Teaching strategies in Grade 11 multilingual Life Sciences classrooms: A case of two schools in East London District.

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By

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ABSTRACT

It is important to find strategies to assist learners who are taught in English especially as learners show different levels of English proficiency. English is taught as an Additional Language in many South African schools. Code switching is a well documented and researched strategy that teachers use in multilingual classrooms where the language of teaching and learning is not the learners' home language. The study is concerned with and seeks to investigate the teaching strategies that Life Science teachers use in multilingual classes in addition to code switching.

A case study of two Grade 11 Life Science teachers was conducted. The study adopts classroom observations and face-to-face interviews as qualitative data – gathering methods. The findings of this study, among other issues, reveal that in addition to code switching teachers use a variety of teaching strategies that include the use of textbooks, preparing notes for students, etc. Evidence available further suggests that the choice of teaching strategies is examination oriented rather than based on an understanding of current thinking on the ways of learning Life Sciences.

Keywords: multilingual classrooms, teaching strategies, Life Sciences.

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- The educators who participated in the study and
- My family who supported me throughout the study.

DECLARATION

I, Noxolo Millicent Jekwa, declare that this dissertation entitled "*AN INVESTIGATION INTO STRATEGIES FOR THE TEACHING OF LIFE SCIENCES : A CASE OF TWO GRADE 11 MULTILINGUAL CLASSROOMS IN EAST LONDON*" is the result of my own investigation and research and has not been submitted in part or in full for any other degree to any university.

Noxolo Millicent Jekwa

……..

Signature

January 2011

ACRONYMS USED

LoLT - Language of Learning and Teaching

SET - Science, Engineering and Technology

HEIs - Higher Education Institutions

DoE - Department of Education

L2 - Second Language

EAL - English as an Additional Language

CALPS - Cognitive Academic Language Proficiency

BICS - Basic Interpersonal Communicative Skills

LASS - Language Acquisition Support System

SLD - Second Language Development

CS - Code switching

FET - Further Education and Training

ELoLT - English Language of Learning and Teaching

ESL - English Second Language

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CHAPTER 1:

BACKGROUND OF THE STUDY

1.1 INTRODUCTION

This chapter, firstly, discusses the background to the study, and analyses the research problem. Secondly, it discusses the purpose and the significance of the study. The study aims at investigating how teachers present Life Sciences lessons in Grade 11 classrooms. What ways do they use for presenting instructional materials or conducting instructional activities in grade 11 Life Sciences classrooms (Ahmad, 2009)? Lastly, it outlines the chapters of the study.

1.2 BACKGROUND TO THE STUDY

1.2.1 Life Sciences in context

Life Sciences is one of the core subjects in the high school curriculum in South Africa (DoE, 2009). It is offered in the Further Education and Training Band (FET) in the National Curriculum Statement (DoE, 2009). Lee and Avalos (2003) define it as the study of natural phenomena in everyday life. Life Sciences as outlined in the National Curriculum Statement (NCS) is made up of four content strands which are the following: Environment Studies; Diversity, Change and Continuity; Life at the Molecular, Cellular, Tissue and Organ Levels and Life Processes in Plants and Animals.

i) Environment Studies

This strand focuses on human influences on the environment (air, land and water issues), sustaining the environment, and on air, land and water-borne diseases.

ii) Diversity, Change and Continuity

In this strand the focus is on Plant and Animal Diversity and Biogeography. Life exists in a huge array of forms and modes of life which scientists organise according to man-made classification systems.

iii) Life at the Molecular, Cellular, Tissue and Organ Levels

This strand focuses on the study of the basic structures and general characteristics of viruses, bacteria, protists and fungi, the effects and management of some diseases caused by micro-organisms, immunity and research on diseases.

iv) Life Processes in Plants and Animals

This strand focuses on the life processes such as support and transport in plants, and excretion. (.Isaac, Chetty, Manganye, .Mdhuli, Mpondwana,White 2009) .

For Life Sciences there are three learning outcomes(LO's) and each learning outcome has three assessment standards(AS's) which are the following:

Learning Outcome 1:Scientific Inquiry and Problem Solving Skills

AS 1: The learner identifies and questions phenomena and plans an investigation.

AS 2: The learner conducts investigations by collecting and manipulating data.

AS 3: The learner analyses, synthesises and evaluates data and communicate findings.

Learning Outcome 2: Construction and Application of Life Sciences Knowledge.

AS 1: Accessing knowledge

AS 2: Interpreting and making meaning of knowledge in Life Sciences

AS 3: Showing an understanding of the application of Life Sciences knowledge in everyday life.

Learning Outcome 3: Life Sciences, Technology, Environment and Society

AS 1: Exploring and evaluating scientific ideas of past and present cultures.

AS 2: Comparing and evaluating the use and development of resources and products, and their impact on the environment and society.

AS 3: Comparing the influence of different beliefs, attitudes and values on scientific knowledge. (DoE, 2011)

These LO's and AS's were also applied in Nated 550 as well as in NCS of Life Sciences

High School learners are expected to study Life Sciences, Chemistry and Physics in order to have a sound foundation for Sector Education and Training (SET) related courses offered in the Higher Education Institutions (HEIs). However, evidence has shown that learners are not performing well in Life Sciences and other Science subjects in South African Matriculation Examinations (DoE 2010). The MEC of Education of the Eastern Cape, when announcing results for 2009, highlighted that there are serious issues concerning the Sciences. He also mentioned that Physical Science was a killer subject which had a reduced pass rate of 28.6% which is a major drop of 14.8% compared to 2008. Life Sciences also declined by 2.6% and the pass rate stands at 58.7%. Moreover research revealed that learners do not have a conceptual understanding of the core knowledge required, (Campfire, 2003). The following discussion reviews how researchers have tried to explain the reasons for the underperformance of Life science learners. The reasons for underperforming are clustered as follows:

The language of learning and teaching; learners' attitudes to Science subjects; learners' economic backgrounds and teachers' approaches to teaching and learning.

1.2.2 The Language of teaching and learning

In South Africa the language of teaching and learning (LOLT) in the high school is English and Afrikaans. However English is a second language (L2) to the majority of high school learners, especially in the Eastern Cape Province where this study was conducted. According to Setati (2002), one of the impediments to effective Science teaching is the use of a foreign language as a medium of instruction.

a. Learner-related issues

Setati (2002) and Rakgong (1994) state that, in classes where English is used as LOLT for learners for whom it is not the main language, it has a negative effect on learners' meaning-making and problem solving skills. Setati (2002) further points out that the unfamiliar language results in learners understanding procedural discourse but not conceptual discourse. In procedural discourse, learners memorize without understanding. Rakgong (1994) says that the problem is not the learners' mental competence but the linguistic mismatch between the natural language of their thought processes and the imposed language of leaning. Alluding to this are studies by Webb (2008) and Lyn and Webb (2008) that revealed the following issues related to the use of English as LOLT:

Learners experience problems as their access to English is limited and there is of many learners hearing English outside the school premises; the use of unfamiliar language affects participation of learners in class activities; and rote learning processes such as memorization, repetition and recall take place. This also affects their performance in examinations. Contributing to the debate are Wildsmith,R and

Gordon,M (2009) who state that English proficiency has an impact on the academic performance of learners. They further noted that from the project they conducted on the performance in English proficiency. , it showed that poor examination performance is caused by lack of understanding of the questions and instructions, which are posed in English.

Du Plessis (2006) found that students' academic ability and performance are massively affected by the community in which they live. He further states that the community has an external influence on English development. Many parents and caregivers and community members may not be proficient in English, or may have been taught by an L2 speaker of English themselves, thus the learners are often exposed to a less than ideal model of English (De Klerk, 2002). In the rural areas of South Africa, the teachers, too, often do not have sufficient exposure to English and consequently may lack the necessary proficiency in English for effective teaching (De Klerk, 2000). From the evidence shown by these studies, it reveals that learners who are taught in English, especially those in rural schools, struggle to understand and comprehend English well.

b)Learners 'attitudes towards Science subjects.

Researchers have previously observed that a relatively low number of Black South African students do not choose Physical Sciences and Mathematics in high school because of the general unfavorable attitude towards Science subjects, and the language used in teaching Life Sciences, (Stephen,D.,Welman,J.,and Jordaan,W, 2004).

Oppenheim (1992) as cited in Young (1998) states that an attitude is a state of readiness, a tendency to respond in a certain manner when confronted with certain stimuli. He found 'attitudes' to contain three elementary components: cognitive, feeling or affective and actions or behaviour. Cognitive consist of the thoughts and knowledge the person has about the object. The affective component consists of the person's emotions, beliefs or evaluation toward the stimulus, and it can either be positive or negative stimulus. The behavioural component consists of how a person tends to act regarding the stimulus. This affects their interest and motivation to learn the subject. Many different factors that have been found to be related to the attitudes of students with regard to science include gender, age, subject content, teacher attitudes, learning environment, self concept and teaching strategies (Jordaan, 2003; Young, 1998). This study therefore investigated the teaching strategies that learners need to be exposed to in Life Sciences classes. The attitude of students can be influenced by the attitude of the teacher and his method of teaching. Studies carried out by Yara (2009) have shown that the teachers' method of mathematics and science teaching and his personality greatly accounted for the students' positive attitude towards mathematics and science. Yara (2009) further submitted that traits such as enthusiasm, respect for students and personality have been shown to influence students' attitude towards science as well as in other subjects. Teachers who teach different subjects are guided by different learning theories of Life Sciences.

c). Teachers' practices in classrooms

Adler (2000), Hornburger (2001) and Vorster (2005) examined the issue of using English as LOLT and drew attention to teachers' experiences and practices. They claim that teachers resort to using traditional teaching methods and their lessons

were mostly teacher-centered. They also resorted to using “safe talk”, such as allowing answering in chorus, when questions were put to the class. Tokwe (2008) conducted a study in many Eastern Cape schools where English is the second language to both teachers and learners in Mathematics classrooms. She observed that teachers’ lack of understanding of the second language and problems in learning and teaching sometimes resulted in a combination of effects, those of the learners and of the teachers . Some of these effects were the complexity of mathematical concepts themselves; the fact that learners had to learn and process mathematics in a second language; and that the teachers had to teach the subject to learners for whom English was a second language. Tokwe’s study focuses on mathematics but the researcher has used it because most of the issues identify with those of Life Sciences. Issues where Mathematics and Life Sciences have been identified as killer subjects in grade 12 examinations.(DoE, 2009).

What emerged from Tokwe’s study was the fact that teachers have a dual task of teaching both mathematics and English at the same time whilst on the other hand the learners have to cope with mathematics and the new language in which it is taught (2008).The reason I am citing Tokwe is that Life Sciences, like Mathematics, is one of the most challenging subjects in the Eastern Cape.

Poor quality of teachers

Ogunniyi (1996: 278) notes that no education system is higher than the level of the teacher. Thus, standards in science classrooms may fall because of the shortage of properly trained science teachers. Deficiencies in practical skills and conceptual

understanding are passed on from teacher to learner who then becomes a teacher – from one generation to the next.

Poor teacher education could account for the teachers' verbatim reliance upon textbook notes and practical instructions (Muwanga-Zake, 1998), the practice of chalkboard teaching observed by Jennings & Everett (1996), and the teachers' inability to use equipment that is not familiar (e.g. 'new' equipment not drawn in their textbooks). Teachers do not show interest in understanding how 'new' equipment works; for example, by reading instructions that accompany equipment. For example, one teacher could not assemble a balance. This could have prompted a subject adviser to instruct teachers not to open science equipment until they were trained how to use it. This means that teachers have to be workshopped on how to use every piece of 'new' science equipment.

b. Practicals do not have clear objectives

According to White (1996: 761), there ought to be clear goals of laboratory teaching. Unfortunately, school textbooks in SA do not outline the objectives of a practical exercise or the science processes which the practical ought to enhance. This degenerates practicals into routine exercises that produce data mainly for calculations or for verifying textbook information, and nothing else. Teachers seem to believe that data has to conform to that in the textbook or else the experiment has to be repeated (Muwanga-Zake, 1998). Setati and Adler (2005) suggest that practical work may enhance interest in science and increase manipulative skills, as well as memory of content. However, the scientific value of practical work in South African classrooms is questionable. Roychoudhury (1996: 423) made similar observations

that, typically, laboratory work is seen as an exercise with a primary focus on the verification of established laws and principles, or on the discovery of objectively knowable

1.2.4 Responding to learners' lack of conceptual discourse in Life Sciences

1.2.4.1 Using code switching

The most researched strategy used by teachers in classes where Life Sciences is taught in a second language is code switching (Adendorrf, 1993; Bohlmann, 2006; Howie, 2004; Moodley, 2004; Mercer and Sams, 2006; Ncedo et al, 2002; Setati, 2005; & Webb and Webb, 2008). Life Science teachers in such contexts mostly use code switching when presenting instructional materials regardless of the teaching method or approach. For example, during group work activities, learners are allowed to use their home languages for discussion and sometimes for presentations. Teachers use two languages interchangeably when posing questions to learners, and translate the questions. Even those teachers who use the text book method clarify issues through code switching. However, code switching is not used during examinations, only the language of teaching and learning is the language of assessment.

