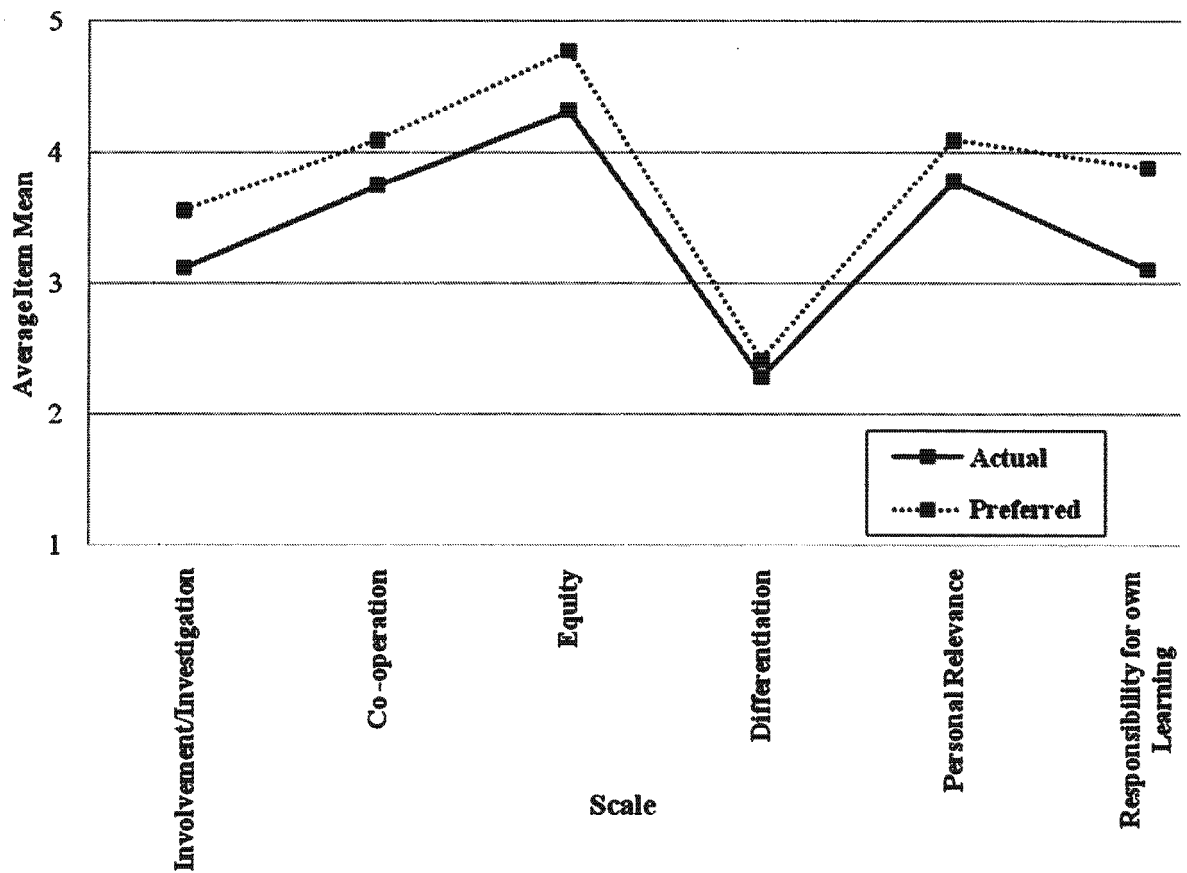


Figure 4.5 Students perceptions of their actual and preferred Science classroom learning environment in Class B.

There is a small discrepancy between students' perceptions of their actual and preferred learning environments within the OBLEQ-WC of *Involvement/Investigation*. This can be attributed to the educator continually asking the students questions, and allowing the students to explore and express their own views about a topic. "She asks a lot of questions, and then if we can't get the answer then she will help out, but she makes us think about the questions before she just answers them," one student said. "She gives us an opportunity to grasp it and get the answers ourselves, and she asks questions that lead up the answer. I like that," another student said. The educator tries to use questions to allow the students' to explore and correct their prior notions about the topic. The educator stated that as far as possible she tries to do investigations but it is hard with such a big class and with the curriculum being so dense.

A small discrepancy between the absolute scores for students' perceptions of their actual and preferred learning environments for the OBLEQ-WC scale of *Differentiation* can be observed from Figure 4.4. One student stated, "If you are treated differently, then people get jealous of you." Another student said,

"Like when you treat someone else different, then either you are picking on them or you're like...I don't know how to say it, like you're putting that person in front of everyone else, and giving special attention to that kind of person. That's why all of us like to be treated the same."

The educator cemented this by responding, "There are some real problems with treating kids differently. My classes are so big; I have to try really hard to treat one kid differently. But I also make a conscious effort to try and treat all the kids the same."

With respect to the OBLEQ-WC scale of *Responsibility for own Learning*, there is a large discrepancy between students' perceptions of their actual and preferred learning environment. Although there is no direct evidence for this in the represented lesson, it is an important dimension to address as it is one of the scales with the largest discrepancy between students' perceptions of their actual and preferred learning environments. Before addressing this environment scale, it is imperative to establish the meaning of the scale to the students'. On interviewing one of the students, he responded, "It means, it's up to you. You can make the notes in class, but in the end it is your decision whether you want to fail or not. You need to set your own goals and your own standards, for yourself." When asked for an example, one student said, "If you look behind the board on the left there is a thing that says 8(1), 8(3) and she says at the beginning of the term, "what do you think your average can be? What can you achieve?" And she sets us a challenge so she gives us something to work towards to which makes it worth your while." Another student says, "She encourages us a lot, like when we do bad in tests she would like, um, tell us that we can do better and we are a class that can achieve more and improve the marks we get." This educator sets goals for the class so the class knows what they are able to achieve. This system may work for some students; however, there are students for which this system may not work. One student said, "I don't like it. It makes me feel like a baby...like I can't think for myself."

### 4.2.3 Class C

Class C is in a school which is situated in an urban area about 15km from the Cape Town city centre, in the heart of an informal settlement. It is a co-educational secondary school that extends from Grade—8 to Grade 12. The students and staff speak in both isiXhosa and English, however, lessons are conducted in English. There are approximately 1513 students enrolled at the school and about 42 educators employed by the WCED, with no governing body posts. There are approximately 38 students per class throughout the school. There are no school fees at this school. If the parents can afford to pay it, R150 is required per year for tuition. However this is not compulsory. The educator informed the researcher that the students from this school are from poor backgrounds and that many come to school in the morning without having had breakfast. The school recognises this problem and offers a feeding scheme where students are able to have a hot lunch at the school.

In terms of the infrastructure, electricity and running water is available. There are flushing toilets for both the staff and students. All the classes are equipped with chalk board. The classrooms are large with a number of desks and chairs. In 2004, the school realised the importance of an Information Technology programme for their students and wanted to include this in their curriculum. The Khanya Project<sup>2</sup> became involved with the school, and there are 26 computers in this school, all of which have the latest educational technology. The educators have been trained to use these and are now all computer literate. From this year i.e. 2009, the school is offering an additional subject of Computer Aided Technology (CAT) to students that are interested in becoming computer literate. The school does have a science laboratory which is fully equipped. There are benches in the laboratory each with a small locker with all the necessary apparatus. There is also a gas outlet at each desk. The laboratory is used primarily by the students' in Grade 11 and 12, however, the students from lower grades also make use of it occasionally. There is a large brick wall that surrounds the perimeter of the school with an automated gate at the front of the school. Three secretaries sit at the front desk and are responsible for the administration of the school. The timetable is structured so that the educators move around to different classrooms whilst the students sit in one classroom, going out for only lunch breaks. The school has worked hard to establish itself both academically and in terms of the extra mural activities. It is a well-known school in the community and many students work hard to be accepted.

A description of a typical lesson in Class C is given in Appendix 7.

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<sup>2</sup> The Khanya Project is an initiative of the WCED which aims to supply all students and educators with computers.

This classroom environment profile in Figure 4.6 indicates that there is very little difference between students' perceptions of their actual and preferred science learning environments. Before the students were asked questions relating to the OBLEQ-WC scales, they were asked to express their opinions about the educators' approach to teaching. Some students' appreciated the educators' method and style of teaching, "I like the way she makes us all repeat the words after her. It makes it easy for me to remember it," one student said. "If I repeat the English words, then I will learn English. I like that about this class. We learn English and Science," another student said. One student stated, "Yes, we learn new words here, like we learn[t] carrot-sive today. I take it home and tell it to my sister." The students seem to enjoy the learning in English. They are not troubled by the educator making them repeat the words. The educator feels that this is a good way for the students to learn, "They will remember the words and they will remember the content. This way it will be less for them to learn in the exams."

The scale of *Differentiation* has a lower mean item value than the rest of the scales in this classroom profile (Figure 4.6). This indicates that the students do not like to be treated differently from each other. The students can't work on different topics because the educator ensures that the students all work together on the same topics. She says, "I like them all to work on the same thing at the same time, because then they can help each other. It would be too hard to keep track of where all the kids were all the time."

The difference between the students' perceptions of their actual and preferred science learning environment on the scale of *Relevance* is very small indeed. The students believe that the concepts learnt in class are ones which are relevant to their lives. "The stuff we learn in class is the stuff we can go home and look at," says one student. Another student says, "Ya...like today we spoke about acids and bases, and I knew that Omo was slippery when I put water on it. So now I know it is a base. You see, I know stuff from home and we talk about it at school." These responses support the classroom environment profile represented in Figure 4.6.

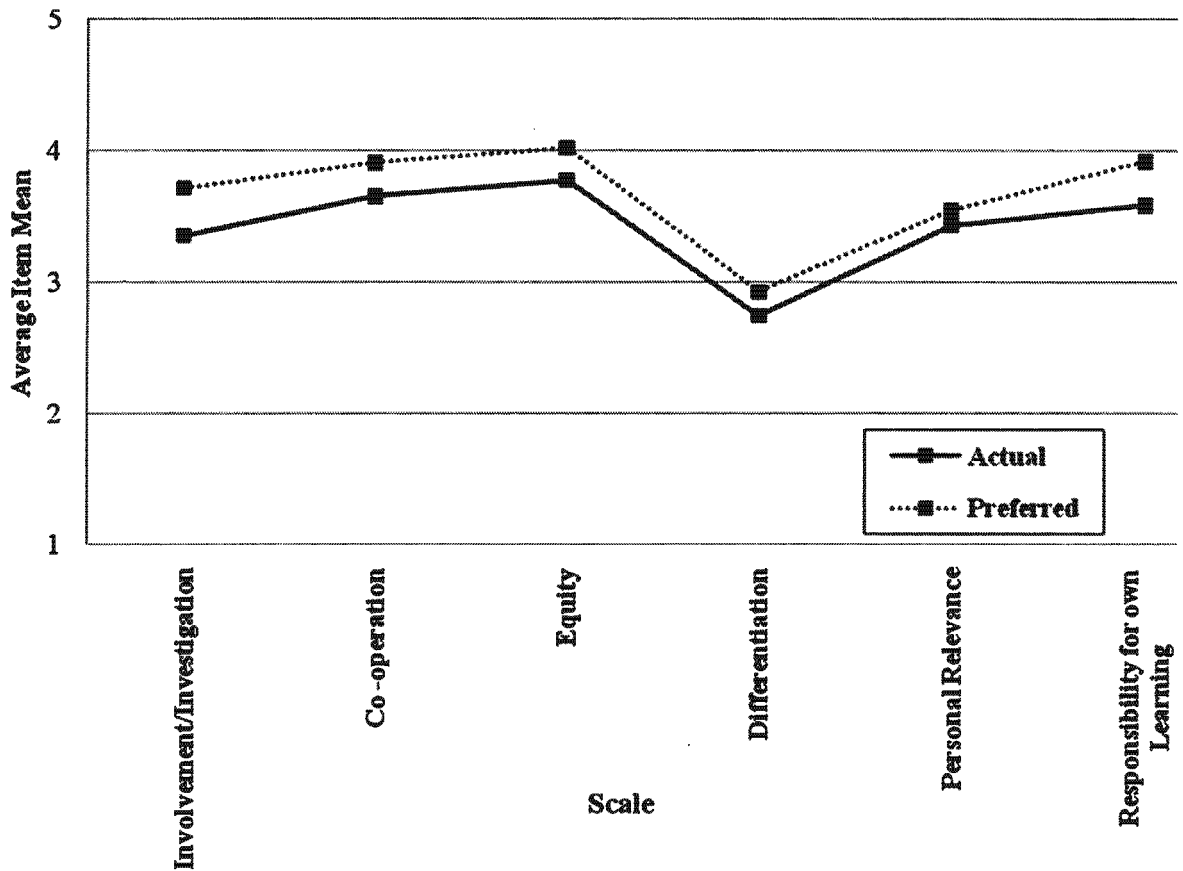


Figure 4.6 Students perceptions of their actual and preferred Science classroom learning environment in Class B.

#### 4.2.4 Class D

Class D is in a school which is situated in an urban area about 5km from the Cape Town city centre. It is a co-educational secondary school that extends from Grade 8 to Grade 12. The students and staff speak in both Afrikaans and English, however, lessons are conducted in English. There are approximately 470 students enrolled at the school and about 18 educators employed by the WCED, with no governing body posts. There are approximately 38 students per class throughout the school.

The educator informed the researcher that the students from this school are from poor backgrounds, and the majority of the students grow up in homes where both parents work in the industries around this area. These parents cannot afford the R4500 school fee per annum.

In terms of the infrastructure, there is running water and electricity available. There are flushing toilets for both the staff and students. Each class is equipped with a chalk board, and desks and chairs for the students'. The school grounds are small and have not been well maintained. There are no rugby fields or swimming pools, and the students instead make use

of such resources at a nearby school. In terms of the academic facilities, this school has recently become part of the Khanya Project<sup>3</sup>. 72 computers have been installed with the latest educational technology in a newly developed computer laboratory. The school aims to make each student computer literate through a series of lesson which each class attends once a week during school hours. These lessons are conducted by an educator who acts as a facilitator; all the educators are computer literate. The school does not have a science laboratory and most of the science practical investigations are done by the educator.

A description of a typical lesson in Class D is given in Appendix 8.

The classroom environment profile for Class D (Figure 4.7) indicates that there is a large discrepancy between the students' perceptions of their actual and preferred classroom learning environments to five of the six OBLEQ-WC scales. The dimension of *Personal Relevance* seems to show a smaller disparity between the students' perceptions of their actual and preferred science classroom environment. The description of the findings below will focus on all six of the OBLEQ-WC environment scales.

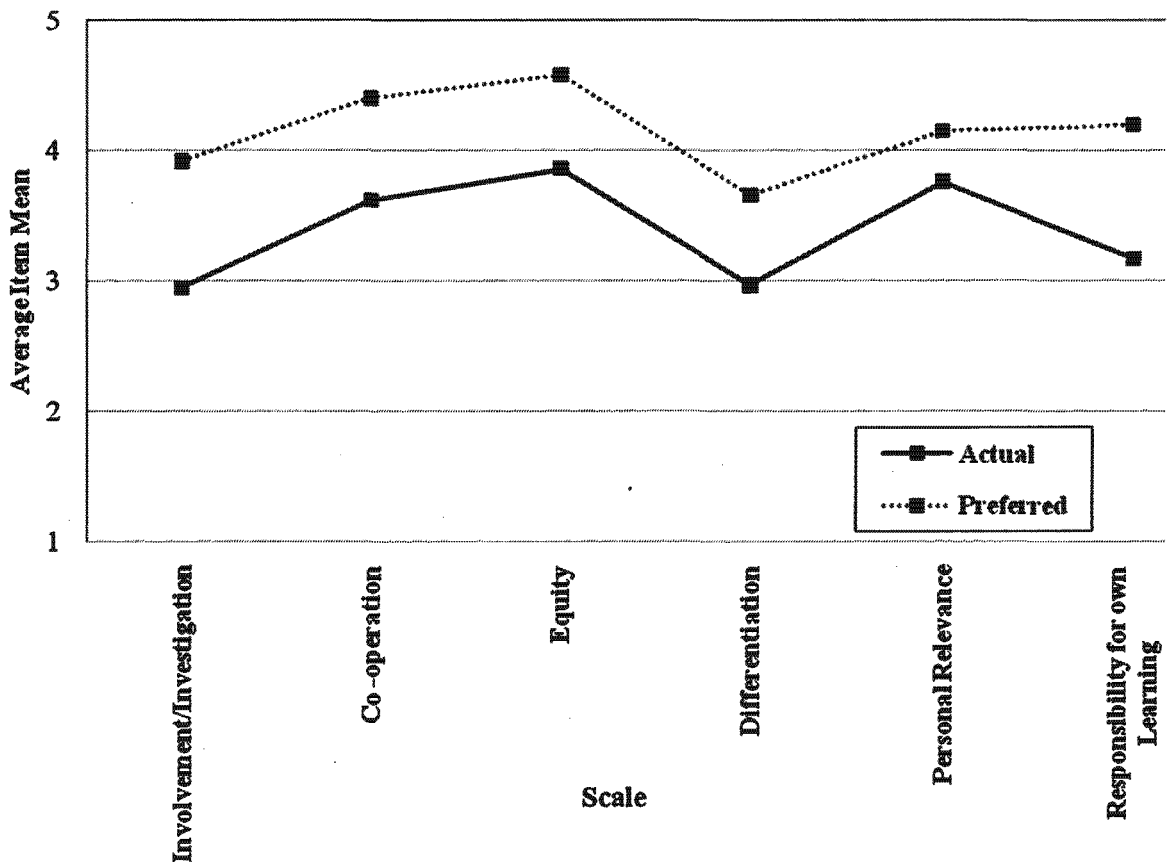


Figure 4.7 Students perceptions of their actual and preferred Science classroom learning environment in Class D.

There is a large discrepancy between the students' perceptions of their actual and preferred learning environments for the environment scale of *Involvement/Investigation*. Through interviews with both the educator and the students, it became apparent that investigation-type activities are done rarely in this class. One student states, "I would like to do more experiments. It's interesting when the educator does it, but sometimes I want to do them too." The educator justifies this by mentioning that these students are very weak and that many of them cannot read. As a result, she is required to work at a slower pace with these students and this leaves very little time for activities which demand a practical aspect. The students are also not given much opportunity to engage with the educator or with other students about their ideas. "The lessons are so short [35 minutes] and I have so much to cover that often I can't ask the kids questions or ask them to share their ideas," the educator states. When interviewed, the students' expressed the fact that sometimes they would like to do an experiment or talk to each other about their ideas. "I think this [speaking about their ideas in class] is good because it helps to see what everyone else in the class is thinking. I also like working in groups to do practical's," one student says. "We don't do lots of practical work here," another student states.

There is very little team work or instances where students' work in groups in this class, as observed by the researcher. This could be due to the reality that the students do not engage with each other or with the educator about their ideas. As a result there is a large difference between students' perceptions of their actual and preferred learning environment for the scale of *Co-operation* (Figure 4.7).