The following are some benefits and the reasons for using code switching revealed by findings from various studies, (Adendorrf,1993; Howie, 2004; Moodley, 2004; Mercer and Sams, 2006; Ncedo, 2002; Setati, 2005; & Webb and Webb, 2008).

- ✓ Code switching is viewed as a “communicative resource” that enables the teachers and students to accomplish a considerable number and wide range of social and educational objectives;
- ✓ Code switching fulfils a variety of social and academic functions that any single instance of code switching may fulfil more than a single function in the context. The teachers do not only teach lessons and inculcate values having to do with conservation of resources but perhaps unconsciously are socializing pupils into prevailing accepted patterns of multilingualism.
- ✓ This strategy also provides explanations to learners in their home language. It is also considered to be a tool which can provide spontaneous and reactive discussions of concepts by learners and teachers in their home language
- ✓ Literature further alludes to the fact that the main language of learners supplies a support system to facilitate the interaction among learners and with the teacher while their proficiency in English develops.

Code switching further enables the students to solve practical problems, communicate effectively and think in a more scientific way (Olugbara, 2008).

- ✓ The use of code switching as one of the teaching strategies helps the teachers to achieve their objectives and make their teaching easier and easily scaffold their teaching so that it becomes accessible to their learners (Vorster, 2008).
- ✓ As code switching is about bilingualism, Baker (1996) observed that in bilingual classes the learners have the ability to think more analytically about things especially when it comes to Science

subjects. He concludes by saying that the two languages give students extra advantages because they have a wider and more varied range of experience than monolinguals. They can draw from experiences, meanings and modes of thinking that the two languages provide.

- ✓ In conclusion, Setati (2004) mentions that the language-in-education policy in South African recognizes eleven official languages and is supportive of code switching as a resource for learning and teaching.

However literature also revealed the down side of code switching in classes where the learners' home language is neither the language of learning and teaching (LOLT) nor the language for assessment. Olugbara (2008) states that the teachers have a negative attitude towards code switching and feel that it promotes reliance on the bilingual's first language rather than the target language which is the LOLT and also the language for assessment. Adler and Setati (2001) coined a concept termed *dilemma of mediation* which states that the tension between validating diverse learner meanings and at the same time intervening their communicative competence makes it even difficult to understand the two languages well.

English is the only language used in the examinations for most English Second Language FET students. There is no code switching during examinations and this makes it difficult for the learners to communicate their answers in the target language which is English (Van der Walt and Mabule ,2008). Teachers are faced with a challenge of teaching learners of limited proficiency in English and

they cannot benefit much from code switching (Moodley, 2007). Nevertheless, much as literature documents problems associated with code switching, it has also revealed that code switching alone seems not to be the solution in the multilingual FET Band classrooms, where the LOLT is not the learners' home language (Dalvit and De Klerk, 2004). However, there seems to be a dearth of research that documents other strategies used by teachers in multilingual FET classrooms , except for code switching.

1.3 STATEMENT OF THE PROBLEM

The improvement of teaching of Science subjects is a challenge facing most educators in multilingual classrooms in South Africa. It has been observed that there is a high rate of underperformance in Science subjects. Most teachers seem to rely heavily on code switching as a way of presenting instructional materials and activities in Life Sciences classrooms. However, there is still evidence that code switching alone is not effective. Learners do not have the Life Sciences discourse and continue to underperform in the subject. It is therefore vital that other strategies be implemented in class to support learners to acquire the discourse in Life Sciences It is against this background that the study poses the following research questions:

1.4 RESEARCH QUESTIONS

Main Question:

What are the relevant strategies for presenting instructional materials in Grade 11 Life Sciences classes?

Sub questions:

- What other strategies, in addition to code switching, do teachers use for teaching Life Sciences in Grade 11 multilingual classrooms?
- What are Grade 11 Life Sciences teachers reasons for the choice of teaching strategies used?
- How do Grade 11 Life Sciences teachers implement the teaching strategies identified?

1.5 PURPOSE OF THE STUDY

This study seeks to investigate teaching strategies used in multilingual Life Sciences classrooms and how teachers implement these strategies.

1.6 OBJECTIVES OF THE STUDY

1.6.1 To investigate and describe the teaching strategies used in multilingual Life Sciences classrooms for presenting instructional materials.

1.6.2 To investigate how these strategies are implemented.

1.6.3 To investigate the underlying reasons for the teachers' choices of teaching strategies.

1.7 SIGNIFICANCE OF THE STUDY

The study seeks to influence teachers to reflect on their practices that are going to help learners to be able to confidently explore and investigate phenomena relevant to Life Sciences by using inquiry, problem solving, critical thinking and other skills.

1.8 RATIONALE FOR THE STUDY

The researcher is a Life Sciences teacher who is concerned about the poor performance of her learners. This experience made her to try and find where the problem is. After some time she discovered that the learners were having difficulties in understanding the subject because they were taught in the second language, namely English, which is not their home language. Learners also reported that when the teachers were teaching, they used both home and second languages. However, when they were writing examinations, all learners were expected to use English as a second language to express themselves. This made it difficult for learners to answer some of the questions. Moreover, the Eastern Cape is one of the Provinces that continues to perform poorly in Grade 12 examinations. (DoE, 2010). This problem is highlighted in the report of the Third International Mathematics and Science Study conducted in 1998 which found that:

The majority of South African pupils cannot communicate their scientific conclusions in the language used for the test, i.e. English in this case. English is the medium of instruction and also the language of examinations for matriculants. In particular, pupils who study Mathematics and Science in their second language tend to have difficulty articulating their answers to open-ended questions and apparently have trouble comprehending several of the questions (Howie, 2001). The researcher's other concern is whether there were other strategies that could be used with code switching to support the teacher.

1.9 DELIMITATION OF THE STUDY

This study was conducted in Grade 11 Life Sciences classes where code switching is between English and isiXhosa and in classes where English is the language of teaching and isiXhosa is the home language for both teachers and learners. The study was conducted in two rural High Schools in the East London District.

1.10. DEFINITION OF CONCEPTS

The following concepts are defined below to reflect the context in which they have been used in this study.

i. Teaching

This is a process of instruction or knowledge from a teacher to students in a school situation for effective learning (Simpton & Weiner, 1989).

ii. Teaching strategy

Strategies are ways of presenting instructional materials or conducting instructional activities (Ahmad, 2009).

iii. Code switching

The use of more than one linguistic variety within the same conservation (Kieswetter, 1995). It is also a strategy that is used by teachers and learners who have a primary language that is different from their language of learning and teaching (Setati,2002).

iv. ESL: English Second Language:

A language learned in addition to one's home language (isiXhosa in the study) (DoE, 2002).

v. Multilingual classrooms

The term multilingualism is defined as a person's ability to process more than two languages in each of the four skills of language (listening, speaking, reading and writing). Multilingual classrooms display linguistic diversity among learners (DoE, 2002).

1.11 CHAPTER OUTLINE

The chapter outline for this study is as follows:

Chapter 1

The chapter introduces the study. The following issues are covered: Introduction, background to the study, statement of the problem, research questions, purpose of the study, objectives of the study, significance of the study, rationale of the study , delimitations of the study and the definition of concepts.

Chapter 2

The chapter deals with the conceptual framework and literature review, and the theoretical framework .

Chapter 3

This chapter covers research methodology, the research paradigm, the research design, data collection instruments and data collection.

Chapter 4

Chapter 4 presents, interprets and analyses data collected from the two High Schools.

Chapter 5

The chapter makes recommendations and states conclusions arising from the findings.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this chapter is to review relevant literature that investigates teaching strategies which could be used for presenting instructional materials in Life Sciences classrooms. It also focuses on the debates on the nature of Life Sciences and the theories that underpin the teaching of a subject like Life Sciences.

2.2 THEORETICAL FRAMEWORK

This study was broadly informed by Lave & Wenger's notion of transparency. Lave and Wenger (1991) argued that access to a practice relates to the dual visibility and invisibility of its resources i.e. teaching strategies for presenting instructional materials in Life Sciences (the resources in this case)

'Invisibility is in the form of unproblematic interpretation and integration into activity in the classroom and *visibility* is in the form of extended access to information (Setati et al, 2008). This is not a dichotomous distinction, since these two crucial characteristics are in a complex interplay. For example, Life Sciences has its own language and is taught in a particular language which, in most cases, is not the learners' home language. Therefore, strategies for presenting instructional material in Life Sciences should help learners understand the language of Life Sciences in the classroom. To be useful, they must be both visible and invisible. They are visible in the sense that they have to be clearly seen and understood by all and invisible in that when interacting with written texts and discussing content subjects like Life Sciences, strategies for presenting instructional materials or activities do

not distract the learners' attention from the task under discussion but facilitate their learning. Furthermore, if there is use of technology in Life Sciences and given that learning is to make meaning of what is taught, the technology needs to be visible so that the learners could notice and use it. However, it also needs to be simultaneously invisible so that the learners' attention is focussed on the concepts that they are trying to comprehend.

Lave & Wenger's concept of transparency seems relevant in this study in that it seeks to identify effective strategies for presenting instructional materials in Life Sciences. Such classes, like the ones studied in this research, are characterised by the complex, multiple teaching demands that are made on learners with limited proficiency in English which is the language of learning and teaching. Moreover, learners struggle in attaining conceptual discourse in the Life Sciences.

2.3 LIFE SCIENCES AS A SUBJECT OFFERED IN THE FET BAND

2.3.1. Life Sciences in Context

There have been many changes in the South African education system since the democratically elected government. Before 1994, the curriculum used in South Africa was Nated 550, which is the old syllabus that was different for each racial divide. Learners were expected to do six subjects from standard eight to standard ten to qualify for a matriculation certificate (All SaintsTrust, 1995). Biology was one of the subjects offered in Higher and Standard Grade from Grade 10 to Grade 12. Biology is now known as Life Sciences in the new

curriculum (NCS). The aims of both subjects are still the same in the Curriculum and Assessment Policy Statement and in the National Curriculum Statement, (DoE, 2011). These aims are as follows:

Specific Aim 1: Knowing Life Sciences

This aim involves knowing, understanding, and making meaning of sciences, thereby enabling learners to make many connections between the ideas and concepts.

Specific Aim 2: Investigating Phenomena in Life Sciences

Learners must be able to plan and carry out investigations as well as solve problems that require some practical ability.

Specific Aim 3: Appreciating and Understanding the History, Importance and Applications of Life Sciences in Society.

This aim enables learners to understand that school science can be relevant to their lives outside of the school and that it enriches their lives.

Biology is one of the largest branches of science. Under biology are the main sub-classifications that deal with the major classes of living beings:

- Zoology – study of animal life
- Botany – study of plant life; and
- Microbiology – study of micro-organisms

Biology was a subject that required the learners to know the theory of biology such as the structure of a cell for example, the process of

photosynthesis, classification of plants and animals, genetics and many other categories. It also had a practical part where experiments are performed to describe certain concepts, for example, to determine the rate of transpiration in different weather conditions. Furthermore biology is based on principles known as the principles of Biology: These principles are:

Cell Theory.

Living things are composed of the basic unit of life, the cell; new cells are formed from old cells through cell division.

Gene Theory

The gene theory states that a living being's traits are encoded in DNA, inside genes that can be passed down and inherited via gene transmission.

Homoestasis

This principle states that all living beings can maintain/adapt the functions of their internal environment despite changes in the external environment.

Energy Principle:

All living beings need energy to survive, and they have the ability to use up as well as transform energy.

2.3.2. THE NATURE OF THE SUBJECT LIFE SCIENCES

For Life Sciences to be accepted as a science, certain methods for broadening existing knowledge or discovering new things are generally used (DoE,2007). These methods are the theory, the practical and the application parts. The theory part deals with the structure and knowledge of the content (NCS, 2006). It is a subject that deals with the role of inquiry, investigations, and data collection. Skills and analysis of information are part of the learning outcomes that need

to be achieved. Most of these skills are mostly achieved by conducting experiments and doing practical activities such as projects and research on the content (DoE, 2010). Through these activities skills are developed such as making observations, handling of materials and apparatus, recording of results and communicating by representing data using graphs and flow charts and making reports (DoE, 2010).

Life Sciences is also a subject that deals with the applications of Life Sciences in society. This learning outcome helps the learners to be able to apply the knowledge that has been taught in the classroom in the society. Learners should be able to describe the history of scientific discoveries and explain the relationship of indigenous knowledge to living systems. They apply Life sciences knowledge in industry, careers opportunities, and in everyday life (NCS, 2008).

2.4 AIM OF TEACHING LIFE SCIENCES

The study of Life Sciences at all levels essentially aims to develop useful skills and abilities pertaining to scientific observation, experimentation and practical use of scientific facts and principles (Deka, 2010). Deka further noted that teaching of Life Sciences should also aim at developing certain abilities such as abilities to sense problems, organization and interpretation of data, analysis and drawing of generalizations or conclusions. In view of this statement, learners studying Life Sciences should be able to locate reliable sources for data collection. They should be able to argue, discuss the content, use the terminology

in the subject and be able to apply their acquired knowledge in solving their daily life problems. Furthermore, the teaching of Life Sciences also aimed at developing certain skills in the learners. These could be experimental, constructional and drawing skills. In drawing skills the learners should be taught the methods of drawing of figures of plants and animals and their internal structures.

. 2.5 LEARNING THEORIES

The two major theories that the study discusses are the Constructivist Learning Theory and the Behaviourist Theories.

2.5.1 Constructivist learning theory

Many Science educators accept constructivism as a major reform in Science education but others raise concerns about the lack of widespread adoption of constructivist practices in Science classrooms (Osborne & Freyberg, 1985; & West, 1986). Constructivism refers to the idea that learners construct knowledge for themselves both individually and socially (Hein,1991). He further argued that constructing meaning is a process of learning and the consequences of this view are twofold:

a. There should be a focus on the learner when thinking about learning.

b. There is no knowledge independent of the meaning attributed to experience.

To clarify this further Hein (1991) explained that although it appears radical on an everyday level, it is a position which had been frequently adopted ever

since people began to ponder epistemology, i.e. to understand the grounds nature, and origins of knowledge and limits of human understanding.

Piaget argued that the child has to understand a concept before s/he could acquire the particular language form in which he/she expresses that concept. He further explains that there could be a point in a child's intellectual development when s/he could compare objects with respect to size. This means that if you give the child a number of sticks to arrange them in order of size, a child who had not yet reached this stage would not be able to learn and use comparative adjectives like bigger or smaller.

This cognitive theory draws attention to the large increase in children's vocabulary at around this stage suggesting a link between object permanence and the learning of labels for objects. Limitations of this theory are that during the first year to 18 months, connections of the type explained above are possible to trace, but as a child developed, so it became harder to find clear links between language and intellect. Some studies have focused on children who learn to speak fluently despite abnormal mental development.

As Constructivists, Piaget and Papert view children as the builders of their own cognitive tools as well as their external realities. For them, knowledge and the world are both constructed and constantly reconstructed through personal experience. Each gains existence and form through the construction of the other. Knowledge is not merely a commodity to be transmitted, encoded, retained, and re-applied, but a personal experience to be constructed and similarly, the world

is not just sitting out there waiting to be uncovered, but gets progressively shaped and transformed through the child's or the scientist's personal experience, Schunk (2009). The implications of this theory in Life Sciences is that the learners who have gained knowledge will be able to apply it in the real world. Knowledge is not something to store but to be used, and to be used to construct and shape the world around them. The teacher provides information and skills to be gained and learners apply them. For Life Sciences, this theory addresses the following specific aim: Knowing Life Sciences which involves knowing, understanding, and making meaning of sciences, thereby enabling learners to make many connections between the ideas and concept

2.5.2 Behaviourist Theory

A definition of Behaviourist theories of learning is that it seeks scientific, demonstrable explanations for simple solutions (Hergenhahn, 1988). This is based on Skinner's theory based on the idea that learning is a function of change in overt behaviour. Children imitate adults, and their correct utterances are reinforced when they get what they wanted or are praised. Changes in behaviour are the result of an individual's response to events (stimuli) that occur in the environment. To understand the behaviourist, it offers some valuable principles to apply the following:

- Repetition
- Small, concrete, progressively sequenced tasks
- Positive and negative reinforcement
- Consistency in the use of re-inforcers during the teaching-learning process

- Once an item is learned, intermittent re-inforcement will promote retention.

Ellis(1985), in supporting this theory, argued that efficient and effective second language learning did not occur purely by building of stimulus-response links. Nor did second language learning occur by merely exposing a child or adult to the second language. Providing input which suits the stage of development of the second language learner becomes important. For many years, the concepts from behavioural theory formed the basis of most of the learning theory applied in child rearing and in classrooms (Bigge, 2004).

Teachers still found that, in many instances, individuals do learn when provided with the appropriate blend of stimuli, rewards, negative re-inforcement, and punishment**.** Successful utterances need to be re-inforced (Lowe and Graham, 1998). Skinner (1957) stated that the basic processes and relations which give verbal behaviour its special characteristics are now fairly understood. Much of the experimental work responsible for this advance has been carried out on other species. But the results have proved to be surprisingly free of species restrictions. Recent work has shown that the methods can be extended to human behaviour without serious modifications. However, the limitation of Skinner's theory is the claim that children who have not acquired language by the age of seven will never entirely catch up.

Another limitation identified was that basic language is based on a set of structures and rules which could not be worked out simply by imitating individual utterances. The mistakes made by children revealed that they were not simply imitating but actively working out or applying rules. Furthermore the

children were often unable to repeat what an adult said, especially if the adult utterances contained a structure the child had not started to use more

2.6 RECENT DEVELOPMENTS ON THE PEDAGOGY FOR LIFE SCIENCES

Practice and research revealed that there are instructional strategies that areeffective in teaching Mathematics and Life Sciences to limited English proficient learners (Vorster, 2008). It is also concluded that teachers do not necessarily have to be bilingual to help students succeed. Strategies that both bilingual and monolingual teachers could use to involve their minority students in the complex Mathematics and Science worlds include the following:

2.7.1 Using scaffolding strategies that include written notes, glossary and tests.

This strategy was studied by Vorster (2008), who felt that there was an urgent need to find a strategy to assist multilingual learners who were taught in English to cope with the subject matter. This strategy was used on learners who had different levels of English proficiency. Vorster (2008) used code switching as a scaffolding or supporting strategy. She explained that the mastery of word sense is important for understanding concepts. In code switching the teacher circumvents language by using a minimum of words and concentrating instead on symbolic language. In Vorster's study the learners were also given notes and a glossary that had both English and Setswana words that were used to interpret the words used in the content. Lee and Avalos (2003) further agreed on this by saying that providing hands-on activities tied to real life contexts, such as these activities, reduces

linguistic dependency meaning that learners will be able to understand by observing the phenomena taking place before them.

Hands-on activities based on natural phenomena are more accessible to students with limited Life Sciences experience than de-contextualized textbook knowledge. Hands-on activities are less independent on formal mastery of the language of instruction and thus reduce the linguistic burden on second language learners. Researchers further realised the importance of giving learners structured opportunities so that they can engage in Life Sciences inquiry and hands on activities with their peers. Collaborative, small group work was found to provide structured opportunities for developing English proficiency in the context of authentic communication about science knowledge (Vorster, 2008).

2.7.2 Linking instructional strategies with second language acquisition techniques such as co-operative learning

Teachers who acquire a repertoire of instructional routines could readily draw upon them as they interact with students in teaching Mathematics and Science. For example, teachers need to know how to respond to a student who gives an answer the teacher does not understand or demonstrates a misconception. Teachers need to know how to deal with students who lack critical prerequisite skills for the day's lesson. Research has shown that expert teachers have a large repertoire of routines. They could choose among a number of approaches for teaching a given topic or responding to a situation that arises in their classes.

Khristy (1995) and Setati (2000) cited that the main language of learners supplied a support system to facilitate the interaction among learners and teachers while their proficiency in English was developed. Laplante (1997) further argued that English second language learners (ESL) face a dual task of learning the language in which science is taught and, simultaneously, that of learning the related content of Life Sciences . The teachers are also facing a dual task of teaching Language as well as Science. Integrating Science instruction was at the base of any successful Science program for ESL learners (Laplante, 1997).

Lemke (1990:16) suggested that “Learning Science means learning to talk Science.” He further said that “Talking Science means observing, describing, comparing, classifying, analysing, hypothesizing, theorizing, questioning, challenging, arguing, designing experiments, following procedures, judging, and evaluating in and through the language of science. To perform these processes, learners must not only understand the scientific concepts involved and know the related vocabulary, but they must also be able to use the required language structures and manipulate the appropriate discourse features. In other words, they must be able to utilize the various genres of Science. Second Language learners are faced with the complexity of Language demands, integrating Language and Science instruction when working with them was only a practical alternative, but probably the only alternative (Spanos,1989). By doing so teachers will have more time at their disposal to teach Science. They would be able to adopt approaches and implement strategies that are known to be favourable to second language development as well as Science learning. Language is most effectively learned when it is a vehicle of instruction and when students use it

as a tool to create and share meaning in authentic and interesting learning situations (Spanos,1989).

2.7.3 Promoting a Language Environment Favourable to Second Language Development.

The language environment created during Life Sciences activities should be favourable to second language development. In such an environment, learners should be provided with numerous opportunities to actively construct from the language input they receive (Laplante,1997). Laplante further described some of the strategies used by immersion and Second Language teachers to help learners transform the linguistic input they received into comprehensible input. These strategies included the extensive use of teacher talk, body language, explicit language modelling by the teacher, reality, visuals and manipulatives in learning activities. These teachers also established predictable instructional routines and built redundancy into their lessons. The implementation of these strategies greatly facilitated the learners' task in constructing meaning. Teachers who adopted an interactionist view of language believed that two components of the language environment were essential to promote Second Language Development (SLD) interaction and comprehensible output (Cummins and Swain,1986). These teachers realized that meaning was jointly constructed through the interaction taking place between speakers.

Teachers with an interactionist view of SLD took specific measures to promote interaction in their classrooms and encouraged the production of comprehensible output. Some of these measures were discursive in nature, questioning, drawing on learners' background knowledge, enriching and elaborating students' utterances

as well as encouraging students to negotiate the meaning and form of their linguistic output. Other measures, affecting the organization of the classroom, included group work during activities and class-wide presentations, discussions and debates (Laplante,1997).

2.7.4 Introducing and Formally Teaching New Vocabulary Words

In this article, Laplante (1997) further explains how, when exploring Science-related themes, new words (such as 'food chains') or ordinary words used in an unfamiliar way (such as 'energy') were often required to define concepts, name and describe objects, or explain phenomena under study. The learners' needs in this regard should be addressed. Some teachers should believe that if they could provide a list with all the correct words at the beginning of a new unit of work and somehow explain the meaning associated with these words, learners would be able to use them when required. However, according to Saville-Troike (1984), vocabulary knowledge in English was the most important aspect of oral English proficiency to academic achievement. Considering the large number of technical terms used in Science, it was unrealistic to expect learners to acquire them without any formal teaching in a purely communicative context.

Fathmann, Quinn & Kessler (1992) noted that it would be difficult for students to understand the meaning of words such as "magnetic pole" or "chemical properties" before they have had some hands-on experiments where these concepts come into play. It was only through such experiences with concrete objects, pictures and visuals, followed by discussions that the scientific

meanings of such words could be constructed. Ideally, new vocabulary words should be introduced only when needed to clarify thinking and promote effective communication (Rutherford & Ahlgren, 1990). When introducing new words and whether in planned or unplanned teaching episodes, it was essential to clearly and effectively convey meaning to the learners. These learners should be able to meaningfully re-use the newly acquired terms in different contexts (Seal,1991).

Laplante (1997:37) said that the most effective way for learners to learn how to talk Science is to actually practise talking Science. Unfortunately, in many classrooms, learners are not spending much time actually talking Science and when they do*, "Teachers tend to leave much of the semantics and grammar of scientific language completely implicit."* Kidd (1996) concurred and suggested that it would be quite unreasonable to think that ESL students automatically acquired control over macro-functions through linguistically unguided participation in content work. In other words, learners should not be expected to discover for themselves how to function successfully within the Science genres. Among other things, learners should be shown through modelling and actual practice how to combine new Science words into complex, syntactically correct sentences and to successfully perform various language micro-functions. They need to learn how to translate their expressive or colloquial language into scientific language. That should be shown how minor genres relate to major genres. They should be taught how to write lab reports (Lemke,1990).