The environment scale of *Equity* shows a large disparity between students' perceptions of their actual and preferred learning environments. This indicates that students in this class believe that they do not experience the same amount of attention from the educator, or that some students' answers are not as highly valued as other students'. There are some students' in this class that believe the educator encourages certain students' more. "It's hard because some of us can work fast and some have to work slowly. So our educator has to work with the slow kids and then the fast kids feel they don't get any attention from her," one student says. The educator states that paying attention to each student equally is a problem, "The students' in this class aren't streamed and so there are students that can't read and I need to help them. It's hard to spread your attention out evenly."

While it may be difficult to give each student a similar amount of attention, this educator nevertheless tries to incorporate a degree of relevance into her lessons. This is allowed by making students to relate the work they study in class to the world outside of school. One

student says, "One day we were talking about climate, and then we started to talk about global warming and evolution and she told us about the moths that changed colour with the smoke from all the factories." "Yes...That was cool! Because my dad works in a factory so I went home and told him about it," another student says. "It's really nice that sometimes we don't stick to only what we need to know, but sometimes we learn things that might not be in the exam but it still links with what we are learning," a third student announces.

The class mean score for *Responsibility for own Learning* suggests a considerable discrepancy between students' perceptions of their actual and preferred learning environments. The students in this class are not encouraged by the educator to make decisions about their own learning process or to think about their learning. The educator feels that there is not enough time in the lessons to encourage students' to think about their own learning. "These students are so weak that I think it is necessary for me to take control and manage the students time and activities. If you give them too much responsibility they may never learn anything," the educator states. "I think it's better for me to guide them through the content," she says.

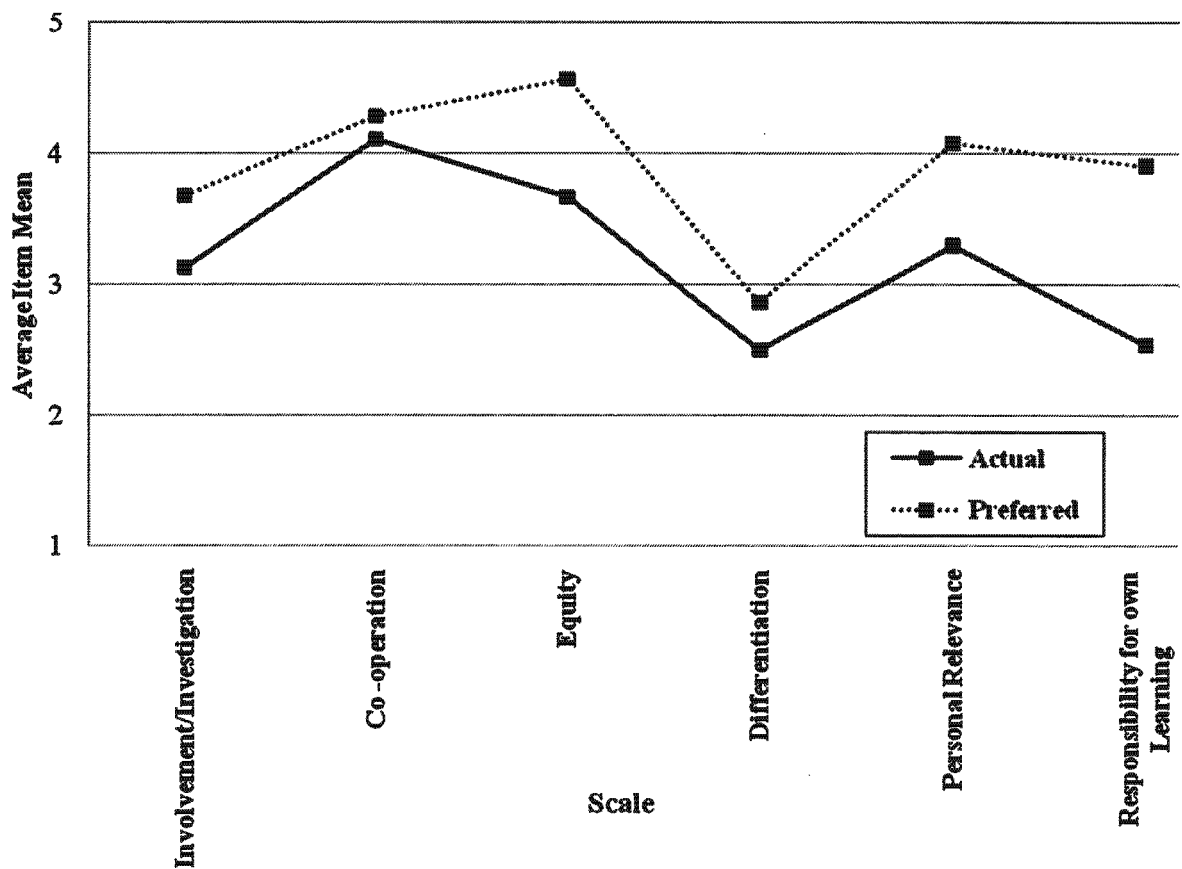
#### *4.2.5 Class E*

Class E is in a school which is situated in an elite Cape Town suburb about 10 kilometres away from the city centre. It is a single sex secondary school that extends from Grade 8 to Grade 12. The students and staff speak English, and lessons are conducted in English. There are approximately 900 students enrolled at the school and about 40 educators employed by the WCED, with 10 educators employed by the SGB. There are also eight members of administrative staff and 12 boarding house staff. The school also employs staff for Marketing and Public Relations, as well as Estates staff to maintain the grounds. There are approximately 20 students per class in Grade 8 and 9, and 15 students per class in Grades 10, 11 and 12. The schools fees for this school are R18 570 a year.

In terms of the schools infrastructure, there is electricity and running water available. Flushing toilets are available for staff, students and guests. Each classroom is equipped with a chalk board, a laptop, a projector and a white screen. The Mathematics and Science departments make use of a Smart board which is an interactive, electronic whiteboard designed to enhance instruction and learning. There are sufficient, well-maintained desks and chairs for the students. There are fully equipped science laboratories which are used by students from Grade 8 to Grade 12.

A description of a typical lesson in Class E is given in Appendix 9.

As can be observed from the environment profile for Class E (Figure 4.8), little difference exists between students' perceptions of their actual and preferred learning environments for the scale of *Co-operation*. There is, however, a large discrepancy between students' perceptions of their actual and preferred learning environments for the environment scales of *Equity*, *Personal Relevance* and *Responsibility for own Learning*. These four environment OBLEQ-WC scales will be considered in further detail.



**Figure 4.8** Students perceptions of their actual and preferred Science classroom learning environment in Class E.

In this lesson, the students worked in a group to come up with an answer to the educators' question about the sources of energy that would be best to sustain life in the space craft. It is evident from classroom observation that working together as a group is a key feature in this classroom. "It is easy for me to allow the students to co-operate with each other, because this is a streamed class. Therefore I know that they all have a similar level of ability," says the educator. One student says, "I really enjoy all the activities that we do in groups. I find it is

easier to make useful suggestions because it's like I am just talking to a group of friends, not to...like, the whole class." Through these comments and the lesson observation, the slight discrepancy between students' perceptions of their actual and preferred learning environments for this environment scale is supported.

There is a great divergence between students' perceptions of their actual and preferred learning environments for the environment scale of *Equity*. This suggests that the educator gives some students more attention than other and tends to value some students answers over others. "There are two groups," one student says, "Either you are naughty and he will pick on you, or you are really clever and he will pick on you. If you are neither, then you don't get much attention." Reference was made to this in the lesson when one student stated, "No Sir, you always pick on me." The educator responds, "I try my best not to pick on the kids, but it is hard and I often fall into the trap of only focussing on the clever kids and the ones that misbehave." From the classroom environment profile, it is evident that the students would prefer little differentiation between the students.

There is a large discrepancy between students' actual and preferred perceptions of the environment scale of *Personal Relevance*. From the student interviews, it is apparent that the educator does not relate the lesson content to the students' experience of the world outside the classroom. "Sir doesn't really encourage us to explore stuff," one student says. When the educator approaches the topic, no connection is made between the topic and the application of the technology to the world outside of the classroom. The educator responds to this by saying, "It is hard to relate everything to their own lives, because we have to get through so much, and the curriculum is so jam-packed. If we had to discuss everything, we would never finish the syllabus. The educator does not encourage these students' to manage their own learning. "These students' are very young and to expect them to take responsibility for their own learning is asking too much. They need someone to manage that for them," the educator states. The students, however, would prefer to make decisions about their own learning process. "Yes, it would be great if Sir gave us an opportunity to plan what I was going to learn, or pay attention to activities that I like." This explanation would explain the large discrepancy between the students' perceptions of their actual and preferred learning environments for the environment scale of *Responsibility for own Learning*.

## Chapter 5

### DISCUSSION AND RECOMMENDATIONS

Before 1994, education policies were established by the Apartheid government. However, in the early 1990s, Apartheid education policies were reformed by the new democratic government (Chapter 2, pg.7) and a new curriculum, *Curriculum 2005* (C2005) was implemented in 1995. However, there were many limitations to C2005 (Chapter 2, pg.9). To address these shortcomings, the curriculum was revised, and the Revised National Curriculum Statement (RNCS) was accepted as policy in 2002 (Chapter 2, pg.9). The RNCS encompasses the philosophy of Outcomes-Based Education (OBE) to promote a student-centered teaching approach (Chapter 2, pg.10). OBE thus forms the foundation of the current curriculum in South Africa.

#### 5.1 Purpose of the study

This study aims to investigate the extent to which educators implement an outcomes-based teaching approach in their Natural Science lessons in the Western Cape. The study also provides a comparative analysis between the results collected from the Western Cape and results already collected from the Limpopo Province by Aldridge , *et al.* (2006). This comparison is anticipated to provide a general overview of the extent to which educators implement OBE in South Africa. The Limpopo Province is one of the poorest provinces in the country (DoE, 2003) and the Western Cape is one of the most prosperous provinces (Phurutse, 2005).

The study therefore aimed to seek answers to the following sub-research questions:

1. To what extent do educators implement an outcomes-based learning environment in Grade 8 science classes in the Western Cape?
2. Do different levels of congruence between students experiences (i.e., actual) and preferred learning environment in selected Grade 8 classrooms in the Western Cape occur and, if so, why?
3. What is the influence of outcomes-based learning environment in promoting student attitude towards Science, equity, and academic achievement?
4. How do the results from the Western Cape compare with results collected in the Limpopo Province?

### 5.1.1 Methodology

In order to provide credible and trustworthy answers to the above research questions, the study made use of a contemporary research design which draws on a mixed-methods approach. This encompasses elements from both a quantitative and qualitative research paradigm. The mixed-methods approach has benefits in that it employs both quantitative and qualitative research paradigms, and as a result can be used to answer a broader and more complete range of research questions (Johnson & Onwuegbuzie, 2004). It can also provide stronger evidence for a conclusion through the convergence and collaboration of findings. It can also be used to increase generalisability of the results, and provide complete knowledge to inform theory and practice (Johnson & Onwuegbuzie, 2004). It also increases the trustworthiness of the findings (Rossman & Rallis, 2003).

The current study is a replication study of research conducted by Aldridge, *et al.* (2006). The original 2006 study developed and used the *Outcomes-Based Learning Environment Questionnaire* (OBLEQ). This instrument was adapted in the current study for use in the Western Cape context and named the *Outcomes Based Learning Environment Questionnaire-Western Cape* (OBLEQ-WC). The OBLEQ-WC contains seven scales which are relevant and important in assessing an outcomes-based classroom learning environment: *Involvement/Investigation, Co-operation, Equity, Differentiation, Personal Relevance* and *Responsibility for own Learning*. To assess the key student outcome of student *Attitude towards Science*, the attitude scale was integrated into the rest of the OBLEQ. An achievement test was included in the questionnaire to assess the key student outcome of academic achievement. The OBLEQ-WC was used to determine 927 Grade 8 students' perceptions of the outcomes-based learning environments in their Natural Science classroom. The qualitative data were collected in the form of five classroom observations, and student and educator interviews for each of the classes. These were used to explain the trends which were identified through the analysis of the quantitative data.

### 5.2 Limitations of the study

The present study has some limitations which need to be taken into account when considering the findings of the study.

The schools which were selected for this study are located in the four EMDCs (EMDC Central, EMDC North, EMDC South and EMDC East) containing most schools in the Western Cape. These EMDCs are located in metropolitan areas of the Western Cape. The

present study thus did not include any data from the rural Western Cape. Inferences therefore cannot be made about the schools in the rural areas of this province. However, there is no reason to believe that the schools in the rural areas of the Western Cape are different to those in the Limpopo Province, for which data is available from Aldridge , *et al.* (2006).

### **5.3 Providing answers to the Sub-Research Questions**

The present study was conducted to monitor and examine the implementation of the OBE curriculum reform in Grade 8 science classrooms in the Western Cape. The four sub-research questions are answered in the subsequent sections.

#### ***5.3.1 Sub-Research Question 1:***

***To what extent do educators implement an outcomes-based learning environment in Grade 8 science classes in the Western Cape?***

The first objective of the current study was to use the environment scales of the OBLEQ-WC to describe the science classroom learning environments in the Western Cape Province. Descriptive statistics were based on analyses conducted on students' responses to the learning environment questionnaire used (i.e., OBLEQ-WC). The average item means were comparatively high for both the actual and preferred versions of the OBLEQ-WC (Table 4.3, pg.42). The average item means for students' actual perceptions of their learning environment were high which suggests that educators are perceived to implement attributes of an outcomes-based teaching approach. However, the average item mean for the Western Cape Province for the scale of *Involvement/Investigation* is the second lowest mean of all the scales. This suggests that the extent to which educators are perceived to encourage experimental work and class discussions is comparatively low with respect to the other learning environment dimensions. Four of the five educators (i.e. from classes B, C, D and E) try to encourage more experimental work and discussions in their lessons. However, this proves difficult because of the large class sizes and the volume of content that needs to be covered, as stated by the teacher interviews in the qualitative component of this study (Chapter 4, pg.58-72).

For the learning environment scale of *Co-operation*, the scale means are comparatively high (Table 4.3, pg.42) which suggests that the extent to which educators are perceived to encourage a co-operative environment is high. Students in the Western Cape perceived educators to encourage co-operative learning, where students are required to work together to solve a problem. This is represented by the educator and student interviews (Class E, Chapter 4, pg.70). The findings suggest educators associate the philosophy of OBE with group-work (Taylor and Vinjevoold, 1999).

The average item mean for the scale of *Equity* is the highest value for all scales. This suggests that educators are perceived to encourage a sense of fairness in their classroom environments. Educators in most schools are sensitive to treating each student fairly (Class B, D, E, pg.62, 67, 70). In some instances educators feel that their classes are so big that it would be difficult create an unfair environment (see, for example, Class B, Chapter 4, pg.64).

The average item mean for the scale of *Differentiation* is the lowest value. The low scale mean for the scale of *Differentiation* suggests that educators are perceived to not differentiate between students and encourage all students to work on the same task at the same pace (Class C, Chapter 4, pg.64). Students do not appreciate educators adopting a differentiated teaching approach. They often perceive the dimension of *Differentiation* as *Equity* (Class A, B, pg.59, 60). Thus, an educator that implements a differentiated teaching approach may be perceived as creating an unfair learning environment.

For the learning environment scale of *Personal Relevance*, the mean value is comparatively high. This suggests that educators are perceived to try and incorporate a link between the content of a lesson and the students' everyday lives. During classroom observations it was noticed that many educators were seen to relate to and incorporate the lesson topics into the students' everyday experiences (Class A, C, E pg.60, 64,70). This was done by either centering the entire lesson on an experience that the majority of students could relate to, or by relating certain topics within the lesson to an experience that a certain student had brought up.

For learning environment scale of *Responsibility for own Learning*, the scale mean was comparatively low which suggests that educators in the Western Cape are not perceived to encourage students to take responsibility for their own learning process. As is evident from the qualitative data, many educators consider the students to be "too young" to direct their own learning process (Class A, D, E, pg.60, 67, 70).

Overall, it can therefore be concluded that science educators in the Western Cape Province are succeeding with the implementation of OBE but that the dimensions which characterize an outcomes-based learning environment are implemented to varying extents. Educators need to be more aware of the values which Outcomes-Based Education encompasses and, instead of focusing only on some of these values, should try to incorporate all aspects of OBE in their science classroom learning environment.

### **5.3.2 Sub-Research Question 2:**

***Do different levels of congruence between students experiences (i.e., actual) and preferred learning environment in selected Grade 8 classrooms in the Western Cape occur and, if so, why?***

In attempting to answer the second sub-research question, both the quantitative and the qualitative findings are again used. The quantitative data established trends in students' perceptions of their classroom learning environment and highlighted discrepancies between students' perceptions of their actual and preferred classroom environments, whereas the qualitative data provided possible explanations for discrepancies between these two perspectives. Table 4.3 (Chapter 4, ppg.52) shows the discrepancies between students' perceptions of their actual and preferred classroom environment. Statistically significant differences exist between students' actual and preferred perceptions of their classroom environments for all six environment scales. The effect sizes are moderate (i.e., ranging from a third to a half of a standard deviation). Figure 4.1 (Chapter 4, pg.44) gives a graphical representation of the discrepancies between student perceptions of their actual and preferred environment. Each environment scale will be examined individually.

#### ***5.3.2.1 Involvement/ Investigation***

It is widely acknowledged that the learning is a constructive process whereby students are required to be actively involved in constructing their own knowledge (Fraser, 2002). The educator is no longer the sole possessor of knowledge but rather a facilitator of the learning process (DoE, 1997a). The educator is also required to encourage students to become involved in constructing their own meaning and knowledge of a concept. The scale of *Involvement* measures the extent to which the students are actively involved in the classroom (Chapter 3, pg.27). The scale of *Investigation* measures the ability of the students to carry out their own investigations and report to the class on their findings. Therefore, emphasis in this scale is placed on skills and the process of inquiry

Through the information gathered from the educator and student interviews, it was clear that students enjoy lessons that encourage them to conduct experiments as well as being involved in class discussions with other students (Chapter 4, pg.58). However, educators are often unable to facilitate lessons of this nature. In some cases this is due to the fact that classes are very big and there is much content to cover in class (Class A, B, C, pg.59, 62, 64). Some educators are inundated with administrative responsibilities and as a result would rather teach

the content in the scheduled time than allow the students participate in an investigation (Class A, pg.59). These administrative burdens are one of the criticisms of OBE outlined by Jansen (1998). Furthermore, many schools do not have facilities to conduct investigations and as a result the educators are required to demonstrate the investigation to the students while they observe the results (Class A, D, pg.59, 67). However, there are a number of schools which do have the facilities and the equipment, but would rather not allow the younger students to make use of it as the students could damage the property (Class C, pg.64).