2.7.5 Reflecting the Nature of Science in the Learning Activities

For learners to have a better understanding, they should be doing Science as scientists do. Scientists always work in small groups, exchanging information and discussing ideas. They thus reflect the collaborative nature of the scientific enterprise (Laplante,1990). For example, Laplante noted that students should explore magnetism with magnets and share their findings with their classmates. Through this, they learn more about chemical reactions by mixing various chemicals together, researching information in books and actually talking with practising chemists. According to Trowbridge and Bybee cited in Cleminson (1990), Science is a system consisting of a body of knowledge and a scientific community of scientists who are engaged in the scientific enterprise. As such an inquiry- based approach reflects an essential aspect of the nature of Science. Learners learn to do Science as scientist do.

This approach helps them to realize how scientific knowledge is actually produced. They become more rational thinkers and better decision makers as their process skills are used to deepen their understanding of scientific concepts (Hart,1987). On the affective level, such an approach is most likely to preserve a child's sense of wonder, joy, excitement and curiosity. From a language perspective, an inquiry approach has many benefits. Due to a number of factors, such as hands-on materials, interaction between students and direct cognitive involvement of all participants, this inquiry based approach could provide a rich language environment favourable to SLD (Kessler & Quinn, 1987).

2.8 Conclusion

The literature reviewed has revealed that it is important for teachers in general to note that, in addition to code switching, there are several other strategies that can be used. In the implementation of their teaching strategies, the learners not only gain knowledge but also skills and values (DoE, 2009). Chapter two highlighted that Science is both a practical and a theoretical subject which has a range of strategies for presenting instructional material and how it should be used. If taught to learners to whom English is a second language, strategies and instructional strategies used should ensure that learners are not denied access to English. Teachers in Life Sciences classes should use strategies that will develop the learners with skills to have independence in their learning.

The next chapter deals with research design and methodology and methods of data collection used in this study.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1. INTRODUCTION

This chapter justifies the research design, methodology and methods of data collection used in this study .

3.2 RESEARCH PARADIGM

The study is located within the interpretivist paradigm. This paradigm understands the subjective world of human experiences (May, 2003). “Interpretivism” is an epistemology that advocates the necessity for the researcher to understand differences between humans and other humans in our role as social actors. This emphasizes the difference between conducting research among people rather than with objects such as trucks and computers (Duku,2009). It is further alluded that crucial to the interpretivist epistemology is that the researcher has to adopt an empathetic stance. The challenge is to enter the social world of our research subjects and understand the world from their point of view (Duku, 2009). This paradigm also researches about experiences (Leedy and Ormrod,2005). The interpretivist’s belief is characterized by seeing the social world from a highly subjective viewpoint. It places the emphasis of explanation in the subjective consciousness of the social participants instead of the objective observer (Cohen, Manion, & Morrison,, 2007). This paradigm deals with the interaction of humans, how they experience things and issues, their behaviour The interpretivists believe that to understand this world of meaning one must interpret it. The inquirer must elucidate the process of meaning

construction and clarify how meanings were embodied in the language and actions of social actors. To prepare an interpretation is in itself to construct a reading of these meanings; it is to offer the inquirer's construction of the construction of the actors one studies, (Denzin and Lincoln, 1998). The ontology of this paradigm is the centrality of human beings and the context which the study is about.

Interpretivists are interested in the meaning that people give to phenomena and requires a detailed and thorough analysis of social situations and also requires firsthand knowledge (Willis, 2007). Conducting observations and doing interviews would give the researcher firsthand knowledge of how the strategies that are used in class are applied and how they support teaching and learning. The social reality will be unveiled as to exactly how these processes prevail. The epistemology of the interpretivist paradigm is that the researcher and the respondents have the same frame of reference of knowledge and understanding (Cohen, *et al*, 2007). New insights will be gained as to how the teachers can improve their teaching. For this study, the interpretivist paradigm is appropriate because it is investigating the teachers' strategies in a multilingual classroom where code switching is used. Through this paradigm the researcher is be able to get rich, in-depth meaning of code switching in practice. As this paradigm focuses on action, researchers work directly with experience and understanding to build their theory on them (Cohen *et al*, 2009).

3.3 RESEARCH APPROACH

This study adopts a qualitative approach. Qualitative research is the social research in which the researcher relies on text data rather than numerical data and also analyses the data in their textual form rather than converting them to numbers for analysis. The qualitative approach aims to understand the meaning of human action. Its flexibility encourages the researcher to be innovative (Silverman, 2000). Guba and Lincoln (1998) explain that qualitative research is a reality that is subjective and seen through the eyes of the participants in the study. The process is inductive in nature. Patterns or theories are developed through the research process (Leedy and Ormrod, 2005). Qualitative research has features such as naturalistic, descriptive data, concern with process, and meaning that have been identified by researchers. Qualitative researchers are concerned with process rather than simple outcomes. For qualitative researchers in education, the process is beneficial in clarifying the "self-fulfilling prophecy" meaning that seeing the processes unfolding in terms of watching what the teachers are doing compared to what they are saying.

3.3.1 Naturalistic

Researchers feel that action can be understood when it is observed in the setting in which it occurs. Qualitative researchers wants to know where, when, how and under what circumstances behaviour came into being. They also enquire what historical circumstances and movements they are part of. Each act, word and gesture is significant in the eyes of the qualitative researcher This approach gives the researcher enough ideas and thoughts on how to approach her research (Willis, 2007).

3.3.2 Descriptive data

Data in qualitative research takes the form of words or pictures rather than numbers. Often the descriptive data contains quotations mentioned by informants to illustrate and substantiate the findings. Data can include transcripts, field notes, photographs, video recordings, audio recordings, personal documents and memos. Qualitative research does not reduce the pages of narration into numbers like quantitative researchers. Nothing is taken for granted or overlooked for a qualitative researcher. Qualitative researchers notices gestures, body language and many other things. These details enrich the data (Willis,2007).

3.3.3 Inductive

Qualitative researchers analyze their data inductively. They do not set out to find data to prove or disprove hypotheses that they have prior to their study. Their theories are derived from the "bottom up" rather than the "top down" approach. The qualitative researcher's theory is grounded in data. The theory emerges as a piece of art that is yet to be created rather than a puzzle where the image is already known. Things are more open at the beginning and more direct and specific at the bottom. It is in the first part of the qualitative research where the researcher discovers the important questions. She does not assume to know the important questions prior to beginning her research (Cohen, *et al*, 2009).

3.3.4 Meaning

The participant perspective focuses on questions about what assumptions people made about their lives. Researchers show their data in the form of transcripts and recorded material to their to informants to make sure their interpretation of what the informants say is accurate (Erickson, 1986). The interplay between researcher and informant can become a major component of qualitative research.

The above features assist and guide the researcher to the correct decisions and give pointers to what a qualitative study should be. The researcher's main focus is to investigate the teaching strategies in Life Sciences. The interplay between the researcher and the teachers is of great importance as they are a main source of information.

Methods used by qualitative researchers exemplifies a common belief that they could provide a 'deeper' understanding of social phenomena than obtaining it from pure quantitative data (Denzin and Lincoln, 1994). Denzin and Lincoln explain that the purpose of using qualitative research is that it could reveal the nature of certain situations, settings, processes, relationships, systems or people. The advantages of using qualitative research are its interpretation which enables the researcher to gain new insights about a particular phenomenon. Other advantages are to develop new concepts or theoretical perspectives about the phenomenon, to discover the problems that existed within the phenomenon (Cohen, *et al*, 2009). Additional advantages identified by Leedy and Ormrod (2005) are that the researcher is allowed to test the validity of certain assumptions, claims or generalizations within real-world contexts and also

provide a means through which a researcher could judge the effectiveness of particular policies, practices or innovations.

This approach is relevant to this study as it is dealing mostly with text data from the respondents. The researcher interacts with the subjects through the emerging design of the research project. In this study the researcher went into the world of teaching in classes where many teaching strategies in multilingual classes are used and engaged with teachers on how they implemented code switching as a teaching strategy and its implications in the classroom. An advantage of using qualitative research is that it helped the researcher to explore many ways of analysing data. Qualitative data collection instruments utilised in this study were observations and face-to–face, semi–structured interviews.

3.4 RESEARCH DESIGN

A research design is a plan, structure or strategy of investigation conceived to obtain answers to research questions or problems (Kumar, 2005). This involves looking at a case or phenomena in its real-life context, employing many types of data, striving to portray to be in a particular situation and to catch up close to reality. There are various research designs that are used by researchers in trying to validate and support their research processes. Cohen (2009), identifies the following research designs:

- *A survey* is used for gathering large-scale data in order to make generalizations.
- *An experiment* is used for comparing under controlled conditions, establishing causality and objective measurement of treatment.

- *Ethnography* is used to portray events on the subjects' terms. It focuses on perceptions and views of participants and is also content specific.
- *Action-research* is used to develop reflective practice and to link practice and research. It focuses on everyday practice and decision-making.
- *A case study* is used to depict, analyze and interpret the uniqueness of real individuals and situations through accessible accounts. It contributes to action and intervention, and is focused on bounded phenomena and systems using single or multiple cases.

This study is located in the qualitative research design, which takes the form of a case study. Creswell (1994) points out that qualitative study is an inquiry process of understanding a social or a human related problem based on building a complex and holistic picture formed with words. It reports detailed views of informants conducted in a natural setting. A case study is an ideal methodology when a holistic, in-depth investigation is needed (Yin, 1993). Case studies are designed to bring out the details from the viewpoint of the participants by using multiple sources of data. Yin (1993) identifies the exploratory, explanatory and descriptive as specific types of case studies. Exploratory cases are sometimes considered as a prelude to social research. Explanatory case studies are used for doing causal investigations. Descriptive cases require a descriptive theory to be developed before starting a project. Yin further presents at least four applications for a case study model:

- To explain complex causal links in real-life interventions,
- To describe the real-life context in which the intervention has occurred,
- To describe the intervention itself, and

- To explore those situations in which the intervention being evaluated has no clear set of outcomes.

It is important to have clear boundaries for your case, for a case study is an exploration of a bounded system that was bounded by time and place Creswell, (1998). This study uses a case study design because it could penetrate situations in ways that are not susceptible to numerical analysis and it could also establish cause and effect (Cohen, *et al*, 2009). The teachers should be able to know how to use the strategies in order for the learners to know their subject and be able to communicate and understand Life Sciences.

There are two types of case studies, namely single-case studies and multiple-case studies. In single-case studies one case is being studied whereas in multiple-case studies two or more cases are examined (Creswell,1998). Single-case studies are ideal for revelatory cases where an observer has access to a phenomenon that is previously inaccessible. These studies could be holistic or embedded, the latter occurring when the same case study involved more than one unit of analysis. Multiple-case studies follow a replication logic. In this study the researcher used a multiple-case study. The cases are two teachers who were observed and interviewed by the researcher.

Denzin and Lincoln (2003) describe a case study as a process of inquiry about the case and the product of that inquiry. It has conceptual structure and is usually organized around a small number of research questions. (Merriam, 1998) further emphasises this point by saying that case studies recognized the complexity and

embedding of social truths. By carefully attending to social situations, case studies could represent something of the discrepancies or conflicts between the viewpoints held by participants. The best case studies are capable of offering some support to alternative interpretations. He also notes that case studies are a 'step to action.' They begin in a world of action and contribute to it. Their insights are directly interpreted and put to use. Case study as a research design is relevant and appropriate for this study because the strategies used by teachers are going to be studied. It was important for the researcher's quest to note how these strategies impacted on the teaching that takes place in a multilingual classroom. The data collecting instruments that are to be used allow the researcher to establish the cause and effect (Cohen, 2009).

Case studies are complex because they generally involved multiple sources of data, included multiple cases within a study, and produce large amounts of data for analysis. Researchers from many disciplines use the case study method to build upon theory, produce new theory, dispute or challenge theory, explain a situation, provide a basis to apply solutions to situations and to explore or to describe an object or phenomenon. The advantages of the case study methods are its applicability to real-life, contemporary, human situations and its public accessibility through written reports. Case study results relate directly to the common reader's everyday experience and facilitates an understanding of complex real-life situations Willis (2007).

Best and Kahn (1989) describe case study as an approach of categorizing a social data for the purpose of screening social reality. A case study is also

defined as an inquiry that scrutinizes multiple sources used. In this context, a case study relates to a rigorous study which involves a very limited number of components which are directed at the perspective of the exceptionality and peculiarity of a particular case in all its complexity (Yin, 1983).

The above assertion influences the researcher to use a case study of two teachers as the sources of data collection for her study. According to Merriam (1988) and Creswell (1994) a case study is used to explore a single entity and to gather detailed information by using a range of data collection methods and practices. In this research, a case study of two teachers is used to collect data from their experience of using teaching strategies. The data collection instruments applied in this study are observations and interviews. These will be discussed extensively in the following paragraphs.

3.5 DATA COLLECTION INSTRUMENTS

Using the qualitative design in this study, descriptive human behaviour, experiences, actions, feelings and opinions of the subject under study were easily factored in the discussion. Merriam and Simpson (1995) affirm that a qualitative method presents a rich and holistic account that divulges the dynamic complexities of the social settings of the investigated phenomena. Using this approach, it becomes easy to understand the respondents' experiences in implementation of the teaching strategies. Cohen and Manion (1994) argue that the interpretive paradigm is used to understand the subjective world of human experience.

3.5.1 Observations

Observations are data collecting instruments that are used in various research designs such as case studies and ethnographies. Observation is a systematic data collection approach. Researchers use all of their senses to examine people in natural settings or naturally occurring situations. They are also used in both qualitative and quantitative studies (Babbie, 2005). Observations also afford the researcher an opportunity to view behavior in a naturalistic setting (Babour, 2008). Denscombe (1998) further cited that observations draw on the direct evidence of the eye to witness events first hand. They are based on the premise that for certain purposes, it is best to observe what actually happened.

There are two types of observations namely systematic and participant observations (Gillham, 2000). In participant- observation, the researcher is involved and is part of the group being observed. This type is used by researchers to infiltrate situations, to understand the culture and processes of the group being investigated (Denscombe,1998). In systematic observation the researcher watches from the outside in a carefully timed and specified way. Participant observation combines participation in the lives of the people being studied with maintenance of a professional distance that allows adequate observation and recording of data (Gillham, 2000).

Advantages of observations

Observations are intentionally unstructured and free-flowing (Leedy and Ormrod, 2005). Babbie (2005) also identifies the following advantages of observations:

- Observations can be done anywhere. If possible the researcher is also able to take notes on her observation as the events unfold. It forces the observer to familiarize herself with the subject .
- Observations allow previously unnoticed or ignored aspects to be seen. People's actions are probably more telling than their verbal accounts and observing these were valuable.
- Observations are unobtrusive and when obtrusive the effect wears off in reasonable time.
- In observation it is important that your notes should include both your empirical observations and your interpretations of them. The researcher must be able to record what s/he knew has happened and what she thought has happened. Sometimes note taking is made easier by preparing a standardized recording forms in advance. If notes are taken during observation, this must be done unobtrusively.
- An advantage of this data-collection procedure is that the behaviour which was to be studied was recorded first-hand as compared to interviews and questionnaires in which information was presented second-hand. Consequently, researchers did not have to depend on the participants' possibly misleading reposts either in interviews or on questionnaires about the relevant behaviour but instead observed it directly (Yin, 2003).

Disadvantages of observations

One disadvantage of observations is that the presence of the observer may alter the subjects' behaviour. This means that if the subjects are watched, they

could change their normal behaviour. This is known as the observer effect. Gall *et.al* (1996) defines observer effect as an action by the observer that has a negative effect on the validity or reliability of the data being collected. However, measuring the magnitude of the observer effect could be a tricky affair.

According to Wilson (1987) it is necessary for researchers to produce positive arguments for the status of their data so that any conclusions based on such data does not turn out to be unfounded. Recording events could be problematic. Written notes are often insufficient to capture the richness of what one was observing (Leedy and Ormrod, 2005).

Observations were conducted for this study. The researcher used an observation schedule (Appendix 1) to observe the strategies used and how they supported the teaching and learning of Life Sciences. The researcher observed which strategies were used and what each particular strategy was used for and how often it was used. Some benefits of using observations are immersion. Prolonged involvement in a setting often leads to the development of rapport, and fosters free and open speaking with members. Observations are an essential part of gaining an understanding of naturalistic settings and its members' ways of seeing They can also provide the foundation for theory hypothesis development (Barbour, 2008).

3.5.2 Interviews

Interviews are in essence flexible tools for data collection. They have a specific purpose and are often question- based with the questions being asked by the interviewer (Cohen, 2007). Interviews are conversations that have a structure and a purpose (Kvale, 1996). They are the principal means of gathering information having direct bearing on the research objectives. By providing access to what is 'inside a person's head', it make it possible to measure what a person knows (knowledge or information), what a person likes or dislikes (values and preferences) and what a person thought (Huysamen, 1994).

Interviews are one of the most important sources of case study information. The interviews appears as guided conversations rather than structured queries. Although the researcher pursues a consistent line of inquiry, her actual stream of questions in a case study interview is likely to be fluid rather than rigid (Rubin & Rubin, 1995). This means that throughout the interview process, the researcher has the following two jobs:

a) to follow her own line of inquiry, as reflected by case study protocol.

b) to ask her actual questions in an unbiased manner that also serves the needs of her line of inquiry (Yin, 2003). Most commonly, case study interviews are of an open-ended nature in which the researcher could ask key respondents about the facts of the matter as well as their opinions about the events.

Types of interviews

There are many types of interviews such as group interviews, structured interviews and semi-structured interviews. Group interviews are used when time

is limited, while some people feel more comfortable talking in a group than alone (Barbour, 2008). Interaction among participants may also be more informative than individually conducted interviews (Leedy and Ormrod, 2005).

Face-to-face interviews have the distinct advantage of enabling the researcher to establish rapport with potential participants therefore gaining their cooperation, thus yielding a high response rate. Furthermore face-to-face interviews allow the researcher to clarify ambiguous answers and, when appropriate, seek follow-up information (Leedy and Ormrod,2005). Kumar (2005) further adds that face-to-face encounters between researcher and respondents are directed towards understanding the respondents' perspective on the lives, experiences or situations as expressed in their own words.

Interviews are two-or-more-person conversations initiated by the researcher for specific reasons of getting relevant information for the study undertaken (Cohen and Marion, 1997). Kyale (1996) affirms that Interviews are used to exchange views between two or many participants with mutual interest. This implies that interviews make both the investigator and the respondents feel liberated to communicate their feelings about prevailing challenges in their respective milieu. Along similar lines, (Kyale, 1996), contends that interviewing as a method of data collection is used when the researcher wishes to question the participants at a conscious level and intends to use personal networking with the research respondents. Similarly ,Cohen, Manion and Morrison (2001) confirm that interviews enable participants to share their interpretations of the world in which they live and to express how they regard situations from their

own point of view. In order to achieve the above, the researcher utilises interview questions (Appendix 2) for all the interviewees to ascertain the purpose of the teaching strategies in the Life Sciences classroom. The researcher considers the interview schedule as the most convenient method to collect data for this study, for it allowed her to obtain large amounts of data rapidly and enabled immediate follow-up questions and clarification if so required.

Barbour (2008), states that interviews allow the interviewees to respond to research questions freely using their own words resulting in a free flow of new ideas. He further considered the interview schedule as involving items that brought in a frame of reference to the participants' responses. As such, items were flexible since they allowed the researcher to probe the interviewees' responses so that he could get in depth of the sample of the study. Cohen *et al* (2001) stated that interviews enabled the research participants (interviewer or interviewees) to discuss their own world in which they lived and expressed their views on how they understood the situation from their own point of view.

Purposes of interviews.

They are used to evaluate or assess a person and they could also be used for sampling respondents' opinions (Denscombe,1998). As interviews are data collection instruments, they gathered data as in surveys or experimental situations. In this study semi-structured, face-to-face interviews were used as

they enabled the researcher to ask open-ended questions and get clarification when necessary (Gillham,2000).

Semi-structured interviews

Interviewing is a commonly used method of collecting information from people (Kumar, 2005). Interviews also offer a versatile way of collecting data and further allowed the researcher to use probes with a view to clearing up vague responses or asking for incomplete answers to be elaborated on. Semi-structured interviews are often open-ended and address central issues but otherwise go in different directions for different participants. The semi-structured interviews used in this study follow the standard questions with one or more individual questions tailored to get clarification or probe a person's reasoning (Huysamen,1994). These interviews have the tendency to be informal and friendly in a qualitative study. In using semi-structured interviews the researcher has complete freedom in terms of the wording she uses and the way questions are explained to the respondents. There is freedom in the context of the discussion for the researcher to formulate questions and raise issues on the spur of the moment, depending upon what occurrs in the context of the discussion.

The researcher has a list of themes and questions to be covered, although they vary from one interview to the next. The themes and questions offer a versatile way of collecting data and they can be used with all age groups. In designing interviews , it is important to formulate the broad overall questions that the survey is intended to answer. Secondly, interviewers translates the

broad overall questions into measurable elements as hypotheses or more precise questions.

Advantages of semi- structured interviews

The advantage of semi-structured interviews is that they are personalized, and they permit the required level of in-depth information gathering, free response and flexibility that could not be obtained by other procedures (Seliger and Shohamy, 1989). Seliger and Shohamy further note that another advantage of interviews is that data that has not been foreseen could be probed and obtained. In addition, open ended interviews allow the respondent maximum freedom of expression thereby allowing ample and often unexpected information to emerge. It is significant to note that interviews are also adaptable. The interviewer could follow up a respondent's answers to obtain more information and clarify vague statements. A stimulated recall interview was also advantageous in the sense that it enabled the teacher as well as the researcher to present their interpretations of what went on in the Life Sciences classroom and links interpretations explicitly to the points in the lesson which give rise to them (Silverman, 2000). Face-to-face interviews enable the interviewer to establish rapport with the respondent and allow the interviewer to observe as well as to listen. They further permit more complex questions to be asked than in other types of data collection. The interviews also allow the interviewer to collect before and after data and to gather opinions on a specific learning or teaching technique. Interviews also build trust and rapport between interviewer and respondent, thus oiling the extraction of information which respondents might otherwise be indisposed to give (Huysamen,1994).

Disadvantages of semi- structured interviews

Cohen (2009) argues that interviews introduced elements of subjectivity and personal bias into the data and that the rapport between the researcher and the participants could cause the participant to respond in a certain way in order to please the interviewer. Another challenge that the interview method poses for the researcher is that it is difficult to standardize the interview situation so that the interviewer does not influence the respondent to answer certain questions in a certain way. This potential threat is alleviated through the preparation of an interview guide so that during the interview, the researcher does not stray much from the purpose of the interview. Some disadvantages are that the interviews can be time- consuming and expensive. The recording and comments of participants are a delicate matter because of the great variety of answers and their complexity (Bless, 1995). During the interviews the researcher makes a conscious effort to avoid leading questions that would yield unreliable responses.

In this study, semi-structured interviews were used. Two Grade 11 Life Sciences teachers were interviewed using an interview schedule. Before the interviews the researcher conducted observations on both teachers. The researcher had a clear list of issues to be addressed and questions to be answered (Denscombe,1998). The researcher as interviewer was prepared to be flexible in terms of the order in which the topics were considered. The researcher was using interviews to try to give meaning to what was observed in the classroom. As the study was about strategies, the respondents are expected to

dwell more on how these different strategies assist them in getting their learners to understand Life Sciences and allow the learners to articulate a good command of the language of instruction. Interviews as a data collection instrument are appropriate in collecting in-depth information. The researcher wanted to find out how teachers experience teaching and the strategies they use in the classrooms (Gilham,2000).

3.6 SAMPLING TECHNIQUES

Sampling is the process of selecting a part of a group under study. In this study the sample is a part of the greater group from which it is drawn. Roussouw (2003) defines sampling as the process which decides who is be observed. Purposive sampling was used for this study. The sampling was selected on the grounds of the existing knowledge of the population. This type of sampling could be used appropriately in the following three cases:

a. when the researcher wants to select unique cases which could provide special information,
b. where the members of the population are difficult to get hold of or were specialized, and
c. to identify specific cases for deep analysis (Rossouw,2003).

In purposive sampling the researcher considers who could provide the best information to achieve the best objectives of the study (Kumar, 2005). Purposive sampling increases the variety that is common in any social phenomenon that would be presented in the data. The teachers that were selected were experienced Life Sciences teachers. The researcher only dealt with those people

who, in her opinion, were likely to have the required information and were willing to share it (Maykut and Morehouse, 1994).

The researcher used purposive sampling. The teachers were experienced teachers who have been teaching Life Sciences for a number of years. They shared how the strategies they are using were working for them over a period of time. In this sampling procedure, the researcher was allowed to use her judgment in selecting informants that were deemed information-rich (Kumar, 2005). This notion of information richness is used to guide the decisions of the researcher regarding the type of Life Sciences teachers she would use. The notion would further establish the experiences of the teachers in using these strategies and the use of languages in achieving the best from learners without compromising their main goal. Sampling is extremely useful when the researcher examined strategies for the teaching of Life Sciences in two multilingual classrooms in East London (Kumar, 2005). However, the disadvantage of purposive sampling is that it relies heavily on the subjective considerations of the researcher rather than on scientific criteria (Bless and Higson-Smith, 1995).

3.6.1 Sampling of Research Sites

Two schools in the East London District were selected by the researcher as research sites. Both schools are situated in a working class (squatter) area. The reason for using the schools was that the people living in the areas had little access to the English language and there is little chance for many learners to

engage in the English language outside the school premises (Webb, 2008). The learners and the teachers' mother-tongue is isiXhosa while the language of instruction is English.