#### 5.3.2.2 *Co-operation*

The environment scale of *Co-operation* measures the extent to which students' co-operate and help each other, rather than competing with each other (Chapter 3, pg.25). In accordance with contemporary outcomes-based teaching and learning, educators should aim to promote co-operative learning (DoE, 1997b). These efforts should result in the mutual benefit of the entire group. Students are required to work together to negotiate and discuss ideas to arrive at a common solution to a problem. The educator supports and facilitates this process by guiding and focusing the students' thoughts (DoE, 2002b).

Students have favorable perceptions about the degree to which the learning environment dimension of *Co-operation* is implemented in their science classrooms. Three of the five educators observed in the current study encouraged the students to work as a class to answer well-directed questions asked by the educator. These answers were then used to make the notes which students would study from (Class B, pg.62). Teachers to some extent also cited large class sizes as a hindering factor for co-operative learning (Class B, pg.62). One of the educators observed insisted that the students work as a group in each lesson. However, it should be noted that this class was exceptionally small in comparison to the other classes observed (Class D, pg.67). Therefore the discrepancies with respect to students' perceptions of this environment scale can possibly be ascribed to large classes. If the classes were smaller, educators would be more inclined to allow students to work in small groups, as is evident from Class D (pg.67).

#### 5.3.2.3 *Equity*

In the past, South Africa had been divided along racial lines. Education policies implemented in the Apartheid years encouraged a division of the nation. As a result, many students in the schooling system were discriminated against. Therefore, equity became a central value in education which was promoted through educational reforms (DoE, 2000). *Equity* in this

context refers to the extent to which a student in the class is treated equally and fairly by the educator (Chapter 3, pg.25).

Students have favorable perceptions about the degree to which the learning environment dimension of *Equity* is implemented in their science classrooms. In four of the five schools observed, the discrepancies between students' perceptions of their actual and preferred learning with respect to the environment scale of *Equity* are low (Class A, B, C, D, pg.59, 62, 64, 67). This would suggest that educators in the Western Cape Province successfully attempt to create a learning environment which encourages fairness among students. However, in one case it was found that there was an unusually large gap between the students' perceptions of their actual and preferred learning environments for this scale. Classroom observation showed that although the educator encouraged many of the values within the OBE philosophy, he would often single out the smart students to provide the answers for the class (Class E, pg. 70). This result suggests that educators need to treat each student fairly and equally by not singling out students from the class continually.

#### 5.3.2.4 Differentiation

Differentiated teaching is regularly referred to as a teaching approach which can be employed to meet the diverse needs of each student in the class. Tomlison (1999: 2) defined the term '*Differentiation*' as to "create a learning environment that encourages students to engage their abilities to the greatest extent possible in what they perceive as safe and positive learning environment." Therefore, students are required to co-operate with each other and take responsibility for their own learning process. It also allows educators to address students with academic ability (Tomlison, 1999). *Differentiation* in this study refers to the extent to which educators cater for students with different learning abilities (Chapter 3, pg.25).

In all of the classroom interviews, the students indicated that they all work on the same tasks and assignments as the rest of the students in the grade. All the interviews show that students believe that they should be given the same work as the rest of the students in the class (Chapter 4, pg.58 –72). This could be attributed to students perceiving the dimension of *Differentiation* to be similar to the dimension of *Equity*. Educators in the Western Cape do not encourage students to work independently on separate topics (Figure 4.1, pg.44) and therefore do not cater for students with differentiated learning abilities.

### 5.3.2.5 Personal Relevance

Science concepts which are discussed in the classroom should also be explained using an example which allows the students to relate the science concept to a real-life context. The importance of this practice has been highlighted in many different studies (Yager, 1989; Steyn and Wilkinson, 1998 Henderson and Reid, 2000 and Botha, 2002). By making the lessons relevant to the students' real-life context, students are able to acquire critical skills and attitudes which will equip them to contribute to the growing economy of South Africa (DoE, 2000).

The effect size for this discrepancy between students perceptions of their actual and preferred learning environment is the largest (Table 4.3, Chapter 4, pg.52), which suggests that students in the Western Cape Province have favorable perceptions of the extent to which relevance is included in their science lessons. Classroom observations indicate that educators strive to make the lessons as relevant as possible. Students in four of the five classes observed claimed to enjoy science more if they could relate their own life experiences to the topics that are being discussed (Class A, B, C D, pg.59, 62, 64, 67). From these results, it can be suggested that students in the Western Cape perceive educators to incorporate relevance into their lesson content. However, even greater efforts need to be made in order to incorporate relevance into the lesson content.

### 5.3.2.6 Responsibility for own Learning

OBE aims to create a student that has a thirst for knowledge but can take responsibility for their own learning processes (DoE, 1997a). The scale of *Responsibility for own Learning* refers to the extent to which a student direct their own learning process (DoE, 2003) (Chapter 3, pg.25).

There is a discrepancy between students' perceptions of their actual and preferred learning environments with respect to this learning environment scale (Figure 4,1, pg. 44; Table 4.3, pg.52). Classroom observations and interviews reveal that these discrepancies may well be due to educators' classroom practices. Educators are reluctant to encourage students to direct their own learning process because they feel that these students are too young and mentally not able to direct their own learning process (Class A, C, D, E pg.59, 62, 67 and 70). In one particular case (Class B, pg.62), the educator did encourage the students to direct their own learning process. In this class, the educator set goals for the students and helped them to evaluate their own learning process. Many of the students in this class were incentivized by this (Chapter 4,

pg.64). However, there were a few students who felt that this approach was patronizing (Chapter 4, pg.64). In Class C (Chapter 4, pg.64), the educator did try to allow the students to reflect on their learning process and make judgments to assess their understanding of the topic. The results suggest that educators could set goals for students based on their academic ability thus encouraging the students to direct their own learning.

In summary, the results from the study suggest that there are discrepancies between students' actual and preferred perceptions of their outcomes-based learning environment. A general finding of all LER studies is that a discrepancy exists between students' perceptions of their actual and preferred classroom environments (Fraser, 1998a), and the actual mean score are typically lower than the preferred mean scores (Fraser, 1998a). This is also the case in the current study. In most cases, these discrepancies may be attributed to the fact that educator practices influence the classroom environment. There are also a number of factors which play a vital role with regard to educator pedagogy. These relate to the resources which the educators have available to them. Many educators mentioned in the interviews that they were frustrated with the class size, which made it impractical to involve students in investigations.

### **5.3.3 Sub-Research Question 3:**

***What is the influence of outcomes-based learning environments in promoting student attitude towards Science, equity, and academic achievement?***

Past research indicates that there is a significant association between students' perceptions of their classroom environment and key student outcomes such as attitudinal and achievement outcomes (Fraser & Chionh, 2000). It has also been established that students developed more positive attitudes towards Science if the educator creates a supportive classroom environment (Rawnsley & Fisher, 1998). Also, student attitudes towards Science are more favorable if the educator implemented some of the values encouraged by an OBE-based teaching philosophy (Rawnsley & Fisher, 1998). Therefore, classroom dimensions can be useful predictors of key student outcomes such as attitude towards science, student perceptions of equity and academic achievement.

In order to answer the third research question, an association between each of the classroom dimensions and key student learning outcomes of *Attitude towards Science*, student perception of equity; and academic achievement was investigated (Chapter 4, pg.45). Simple correlations and multiple regression coefficients are reported for each key student outcome and OBLEQ-WC scales. These analyses were conducted at the level of the individual and the level of the

class mean. Using the individual as the unit of analysis is essential in providing a between-student analysis of the data which is used to draw conclusions about the students' individual perception of their science classroom. Using the class mean as the unit of analysis provides information about the average classroom environment perception of all the students' in a particular class (Aldridge & Fraser, 2000).

*5.3.3.1. The association between students' perceptions of Outcomes-based learning environments and Attitude towards Science.*

Investigation of student attitude towards their science classroom environment has been a common feature in science education in the LER field (Fraser & Fisher, 1982; Nair & Fisher, 2001). In keeping with this tradition, the current study investigated to association between outcomes-based learning environments and student attitudes. In order to examine this relationship between outcomes-based learning environment and students attitudes towards science, an attitude scale was adopted from the OBLEQ (Aldridge , et al., 2006).

Using the individual as the unit of analysis, the results as depicted by Table 4.4 ( pg.47) show that there is a positive, statistically significant simple correlation between student attitudes towards science and the environment scales of *Involvement/Investigation*, *Co-operation*, *Equity*, *Personal Relevance* and *Responsibility for own Learning*. This suggests that students attitude towards science will be positively influenced if their learning environment incorporates attributes characterized by these five scales.

With the class mean as the unit of analysis, there is a statistically significant simple correlation for only two scales namely *Personal Relevance* and *Responsibility for own Learning* (Table-4.4, Chapter 4, pg.47). This suggests that students have more positive attitudes towards Science if educators relate their lessons to the student's everyday lives. Students will have a more positive attitude towards science if they could understand the relevance of this subject to their own lives. Students would also have more positive attitudes towards science if educators encourage students to direct their own learning process and reflect on their own learning. Attitudes towards science could improve if educators provided goals for students as a class to work towards. The educator of Class B (pg.62) tried to encourage this, and the students of this class appear to have a positive attitude towards science.

Standardized regression coefficients ( $\beta$ ) were reported in Table 4.4 (pg.47) for both the individual and class mean as the unit of analysis. Using the individual as the unit of analysis; positive, statistically significant regression coefficients were reported for the environment

scales of *Involvement/Investigation*, *Equity*, *Differentiation*, *Personal Relevance* and *Responsibility for own Learning*. This suggests that these five OBLEQ-WC scales were found to be significant independent predictors of student attitudes. This suggests that improvement in student attitude is likely to be achieved best by enhancing and aligning the OBLEQ-WC scales of *Involvement/Investigation*, *Equity*, *Differentiation*, *Personal Relevance* and *Responsibility for own Learning*. In other words, teaching and learning in science classes should incorporate lesson content that is relevant to the students' everyday lives. Educators need to create a classroom environment in which each student feels supported and encouraged equally. Classroom activities should encourage class discussions that are relevant to the students' everyday lives and afford them an opportunity to direct their own learning process. Educators should also encourage more investigative work between the students.

These results support the results from the simple correlation analysis, suggesting that student attitudes can be enhanced in science classrooms in which the teaching strategy incorporates attributes from these scales. There is a negative statistically significant association between attitude towards Science and the environment scale of *Differentiation*. This suggests that students' attitudes towards science will be negatively influenced if educators integrate a differentiated teaching approach. Students associate the classroom dimension of *Differentiation* with that of *Equity*. As a result, students do not like to be treated differently. It is important for educators to make a distinction between these two dimensions in classroom environments.

Using the class mean as the unit of analysis, a positive, statistically significant multiple regression co-efficient exists only for the environment scale of *Responsibility for own Learning*. This suggests that *Responsibility for own Learning* is a strong independent predictor of student attitudes towards science. Therefore, student attitudes towards Science will be more positive if educators encourage students to take charge of their learning.

The results from these findings suggest that all OBLEQ-WC scales are significantly correlated with student attitude towards science. Moreover, five out of the six OBLEQ-WC scales were found to be independent predictors of student attitude at the individual level of analysis. This result suggest that educators aiming to improve individual students' attitudes towards science may want to focus on incorporating attributes of these five dimensions *Involvement/Investigation*, *Equity*, *Differentiation*, *Personal Relevance* and *Responsibility for own Learning* in their classroom environments.

### 5.3.3.2 *The association between students' perceptions of their Outcomes-based learning environments and equity*

Learning should be characterized by the fair treatment of students as well as a mutual respect towards the educator and fellow students (DoE, 1997a). If a student perceives a classroom environment as being unfair, withdrawal from active participation in class activities could result. This could have an adverse effect on the students' attitudes towards the subject as well as academic achievement within the subject (Fraser & Chionh, 2000). Therefore, equity is believed to be one of the most important outcomes that should be achieved in an outcomes-based teaching approach (Fraser & Chionh, 2000).

At the level of the individual, the results as depicted by Table 4.4 (pg.47) show that there is a statistically significant simple positive correlation between *Involvement/Investigation*, *Co-operation*, *Personal Relevance* and *Responsibility for own Learning* and equity. Using the class mean as the unit of analysis only the environment scale of *Personal Relevance* show a statistically significant simple correlation with equity. Positive simple correlations between the students' perception of equity and the four already mentioned OBE classroom dimensions imply that educators intending to enhance their students' perception of fair treatment and equal support in their classes should strive to incorporate features addressed by these four classroom dimensions.

The standardised regression coefficient ( $\beta$ ) indicates that, with the individual as the unit of analysis, all five of the OBLEQ-WC scales individually accounted for statistically significant amounts of variance for equity in the classroom (Table 4.4, pg.47). All the environment scales with the exception of *Differentiation* have a positive regression coefficient. This would suggest that the environment scales, namely *Involvement/Investigation*, *Co-operation*, *Personal Relevance* and *Responsibility for own Learning*, are strong independent predictors of students' perceptions of equity in the classroom. This suggests that students' perceptions of equity in the classroom can be enhanced by incorporating attributes from these four scales. The regression coefficient is negative between the environment scale of *Differentiation* and equity in the classroom. Educators who would make use of a differentiated teaching approach should do so with care as students might not welcome this practice in their science classes.

These findings show that a significant association exists between the scales of *Involvement/Investigation*, *Co-operation*, *Personal Relevance* and *Responsibility for own Learning* and the student outcome of equity. This suggests that for students to perceive fairness in their classrooms educators should encourage a co-operative learning environment

among students and actively involve them is relevant class activities that foster investigation skills. It is also important to allow students to take charge of their own learning.

#### 5.3.3.3 *The association between students' perceptions of their Outcomes-based learning environments and academic achievement.*

The introduction of OBE in South African education system was seen as an effective means of improving the quality of education for all students (Botha, 2002). It was envisaged that improving the quality of learning, students would perform at their maximum potential (DoE, 1997a). As a result, students would then develop positive attitudes towards schooling in general (Harley & Wedekind, 2004). To assess the possible influence that an outcomes-based science learning environment has on students' academic achievement, a science achievement test was adopted from Aldridge , et al. (2006), who used one of the common assessments tasks for Grade 8 Natural Science students'(DoE, 2001b) for this task. This achievement test was used to examine students' understanding of scientific investigations, which supports Learning Outcome 1 for Grade 8 in the RNCS for Natural Sciences (DoE, 2002c).

For both the individual and the class mean as the unit of analysis, the results depicted in Table 4.4 (pg.47) show that there is a statistically significant positive simple correlation between academic achievement and the environment scales of *Co-operation* and *Equity*. This association suggests that students' academic achievement may improve if the educators integrate the OBE features assessed through the two environment scales of *Co-operation* and *Equity*. This positive relationship suggests that enhancement of student academic achievement can be realized by incorporating OBE features assessed through these two dimensions in science classroom learning environments.

Standardized multiple regression coefficients ( $\beta$ ) were reported in Table 4.4 (pg.47) using both the individual and class mean as the unit of analysis. At the level of the individual, positive statistically significant regression coefficients were reported for the two environment scales of *Co-operation* and *Equity*. At the level of the class mean, a statistically significant positive multiple regression coefficient was reported for the environment scale of *Equity*. This suggests that learning environments which incorporate attributes from these two scales will influence students' academic achievement. This suggests that *Co-operation* and *Equity* are independent predictors of student achievement in science classes in the Western Cape. This implies that attempts by educators to enhance student academic achievement should integrate teaching and learning strategies measured through these critical OBE dimensions. However, there is a negative association between students' academic achievement and the environment

scale of *Responsibility for Own Learning*. Through classroom observations, it was apparent that educators did not have the confidence to allow students at this level to direct their own learning process. As a result, students are not used to this teaching approach. Therefore, when it is used in the classroom, students may enjoy being responsible for their own learning process, however academically they may not achieve very high results because they are not accustomed to this responsibility. From these findings, it can be inferred that students have inadequate conceptions about learning. The emphasis is on active participation by students in any teaching and learning situation as a requisite for meaningful and effective learning. Active participation is essential to learning (Smith & MacGregor, 1992).

To summarize, the present study has shown the influential role played by the outcomes-based learning environment in promoting student outcomes of attitudes towards science; perception of equity and academic achievement. Fraser and Chionh (2000) found that positive learning environment plays a role in enhancing student attitude and achievement whilst also boosting students' self-esteem. The present study replicated the crucial influence of classroom learning environment on student outcomes in an outcomes-based setting. The results of the present study replicated the results of previous LER studies that established strong associations between classroom environments and student attitudinal and achievement outcomes (Kouros & Abrami, 2003). Marguanti, Fraser and Aldridge (2002), in their study with Indonesian university students found that the learning environment was perceived to be positively related to student attitudes and academic achievement. Teh and Fraser (1995) found associations between classroom environment dimensions and student attitudes and achievement in high school geography students in Singapore.

#### ***5.3.4 Sub-Research Question 4:***

***How do the quantitative results from the Western Cape Province compare with those from the Limpopo Province?***

The fourth objective of the current study was to make a comparison between the results from this and a matching study conducted in the Limpopo Province. The Limpopo Province is very different to the Western Cape Province in a number of important respects (i.e., poverty, rural/urban extent) (Chapter 1, pg.2). It was thus essential to provide a Limpopo Province-Western Cape comparison as it contributes to a better understanding of the extent to which Outcomes-Based Education has been implemented in South Africa in general.

A simple linear regression model was developed to compare the average item means for each of the environment scales between the two provinces as well as the differences between the

perceptions of male and female of their learning environments. In the regression model, a regression coefficient was provided for both the actual and preferred forms of each of the environment scales, as well as an associated two sample student *t*-statistic. A regression coefficient and two sample student *t*-statistic was provided for the differences between students perceptions of the environment scales between the two provinces, as well as the differences between the genders between provinces. These results are recorded in Table 4.6 (pg.54) and graphically represented in Figure 4.3 (pg.52). Each of the environment scales will be discussed below, highlighting the statistically significant differences. The student outcomes of attitudes towards science and academic achievement will also be discussed below. The discussion focussed primarily on the students actual perceptions of their learning environments as a factor analysis was performed on the actual data.

#### 5.4.4.1 Overall differences between the Limpopo Province and the Western Cape

It can be observed that there is a statistically significant difference between students' perceptions of their actual learning environment with respect to the scale of *Involvement/Investigation* between provinces. Educators in the Limpopo Province are perceived to implement attributes of this environment dimension to a greater extent than their colleagues in the Western Cape. This is unusual as the schools in the Western Cape appear to be more equipped with resources, whereas the resources in the Limpopo Province are limited. The schools in the Western Cape also have a lower educator to student ratio than the schools in the Limpopo Province. The reasons for this finding could be explored in future research.

There is a statistically significant difference between students' perceptions of their actual learning environment with respect to the scale of *Equity* between the two provinces. Educators in the Western Cape are perceived to implement attributes of this environment dimension to a greater extent than their colleagues in the Limpopo Province (Table 4.6, pg.54). This could be attributed to the fact that classes the Western Cape have a lower educator-to-student ratio than the Limpopo Province. The class sizes in the Limpopo Province are so large which results in a teacher-centered pedagogy. With a larger class sizes, it may be impossible for educators to pay attention to each individual student. As a result, educators in the Limpopo Province may only focus their attention on students that require individual support. The students may perceive the educator as favouring students, and hence creating an unfair classroom environment.