3.6.2 Sampling Respondents

Only two teachers who taught Life Sciences in Grade 11 participated in this study. These teachers were purposefully selected because they could share how teaching strategies have worked for them over a period of time.

3.7 DATA ANALYSIS TECHNIQUES FOR QUALITATIVE STUDY

Data analysis is the process of breaking down, examining, comparing, conceptualizing and categorizing data (Strauss and Corbin, 1990). Coding was used in this qualitative study. In this context coding represented the gradual building up of categories out of the data collected. Axial coding involved a set of procedures whereby data was put back together in new ways after open coding by making connections between categories (Bryman and Burgess, 1994). (Gilham, 2000), described coding as representing a key step in the process by providing the link between data and the conceptualization. Data analysis in a case study involves the identification of patterns where respondents' interpretations are scrutinized for underlying themes and other patterns that characterize the case more broadly than a single piece of information could reveal (Leedy and Ormrod, 2005). The two researchers further state that an overall portrait of the case is constructed. It is important to establish units of analysis of the data, indicating how these units of analysis of the data are

similar to and different from each other. The criterion here is that each unit of analysis is the actual classification element (Cohen, 2007).

A summary of data collection instruments and corresponding analysis techniques is presented in the table below:

Table 1: Research instruments, data analysis techniques and data

Research instrument	Analysis technique	Data
Observation schedule	Basic descriptive analysis of the data gathered	Teachers' strategies used when teaching.
Semi-structured interviews - pre-observation and post-observation	Thematic analysis of the responses from the teachers	Reflections of the teachers on their use of strategies.

In this study an observation schedule and semi- structured interviews were used. From the observations the researcher inquired to observe which strategies were used. Basic descriptive analysis was applied as the researcher described what really happened during her observation.

Semi- structured interviews were conducted after observations as the researcher established themes and situations that would need explanations as well as clarifications. Interpretations and identification of patterns were scrutinized for underlying themes (Leedy and Ormrod, 2005).

3.8 ETHICAL CONSIDERATIONS

The following ethical issues were addressed in the study:

Informed consent

De Vos, *et al* (1998:25-26) suggest that informed consent relates to the communication of all possible information as accurately as possible about the research to the research participants. The participants of this research were adults who had the capacity to give informed consent directly. Consequently, the researcher provided participants with information about the research and formally requested their permission to participate in the investigation. Issues related to the study such as its goals, procedures of investigation, and possible advantages or disadvantages were shared. Each participant was asked to sign a consent form as proof of agreement.

3.8.1 Voluntary participation

Participation in this study was voluntary with participants having the freedom to withdraw at any time. This was explained to each participant before the research commenced.

3.8.2 Anonymity and confidentiality

Strict anonymity and confidentiality of participants were maintained in this study, even if the findings are going to be published in the future. This issue was communicated to participants formally. Every attempt was made to group the data collected so that personal characteristics or traceable details of participants would not be known (Yin,1989).

3.9 HOW THE STUDY WAS CONDUCTED

This section details how this study was carried out.

3.9.1. Phase one

Negotiation of entry

Department of Education

Permission was asked from the Department of Education to conduct the study at the two schools involved. A standard letter from the University of Fort Hare was presented to the District Manager's office.

Principals of the schools where the study was conducted

The researcher visited the schools she had identified and asked permission from the Principals. The aim of the study was to seek access to the teachers and learners and to understand the teachers' practices in grade 11 Life Sciences classes.

Negotiating with the participants

The researcher met Separately with the teachers who were going to participate.. She explained the purpose of the research and how interviews as well as observations in the classrooms were going to be conducted.

3.9.2 Phase two

Pilot study

The pilot study is used with the aim of eliminating ambiguity of research questions. Best, & Kahn, (1998) emphasize that no matter how astute the researcher had been in wording the interview questions, it is essential to try them out with respondents prior to the commencement of the actual study.

A pilot study or a feasibility study is a pre-study of a fuller study. It is also a small experiment designed to test logistics and gather information prior to a larger study in order to improve the latter's quality and efficiency. A pilot study reveals deficiencies in the design of a proposed experiment or procedure and these can be addressed before time and resources are expended on large scale studies (Best, 2003). A pilot study involves testing the actual programme on a small sample taken from the community for whom the programme is planned. In cases where a pilot study uncovers many difficulties in the design of a programme, it is necessary for the planning to be revised (Bless and Higson-Smith,1995). However, its limitation are limited to using fewer subjects than the researcher planned to include in the full study (Miles,D,http://sru.soc.surrey.ac.uk/SRU35.html, accessed on 2010/06/21).

Yin (1989) contends that it is important to employ pilot interviews before the actual scenario. Bell (1993) also saw the importance of piloting so as to detect all the problems that might crop up when the actual study was done and how such problems could be dealt with before the commencement of the actual study. It was also an excellent way to determine the feasibility of this study. It further informs the researcher which approaches were and were not effective in helping her solve her overall research problem (Leedy and Ormrod, 2005).
Pilot studies are based on quantitative and/or qualitative methods and some large scale studies employed a number of pilot studies before the main study was conducted. Thus researchers start with qualitative data collection and analysis on a relatively unexplored topic using the results to design a subsequent quantitative phase of the study. Pilot studies use many data collection

instruments such as in-depth interviews, questionnaires and multiple-choice questions (Hundley *et al*, 2000).

Pilot studies attempt to identify potential practical problems in the research such as poor recording and response rates. Once these problems are identified, precautionary procedures or safety nets are devised (*Hundley et al,* 2000).

3.9.3 Advantages of a pilot study

Doing a pilot study helped to work out some of the procedural bugs even though it was not likely to add anything new or important to the main study (Miles, 2010).

Miles(2010) further added more reasons to consider a pilot study:

- It permits preliminary testing of the hypotheses that lead to testing more precise hypotheses, dropping some, or developing new hypotheses
- It often provides the researcher with ideas, approaches, and clues that may not have been foreseen before conducting the pilot study. Such ideas and clues increases the chances of getting clearer findings in the main study.
- It permits a thorough check of the planned statistical and analytical procedures, giving the researcher a chance to evaluate their usefulness for the data. The researcher would then be able to make needed alterations in the data collecting methods and therefore analyze data in the main study more efficiently. Well-designed and well-conducted pilot studies inform us

about the best research process and occasionally about likely outcomes (Miles,2010).

3.9.4 Disadvantages of a pilot study

Pilot studies have a number of limitations. These include the possibility of making inaccurate predictions or assumptions on the basis of pilot data. Problems could arise from contamination. Contamination occurrs where data from the pilot study is included in the main results and where pilot participants are included in the main study resulting in new data being included. A further concern is that the data could have already been exposed to an intervention and therefore may respond differently from those who have not previously experience it (Miles, 2010). Sometimes completing a pilot study successfully is not a guarantee of the full-scale data gathering process. Other problems may also not become obvious until the larger scale study is conducted.

The pilot study for the researcher was useful in this study because it gave the researcher time to test her research instruments to avoid later errors that may have greatly weakened the interpretation of her research. The researcher, through the pilot study, had a broader picture of what was expected in the real study. As the researcher observed the strategies used in the study, she acknowledged the possibilities of other applicable strategies present in the classroom.

3.10 PILOT STUDY REPORT

The pilot study was conducted in one school over a period of three days. The data instruments that were piloted were the interview schedule and the observation schedule. From the pilot study it emerged that the interviews took a long time to conduct. For the actual study, they had to be done outside the classroom. The interview schedule was prepared in English but the respondents sometimes answered in isiXhosa. The researcher had prepared one interview schedule but after the pilot study, she decided to make two interview schedules i.e - one before observations and the other after observations. During the observation period, the researcher needed to know exactly what she was observing because she was at times distracted by other activities.

3.10. CONDUCTING THE MAIN STUDY

3.10.1 Conducting Semi-structured Interviews

Stage one

The semi-structured interviews were responding to the research question:

What are the relevant strategies for presenting instructional materials in Life Sciences

The interviews (Appendix 2) were conducted outside the classroom during the teacher's optional free time. Each interview lasted for approximately fifty minutes and was done individually. In the semi-structured schedule the teachers were interviewed. The focus was on the teaching strategies they used in their classrooms and how and why they implemented them. The interviews were conducted in English although at times the participants answered in isiXhosa. During

the interviewing process, there were pauses which allowed the researcher to probe the participants to get answers and further explanations to questions.

3.10.2 Observation process

Stage two

The observation process is responding to the following research question:

What are grade 11 Life Sciences teachers' reasons for the choice of teaching strategies used?

Interviews were done before and after the observations. They were done to identify strategies used by the teachers and to ascertain why these strategies were implemented.

The traditional paper-and-pencil note-taking techniques were used to record all the events that happened during the classroom observation for both teachers. Different topics were taught by the teachers. The researcher visited the teacher in School A during July. She was teaching the following topic: *"The structure of the heart and the functioning of the heart."* whilst the teacher in School B who was visited in August taught the lesson: "*Upward Movement of Water and Mineral Salts through the Stem from Roots to Leaves.*" The reason for the different topics was due to the teachers' strike action that took place during this period. Each topic was taught over three class periods in each school. Each period consisted of fifty minutes.

The research investigating took place over a period of three days in each school. The researcher observed teaching strategies that were used by the teachers.

Strategies identified were, the taking of notes, the use of textbooks, and the use of question papers and memoranda. Although the focus was on teachers 'strategies and the implementation of instructional materials, the reaction of the learners was of utmost importance. After observing in the classroom, the researcher conducted an interview based on the observation that was done in class.

3.10.3 Post observation interviews

Stage three

The post observation interviews were also conducted. From these interviews, the researcher wanted the participants to reflect on their implementation of the strategies and to reflect on their effectiveness for the learners. These were also done outside the classroom and took about a further fifty minutes per section. The interviews were essentially conducted in English although the participants responded in IsiXhosa at times.

3.11 TRUSTWORTHINESS OF THE STUDY

This study was located within the interpretive paradigm. In order to ensure the credibility of this study and its findings, the researcher piloted the interviews with another participant from a neighbouring school. Bell (1993) confirmed that a pilot study was an exercise to detect all problems that may crop-up during a study. Such setbacks could be dealt with before the commencement of the actual investigation. For further trustworthiness in this study, more methods of data collection were used so that the researcher could get more insight about how teachers implement the strategies from another perspective, which, in this case, were observations.

According to Creswell (2003), the use of multiple methods in research work enhances understanding by adding layers of information by using one type of data to validate or refine the other. The various methods of data collection were exploited at the same time. Denzin and Lincoln (1998) stated that no single method ever solved research investigation adequately. For further credibility the researcher gave back the interview schedule and responses to the respondents to check for a true reflection of what they said. Heck (2006) claimed that it was essential to send back collected data and interpretations to the research participants to check whether the results analysis was correct.

3.12 LIMITATIONS OF THE METHODOLOGY

The disadvantage of the methodology was that interviews could be biased towards what the interviewer chose to hear during face-to-face conversations. When interviewing, it was difficult for the researcher to strike a balance between complete objectivity and trying to put the respondent at ease because the researcher was familiar with the respondents . This was reflected in the way the respondents answered the interview questions and thus influenced the quality of the responses. Creswell (2003) concurs that the collection of data by interviews involves a complex set of social relationships that could contaminate the final product. The social relationships could result in the distortion of information supplied as well as being open to unconscious bias on the part of the researcher in assessing it.

3.13 CONCLUSION

The focus of this chapter was on methodology and selected techniques for data collection. These gave the researcher a broader view of how to present and analyze the raw data that was collected. The pilot study was able to give the researcher an insight into what to expect when doing the actual study. The next chapter is about data presentation and analysis.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1. INTRODUCTION

This chapter presents and analyses data collected on strategies used for the teaching of Life Sciences in Grade 11 classes where code switching regularly took place. The data presented was collected through observations and face-to-face interviews with two teachers. Due to ethical reasons pseudonomes were used for the two teachers. They are referred to as Teacher A and Teacher B.

The following research questions guided the data presentatation:

Main Question

What are the relevant strategies for presenting instructional materials in Life Sciences?

Sub questions

1. What other strategies, in addition to code switching, do teachers use for teaching Life Sciences in Grade 11 multilingual classrooms?
2. What are Grade 11 Life Sciences teachers reasons for the choice of teaching strategies used?
3. How do Grade 11 Life Sciences teachers implement the teaching strategies identified?

This chapter is structured as follows:

i. Synopsis of the schools where the study was conducted

ii Biographical data of participants.

iii. Presentation and analysis of data gathered through semi-structured interviews

iv. Presentation and analysis of data gathered from observations.

v. Presentation and analysis of data gathered through interviews (Post observations).

vi. Limitations of the study.

vii. Conclusion.