There is a statistically significant although very small difference between students' perceptions of their actual learning environment with respect to the scale of *Differentiation*

between the two provinces. Educators in the Western Cape are perceived to implement attributes of this environment scale to a greater extent than their colleagues in the Limpopo Province. This could be attributed to the large class sizes in the Limpopo Province which make it difficult for educators to make use of a differentiated teaching approach. In order to cope/manage larger student numbers, educators may find it more feasible for each student to receive the same work as the rest of the students in the class.

There is a statistically significant difference between students' perceptions of their actual learning environment with respect to the scale of *Personal Relevance* between provinces. This suggests that educators in the Western Cape are perceived to implement attributes of this environment scale to a greater extent than their colleagues in the Limpopo Province as is evident from the quantitative data collection phase (Figure 4.6, pg.54). The educators in this sample make an effort to ensure their science lessons are relevant to the students' lives. The incorporation of relevance may be attributed to the fact that the educators in the Western Cape have greater access to certain resources than their colleagues in the Limpopo Province, such as, for example, the internet. Educators in the Western Cape are able to make use of these resources to research and prepare their lessons focussing on relevance and application of the topic.

There is a statistically significant difference between students' perceptions of their actual learning environment with respect to the scale of *Responsibility for own Learning* between provinces. It is again found that educators in the Western Cape are perceived to implement attributes of this environment scale to a greater extent than their colleagues in the Limpopo Province. Educators in both the Western Cape and the Limpopo Province are reluctant to give students an opportunity to direct to take charge of their own learning process. However, students in the Western Cape are given more opportunity to take charge of their own learning process than students in the Limpopo Province. This could be attributed to the fact that the Western Cape Province has a lower educator to student ratio than the Limpopo Province. As a result, educators in the Western Cape are able to support students and endorse a learner-centered teaching approach to a greater extent than educators in the Limpopo Province.

Students in this sample have a more positive attitude towards science (Figure 4.6, pg.54). This could be attributed to the fact that the Western Cape Province is more resourced and the educator to student ratio is lower than that of the Limpopo Province. Also, classroom environments in the Western Cape Province support and encourage more co-operative learning. Educators try to make the lessons as relevant as possible whilst also making sure that

students are treated fairly and equally. Educators in the Western Cape Province try to encompass all of the attributes associated with an OBE teaching approach.

Students in the sample from the Western Cape achieved higher results on the achievement test than did the students from the sample taken in the Limpopo Province. This could be attributed to educators in the Western Cape attempting to incorporate all of the attributes that are central to the OBE philosophy, as can be interpreted from the results collected (Chapter 4, page 47). Students' attitude towards their learning environments has an effect on their academic achievement (DoE, 1997a). The more positive the students' attitude toward their learning environment is, the greater their academic achievement will be (DoE, 1997a). The students in the sample from the Western Cape have a more positive attitude towards Science (Chapter 4, page 54) than the students in the sample from the Limpopo Province, and this could suggest a reason for these students achieving better academically.

#### 5.4.4.2 Gender related province differences

The results from Table 4.6 (pg.54) suggest that females perceive their learning environments to be more co-operative, by encouraging and promoting fairness and equality between the students. However, males perceive educators to apply a differentiated teaching approach.

In summary, educators in this sample are perceived to implement attributes associated with OBE to a greater extent than the educators in the sample from the Limpopo Province. The educators in the Western Cape Province are perceived to encompass more of the classroom dimensions than that of educators in the Limpopo Province. This could possibly be attributed to the fact that the Western Cape Province is more affluent (Phurutse 2005) and better resourced than that of the Limpopo Province. Better resources in the Western Cape allows educators to implement more investigative work in the classes, while focusing the lessons on students everyday-lives and encouraging a sense of relevance in the lesson. The student-to-educator ratio in the Western Cape Province is lower than that of the Limpopo Province (DoE, 2006). Therefore this allows educators in the Western Cape encourage classroom discussions, while promoting teamwork. The smaller class sizes also allow educators to encourage and support each individual student. However, this is not done to a great extent. In general, these results suggest that the educators in the sample from the Western Cape Province implement OBE to a greater extent than educators in the sample from the Limpopo Province. In terms of gender differences, females perceive their classroom environment more favourably than males, irrespective of province. This could be attributed to the fact that females tend to have more positive attitude towards Science and they tend to achieve better academically than

males (Fraser, 1981). Therefore, their perceptions of the classroom environments are more positive.

### ***5.5 Implications of the findings and recommendations***

The present study revealed important findings which, if taken into account, have the potential to improve the outcomes-based learning environment of Grade 8 Natural Science classes in South Africa. On the basis of the findings, some recommendations can be suggested for classroom practices and professional development programs for science educators (e.g., OBE classroom dimensions that enhance student outcomes).

The results of the study suggest that several challenges face educators when implementing an outcomes-based teaching approach. First, the environment scales of *Involvement* and *Investigation* loaded onto one component in the principle component analysis (Figure 4.1, Chapter 4, pg.41)-unlike in numerous past studies. This suggests that students are unable to distinguish between the processes related to these two scales despite them measuring two distinct classroom dimensions. These important and distinct scales are included in most other classroom environment instruments. These two important separate and different classroom environment scales are always included in many instruments used in the field of LER (e.g., CLES and WIHIC) (Fraser, 1998a). Therefore it is important for educators to distinguish between the two classroom dimensions of *Involvement* and *Investigation* in the order to promote a successful outcomes-based classroom environment. By encouraging class discussions and allowing students to take part in more investigative work students may be able to make a distinction between these two classroom dimensions. Science educators need to create a more extensive co-operative classroom environment where students can share their ideas with each other. This encourages productive discussions between the students where they can contribute and interact in a non-threatening environment. Educators need to involve students in relevant learning activities which are related to the students' experiences and in so doing providing a personal basis for new learning experiences. The educators also need to establish a sense of fairness within their environments. Students need to be encouraged to take charge of their learning process and educators need to be confident that these students can take responsibility accountability for their own learning process. The findings of this study provide science educators with practical ways of improving their learning environment, by providing an approach to assess students' perceptions of their actual and preferred science environment and using this as the basis for monitoring and guiding their own teaching approach.

Another challenge which educators face is that the scale of *Differentiation* proves to be a negative predictor of student attitude towards Science and equity. This suggests that educators who may endorse a differentiated teaching approach in a classroom environment, discourages students and as a result students do not have a positive attitude towards Science. As a result of this finding, it is important that educators inform students about the realities of learning, and that each student has an individual learning ability. Educators need to plan for the fact that students bring with them to class a number of shared learning abilities as well as very important differences.

The findings also suggest that there is a negative association between the scales of *Responsibility for own Learning* and academic achievement in the Western Cape Province. It can therefore be concluded that by students responsibility to take control of their own learning process, could possibly lead to lower student achievement. Educators justified this view by suggesting that students are cognitively too young to direct their own learning process, and thus the students'; when given an opportunity to play an active role in their learning process; do not improve their results. From these findings, it can be inferred that students have inadequate conceptions about their learning. Learning is not a passive process, but rather an active constructive process. Students should be encouraged to actively participate in the class. This finding poses a challenge to educators and it would be desirable to conduct a study that explores students' conceptions and understanding of learning in South Africa. From the present study, it can only be speculated that students have inadequate conceptions about learning. The students may consider it to be the educators' responsibility to take charge of their learning process.

From the findings of the present study, it can be deduced that there are several potential benefits that should be recommended for educators' professional development program. Fraser, (1998a: 553) noted "although the field of psychosocial learning environment provided a number of potentially valuable ideas and techniques for inclusion in teacher education program, little has been made in incorporating these into teacher education". Therefore, it could be suggested that pre-service and in-service teacher education programs incorporate the study of students' perceptions towards their actual and preferred classroom environments. Therefore the findings of the study could potentially be used as a basis for informing decisions about the nature of a professional development program for educators to create a science learning environment that is congruent to those preferred by students.

### 5.6 Significance of the study

The motivation for conducting this study in the Western Cape was to provide data the implementation of an outcomes-based learning environment in this province in South Africa. Currently, very little data exists on Science learning environments in the Western Cape. This study provided data on, and a comparison between the results obtained from outcomes-based Grade 8 Science learning environments in the Western Cape Province and the data that have already been collected from the Limpopo Province. This comparison is anticipated to contribute to a better understanding of the extent to which Outcomes-Based Education has been implemented in South Africa in general. This study also contributes to a clearer impression of the degree to which the education system in South Africa has been transformed in line with the requirements of the current curriculum. Furthermore, the field of LER is just emerging in South Africa, despite the 30 years that the field has been in existence (Fisher & Fraser, 2003) and the study is thus significant in a broader sense as it aims to make a contribution to the LER field by providing a better understanding of learning environments in South Africa.

The study succeeded in assessing students perceptions of their actual and preferred learning environments in the Western Cape. The study found that OBE is being implemented successfully in the Western Cape. Students have favorable attitudes towards science if educators incorporate attributes of these classrooms dimensions into their learning environment: *Involvement/Investigation, Equity, Differentiation, Personal Relevance and Responsibility for own Learning*. The results from this study were compared to a matching study done in the Limpopo Province (Aldridge, *et al.* 2006). It was found that educators in the Western Cape implement OBE to a greater extent than their colleagues in the Limpopo Province. It was also found that irrespective of province, females perceived their outcomes-based learning environments to be more favourable than males.

APPENDIX 1

*THE OUTCOMES-BASED LEARNING ENVIRONMENT QUESTIONNAIRE-WESTERN CAPE*

(OBLEQ –WC) BEFORE PILOT TESTING



**WESTERN CAPE  
GRADE 8 LEARNERS' QUESTIONNAIRE**

**WES-KAAPSE  
GRAAD 8 LEERDERSVRAELYS**

**INTSHONA KOLONI  
IXWEBU LEMIBUZO LABAFUNDI BEBANGA LESI-8**

**Section A  
Afedeling A  
Incandelo A**

**BACKGROUND QUESTIONS**

**AGTERGRONDSVRAE**

**IMIBUZO NGAWE**

Name of your <u>school</u> Naam van jou <u>skool</u> <i>Igama lesikolo</i>							
<u>Your name</u> <u>Jou naam</u> <i>Igama lakho</i>							
What class are you in? Watter klas is u in? <i>Ufunda eliphi ibanga?</i>							
Your age ( <i>Please circle your answer</i> ) Jou ouderdom ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Iminyaka yakho (Nceda ubiyele impendulo yakho)</i>		13	14	15	16	17	18
Are you a girl or a boy? ( <i>Please circle your answer</i> ) Is jy 'n meisie of 'n seun? ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Uyintombi okanye inkwenkwe? (Nceda ubiyele impendulo yakho)</i>				Girl Meisie <i>Intombi</i>		Boy Seun <i>Inkwenkwe</i>	
Are you repeating this grade? ( <i>Please circle your answer</i> ) Herhaal jy hierdie graad? ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Uyaliphinda eli banga? (Nceda ubiyele impendulo yakho)</i>				Yes Ja <i>Ewe</i>		No Nee <i>Hayi</i>	

**Section B**  
**Afedeling B**  
**Incandelo B**

**INSTRUCTIONS**

**INSTRUKSIES**

**IMIYALELO**

1. This questionnaire contains statements about practices that could take place in this **SCIENCE** class. You will be asked how often each practice takes place.

Die vraelys bevat stellings omtrent praktyke wat kan plaasvind in hierdie **WETENSKAP**-klas. Jy sal gevra word hoe gereeld elke praktyk plaasvind.

*Eli xwebu lemibuzo liqulathe izivakalisi ngeenkqubo ezinokuqhubeka kwiklasi yeze**NZULULWAZI**.*

2. There are no 'right' or 'wrong' answers. Your opinion is what is wanted. Your responses will be confidential.

Daar is geen "regte" of "verkeerde" antwoorde nie. Jou opinie is al wat verlang word. Jou antwoorde sal vertroulik wees.

*Akukho mpendulo zichanekileyo okanye zingachanekanga. Izimvo zakho zezona zinto zifunekayo. Iimpendulo zakho ziza kukhuseleka.*

3. The 'Actual' column is to be used to describe how often each practice actually takes place in your class.

Die "Werklikheid" kolom moet gebruik word om te beskryf hoe gereeld elke praktyk in werklikheid in die klas plaasvind.

*Uluhlu lwe-'Yona nto iqhubekayo' luza kusetyenziselwa ukuchaza inkqubo nganye ukuba iqhubeka kangakanani na eklasini yakho.*

4. The 'Preferred' column is to be used to describe how often you would like each practice to take place (a wish list).

Die "Verkose" kolom moet gebruik word om te beskryf hoe gereeld jy sou wou hê dat elke praktyk moet plaasvind ('n wenslys).

*Uluhlu lwe-'nto endiyikhethayo' luza kusetyenziselwa ukuchaza ukuba ungathanda ukuba le nkqubo iqhubeke njani na ( uluhlu lokunqwenelela).*

Now please respond to statements in **Section C** starting on the next page. Please **circle** your responses.

Reageer nou asseblief op die stellings in **Afdeling C** wat op die volgende baldsy begin. Trek 'n **sirkel** om u antwoorde asseblief.

*Nogoku phendula izivakalisi ezikwi**Candelo C** ezikwiphepha elilandelayo. Nceda **abiyete** impendulo zakho.*

Section C Afedeling C Icandelo C		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it is. Hoe dit is. <i>Iqhubeka njani na.</i>					How I want it. Hoe ek dit wil hê. <i>Ndiyifuna njani.</i>				
Involvement Betrokkenheid Ukuthatha inxaxheba In this Science class: In hierdie wetenskap klas: Kwinklasi yezenzulwazi:		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Setide	Soms	Geresele	Altyd	Nooit	Setide	Soms	Geresele	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhapha- kile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhapha- kile	Qho
1.	I discuss ideas in class. Ek bespreek idees in die klas. <i>Ndixoxa izimvo eklasini.</i>	1	2	3	4	5	1	2	3	4	5
2.	I give my opinions during class discussions. Ek lig my opinie gedurende klasbesprekings. <i>Ndinika izimvo zam ngexesha leklasi.</i>	1	2	3	4	5	1	2	3	4	5
3.	The teacher asks me questions. Die onderwyser vra vir my vrae. <i>Undibuza imibuzo.</i>	1	2	3	4	5	1	2	3	4	5
4.	My ideas and suggestions are used during classroom discussions. My idees en voorstelle word tydens klasbesprekings gebruik. <i>Zimvo nengcebiso zam ziyasetyenziswa ngexesha leengxoxo zeklasi.</i>	1	2	3	4	5	1	2	3	4	5
5.	I ask the teacher questions. Ek vra die onderwyser vrae. <i>Ndibuza utitshala imibuzo.</i>	1	2	3	4	5	1	2	3	4	5
6.	I explain my ideas to other students. Ek verduidelik my idees aan ander leerders. <i>Ndicacisa izimvo zam kubafundi.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Ngooi	Selde	Soms	Gerseid	Altijd	Ngooi	Selde	Soms	Gerseid	Altijd
Zange iqhubeko	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho	Zange iqhubeko	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho

7.	<p>Students discuss with me how to go about solving problems.</p> <p>Leerdere bespreek met my hoe om probleme op te los.</p> <p><i>Abafundi baxoxa nam ngokuba singayisombula njani le ngxaki.</i></p>	1	2	3	4	5	1	2	3	4	5
8.	<p>I am asked to explain how I solve problems.</p> <p>Ek word gevra om te verduidelik hoe ek probleme oplos.</p> <p><i>Ndiyacelwa ukuba ndicacise ukuba ndiyisombulule njani na ingxaki.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Investigation</b> <b>Onderzoek</b> <b>Uphando</b> In this Science class: In hierdie wetenskap klas: Xwiklasi yezenzulwazi:</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Ngooi	Selde	Soms	Gerseid	Altijd	Ngooi	Selde	Soms	Gerseid	Altijd
		Zange iqhubeko	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho	Zange iqhubeko	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho
9.	<p>I carry out investigations to test my ideas.</p> <p>Ek doen ondersoeke om my idees te toets.</p> <p><i>Ndenza amaphando ukuvavanya izimvo zam.</i></p>	1	2	3	4	5	1	2	3	4	5
10.	<p>I am asked to think about the supporting facts for statements.</p> <p>Ek word gevra om te dink oor ondersteunende feite vir my stellings.</p> <p><i>Ndiyacelwa ukuba ndicinge ngendlela endingaxhasa ngayo ubunyani besivakalisi.</i></p>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil hê</u> . <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selds	Soms	Geriewel	Altyd	Nooit	Selds	Soms	Geriewel	Altyd
		Zange iqhubeka	Inqabile	Njani na a. naxesha	Isaphakile	Qho	Zange iqhubeka	Inqabile	Njani na a. naxesha	Isaphakile	Qho
11.	I carry out investigations to answer questions coming from discussions. Ek doen ondersoek om vrae te kan beantwoord wat uit besprekings vloei. <i>Amaphando ukuphendula imibuzo esuka kwiingxoxo.</i>	1	2	3	4	5	1	2	3	4	5
12.	I explain the meaning of statements, diagrams and graphs. Ek verduidelik die betekenis van stellings, diagramme en grafieke. <i>Ndicacisa into ethethwa sisivakalisi; umzobo kunye neegravu.</i>	1	2	3	4	5	1	2	3	4	5
13.	I carry out (i.e. do) investigations to answer questions that puzzle me. Ek doen ondersoek om vrae wat my pla te beantwoord. <i>Ndiqhuba amaphando ukuphendula imibuzo endothusayo.</i>	1	2	3	4	5	1	2	3	4	5
14.	I carry out investigations to answer the teacher's questions. Ek doen ondersoek om die onderwyser se vrae te beantwoord. <i>Ndiqhuba amaphando ukuphendula imibuzo yootitshala.</i>	1	2	3	4	5	1	2	3	4	5
15.	I find out answers to questions by doing investigations. Ek vind antwoorde op vrae deur ondersoek te doen. <i>Ndifumanisa iimpendulo ngokwenza amaphando.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always
Ngant	Selde	Sonke	Ongakali	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho

Never	Seldom	Sometimes	Often	Always
Ngant	Selde	Sonke	Ongakali	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho

16. I solve problems by using information obtained from my own investigations.  
Ek los probleme op deur inligting te gebruik wat ek bekom het deur my eie ondersoek.  
*Ndisombulula iingxaki ngokusebenzisa uhwazi endilufumene kumaphando am.*

1 2 3 4 5

1 2 3 4 5

**Cooperation  
Samewerking**

**Intsebenziswano**  
in this Science class:  
In hierdie wetenskap klas  
Kwinklasi yezenzulwazi:

Never	Seldom	Sometimes	Often	Always
Ngant	Selde	Sonke	Ongakali	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho

Never	Seldom	Sometimes	Often	Always
Ngant	Selde	Sonke	Ongakali	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho

17. I cooperate with other students when doing assignment work.  
Ek werk saam met ander leerlinge aan opdragte.  
*Ndisebenzisana nabanye abafundi xa ndisenza umsebenzi wexeshana.*

1 2 3 4 5

1 2 3 4 5

18. I share my books and resources with other students when doing assignments.  
Ek deel my boeke en hulpbronne met ander leerders tydens die uitvoer van opdragte.  
*Ndibolekisa ngeencwadi zam nangezixhobo zam nabanye abafundi xa sisenza umsebenzi wexeshana.*

1 2 3 4 5

1 2 3 4 5

ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nesini	Selule	Sonke	Gereeld	Altyd	Nom	Seide	Sokus	Gereeld	Altyd
Zange khubeka	Inqabile	Ngamanye anzozosha	Ishapha- kile	Qho	Zange- qhubeka	Inqabile	Ngamanye anzozosha	Ishapha- kile	Qho

19.	When I work in groups in this class, there is teamwork.  Wanneer ek in 'n groep werk in hierdie klas is daar spanwerk.  <i>Xa ndisebenza namaqela kule klasi. sisebenzisana sonke.</i>	1	2	3	4	5	1	2	3	4	5
20.	I work with other students on projects in this class.  Ek werk saam met ander leerlinge in hierdie klas aan projekte.  <i>Ndisebenza nabanye abafundi kwiiprojekthi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
21.	I learn from other students in this class.  Ek leer by ander leerlinge in hierdie klas.  <i>Ndifunda kwabanye abafundi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
22.	I work with other students in this class.  Ek werk saam met ander leerlinge in hierdie klas.  <i>Ndisebenza nabanye abafundi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
23.	I cooperate with other students on class activities.  Ek werk saam met ander leerlinge aan klasaktiwiteite.  <i>Ndisebenzisana nabanye abafundi kwimisebenzi yeklasi.</i>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Noon	Selde	Soms	Ofters	Altyd	Noon	Selde	Soms	Ofters	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isiphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isiphakile	Qho
24.	<p>Students work with me to achieve class goals.</p> <p>Ander leerlinge werk saam met my om klasdoelwitte te bereik.</p> <p><i>Abafundi basebenza nam ukuphumeza injongo zeklasi.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Equity</b> <b>Gelykheid</b> <b>Ulungelelaniso</b> In this Science class: In hierdie wetenskap klas: Kwiklasi yezenzuluwazi</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Noon	Selde	Soms	Ofters	Altyd	Noon	Selde	Soms	Ofters	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isiphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isiphakile	Qho
25.	<p>The teacher gives as much attention to my questions as to other students' questions.</p> <p>Die onderwyser gee ewe veel aandag aan my vrae soos aan die van ander leerlinge.</p> <p><i>Utitshala undinika ixesha lakhe lonke kwimibuzo yam njengoko esenza kwabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
26.	<p>I get the same amount of help from the teacher as do other students.</p> <p>Ek kry dieselfde hoeveelheid hulp van die onderwyser soos die ander leerlinge.</p> <p><i>Ndifumana uncedo olulinganayo kutitshala njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Neoni	Sela	Sonke	Gercedi	Aliny	Neoni	Selde	Sonke	Gercedi	Aliny
		Zange iqhubeka	Impela	Ngunanye unaxosha	Ubuphila kile	Qoo	Zange iqhubeka	Impela	Ngunanye unaxosha	Ubuphila kile	Qoo
27.	<p>I have the same amount of say in this class as other students.</p> <p>Ek het net soveel sê soos die ander leerlinge in die klas.</p> <p><i>Ndinexesha lokuthetha kule klasi njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
28.	<p>I am treated the same as other students in this class.</p> <p>Ek word dieselfde soos ander leerlinge in die klas behandel.</p> <p><i>Ndiphethwe njengabanye abafundi kule klasi.</i></p>	1	2	3	4	5	1	2	3	4	5
29.	<p>I receive the same encouragement from the teacher as other students do.</p> <p>Ek ontvang dieselfde aanmoediging van die onderwyser soos die ander leerlinge.</p> <p><i>Ndifumana inkuthazo kutitshala njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
30.	<p>I get the same opportunity to contribute to class discussions as other students.</p> <p>Ek kry dieselfde geleentheid soos ander leerlinge om tot klasbesprekings by te dra.</p> <p><i>Ndifumana iithuba lokufaka isandla kwiingxoxo zeklasu njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nooit	Selde	Soms	Gereld	Altyd	Nooit	Selde	Soms	Gereld	Altyd
Zange iqubeké	Inqabile	Nqamanye amaxesha	Isaphakile	Qho	Zange iqubeké	Inqabile	Nqamanye amaxesha	Isaphakile	Qho

31.	My work receives as much praise as other students' work. My werk ontvang net soveel lof soos die ander leerlinge s'n. <i>Umsebenzi wam ufumana ukunconywa njengwabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
-----	--	---	---	---	---	---	---	---	---	---	---

32.	I get the same opportunity to answer questions as other students Ek kry dieselfde geleentheid soos ander leerlinge om vrae te beantwoord. <i>Ndifumana iithuba lokuphendula umbuzo njengwabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
-----	---	---	---	---	---	---	---	---	---	---	---

**Differentiation  
Onderskeid  
Iyantlukwano**

In this Science class  
In hierdie wetenskap klas.  
Kwi-klasi yozenzu wazi.

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nooit	Selde	Soms	Gereld	Altyd	Nooit	Selde	Soms	Gereld	Altyd
Zange iqubeké	Inqabile	Nqamanye amaxesha	Isaphakile	Qho	Zange iqubeké	Inqabile	Nqamanye amaxesha	Isaphakile	Qho

33.	I work at my own speed. Ek werk teen my eie pas. <i>Ndisebenza ngendlela endifuna ngayo.</i>	1	2	3	4	5	1	2	3	4	5
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34.	Students who work faster than me move on to the next topic. Leerlinge wat vinniger as ek werk beweeg aan na die volgende onderwerp. <i>Abafundi abakhawulozisayo kunam bagqithela kwisihloko esilandelayo.</i>	1	2	3	4	5	1	2	3	4	5
-----	--	---	---	---	---	---	---	---	---	---	---

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
Iqhubeka njani na.

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
Ndiyifuna njani.

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Noon	Selibe	Sonke	Gercede	Altyd	Noon	Selibe	Sonke	Gercede	Altyd
Zange iqhubeka	Inqobo	Njanzane amaxesha	qhupha-kile	Qho	Zange iqhubeka	Inqobo	Njanzane amaxesha	qhupha-kile	Qho

35.	I am given a choice of topics to work on. Ek kry 'n keuse van onderwerpe om aan te werk. <i>Ndiyazikhethela isihloko endisifunayo.</i>	1	2	3	4	5	1	2	3	4	5
36.	I am set tasks (i.e. given work) that are different from other students' tasks. Ek kry take (m.a.w. kry werk) wat verskillend is van ander leerlinge s'n. <i>Ndinikwa imisebenzi engafaniyo neyabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
37.	I am given work that matches my ability. Ek ontvang werk wat by my vermoë pas. <i>Ndinikwa umsebenzi endikwaziyo ukuwenza.</i>	1	2	3	4	5	1	2	3	4	5
38.	I use different materials from those used by other students. Ek gebruik ander stof as die wat deur ander leerlinge gebruik word. <i>Ndisebenzisa izixhobo ezahlukeneyo kwezabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
39.	I use different assessment methods from other students. Ek gebruik ander metodes as die ander leerlinge om te assessee. <i>Ndisebenzisa iintlobo zovavanyo ezahlukileyo kwezabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Noot	Selde	Soms	Geroeft	Altyd	Noot	Selde	Soms	Geroeft	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishaphakile	Qho

40.	<p>I do work that is different from other students' work. Ek doen werk wat verskil van ander leerlinge s'n. <i>Ndenza umsebenzi owahlukileyo kowabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Attitude to Science</b> <b>Houding teenoor Wetenskap</b> <i>Indlela abaziphatha ngayo xa besenza isifundo seNzululwazi</i> In this Science class: In hierdie wetenskap klas: Kwika si yezenzululwazi.</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Noot	Selde	Soms	Geroeft	Altyd	Noot	Selde	Soms	Geroeft	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishaphakile	Qho
41.	<p>I look forward to lessons in science. Ek sien uit na wetenskaplesse. <i>Ingathi asifiki isifundo seNzululwazi</i></p>	1	2	3	4	5	1	2	3	4	5
42.	<p>Lessons in science are fun. Wetenskaplesse is pret. <i>Izifundo zeNzululwazi zinomdla.</i></p>	1	2	3	4	5	1	2	3	4	5
43.	<p>I dislike lessons in science. Ek hou nie van wetenskaplesse nie. <i>Ndiyasicaphukela isifundo senzululwazi.</i></p>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nooit	Selds	Soms	Geradeld	Altyd	Nooit	Selds	Soms	Geradeld	Altyd
Zange iqhubeka	Inqandl	Ngamanye amaxesha	ixhaphakile	Qho	Zange iqhubeka	Inqandl	Ngamanye amaxesha	Ixhaphakile	Qho

44. Lessons in science bore me. Wetenskaplesse verveel my. <i>Izifundo zenzululwazi ziyandidika.</i>	1	2	3	4	5	1	2	3	4	5
45. Science is one of the most interesting school subjects. Wetenskap is een van die interessantste skoolvakke. <i>Inzululwazi yenye yezifundo ezinika umdla.</i>	1	2	3	4	5	1	2	3	4	5
46. I enjoy lessons in science. Ek geniet wetenskaplesse. <i>Ndiyazithanda izifundo zenzululwazi.</i>	1	2	3	4	5	1	2	3	4	5
47. Lessons in science are a waste of time. Wetenskaplesse is 'n vermorsing van tyd. <i>Izifundo zenzululwazi ziyinkcitha-xesha.</i>	1	2	3	4	5	1	2	3	4	5
48. These lessons make me interested in science. Die lesse maak my geïnteresseerd in wetenskap. <i>Ezi zifundo zindenza ndibenomdla kwezenzululwazi.</i>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it is. Hoe dit is. <i>Iqhubeka njani na.</i>					How I want it. Hoe ek dit wil hê. <i>Ndiyifuna njani.</i>				
Personal relevance		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Persoonlike toepaslikheid		Nooit	Selde	Soms	Gerêeld	Altyd	Nooit	Selde	Soms	Gerêeld	Altyd
<b>Ndingakwazi ukuyisebenzisa</b> In this Science class. In hierdie wetenskap klas. Kwi klas' yezenzuluwazi:		Zange iqhubeka	Incabile	Ngunanye amaxesha	Isiqapha- kile	Qho	Zange iqhubeka	Incabile	Ngunanye amaxesha	Isiqapha- kile	Qho
49.	I learn about the world outside of school. Ek leer omtrent die wêreld buite die skool. <i>Ndifunda ngezinto zelizwe ezingaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
50.	My new learning starts with problems about the world outside of school. My nuwe leerproses begin met probleme omtrent die wêreld buite die skool. <i>Isifundo sam esitsha siqala ngeengxaki ezingaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
51.	I learn how science can be part of my out-of-school life. Ek leer hoe wetenskap deel kan wees van my lewe buite die skool. <i>Ndifunda ngokuba ndingasisebenzisa njani na isifundo senzuluwazi kubomi bam bangaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
52.	I get better understanding of the world outside of school. Ek verkry 'n beter begrip van die wêreld buite die skool. <i>Ndifumana ukwazi ngcono ngelizwe kubomi bangaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Noor	Selde	Soms	Geried	Altyd	Noor	Selde	Soms	Geried	Altyd
Zange iqhubeka	Incabile	Ngamsaeyo amaxesha	Exhaphakile	Qho	Zange iqhubeka	Incabile	Ngamsaeyo amaxesha	Exhaphakile	Qho

53.	<p>I learn interesting things about the world outside of school.</p> <p>Ek leer interessante dinge omtrent die wêreld buite die skool.</p> <p><i>Ndifunda ngezinto ezinomdla zelizwe kubomi bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
54.	<p>What I learn has nothing to do with my out-of-school life.</p> <p>Wat ek leer het niks te doen met my lewe buite die skool nie.</p> <p><i>Into endiyifundayo ayinanto yakwenza ngobomi bam bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
55.	<p>What I learn I can use in my out-of-school life.</p> <p>Wat ek leer kan ek gebruik in my lewe buite die skool.</p> <p><i>Into endiyifundayo ndingayisebenzisa kubomi bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
56.	<p>What I learn I can link to what I already know.</p> <p>Wat ek leer kan ek koppel aan wat ek reeds weet.</p> <p><i>Into endifundayo ndingayidibanisa kwinto ebendihleli ndiyazi.</i></p>	1	2	3	4	5	1	2	3	4	5

ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Kwazi	Sikho	Somaxes	Okhona	Akholo	Kwazi	Sikho	Somaxes	Okhona	Akholo
		Zange iqhubeke	Isahlile	Ngamanye amaxesha	Okhona- sini	Okhona- kholo	Zange iqhubeke	Isahlile	Ngamanye amaxesha	Okhona- kholo	Okhona- kholo
<b>Responsibility for own learning</b> <b>Verantwoordelikheid vir my eie leer</b> <b><i>Uxanduva lokuzifundela</i></b> In this Science class: In hierdie wetenskap klas: Kwidasi yezenzuluwazi:											
57.	The teacher encourages me to plan what I'm going to learn. Die onderwyser moedig my aan om te beplan wat ek gaan leer. <i>Utitshala uyandikhuthaza ndicwangcise into endiza kuyifunda.</i>	1	2	3	4	5	1	2	3	4	5
58.	The teacher encourages me to decide how well I am learning. Die onderwyser moedig my aan om te besluit hoe goed ek leer. <i>Utitshala uyandikhuthaza ukuba ndizigqibele ukuba ndifunda kakuhle na.</i>	1	2	3	4	5	1	2	3	4	5
59.	The teacher encourages me to decide which activities are best for me. Die onderwyser moedig my aan om te besluit watter aktiwiteite die beste is vir my. <i>Utitshala uyandikhuthaza ukuba ndizigqibele ukuba yeyiphi imisebenzi endilungele bhetele.</i>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit wil <u>hê</u> . <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Noot	Selde	Soms	Geradeld	Altyd	Noot	Selde	Soms	Geradeld	Altyd
		Zange iqhubeka	Inqabulo	Ngamanye amaxesha	Isiqabakile	Qho	Zange iqhubeka	Inqabulo	Ngamanye amaxesha	Isiqabakile	Qho
60.	<p>The teacher encourages me to decide how much time I spend on learning activities.</p> <p>Die onderwyser moedig my aan om te besluit hoeveel tyd ek spandeer aan leeraktiwiteite.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngexesha endlichitha ndifunda umsebenzi wesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
61.	<p>The teacher encourages me to decide which activities I do.</p> <p>Die onderwyser moedig my aan om te besluit watter aktiwiteite ek kan doen.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngemisebenzi endifuna ukuyenza.</i></p>	1	2	3	4	5	1	2	3	4	5
62.	<p>The teacher encourages me to assess (i.e. think about) my learning.</p> <p>Die onderwyser moedig my aan om te assessee (m.a.w.dink oor) wat ek leer.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizivavanye ngendlela endifunda ngayo.</i></p>	1	2	3	4	5	1	2	3	4	5

ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
Zange iqhubeke	Inqabile	Ngamanye amaxesha	Isigqabekile	Qho	Zange iqhubeke	Inqabile	Ngamanye amaxesha	Isigqabekile	Qho

<p>63. The teacher encourages me to decide the pace at which I learn best.</p> <p>Die onderwyser moedig my aan om te besluit teen watter pas ek die beste leer.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngesantya endifunda ngaso bhetele.</i></p>	<p>1      2      3      4      5</p>	<p>1      2      3      4      5</p>
<p>64. The teacher encourages me to think about areas in my learning that I need to improve upon.</p> <p>Die onderwyser moedig my aan om te dink oor leerareas waar dit nodig is dat ek verbeter.</p> <p><i>Utitshala uyandikhuthaza ukuba ndicinge ngeendawo ezifuna ukuphuculwa kwizifundo zam.</i></p>	<p>1      2      3      4      5</p>	<p>1      2      3      4      5</p>

**Section D**  
**Afedeling D**  
**Icandelo D**

Please read the text below and answer the questions that follow.

Lees asseblief sie onderstaande teks en beantwoord die daaropvolgende vrae.

*Nceda ufunde esu sicatchulwa singezantsi uze uphendule imibuzo elandelayo.*

Candles in the market

Kerse in die winkel

*Amakhandlela emakethi*

Tebogo's granny was complaining about how many different kinds of candles there were to buy in the market. She was not sure whether to buy thin candles or thick candles. Tebogo set up a simple experiment to help her decide. He used four candles that were the same in everything except thickness. He lit the four candles together and then let them burn for ten minutes. Then he blew out each flame and measured the length of the candles.

Tebogo se ouma het gekla oor hoe baie verskillende kerse daar te koop was in die winkels. Sy was nie seker of sy dun kerse of dik kerse moes koop nie. Tebogo het 'n eenvoudige eksperiment uitgevoer om haar te help besluit (watter tipe kerse sy moes koop). Hy het vier kerse gebruik wat presies dieselfde was behalwe vir hulle dikte. Hy het die vier kerse tergelyketyd aangesteek en hulle vir tien minute laat brand. Hy het die kerse toe uitgeblaas en die lengte van die kerse gemeet.

*Umakhulu kaTebogo waye khalaza ngeendidi zamakhandlela ekufuneka ukhethe kuzo xa uthenga emakethi. Wayengaqinisekanga ukuba athenge amakhandlela abhityileyo okanye atyebileyo. UTebogo umenzele uvavanywana olulula ukuba athathe isigqibo. Uthathe amakhandlela amane afana ngento yonke ngaphandle kobukhulu. Uwalayitile amakhandlela omane ngexesha elinye waze wawayeka alayita kangangemizuzu elishumi. Emva koko uye wawacima nganye nganye waze wamejarisha ubude bamakhandlela.*

He recorded the results in a table:

Hy het die uitslae in 'n tabel aangeteken:

*Iziphumo zovavanyo uzibhale kuluhlu olungezantsi:*

Results table

Uitslae tabel

Kuluhlu olungezantsi

Candle	Thickness (cm)	Length at the beginning (cm)	Length after 10 minutes (cm)
Kers	Dikte (cm)	Lengte aan die begin (cm)	Lengte na 10 minute (cm)
<i>Ikhandlela</i>	<i>Ubukhulu (cm)</i>	<i>Ubude ekuqaleni (cm)</i>	<i>Ubude emva kwemizuzu elishumi (cm)</i>
1	2	15.0	10.0
2	4	15.0	12.0
3	6	15.0	14.0
4	8	15.0	14.5

**Now please answer the following 5 questions in the spaces provided:**

**Antwoord nou asseblief die volgende 5 vrae in die spasies wat voorsien is:**

***Ngoku nceda uphendule le mibuzo 5 ilandelayo elinkezelwayo ngezantsi:***

1. What problem was Tebogo trying to solve?

Watter problem het Tebogo probeer oplos?