4.2. SYNOPSIS OF THE SCHOOLS

Two schools were involved in this study. Both schools are from the same district and geographical area in the East London District and they are both situated in the informal settlement areas. Both of them are High Schools with classes ranging from Grade 8 to Grade 12. These schools are what the education community call Section 21 schools which means that these are 'no fees' schools which provide all resources such as books, stationery and nutrition through funding by the government. Both schools are well-built, that is, they have school buildings made of bricks with laboratories and libraries which are under-resourced.

School A

In school A, the teacher uses the laboratory as a classroom. As this school is nearer to the city, most learners stay with their parents but the level of unemployment is high and some parents depend on part-time jobs in the city. This school is one of the schools that has a good pass rate. According to their records, since 2008 their overall pass rate has been above sixty percent and Life Sciences have constantly scored between sixty and seventy percent. This is

considered a P4 school. The school's enrolment fluctuates between one thousand (1000) and one thousand two hundred (1200) learners.

School B

In school B, most learners stay with grandparents or are heading their own households, as their parents stay in areas next to the city where they can get jobs. School B is also a considered to be a P4 school. The school's enrolment is between nine hundred (900) and one thousand (1000) learners. The area has a high unemployment rate and level of poverty. The overall performance of the school has been between fifty and sixty percent. The learners' performance in Life Sciences has averaged between forty (40%) and fifty percent (50%) in 2008 and 2009 but improved in 2010 to above sixty percent (60%). Although Life Sciences' performance has improved, the quality of passes is manifested on the lower scale of the ratings. These means that most learners have achieved between level 2 (30%) and level 3 (40%) pass rates.

Table 2

BIOGRAPHICAL DATA OF PARTICIPANTS

	Age	**Teaching experience**	**Qualifications**	**Gender**	**Teaching experience in the subject**	**Class size**	**Subject majored in**	**Official Language of learning and teaching**	**Language used in class**
Teacher A	45yrs	15yrs	S.T.D B.Ed	Male	15yrs	33	English and Biology	English	English and isiXhosa
Teacher B	40yrs	13yrs	B.Sc	Male	10yrs	40	Mathematics and Biology	English	English and isiXhosa

From table 2 above it has emerged that the teachers who participated in the study are male teachers. One teacher is 40 years old and the other 45 years old. Each teachers' teaching experiences is above 10years. Both teachers are experienced in teaching the *Nated 550 Curriculum* which was implemented before the Outcomes Based Approach and the current National Curriculum Statement (NCS) were introduced in South Africa. The language of teaching and learning at the schools is English. The teachers share the same home language with the learners (isiXhosa). The schools had an average class size of between 30 -40 learners. The size of classrooms is average size which appeared manageable. Teacher A had a Secondary Teacher's Diploma and a Bachelor of Education degree (B.Ed). Teacher B had an academic degree (B.Sc). Both teachers studied Biology as a major subject. Teacher B's degree was content based although he has no teaching qualification. However, the researcher assumed that the fact that Teacher B has a limitation by not having a teaching qualification, this would be balanced by the experience the teacher has gained over the years.

4.3. PRESENTATION AND ANALYSIS OF DATA GATHERED THROUGH SEMI-STRUCTURE INTERVIEWS.

Interviews were conducted in response to the following research question:

- What other strategies, in addition to code switching, do teachers use for teaching Life Sciences in Grade 11 multilingual classrooms?
- What are Grade 11 Life Sciences teachers reasons for the choice of teaching strategies used?

The following issues emerged from the interviews:

a) Teachers interviewed reported to be using similar teaching strategies

b) Teachers interviewed reported to have similar approaches in implementing some of the strategies.

c) Teachers interviewed reported some variations in the implementation of some of their identified strategies.

d) The choice of strategies seemed to be examination oriented.

Table 3

Similar strategies identified by the two teachers

Strategy used
1. Prepared notes
2. Diagrams and worksheets
3. Textbooks

Both teachers claimed to use the strategies in Table 4 above. Both teachers agreed that it was necessary to use different strategies when teaching Life Sciences so as to cater for the different types of learners in the classrooms.

Teacher A: "**As a Life Sciences teacher you are forced ukuba usebenzise different strategies because you have different types of learners who understand in different ways."**

Teacher B: **"Teaching a subject like Life Sciences yenza ukuba uzi-trye zonke iindlela onazo for the learners kuba abantwana abafani ngendlela abafunda ngayo."**

However the strategies identified seemed to treat Life Sciences as a theoretical subject as teachers did not mention any hands-on activities for the teaching of this

subject. There were no practical tasks such as experiments and hypothesis testing activities done in the classes.

4.3.1 Teachers' implementation of strategies and the reasons for using the identified strategies

Similar strategies used by teachers

Table 4

Strategy used	**Teacher A : APPLICATION**	**Teacher B: APPLICATION**
1. Prepared notes	To consolidate what is taught in class	For studying on their own when preparing for tests and examinations
2.Diagrams and worksheets	To teach the structure and functions of the different organs	To teach the structure and functions of the different organs
3.Textbooks	To familiarize the learners with textbooks showing them how important it is	For referencing and diagrams
4.Question papers and memoranda	Questions based on topic identified and learners taught how to answer	For revision

The table above shows similar strategies that were used by the teachers. These strategies are discussed fully in the following sections:

1) Prepared notes

Prepared notes were compiled by the teachers and given to the learners. The teachers claimed that they prepare notes beforehand because they use different books or references to compile notes Both teachers claimed to use the notes. The teachers said that notes consolidated what was taught in class. They also mentioned that notes gave the learners an opportunity to read whilst they were writing. The notes would assist the learners to spell the words in a correct manner. The Life Sciences notes were identified to afford the learners an opportunity to support what is written in their textbooks.

Teacher A:**linotes help to simplify what was taught in class kuba nawe as a teacher when compiling notes you try ukuba icontent ibe accessible to learners. Sometimes you will find that abanye abantwana depend kwezi-notes, they do not even read or use their textbooks. I also explain to them kuba sometimes bayathanda ukuba confused.**

Teacher B: **Prepared notes are for the learners to read and use them with their textbooks to further understand my teaching.**

From what the teachers have said, I have noticed that they both used this strategy but for different reasons. Teacher A seemed to be using it to make the content easier but Teacher B was just giving the learners notes to read on their own, and did not seem to note whether the learners read them or not.

2) Diagrams and worksheets

The teachers claimed to use diagrams and worksheets to teach the structures of the organs and the functions of their parts while the learner were able to draw and label them correctly. They also claimed that the worksheets were useful for training the learners for the different types of questions that are asked in examinations.

Teacher A: **The teaching of the structure of the organs facilitates the gaining of knowledge in the sense that, when teaching the diseases, the teacher is able to point out exactly the very part that is affected because in the heart, for example, there are more than one disease that affect it, so this needs for one to be more specific. The worksheets based on the diagram gives the learners a chance to practice them and know the functions of the different parts kuba zezi zinto zibuzwayo nakwi- exams.**

Both teachers agree on the same principles in using diagrams and worksheets, that is, they afford the learners a chance to practice and know the diagrams.

3) Textbooks

The teachers mentioned that they used textbooks. Teacher A used as many textbooks that he could get whereas Teacher B used one textbook that was recommended by another teacher. The same textbook was used by the learners. There is no prescribed textbook. The Department does not recommend a specific textbook but the teachers have to use the work schedule to determine

the topics to be covered and to plan for their lessons. The textbooks were used to emphasize the content taught, for drawing correct diagrams, for class-work and home-work. The teachers said that the District office of the DoE emphasized during workshops that they attended that the learners had to be given textbooks to help them in the learning of the subject. This was also emphasized by the current Minister of Basic Education, Mrs Angie Motshekga, the former MEC for Gauteng Province during the press conference of December 2008. She mentioned the importance of textbooks as a very useful resource for all learners.

Teacher A: **When teaching, you do not say all the information that is in the book, so the use of textbooks allows you that opportunity to say what was forgotten. When using textbooks with learners is to try and encourage them to also use them not only for diagrams but to train them the skill of being able to extract important information."The reason I use different textbooks is not you will find that one textbook does not cover all the work that should be taught.**

Teacher B: **Textbooks have more information so it is necessary for the learners to have them and also for the diagrams that they had to draw.**

Both teachers used textbooks for different reasons, one used them as a resource for learning and the other one gave the learners the textbooks as a reference for diagrams.

4) Question papers and memoranda

Both teachers used question papers and memoranda as one of the teaching strategies. The teachers claimed that they were using question papers and memoranda to prepare the learners for examinations and tests. Teacher A gave the learners question papers at the beginning of the year and Teacher B gave them when they are going to write tests and examinations. Using previous question papers familiarized the learners with the type of questions that were asked so that they could learn how to answer them. For example, Teacher B mentioned that using previous question papers was familiarizing the learners with the language used.

Teacher A: **I give the learners question papers ukuqala konyaka so that when we finish each topic sijonge iquestions ezi ngalo topic siziphendule,by doing this ndiyabafundisa indlela yokuphendula eright ndibanike ne-memorandum kwangoko.**

Teacher B: **liquestion papers ziright bazinikwe abantwana for revision especially xa bezakubhala itests and examinations.**

From the above discussion one can conclude the following about the teachers' strategies:

- One teacher seems to be focusing on learners performing well in exams (worksheets, diagrams).
- Both seem to focus on conceptual knowledge and not understanding (notes). The teachers were concerned about the learners knowing the concepts to pass their tests and examinations. The teachers were

not concerned about the learners being able to apply the knowledge they have been taught.

4.3.2 A comparative analysis of the teacher's implementation of identified strategies

The following table shows variations in the ways in which teachers claimed to implement the strategies.

Table 5

Strategy used	**Teacher A: VARIATION**	**Teacher B: VARIATION**
1. Prepared notes	Given as a summary of what is taught in each period	Given when the learners are going to write a test or exam
2.Question paper and memoranda	Teacher goes through the questions with learners and they answer the questions together. The question papers are given at the beginning of the year	The learners are given the question papers to do their own revision. The question papers are given when tests and exams are to be written.

From what the researcher heard from the interviews, there existed some variation in the ways in which the teachers claimed to implement the identified strategies.

2) Prepared notes

Teacher A reported that he gave notes to the learners for them to consolidate what was taught in class. He allowed them to copy the notes and then discussed them with the learners. He stated that this strategy improves their level of understanding the topic.

Teacher A: **Sometimes when going through the notes, it also helps you as a teacher as a form of reflecting on your teaching, because you explain much clearer than when you were teaching.**

Teacher B said that he gave the notes to the learners so that the learners could study them on their own. He mentioned that what was written in the notes was already taught. They had to learn the content of the notes when they were preparing for examinations and tests.

3) Question paper and memoranda

Teacher B said that he handed the question papers to the learners so that they could conduct their own revision. He did not hand out memoranda as this would allow them to memorize the answers. Teacher B sometimes used the questions when setting class tests. On the contrary, Teacher A said that it was important to use the question papers in class because it gave the learners the opportunity to understand the questioning and how to answer the question papers with the teacher's assistance. He gave the memoranda to the learners to cross check or assess the learners' answers.

Teacher A: **In Life Sciences for example, the examiners like to use case studies, the learners need to know that not only questions based on the case study will be asked but also from knowledge of the content taught in class.**

4.4 PRESENTATION AND ANALYSIS OF DATA GATHERED FROM OBSERVATIONS

A comparative analysis of the two teachers' practice

Observations were conducted in an attempt to find out whether there was a relationship between what the teachers claimed during the interviews and their observed practice. Classroom observations were conducted to gather evidence in response to the following research question:

- **How do Grade 11 Life Sciences teachers implement the teaching strategies identified?**

The following issues emerged from observation in the teachers' classrooms:

i) Teachers used the following strategies: code switching, prepared notes, textbooks and question papers and memoranda

ii) The application of strategies seemed to be influenced by a range of factors, such as learners' participation.

iii) Strategies seem to encourage rote learning rather than students discovering things for themselves.

1) **Prepared notes**

In the use of prepared notes, Teacher A brought the notes already prepared and was writing them whilst presenting the lesson. After he finished teaching, he

asked the learners to copy them and then he emphasized important sections so that they were able to form a linkage between them and the knowledge they had. The notes then assisted the learners when they were using them with textbooks because the teacher used both learning tools when preparing the lesson. The notes were therefore user-friendly for the purpose of learning. In Teacher A's case the notes were done in such a way that they had a purpose and formed part of the learners' learning.