*Yeyiphi ingxaki uTebogo wayezama ukuyisombulula?*

2. What variable did he change on purpose?  
Watter veranderlike het hy met opset verander?  
*Yeyiphi into ayitshintshileyo emakhandleleni ngenjongo?*

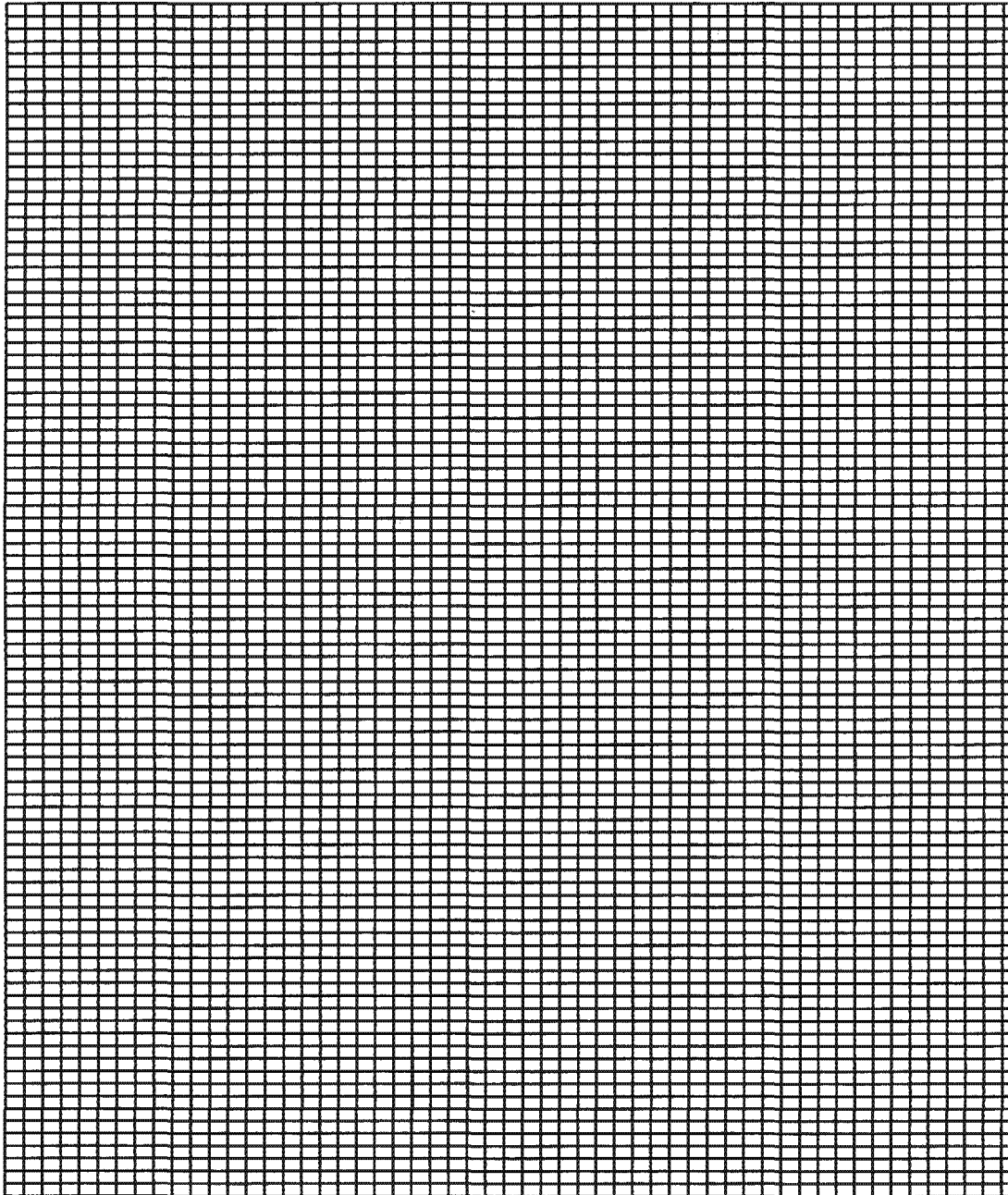
3. What variables did he control?  
Watter veranderlikes het hy beheer?  
*Zeziphi izinto athe wazi lawula ngokwakhe?*

4. Was it a fair test? Give a reason for your answer.  
Was dit 'n regverdige toets? Gee 'n rede vir u antwoord.  
*Ibe luvavanyo olulungileyo olu? Nika isizathu sempendulo yakho.*

5. On the graph paper provided below, draw a **labelled bar graph** of each candle at the length at the beginning and the length after 10 minutes (results recorded in the table).

Op die grafiekpapier wat hieronder voorsien word teken 'n **grafiek** met **byskrifte** vir elke kers van die lengte aan die begin en die lengte na 10 minute( uitslae soos aangeteken in die table).

*Ephepheni legrafu elinikezelweyo ngezantsi **zoba igrafu enonjolweyo** ubude ekuqaleni waze ubude emva kwemizuzu elishumi (ezibhalwe).*



**Thank you for filling out this questionnaire!**

**Dankie dat u die vraelys voltooi het!**

***Enkosi ngokuzalisa eli xwebu lemibuz***

APPENDIX 2

FINAL VERSION OF THE *OUTCOMES-BASED LEARNING ENVIRONMENT*

*QUESTIONNAIRE-WESTERN CAPE (OBLEQ –WC)*



**WESTERN CAPE  
GRADE 8 LEARNERS' QUESTIONNAIRE**

**WES-KAAPSE  
GRAAD 8 LEERDERSVRAELYS**

**INTSHONA KOLONI  
IXWEBU LEMIBUZO LABAFUNDI BEBANGA LESI-8**

**Section A  
Afedeling A  
Incandelo A**

**BACKGROUND QUESTIONS**

**AGTERGRONDSVRAE**

**IMIBUZO NGAWE**

Name of your <u>school</u> Naam van jou <u>skool</u> <i>Igama lesikolo</i>						
<u>Your</u> name <u>Jou</u> naam <i>Igama lakho</i>						
What class are you in? Watter klas is u in? <i>Ufunda eliphi ibanga?</i>						
Your age ( <i>Please circle your answer</i> ) Jou ouderdom ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Iminyaka yakho( Nceda ubiyele impendulo yakho)</i>	13	14	15	16	17	18
Are you a girl or a boy? ( <i>Please circle your answer</i> ) Is jy 'n meisie of 'n seun? ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Uyintombi okanye inkwenkwe? (Nceda ubiyele impendulo yakho)</i>			Girl Meisie <i>Intombi</i>	Boy Seun <i>Inkwenkwe</i>		
Are you repeating this grade? ( <i>Please circle your answer</i> ) Herhaal jy hierdie graad? ( <i>Trek 'n sirkel om jou antwoord</i> ) <i>Uyaliphinda eli banga? (Nceda ubiyele impendulo yakho)</i>			Yes Ja <i>Ewe</i>	No Nee <i>Hayi</i>		

**Section B**  
**Afedeling B**  
**Incandelo B**

**INSTRUCTIONS**

**INSTRUKSIES**

**IMIYALELO**

1. This questionnaire contains statements about practices that could take place in this **SCIENCE** class. You will be asked how often each practice takes place.

Die vraelys bevat stellings omtrent praktyke wat kan plaasvind in hierdie **WETENSKAP**-klas. Jy sal gevra word hoe gereeld elke praktyk plaasvind.

*Eli xwebu lemibuzo liqulathe izivakalisi ngeenkqubo ezinokuqhubeka kwiklasi yeze**NZULULWAZI**.*

2. There are no 'right' or 'wrong' answers. Your opinion is what is wanted. Your responses will be confidential.

Daar is geen "regte" of "verkeerde" antwoorde nie. Jou opinie is al wat verlang word. Jou antwoorde sal vertroulik wees.

*Akukho mpendulo zichanekileyo okanye zingachanekanga. Izimvo zakho zezona zinto zifunekayo. Iimpendulo zakho ziza kukhuseleka.*

3. The 'Actual' column is to be used to describe how often each practice actually takes place in your class.

Die "Werklikheid" kolom moet gebruik word om te beskryf hoe gereeld elke praktyk in werklikheid in die klas plaasvind.

*Uuhlu lwe-'Yona nto iqhubekayo' luza kusetyenziselwa ukuchaza inkqubo nganye ukuba iqhubeka kangakanani na eklasini yakho.*

4. The 'Preferred' column is to be used to describe how often you would like each practice to take place (a wish list).

Die "Verkose" kolom moet gebruik word om te beskryf hoe gereeld jy sou wou hê dat elke praktyk moet plaasvind ('n wenslys).

*Uuhlu lwe'nto endiyikhethayo' luza kusetyenziselwa ukuchaza ukuba ungathanda ukuba le nkqubo iqhubeke njani na ( uuhlu lokunqwenelela).*

Now please respond to statements in **Section C** starting on the next page. Please **circle** your responses.

Reageer nou asseblief op die stellings in **Afdeling C** wat op die volgende baldsy begin. Trek 'n **sirkel** om u antwoorde asseblief.

*Nogoku phendula izivakalisi ezikwi**Candelo C** ezikwiphepha elilandelayo. Nceda **ubiyete** impendulo zakho.*

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixbaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixbaphakile	Qho
7.	<p>Students discuss with me how to go about solving problems.</p> <p>Leerdere bespreek met my hoe om probleme op te los.</p> <p><i>Abafundi baxoxa nam ngokuba singayisombula njani le ngxaki.</i></p>	1	2	3	4	5	1	2	3	4	5
8.	<p>I am asked to explain how I solve problems.</p> <p>Ek word gevra om te verduidelik hoe ek probleme oplos.</p> <p><i>Ndiyacelwa ukuba ndicacise ukuba ndiyisombulule njani na ingxaki.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Investigation</b></p> <p><b>Ondersoek</b></p> <p><b>Uphando</b></p> <p>In this Science class: in hierdie wetenskap klas: Kwikiasi yezenzulwazi:</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixbaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixbaphakile	Qho
9.	<p>I carry out investigations to test my ideas.</p> <p>Ek doen ondersoeke om my idees te toets.</p> <p><i>Ndenza amaphando ukuvavanya izimvo zam.</i></p>	1	2	3	4	5	1	2	3	4	5
10.	<p>I am asked to think about the supporting facts for statements.</p> <p>Ek word gevra om te dink oor ondersteunende feite vir my stellings.</p> <p><i>Ndiyacelwa ukuba ndicinge ngendlela endingaxhasa ngayo ubunyani besivakalisi.</i></p>	1	2	3	4	5	1	2	3	4	5

**Section C**  
**Afedeling C**  
**Icandelo C**

**ACTUAL**  
**WERKLIKHEID**  
**EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED**  
**VERKOSE**  
**INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

<b>Involvement</b> <b>Betrokkenheid</b> <b>Ukuthatha inxaxheba</b> In this Science class: In hierdie wetenskap klas: Kwiklas yezenzuluwazi:		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooi	Selde	Soms	Geradig	Altyd	Nooi	Selde	Soms	Geradig	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixaphakile	Qho
1.	I discuss ideas in class. Ek bespreek idees in die klas. <i>Ndixoxa izimvo eklasini.</i>	1	2	3	4	5	1	2	3	4	5
2.	I give my opinions during class discussions. Ek lig my opinie gedurende klasbesprekings. <i>Ndinika izimvo zam ngexesha leklasi.</i>	1	2	3	4	5	1	2	3	4	5
3.	The teacher asks me questions. Die onderwyser vra vir my vrae. <i>Undibuza imibuzo.</i>	1	2	3	4	5	1	2	3	4	5
4.	My ideas and suggestions are used during classroom discussions. My idees en voorstelle word tydens klasbesprekings gebruik. <i>Zimvo nengcebiso zam ziyasetyenziswa ngexesha leengxoxo zeklasi.</i>	1	2	3	4	5	1	2	3	4	5
5.	I ask the teacher questions. Ek vra die onderwyser vrae. <i>Ndibuza utitshala imibuzo.</i>	1	2	3	4	5	1	2	3	4	5
6.	I explain my ideas to other students. Ek verduidelik my idees aan ander leerders. <i>Ndicacisa izimvo zam kubafundi.</i>	1	2	3	4	5	1	2	3	4	5

		<b>ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO</b>  How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					<b>PREFERRED VERKOSE INTO ENDIYIKHETHAYO</b>  How I <u>want</u> it. Hoe ek dit <u>wil hê</u> . <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Naosi	Selde	Soms	Geroeid	Altyd	Naoit	Selde	Soms	Geroeid	Altyd
		Zange- aqhubeki	Inqabile	Ngamanye amaxesha	Ikhuphi- akile	Qho	Zange- iqhubeki	Inqabile	Ngamanye amaxesha	Ikhuphi- akile	Qho
11.	I carry out investigations to answer questions coming from discussions.  Ek doen ondersoek om vrae te kan beantwoord wat uit besprekings vloei.  <i>Amaphando ukuphendula imibuzo esuka kwiingxoxo.</i>	1	2	3	4	5	1	2	3	4	5
12.	I explain the meaning of statements, diagrams and graphs.  Ek verduidelik die betekenis van stellings, diagramme en grafieke.  <i>Ndicacisa into ethethwa sisivakalisi; umzobo kunye neegrafu.</i>	1	2	3	4	5	1	2	3	4	5
13.	I carry out (i.e.do) investigations to answer questions that puzzle me.  Ek doen ondersoeke om vrae wat my pla te beantwoord.  <i>Ndiqhuba amaphando ukuphendula imibuzo endothusayo.</i>	1	2	3	4	5	1	2	3	4	5
14.	I carry out investigations to answer the teacher's questions.  Ek doen ondersoeke om die onderwyser se vrae te beantwoord.  <i>Ndiqhuba amaphando ukuphendula imibuzo yootitshala.</i>	1	2	3	4	5	1	2	3	4	5
15.	I find out answers to questions by doing investigations.  Ek vind antwoorde op vrae deur ondersoek te doen.  <i>Ndifumanisa iimpendulo ngokwenza amaphando.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nood	Selde	Soms	Gereeld	Altyd	Nood	Selde	Soms	Gereeld	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ibhapha-kile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ibhapha-kile	Qho

<p>16. I solve problems by using information obtained from my own investigations. Ek los probleme op deur inligting te gebruik wat ek bekom het deur my eie ondersoeke. <i>Ndisombulula iingxaki ngokusebenzisa ulwazi endilufumene kumaphando am.</i></p>	<p>1 2 3 4 5</p>	<p>1 2 3 4 5</p>
<p><b>Cooperation</b> <b>Samewerking</b> <b>Intsebenziswano</b> In this Science class: In hierdie wetenskap klas: Kwiklasi yezenzuluwazi:</p>	<p>Never Seldom Sometimes Often Always Nood Selde Soms Gereeld Altyd Zange iqhubeka Inqabile Ngamanye amaxesha Ibhapha-kile Qho</p>	<p>Never Seldom Sometimes Often Always Nood Selde Soms Gereeld Altyd Zange iqhubeka Inqabile Ngamanye amaxesha Ibhapha-kile Qho</p>
<p>17. I cooperate with other students when doing assignment work. Ek werk saam met ander leerlinge aan opdragte. <i>Ndisebenzisana nabanye abafundi xa ndisenza umsebenzi wexeshana.</i></p>	<p>1 2 3 4 5</p>	<p>1 2 3 4 5</p>
<p>18. I share my books and resources with other students when doing assignments. Ek deel my boeke en hulpbronne met ander leerders tydens die uitvoer van opdragte. <i>Ndibolekisa ngeencwadi zam nangezixhobo zam nabanye abafundi xa sisenza umsebenzi wexeshana.</i></p>	<p>1 2 3 4 5</p>	<p>1 2 3 4 5</p>

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I want it. Hoe ek dit wil hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ikhuphukile	Obo	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ikhuphukile	Qho
19.	When I work in groups in this class, there is teamwork. Wanneer ek in 'n groep werk in hierdie klas is daar spanwerk. <i>Xa ndisebenza namaqela kule klasi, sisebenzisana sonke.</i>	1	2	3	4	5	1	2	3	4	5
20.	I work with other students on projects in this class. Ek werk saam met ander leerlinge in hierdie klas aan projekte. <i>Ndisebenza nabanye abafundi kwiiprojekthi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
21.	I learn from other students in this class. Ek leer by ander leerlinge in hierdie klas. <i>Ndifunda kwabanye abafundi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
22.	I work with other students in this class. Ek werk saam met ander leerlinge in hierdie klas. <i>Ndisebenza nabanye abafundi kule klasi.</i>	1	2	3	4	5	1	2	3	4	5
23.	I cooperate with other students on class activities. Ek werk saam met ander leerlinge aan klasaktiwiteite. <i>Ndisebenzisana nabanye abafundi kwimisebenzi yeklasi.</i>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Noot	Selde	Soms	Gerreeld	Altyd	Noot	Selde	Soms	Gerreeld	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixapho- kile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixapho- kile	Qho

24. Students work with me to achieve class goals.  
Ander leerlinge werk saam met my om klasdoelwitte te bereik.  
*Abafundi basebenza nam ukuphumeza iinjongo zeklassi.*

1	2	3	4	5	1	2	3	4	5
---	---	---	---	---	---	---	---	---	---

**Equity**

**Gelykheid**

**Ulungelelaniso**

In this Science class:  
In hierdie wetenskap klas:  
Kwikklassi yezenzuluwazi:

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Noot	Selde	Soms	Gerreeld	Altyd	Noot	Selde	Soms	Gerreeld	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixapho- kile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixapho- kile	Qho

25. The teacher gives as much attention to my questions as to other students' questions.  
Die onderwyser gee ewe veel aandag aan my vrae soos aan die van ander leerlinge.  
*Utitshala undinika ixesha lakhe lonke kwimibuzo yam njengoko esenza kwabanye abafundi.*

1	2	3	4	5	1	2	3	4	5
---	---	---	---	---	---	---	---	---	---

26. I get the same amount of help from the teacher as do other students.  
Ek kry dieselfde hoeveelheid hulp van die onderwyser soos die ander leerlinge.  
*Ndiyifumana uncedo olulinganayo kutitshala njengabanye abafundi.*

1	2	3	4	5	1	2	3	4	5
---	---	---	---	---	---	---	---	---	---

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nooit	Selden	Soms	Geroeke	Altyd	Nooit	Selden	Soms	Geroeke	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishephephe kile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishephephe kile	Qho

27.	<p>I have the same amount of say in this class as other students.</p> <p>Ek het net soveel sê soos die ander leerlinge in die klas.</p> <p><i>Ndinexesha lokuthetha kule klasi njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
28	<p>I am treated the same as other students in this class.</p> <p>Ek word dieselfde soos ander leerlinge in die klas behandel.</p> <p><i>Ndiphethwe njengabanye abafundi kule klasi.</i></p>	1	2	3	4	5	1	2	3	4	5
29.	<p>I receive the same encouragement from the teacher as other students do.</p> <p>Ek ontvang dieselfde aanmoediging van die onderwyser soos die ander leerlinge.</p> <p><i>Ndifumana inkuthazo kutitshala njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
30.	<p>I get the same opportunity to contribute to class discussions as other students.</p> <p>Ek kry dieselfde geleentheid soos ander leerlinge om tot klasbesprekings by te dra.</p> <p><i>Ndifumana ithuba lokufaka isandla kwiingxoxo ze klasi njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit is. <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixaphakile	Qho
31.	<p>My work receives as much praise as other students' work.</p> <p>My werk ontvang net soveel lof soos die ander leerlinge s'n.</p> <p><i>Umsebenzi wam ufumana ukunconywa njengowabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
32.	<p>I get the same opportunity to answer questions as other students</p> <p>Ek kry dieselfde geleentheid soos ander leerlinge om vrae te beantwoord.</p> <p><i>Ndifumana ithuba lokuphendula umbuzo njengabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Differentiation</b> <b>Onderskeid</b> <b>Iyantlukwano</b> In this Science class; in hierdie wetenskap klas. Kw'klasi yezenzulwaz.</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isixaphakile	Qho
33.	<p>I work at my own speed.</p> <p>Ek werk teen my eie pas.</p> <p><i>Ndisebenza ngendlela endifuna ngayo.</i></p>	1	2	3	4	5	1	2	3	4	5
34.	<p>Students who work faster than me move on to the next topic.</p> <p>Leerlinge wat vinniger as ek werk beweeg aan na die volgende onderwerp.</p> <p><i>Abafundi abakhawutezisayo kunam bagqithela kwisihloko esilandelayo.</i></p>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooni	Selde	Soms	Gerseid	Altyd	Nooni	Selde	Soms	Gerseid	Altyd
		Zange iqhubeke	Isicabile	Ngamanye amaxesha	Ixhaphakile	Qho	Zange iqhubeke	Isicabile	Ngamanye amaxesha	Ixhaphakile	Qho
35.	I am given a choice of topics to work on. Ek kry 'n keuse van onderwerpe om aan te werk. <i>Ndiyazikhethela isihloko endisifunayo.</i>	1	2	3	4	5	1	2	3	4	5
36.	I am set tasks (i.e.given work) that are different from other students' tasks. Ek kry take (m.a.w.kry werk) wat verskillend is van ander leerlinge s'n. <i>Ndinikwa imisebenzi engafaniyo neyabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
37.	I am given work that matches my ability. Ek ontvang werk wat by my vermoë pas. <i>Ndinikwa umsebenzi endikwaziyo ukuwenza.</i>	1	2	3	4	5	1	2	3	4	5
38.	I use different materials from those used by other students. Ek gebruik ander stof as dié wat deur ander leerlinge gebruik word. <i>Ndisebenzisa izixhobo ezahlukeneyo kwezabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5
39.	I use different assessment methods from other students. Ek gebruik ander metodes as dié ander leerlinge om te assessee. <i>Ndisebenzisa iintlobo zovavanyo ezahlukileyo kwezabanye abafundi.</i>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it is. Hoe dit is. <i>Iqhubeka njani na.</i>					How I want it. Hoe ek dit wil hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selds	Soms	Gerereid	Altyd	Nooit	Selds	Soms	Gerereid	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho
40.	<p>I do work that is different from other students' work.</p> <p>Ek doen werk wat verskil van ander leerlinge s'n.</p> <p><i>Ndenza umsebenzi owahlukileyo kowabanye abafundi.</i></p>	1	2	3	4	5	1	2	3	4	5
<p><b>Attitude to Science</b></p> <p><b>Houding teenoor Wetenskap</b></p> <p><b>Indlela abaziphatha ngayo xa besenza isifundo seNzululwazi</b></p> <p>In this Science class: In hierdie wetenskap klas: Kwinklasi yezer-zukulwazi.</p>		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selds	Soms	Gerereid	Altyd	Nooit	Selds	Soms	Gerereid	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixhaphakile	Qho
41.	<p>I look forward to lessons in science.</p> <p>Ek sien uit na wetenskaplesse.</p> <p><i>Ingathi asifiki isifundo seNzululwazi</i></p>	1	2	3	4	5	1	2	3	4	5
42.	<p>Lessons in science are fun.</p> <p>Wetenskaplesse is pret.</p> <p><i>Izifundo zeNzululwazi zinomdla.</i></p>	1	2	3	4	5	1	2	3	4	5
43.	<p>I dislike lessons in science.</p> <p>Ek hou nie van wetenskaplesse nie.</p> <p><i>Ndiyasicaphukela isifundo senzukulwazi.</i></p>	1	2	3	4	5	1	2	3	4	5

**ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO**

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

**PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO**

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Nosit	Selde	Soma	Gercedl	Abyd	Nosit	Selde	Soma	Gercedl	Abyd
Zin. gu- iqhubeka	Incapile	Nqanonye amaxesha	Ixapba- kile	Qho	Zange- iqhubeka	Incapile	Nqanonye amaxesha	Ixapba- kile	Qho

44.	Lessons in science bore me. Wetenskaplesse verveel my. <i>Izifundo zenzululwazi ziyandidika.</i>	1	2	3	4	5	1	2	3	4	5
45.	Science is one of the most interesting school subjects. Wetenskap is een van die interessantste skoolvakke. <i>Inzululwazi yenye yezifundo ezinika umdla.</i>	1	2	3	4	5	1	2	3	4	5
46.	I enjoy lessons in science. Ek geniet wetenskaplesse. <i>Ndiyazithanda izifundo zenzululwazi.</i>	1	2	3	4	5	1	2	3	4	5
47.	Lessons in science are a waste of time. Wetenskaplesse is 'n vermorsing van tyd. <i>Izifundo zenzululwazi ziyinkcitha- xesha.</i>	1	2	3	4	5	1	2	3	4	5
48.	These lessons make me interested in science. Die lesse maak my geïnteresseerd in wetenskap. <i>Ezi zifundo zindenza ndibenomdla kwezenzululwazi.</i>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it is. Hoe dit is. Iqhubeka njani na.					How I want it. Hoe ek dit wil hê. Ndiyifuna njani.				
Personal relevance		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
Persoonlike toepaslikheid		Nooit	Selds	Soms	Gewoos	Altyd	Nooit	Selds	Soms	Gewoos	Altyd
Ndingakwazi ukuyisebenzisa		Zange iqhubeka	Inqabile	Njanyanyo amaxesha	Isiqaphe- lile	Oko	Zange iqhubeka	Inqabile	Njanyanyo amaxesha	Isiqaphe- lile	Oko
In Uys Science class. In h'ecle wetenskap klas. Kwikizisi yezenzulwazi											
49.	I learn about the world outside of school. Ek leer omtrent die wêreld buite die skool. <i>Ndifunda ngezinto zelizwe ezingaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
50.	My new learning starts with problems about the world outside of school. My nuwe leerproses begin met probleme omtrent die wêreld buite die skool. <i>Isifundo sam esitsha siqala ngeengxaki ezingaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
51.	I learn how science can be part of my out-of-school life. Ek leer hoe wetenskap deel kan wees van my lewe buite die skool. <i>Ndifunda ngokuba ndingasisebenzisa njani na isifundo senzukulwazi kubomi bam bangaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5
52.	I get better understanding of the world outside of school. Ek verkry 'n beter begrip van die wêreld buite die skool. <i>Ndifumana ukwazi ngcono ngelizwe kubomi bangaphandle kwesikolo.</i>	1	2	3	4	5	1	2	3	4	5

ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO

PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

Never	Seldom	Sometimes	Often	Always
Nooit	Selde	Soms	Gerced	Altyd
Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ishapha- kile	Qho

Never	Seldom	Sometimes	Often	Always
Nooit	Selde	Soms	Gerced	Altyd
Zinye iqhubeka	Inqabile	Ngamanye amaxesha	Ishapha- kile	Qho

53.	<p>I learn interesting things about the world outside of school.</p> <p>Ek leer interessante dinge omtrent die wêreld buite die skool.</p> <p><i>Ndifunda ngezinto ezinomdla zelizwe kubomi bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
54.	<p>What I learn has nothing to do with my out-of-school life.</p> <p>Wat ek leer het niks te doen met my lewe buite die skool nie.</p> <p><i>Into endiyifundayo ayinanto yakwenza ngobomi bam bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
55.	<p>What I learn I can use in my out-of-school life.</p> <p>Wat ek leer kan ek gebruik in my lewe buite die skool.</p> <p><i>Into endiyifundayo ndingayisebenzisa kubomi bangaphandle kwesikolo.</i></p>	1	2	3	4	5	1	2	3	4	5
56.	<p>What I learn I can link to what I already know.</p> <p>Wat ek leer kan ek koppel aan wat ek reeds weet.</p> <p><i>Into endifundayo ndingayidibanisa kwinto ebendihleli ndiyazi.</i></p>	1	2	3	4	5	1	2	3	4	5

ACTUAL  
WERKLIKHEID  
EYONA NTO IQHUBEKAYO

How it is.  
Hoe dit is.  
*Iqhubeka njani na.*

PREFERRED  
VERKOSE  
INTO ENDIYIKHETHAYO

How I want it.  
Hoe ek dit wil hê.  
*Ndiyifuna njani.*

		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always	
		Ngoo	Selibe	Sonjani	Canjani	Aktyd	Ngoo	Selibe	Sonjani	Canjani	Aktyd	
		Zange sibabele	Inobilo	Nyonyonyo anaweso	Ishapha- kile	Obo	Zange sibabele	Inobilo	Nyonyonyo anaweso	Ishapha- kile	Obo	
<b>Responsibility for own learning</b> <b>Verantwoordelikheid vir my eie leer</b> <b><i>Uxanduva lokuzifundela</i></b> In this Science class: In hierdie wetenskap klas: Kwiklasi yezenzulwazi.												
57.	The teacher encourages me to plan what I'm going to learn. Die onderwyser moedig my aan om te beplan wat ek gaan leer. <i>Utitshala uyandikhuthaza ndicwangcise into endiza kuyifunda.</i>	1	2	3	4	5	1	2	3	4	5	
58.	The teacher encourages me to decide how well I am learning. Die onderwyser moedig my aan om te besluit hoe goed ek leer. <i>Utitshala uyandikhuthaza ukuba ndizigqibele ukuba ndifunda kakuhle na.</i>	1	2	3	4	5	1	2	3	4	5	
59.	The teacher encourages me to decide which activities are best for me. Die onderwyser moedig my aan om te besluit watter akwiteite die beste is vir my. <i>Utitshala uyandikhuthaza ukuba ndizigqibele ukuba yeyiphi imisebenzi endilungele bhetele.</i>	1	2	3	4	5	1	2	3	4	5	

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Seldc	Soms	Gereeld	Altyd	Nooit	Seldc	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isibaphakile	Oho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Isibaphakile	Oho
60.	<p>The teacher encourages me to decide how much time I spend on learning activities.</p> <p>Die onderwyser moedig my aan om te besluit hoeveel tyd ek spandeer aan leeraktiwiteite.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngexesha endilichitha ndifunda umsebenzi wesikola.</i></p>	1	2	3	4	5	1	2	3	4	5
61.	<p>The teacher encourages me to decide which activities I do.</p> <p>Die onderwyser moedig my aan om te besluit watter aktiwiteite ek kan doen.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngemisebenzi endifuna ukuyenza.</i></p>	1	2	3	4	5	1	2	3	4	5
62.	<p>The teacher encourages me to assess (i.e. think about) my learning.</p> <p>Die onderwyser moedig my aan om te assessee (m.a.w.dink oor) wat ek leer.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizivavanye ngendlela endifunda ngayo.</i></p>	1	2	3	4	5	1	2	3	4	5

		ACTUAL WERKLIKHEID EYONA NTO IQHUBEKAYO					PREFERRED VERKOSE INTO ENDIYIKHETHAYO				
		How it <u>is</u> . Hoe dit <u>is</u> . <i>Iqhubeka njani na.</i>					How I <u>want</u> it. Hoe ek dit <u>wil</u> hê. <i>Ndiyifuna njani.</i>				
		Never	Seldom	Sometimes	Often	Always	Never	Seldom	Sometimes	Often	Always
		Nooit	Selde	Soms	Gereeld	Altyd	Nooit	Selde	Soms	Gereeld	Altyd
		Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixaphelele	Qho	Zange iqhubeka	Inqabile	Ngamanye amaxesha	Ixaphelele	Qho
63.	<p>The teacher encourages me to decide the pace at which I learn best.</p> <p>Die onderwyser moedig my aan om te besluit teen watter pas ek die beste leer.</p> <p><i>Utitshala uyandikhuthaza ukuba ndizigqibele ngesantya endifunda ngaso bhetele.</i></p>	1	2	3	4	5	1	2	3	4	5
64.	<p>The teacher encourages me to think about areas in my learning that I need to improve upon.</p> <p>Die onderwyser moedig my aan om te dink oor leerareas waar dit nodig is dat ek verbeter.</p> <p><i>Utitshala uyandikhuthaza ukuba ndicinge ngeendawo ezifuna ukuphuculwa kwizifundo zam.</i></p>	1	2	3	4	5	1	2	3	4	5

**Section D**  
**Afedeling D**  
**Icandelo D**

Please read the text below and answer the questions that follow.

Lees asseblief sie onderstaande teks en beantwoord die daaropvolgende vrae.

*Nceda ufunde esu sicatchulwa singezantsi uze uphendule imibuzo elandelayo.*

Candles in the market

Kerse in die winkel

*Amakhandlela emakethi*

Tebogo's granny was complaining about how many different kinds of candles there were to buy in the market. She was not sure whether to buy thin candles or thick candles.

Tebogo set up a simple experiment to help her decide. He used four candles that were the same in everything except thickness. He lit the four candles together and then let them burn for ten minutes. Then he blew out each flame and measured the length of the candles.

Tebogo se ouma het gekla oor hoe baie verskillende kerse daar te koop was in die winkels. Sy was nie seker of sy dun kerse of dik kerse moes koop nie. Tebogo het 'n eenvoudige eksperiment uitgevoer om haar te help besluit (watter tipe kerse sy moes koop). Hy het vier kerse gebruik wat presies dieselfde was behalwe vir hulle dikte. Hy het die vier kerse tergelyketyd aangesteek en hulle vir tien minute laat brand. Hy het die kerse toe uitgeblaas en die lengte van die kerse gemeet.

*Umakhulu kaTebogo waye khalaza ngeendidi zamakhandlela ekufuneka ukhethe kuzo xa uthenga emakethi. Wayengaqinisekanga ukuba athenge amakhandlela abhityileyo okanye atyebileyo. UTebogo umenzele uvavanywana olulula ukuba athathe isigqibo. Uthathe amakhandlela amane afana ngento yonke ngaphandle kobukhulu. Uwalayitile amakhandlela omane ngexesha elinye waze wawayeka alayita kangangemizuzu elishumi. Emva koko uye wawacima nganye nganye waze wamejarisha ubude bamakhandlela.*

He recorded the results in a table:

Hy het die uitslae in 'n tabel aangeteken:

*Iziphumo zovavanyo uzibhale kuluhlu olungozantsi:*

Results table

Uitslae tabel

Kuluhlu olungezantsi

Candle	Thickness (cm)	Length at the beginning (cm)	Length after 10 minutes (cm)
Kers	Dikte (cm)	Lengte aan die begin (cm)	Lengte na 10 minute (cm)
<i>Ikhandlela</i>	<i>Ubukhulu (cm)</i>	<i>Ubude ekuqaleni (cm)</i>	<i>Ubude emva kwemizuzu elishumi (cm)</i>
1	2	15.0	10.0
2	4	15.0	12.0
3	6	15.0	14.0
4	8	15.0	14.5

**Now please answer the following 5 questions in the spaces provided:**

**Antwoord nou asseblief die volgende 5 vrae in die spasies wat voorsien is:**

***Ngoku nceda uphendule le mibuzo 5 ilandelayo elinkezelwayo ngezantsi:***

1. What problem was Tebogo trying to solve?

Watter problem het Tebogo probeer oplos?

*Yeyiphi ingxaki uTebogo wayezama ukuyisombulula?*

2. What variable did he change on purpose?

Watter veranderlike het hy met opset verander?

*Yeyiphi into ayitshintshileyo emakhandleleni ngenjongo?*

3. What variables did he control?

Watter veranderlikes het hy beheer?

*Zeziphi izinto athe wazi lawula ngokwakhe?*

4. Was it a fair test? Give a reason for your answer.

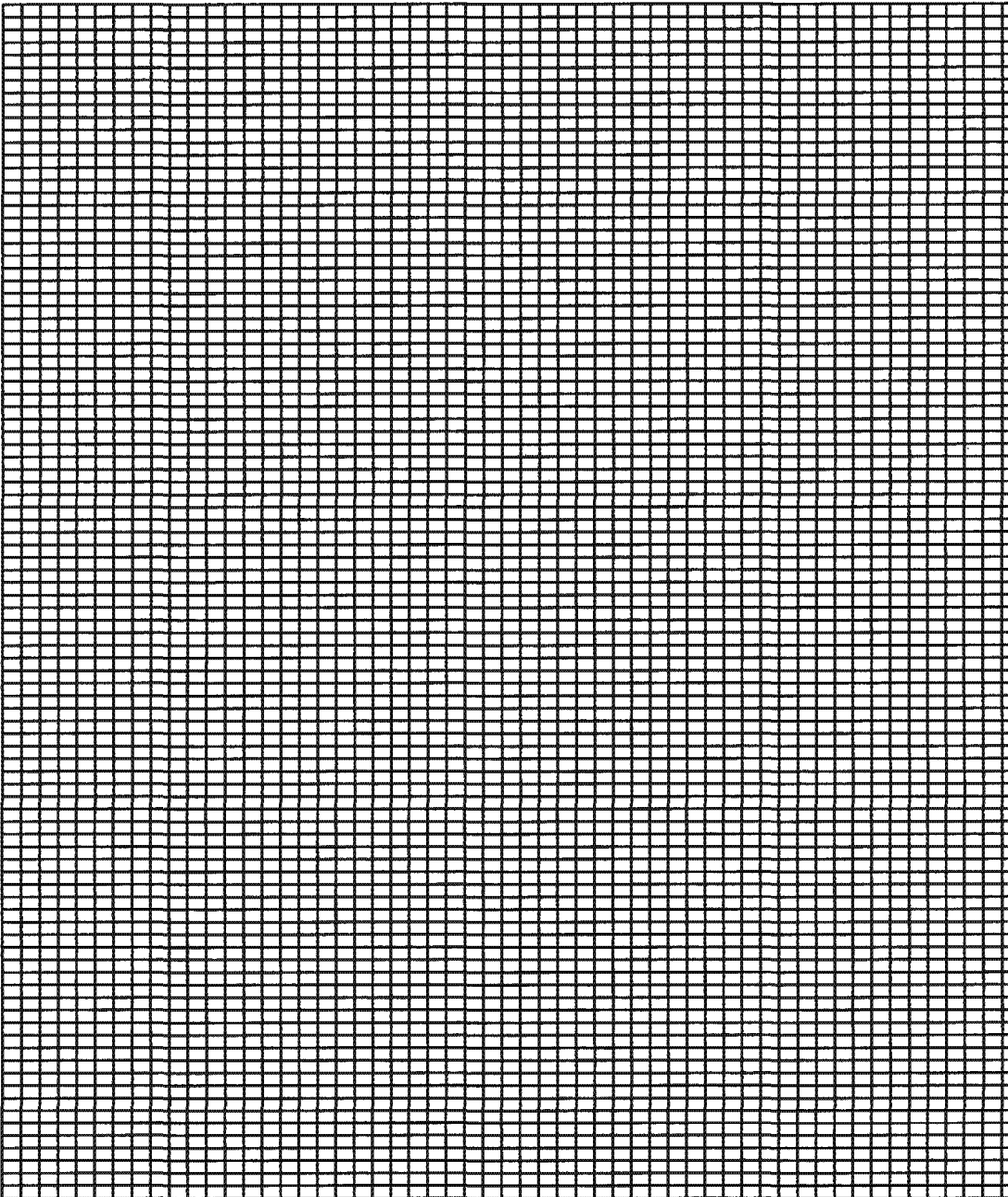
Was dit 'n regverdige toets? Gee 'n rede vir u antwoord.

*Ibe luvavanyo olulungileyo olu? Nika isizathu sempendulo yakho.*

5. On the graph paper provided below, draw a **labelled bar graph** of each candle at the length at the beginning and the length after 10 minutes (results recorded in the table).

Op die grafiekpapier wat hieronder voorsien word teken 'n **grafiek** met **byskrifte** vir elke kers van die lengte aan die begin en die lengte na 10 minute( uitslae soos aangeteken in die table).

*Ephepheeni legrafu elinikezelweyo ngezantsi **zoba igrafu enonjolweyo** ubude ekuqaleni waze ubude emva kwemizuzu elishumi (ezibhalwe).*



**Thank you for filling out this questionnaire!**

**Dankie dat u die vraelys voltooi het!**

**Enkosi ngokuzalisa eli xwebu lemibuz**

APPENDIX 3

APPROVAL FROM WESTERN CAPE EDUCATION DEPARTMENT (WCED)



APPENDIX 4

LETTER TO SCHOOLS



Navnne  
Enquiries  
Imibuzo  
Telefoni  
Telephone  
Ifoni  
Faks  
Fax  
Ifeksi

Dr RS Cornelissen  
(021) 467-2286  
(021) 425-7445

Verwysing  
Reference  
ISalathiso

20080529-0003



Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISEBE IeMfundo IeNtshona Koloni

Miss Candice Critien  
84 Newlands Avenue  
NEWLANDS  
7700

Dear Miss C. Critien

**RESEARCH PROPOSAL: THE IMPLEMENTATION OF OUTCOMES-BASED EDUCATION (OBE) IN GRADE 8 SCIENCE CLASSROOMS IN THE WESTERN CAPE.**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **2<sup>nd</sup> June 2008 to 30<sup>th</sup> September 2008**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as submitted to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:  
**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen  
for: **HEAD: EDUCATION**  
DATE: 2<sup>nd</sup> June 2008

MELD ASSEBLIEF VERWYSINGSNOMMERS IN ALLE KORRESPONDENSIE / PLEASE QUOTE REFERENCE NUMBERS IN ALL CORRESPONDENCE /  
NCEDA IINTSHONA IINOMBOLO ZESALATHISO KUYO YONKE IMBATHISO

GRAND CENTRAL TOWERS, LOWER PARLIAMENT STREET, PRIVATE BAG X9114, CAPE TOWN 8000  
GRAND CENTRAL TOWERS, LOWER PARLIAMENT STREET, PRIVATE BAG X9114, CAPE TOWN 8000

WEB: <http://wced.wcape.gov.za>

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VEI.IGE SKOLE/SAFE SCHOOLS ☎ 0800 45 46 47



## School of Education

Rondebosch 7701  
Tel: 076 907 7096  
Fax: (+27 21) 650-3489  
Email: [crtcan001@uct.ac.za](mailto:crtcan001@uct.ac.za)

The Principal  
School  
Address1  
Address2  
Address3

DATE

Dear Sir/Madam

**Research Project: *Implementation of Outcomes-Based Education (OBE) in Grade 8 Science classrooms in the Western Cape Province.***

I am currently conducting a research project on the above topic. Using learners' perceptions, the project aims to describe, analyse and compare how learner-centred learning environments are being created in Natural Science in Grade 8 in a variety of school settings. The project thus contributes toward urgently-needed empirical evidence that could be used to inform the implementation of the OBE. **This study is supported by the Western Cape Education Department (see attached letter).**

Your school has been randomly selected as one of 30 schools in the Western Cape to participate in the project. Only **one Grade 8 Natural Science classroom** can be selected per school. The research project involves conducting a survey to the learners, which will be in the form of a pencil-and-paper questionnaire. A "once-off" time period of approximately one hour will be required for learners to complete the questionnaire. Participation in the study is voluntary, and individual participants and schools, are assured anonymity and confidentiality throughout the duration of the project.

**I would be grateful if permission would be granted to research in you school, and if you would kindly arrange that I be put in contact with a liaison Natural Science teacher.** The teacher and I would make the necessary arrangements regarding the administration of the questionnaire.

- I would appreciate confirmation of your participation in the study by completing the reply slip below.
- Could you please complete the reply slip by the **20 June 2008**, and fax it to me, or alternatively confirm your participation telephonically or via E-mail. You could also contact me if you have any queries regarding my project or request. My contact details are as follows:  
Fax (021) 650 -3489 / Cell no. 076-907 7096 / via E-mail at "[crtcan001@uct.ac.za](mailto:crtcan001@uct.ac.za)".
- I will then contact the liaison Natural Science Teacher.

Your assistance is much appreciated.

Yours sincerely

Candice Critien  
(M. Ed Student)

A/Prof. RC Laugksch  
(Supervisor)

## ATT: CANDICE CRITIEN

(Researcher – School of Education, UCT)

Cell no: 076 907 7096    E-mail: crtcan001@uct.ac.za    Fax:(021) 650-3489

Name of school:

I confirm my school's participation in the study of  
Gr 8. Implementation of OBE in Natural Science  
learning environments in the Western Cape

(please tick)

YES

NO

Principal signature:

HOD (Natural Science) name :

HOD (Natural Science) Contact details:

Tel:

Cell:

Email:

HOD (Natural Science) signature:

Natural Science liaison teacher name:

Natural Science liaison teacher contact details :

Tel:

Cell:

Email:

Natural Science liaison teacher signature:

## APPENDIX 5

### A LESSON DESCRIPTION OF A TYPICAL LESSON IN CLASS A



## APPENDIX 5

### A lesson description of a typical lesson in this classroom (Class A)

On the day of my visit to the school, I am accompanied to the classroom by the secretary. After waiting for the headmaster to finish with his class, he comes out of the classroom talking on his cellphone. I wait for him to complete his discussion. He invites me into the classroom. He does not introduce me but rather points to a place at the back of the class where I should sit. The students in this class sit in neat, traditional rows that face the board. There are about 17 students in the class today.

Today he is discussing pollution. He explains to the students' that they will be doing an experiment to see whether car emissions contribute toward the pollution in Cape Town. He has written the 'Proof' up on the board and the students' are silently copying this down. He then writes the 'Apparatus' up on the board. Again, the students' just copy this down. He explains the procedure for this experiment and says that he wants to 'rev' three cars: one old car, one new car with a catalytic converter, and a diesel truck. On the exhaust of each car he wants to place a paper towel. The class needs to observe the results. Once the procedure has been explained to them, the class heads outside to the parking lot where the vehicles are parked. The headmaster then conducts the experiment, while the class gathers around the vehicles. After about a half an hour, the results have been collected and the class walk back to their classroom. When they are back in the classroom, I expect the lesson to finish because 45 minutes have already lapsed, however it continues. He begins to explain the difference between the three cars. He explains that car fumes are the biggest contributor to smog in Cape Town and reminds the students of an excursion that they went on recently. Now the students have to write out exactly what they did, but he doesn't give them any time to do this in. He moves on and begins to speak about the conclusions to this experiment. The students are not talking, or contributing to the formulation of the conclusion- they are just sitting quietly.

He now asks the students to draw the results in their books, that is, draw a car exhaust and the colour of the the paper towel for each exhaust. At this stage the students' are just talking. He begins to draw the results up on the board (what he expects). His cell phone rings a second time in the class, and he takes the second call in the same manner as the first. When he comes back into the classroom again, begins to grade the students' work. The bell rings for the end of the school day. (The lesson has been about two and half hours).



## APPENDIX 6

### A LESSON DESCRIPTION OF A TYPICAL LESSON IN CLASS B



## APPENDIX 6

### A lesson description of a typical lesson in this classroom (Class B)

On the morning of my visit to the school, I am initially greeted by the secretary. I wait for about five minutes in the foyer and am then greeted by a very friendly educator, whom I had met before when I administered the OBLEQ-WC questionnaires. She directs me to her classroom. The students are standing outside the classroom in two neat rows of boys and girls. I enter the classroom first and the students follow. The educator then introduces me, "This is a researcher from UCT. Do you remember the questionnaires you filled out a few weeks ago? Well, she's here for that. She is going to be observing our classes for a few days and then she will interview a few of you." Before the start of each week the educator outlines the work which will be covered in that week. This week the students will be learning about weather and climate.

She begins the lesson by asking the class, "What is the difference between weather and climate?" There is a pause for a few seconds, and she asks another question "Is there a difference? What is the difference?" A student puts up his hand, "Isn't weather like a certain climate?" The educator says, "Are you asking me or are you answering my question?" The class giggles, and he says, "No, no..." The educator moves onto someone else. A girl answers, "Weather is measured over a short period of time and climate over a longer period of time." "RIGHT," she says in a loud booming voice, "That's correct." "Climate is measured from a minimum of..?" and she pauses for a while, and lets the kids think, and then she answers, "30 years. So climate is general. But today, we've been having all four seasons; we're in the winter season again because it's started to rain again." The students' laugh a bit. The educator continues the lesson by asking questions to establish a link between the students' prior knowledge and the current lesson content.

While she is talking, the students' are responding to her questions, and they are getting just as excited about the material as she is. At one stage in the lesson this becomes evident. She says, "Why don't we have the same sort of weather in Cape Town that they experience in Durban?" A student answers, "It's because we are closer to the sea." She says, "No, Durban is closer to the beach and Cape Town has a beach." Another student says, "No wait; it's the different currents in the sea!!" "YES," she says, "We have two what?" The students' are getting excited now. One student states, "We have a Benguela!" She is starting to get excited and asks, "What is the Benguela?" "It's a current!!" says one student. "Ah yes," she says, "and what's the other current?" "The Agulhus!" says another student. "Yes, right, and which one is cold and which one is warm?" she asks. There is a discussion in the class about this. The class talks in amongst themselves. She then says, "Ok, come on, stay with me..." In the last fifteen minutes of the lesson, the educator writes up notes on the board and the students take these down in their notebooks.



## APPENDIX 7

### A LESSON DESCRIPTION OF A TYPICAL LESSON IN CLASS C



## APPENDIX 7

### A lesson description of a typical lesson in this classroom (Class C)

On arrival at the school, I go straight to the foyer and speak with one of the secretaries. She informs me that the school has been expecting me. The principal comes out of her office and introduces herself. I have met her already when I administered the OBLEQ-WC questionnaires. She takes me straight to the Natural Science classroom, and introduces me to the class educator, whom I have also met before. She then leaves and the class educator waves me into the classroom. I am introduced and the purpose of my visit is explained to the students. There are about 50 students in this class, sitting neatly in groups of eight. I sit at the back of the class in one of the groups.

The educator asks the class to take their workbooks out, and they all do so. There is no talking in the class. "Today's lesson is on acids and bases. We will be doing this for the rest of the week and at the end of the week we are going to do a practical on this," she says. She starts the lesson by writing "acids" in big capital letters on the chalk board. She asks the class, "What are the properties of acids?" The students then all repeat this, "What are the properties of acids?" One student answers, "Acids have a sour taste." All the students then repeat this simultaneously, "Acids have a sour taste." Once the students have repeated what the educator has said previously, a note is written on the board, and the students are required to copy this down.

After she has discussed the properties of acids, she begins to discuss the properties of bases. "What are the properties of bases?" she asks. The students repeat this, "What are the properties of bases?" Someone answers, "Bases feel slippery." She writes this on the board and the class repeats, "bases feel slippery." She then moves back to acids, and asks the class, "How do you think an acid feels?" They can't answer this, and so she says they are corrosive. "Carrot-sive," is how she says this word, and spells it this way too. She explains the meaning of the word, "This means that an acid eats away at something." The students all repeat it, "An acid feels carrot-sive and eats away at something." The bell rings and the lesson has come to an end. The lesson lasted 30 minutes. The students' pack up their books and bags and stand at their desks. The educator greets them, and they rush off to the quad where they will receive their meals.



## APPENDIX 8

### A LESSON DESCRIPTION OF A TYPICAL LESSON IN CLASS D



## APPENDIX 8

### A lesson description of a typical lesson in this classroom (Class D)

I arrive at the school in the morning and walk directly to the front office which is easy to find. I wait in the staff room for the educator to come through from her home room. The Natural Science educator, whom I have met before, arrives and I am led to her classroom. Her class has not arrived yet and she just takes a bit of time to have a conversation with me about the class and the school. The bell rings and she stands outside waiting for the class. The students arrive and line up outside the classroom in two straight rows of boys and girls. She waits for the class to quieten down. The girls are allowed in first and, after that, the boys. Students stand at their desks and she waits for the talking to recede before she greets the class, "Good morning everyone and today we have a visitor from UCT. She will be with us for a few days. Please sit down." The students all say good morning and sit down.

There is a lot of talking and the educator tries to control this, "Hey...who's talking? Shhhh." "Right guys, today we will be talking about the same stuff we have been talking about all week. Please and get your books out." The students all get their books out of their bags and the class begins to quieten down, however, it has taken a bit of time to achieve this.

The students have been learning about the climate in South Africa and the water crisis which South Africa is experiencing. The educator is going to teach them about droughts and agriculture today. "Right kids, what is a drought?" she asks. One student answers, "It is a long time with no water." "Very good...ok so a drought is a long time without water or when the rainfall is much lower than normal for a very long time," she says. She then writes this up on the board. The students then get a chance to copy it down. Once the students are finished writing down the notes on the board in their books she says, "Ok...now, droughts are a water shortage and this causes crop damage and loss of livestock, a reduction of water in the dams and a loss of groundwater and soil moisture." She writes these four reasons up on the board. The students' then copy this down. This class is very slow, and often need a bit of time to come up with the answers to the educators questions. The teacher informs me that seven out of the 40 students' in the class cannot read or write, and as a result the educator needs to be accommodating towards this. The educator says it out loud first and these students can write it down. It takes them a long while to write it down. One student asks what groundwater is and why it is so important. She says its water under the ground and it keeps the crops fed with water.

She then puts a graph up on the overhead projector. It shows the rainfall patterns for South Africa over the years between 1910 and 1980. She explains that the horizontal line represents the normal rainfall line. And if the graph goes above the line, then the rainfall is above average and if it goes below the line, then the amount of rainfall is below average. "I don't understand,"

says one student. "Ok...do you see this horizontal line?" the educator asks while she is pointing to the line. "Yes," the student says. "Ok," she says, "now can you see how the graph goes above this line?" "Yes," the student says. "Right, that means the rainfall is above the normal average for that year." "Ohhh," says the student. Some of the other students are listening to this, and some are talking. "Shhh...do you want to learn this or not?" she asks. "Does everyone understand this?" she asks. The students all say that they do understand. She continues to explain the term "carrying capacity" in much the same manner. She first starts out with a question and then she tries to elicit a response from the students. Once they have answered, she writes the note out on the board.

It is the last ten minutes of the lesson and she gives the students a worksheet to work on. The worksheet is based on what they have just learnt. The questions are all basic recall questions with no higher-order questions. They need to finish it in class and if they can't finish then they have it for homework. The educator goes to sit at the front desk. The students are chatting in amongst themselves, not doing much work. The bell then signals the end of the lesson.

## APPENDIX 9

### A LESSON DESCRIPTION OF A TYPICAL LESSON IN CLASS E



## APPENDIX 9

### A lesson description of a typical lesson in this classroom (Class E)

I arrive at the school and wait in a very comfortable and spacious waiting room for the liaison educator to arrive. After a long while, the educator comes to the front office to ask for me and takes me to his classroom. The bell has just rung and the students are waiting outside of the class. He just gestures them to come in and tells me to take a seat at the back. The seats are lined up in rows with four boys per row, and the students sit on high stools to reach the laboratory desks. The students are very polite and all greet me individually. The students all stand and talk and the educator makes a hand gesture for the students to sit down. "Sit down boys," he says, while he is searching for a lesson on the school science laboratory laptop at the front of the classroom. The students all sit down, however, they are still talking. He finds something, and says, "Right boys, we are going to be dealing with our voyage to Mars." He is allowing the students to "plan their own trip to Mars." He first deals with the difference between a star and a planet, and then deals with the Solar system and Earth's position in relation to Mars and the Solar system. He makes the students consider the aspects of a trip to Mars before thinking about before undertaking the 'mission'. For example, in the previous lessons, the class has been discussing the resources that Mars has, and the how long it may take for an astronaut to reach the planet. Today the class will be thinking about energy sources for the Mars mission. This provides the background for today's lesson.

He begins by asking the class, "Why do you think the mission will need energy?" The students are quiet and are thinking. One student says, "To keep all the systems in the craft working so that the astronauts can stay alive?" The educator replies, "Yes that's right! The whole point of the energy is to keep everyone in the craft alive. So today, what you need to do in your groups is take a few minutes to think about what sources of energy would be best to use."

He walks around the class and listens to what they are discussing and gives the students about 20 minutes to talk it over in their groups. One group is making a lot of noise without being very productive. "Boys in the corner, I don't think you are talking about the mission." He refers to one student individually. Eventually the noise starts to subside and the students indicate that they are finished discussing their ideas. Now each group needs to present what they have found. "Right boys, which group feels confident enough to share their ideas with us?" He refers to one boy in particular. "[Student 1] are you and your group ready to share?" "No Sir...you always pick on me," the boy says. "That's because you give the best answers. Now, what did you come up with?" the educator replies. He goes through the group's answers and then begins on another group. The boys have come up with some very good ideas and it is apparent that these students are all very competent.

He says, "Right, boys for homework, I would like you to think about why coal burning power stations are not suitable for Mars." The boys are despondent about the homework. "Do we have to do this Sir?" one student asks. "Yes...you do. Now get on with it, if you start now, you could finish it in class and have no homework," he says. As soon as he says this, the bell sounds. The boys pack up and stand at their desks. The educator waits for them all to be quiet, and then greets them.

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