In Teacher B's case, the notes that were given at the end of the lesson did not have a substantial meaning. The notes served as a transfer of the textbook to their notebooks which could lead to the learners transferring them to their tests and exams. Teacher B simply asked one of the learners to copy the notes from the same book that they had. It proved to be a mere transfer of the textbook to the learner's notebook without learning taking place. From what the researcher observed, the use of notes by the teachers had a different impact on the learners.

The prepared notes that were handed out were written in English. For the learners to be able to understand the notes, they must have a command of the English language. The teacher who took his learners through their notes was trying to allow them to interact with the English language by using speaking and listening teaching strategies. He explained the notes by using code switching, affording the learners the opportunity to have more clarity about the subject content and language usage.

2) Textbooks

The textbooks were used for many activities such as drawing of diagrams, class-work, home-work and as referencing tools. The teacher emphasized certain points to let the learners understand the content. At the end of the lesson, Teacher A asked the learners to take out their textbooks while he discussed the lesson topic with them. The learners who experienced problems were assisted by their peers. When the learners were given class- work the following day, their performance showed a remarkable improvement.

Teacher B did not use much of the textbook. He only referred the learners to a diagram that they were suppose to know.

Teacher B **: The diagram of the potometer on page 29 in your textbooks will clearly show you how the environmental factors affect the rate of transpiration and please note what each apparatus represent**.

The teacher did not even ascertain to see if the learners were aware of the diagram nor if they would be able to look for what he said they should look for. The textbooks were used for consolidation and referencing. The way this teacher was conducting himself confirmed the view that Secondary School Biology teachers who showed low willingness in using teaching aids and conducting demonstrations in the classroom to supplement classroom learning, might reduce the learners' attainment of learning outcomes and attitudes.

3) Question papers and memoranda

Teacher A gave the learners previous years' question papers and they had to look for questions based on the topic taught. The learners answered the questions and the teacher gave them memoranda. He gave them so that they could see how the questions were constructed and how many marks were allocated for each question. He further wanted them to understand the language used by the examiner so that the learners could be familiar with it.

Teacher B gave the learners the question papers when he they were going to write tests and examinations to revise on their own. He commented that using previous question papers familiarized the learners with the language used.

In addition to the said strategies one of teachers used another method in presenting the content and that was group work. The learners were given questions based on the different blood groups. They had to identify the parents and children using their knowledge of which blood type matches which. The aim of the teacher was to let the learners understand blood types and how they can be used for donating blood and identification of relatives. The learners were divided into groups of five and each group had a leader and a scribe and then members of the group. Through this activity the learners are able to interact with one another and work on their own and be able to understand the concepts on their own.

In Teacher B 's case, he used the whole class, everybody concentrated on him and all the activities were controlled by him. Learner participation was minimal.

This approach was intimidating to the learners because they depended on him for everything. There was no moment of discovery for the learners.

From what I have observed it is worth noting that the use of language was very poor, meaning that the teachers mostly when teaching were using about eighty percent isiXhosa and twenty percent English. The learners were not exposed to English. For example, when Teacher B was teaching the diagram of the 'potometer', the learners were supposed to understand what each apparatus was used for but he still emphasized that they should study the diagram for examination purposes. The researcher understood that this was a problem of teachers not letting learners be taught in English or the language of the subject because the learners found it difficult to understand the formulae and were unable to express themselves in English.

4.5 PRESENTATION AND ANALYSIS OF DATA GATHERED FROM INTERVIEWS

(Post – observation interviews)

Post observation interviews also helped in responding to the following research question:

What are Grade 11 Life Sciences teachers reasons for the choice of teaching strategies used?

A discussion was held with both teachers on issues that emerged during the classroom observations on which the researcher needed clarity. The focus was on the teachers' reflection on the effectiveness of the teaching practices used in the classroom.

Issues that emerged from post observation interviews

a. Both teachers acknowledged the importance of using different teaching strategies.

b. Both teachers reflected on the effectiveness of the teaching strategies used.

4.5.1 The importance of using different teaching strategies

The use of textbooks made it easier to explain concepts as there were diagrams and flowcharts to scaffold or support the content (Vorster, 2008). Prepared notes helped to simplify the content taught as the language used was simpler than that used in textbooks.

Teacher A: **Kubalulekile ukusebenzisa different strategies kuba zenza umsebenzi ubelula especially in our learners are not fluent enough kwilanguage that is used for teaching, so to get into them this helps.**

4.5.2 The effectiveness of the teaching strategies used

Teacher A mentioned that he felt that the strategies were effective as the participation of the learners showed an improvement. The response to the activities done in class and how they were able to assist one another was positive.

Teacher A: **To be able to know the effectiveness of the strategies, ubona nge-improvement ye-performance kwitest nakwi-examinations and also nalapha eklasini kwiparticipation yabo. It worries to see your learners not showing any understanding.**

Teacher A: **Something else is that, usually i-life sciences njengokuba iyi-practical subject it helps learners to apply knowledge to real life situations.**

Teacher B was teaching about the **"Upward Movement of Water and Mineral Salts through the Stem from Roots to Leaves."** This part deals with a lot of biological terms and processes that the learners found difficult to understand. Such processes and terms were terms like: *root pressure, capillarity, transpiration pull,* and many others**.**

Teacher B: **It is difficult to say these strategies are effective kuba sometimes you do not have enough time to evaluate each strategy because of the little you uleqa uku-coverisha umsebenzi or syllabus.**

4.6 LIMITATIONS OF THE STUDY

The effective use of time proved to be a limitation that stood out in the study. The time available for data collection was too short. The number of days used was less than originally planned due to the teachers' national strike which made visits to schools challenging. The respondents did not want the researcher to use a tape recorder as agreed earlier. I think they thought that they were going to be put in the spotlight about what they said in the interview. The researcher could not stay longer to allow time to observe the learners while they were writing a test. The test was a more form of formal work than class work.

4.7 CONCLUSION

In this chapter the data was presented, analyzed and interpreted. The findings indicated that teachers who participated in this study implemented a variety of strategies for teaching Life Sciences, such as textbooks, prepared notes , question papers and memoranda. As there were two teachers involved in the study, different responses are obtained. For example, both teachers focused on the performance of the learners but with Teacher B, strategies used by the teacher were not transparent enough to the learners in terms of language use. As an example, in the use of the prepared notes which the learners copied and rote-learned, this method or strategy failed to prepare the learners for exams and proved to be a form of transferring of information from the book to the chalkboard and back to the learner's book. When it was time for the learners to be assessed, they simply copied the work from their notes to the answer books without grasping the content of their work.

Evidence suggested that teachers used strategies in their teaching to make the subject content accessible to the learners. Through the use of question papers and memoranda the learners are able to understand the way of questioning and how to answer to make it easy for them to understand the subject matter. The implementation of the different strategies empowered the teachers to be able to present their teaching in different forms. This exposed the learners to diverse methods of understanding. However, most of the teaching strategies seemed to focus on Life Sciences as a theoretical subject, such as textbooks, prepared notes. The teachers used the old method of class control with learners having to learn

concepts but given no opportunities to discover content for themselves. The following chapter will discuss the findings, draw conclusions and make recommendations for further research

CHAPTER 5

DISCUSSIONOF FINDINGS,RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

The study mainly focused on investigating the teaching strategies used in multilingual classrooms, in addition to code switching. Data was gathered through interviews and observations of two Grade 11 Life Sciences teachers' practices.

5.2 DISCUSSION OF THE FINDINGS OF THE STUDY

Issue 1: ***The nature of teachers' strategies:***

Teachers demonstrated a lack of knowledge of the relevant and effective strategies for teaching Life Sciences.

Evidence presented revealed that, in addition to code switching, the teachers used the following strategies: notes, question papers and memoranda and textbooks. However, the strategies used seem to treat Life Sciences as a theoretical subject whereas Life Sciences is also a practical subject (Laplante, 1997). Furthermore, Lemke (1990:16) suggested that "Learning Science means learning to talk Science." "Talking Science" means observing, describing, comparing,classifying,analysing,hypothesizing,theorizing,questioning, challenging, arguing, designing experiments, following procedures, judging, and evaluating in and through the language of science. To perform these processes, learners must not only understand the scientific concepts involved and know the related vocabulary, but they must also be able to use the required language structure and manipulate the appropriate discourse features, i.e. they must be able to utilize the various genres of Science

This study further revealed that the choice of teaching strategies seemed to be influenced by factors such as: learners' understanding of the subject content and preparation for examinations. Practice and research revealed that there are instructional strategies that are effective in teaching Mathematics and Life Sciences to limited English proficient students (Chapman, 1994; Vorster, 2008). However the teachers studied seemed to have a minimal knowledge of these.

Issue 2: ***Teachers' practices of implementing strategies.***

Most of the strategies used by the teachers were mostly teacher-centered and the nature of Science was not reflected in the presentation of activities

Laplante (1990) suggests that for learners to have a better understanding, they should be doing Science as scientists do. Scientists always work in small groups, exchanging information and discussing ideas. They thus reflect the collaborative nature of the scientific enterprise For example, Laplante noted that students should explore magnetism with magnets and share their findings with their classmates.

In the classrooms observed, code switching was the most used strategy in supporting the other strategies that included the use of textbooks, giving learners prepared notes and using question papers and memorandum. However, there was no meaningful interaction between teachers and learners with the aim of getting the learners to own the subject content, work as scientists do and moreover to develop a language of their own. They end up doing rote- learning. For example, in using prepared notes as a strategy, the teachers were just

transferring information from one source to another, i.e. from the textbooks to the learners' notebooks. Teachers did not pay attention to learners' language skills in the target language nor did they find means to simplify information.

Issue 3:*Teachers' reflection on the effectiveness of their strategies*.

Teachers were defensive of the teaching strategies they use in their Life Sciences classes.

They believed that the strategies they implemented were effective to them as teachers and were not ready to make any changes. They believed that their strategies prepared the students thoroughly for examinations and tests. These teachers seemed to subscribe to the behaviourist school of thought.

5.3 RECOMMENDATIONS SPECIFIC FOR THIS STUDY

Issue 1: Each Subject is unique in nature in terms of its scope and teaching objectives and relevant teaching strategies should be researched and applied in order to achieve the learning outcomes for the subject. *For Life Sciences, teachers must note that the content taught must be applied to the learners' everyday life and not just to achieve a good performance in exams. The use of case studies will help learners to get closer to the real world.*

Issue 2: *Teachers should aim at improving their practice and implement a variety of teaching strategies that* reflect an understanding of the nature of Life Sciences, that are learner-centred and that aim at *empowering learners to develop both their procedural and conceptual discourse in life sciences. T*eachers should engage the

learners in the subject matter so that the learners are supported to gain insight into Life Sciences as a subject.

Issue 3: *Teachers' reflection on the effectiveness of their strategies*.

For effective learning to take place teachers acknowledged that they need to reflect on the effectiveness of their teaching strategies. *The teachers must give exercises and activities that will give the learners opportunities to implement the strategies.*

5.4. CONCLUSION

Teachers in this study used a variety of teaching strategies, in addition to code switching which is the most used strategy in multilingual classrooms. Evidence presented in this study suggested that teaching strategies should be relevant to the nature of the subject taught and also aimed at helping the teachers to scaffold the subject matter, so that it is easily accessible to the learners. However, for teachers to be abreast with relevant pedagogies in their field, there is a need for them to be vigorous researchers in their respective field of expertise. The Department of Education has a duty to support the teachers by conducting workshops. The workshops must be conducted for all teachers in the FET Band so that the teachers are able to implement the new educational content from Grade 10.

5.5 SUGGESTIONS FOR FURTHER RESEARCH

- It has been acknowledged that the limitation of this research is that it focused on two teachers of similar gender. Replicating this research with a larger sample of Life Sciences teachers of both genders would substantiate the findings of this study.
- This study was conducted in schools in which learners are taught Life Sciences through the medium of English which is an Additional Language to both the teachers and learners. Extending this research to incorporate schools where learners are taught in their home language and finding out the teaching strategies used would add a different perspective.

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APPENDICES

APPENDIX 1: OBSERVATION SCHEDULE

AIM OF THE STUDY: INVESTIGATION OF TEACHING STRATEGIES THAT ARE USED IN ADDITION TO CODE SWITCHING IN MULTILINGUAL GRADE 11 LIFE SCIENCES CLASSROOMS

Strategy used	How the strategy was used and what seemed to be the reasons for using the strategy	Effectiveness of the strategy
1. Code switching	Teacher-LI-70%,HL -30% Learners to teacher – LI-60%,HL -40% Amongst themselves – 100% Teacher explains in LI and switches to HL when the learners do not understands. Concepts are written on the board and explained in HL and then in LI. When the learners talk to each other, they use only the home language.	
2. Question and Answer Sheets	Sheets given to learners when revising preparing for the test and exams.	
3. Homework is given	To help them to study at home, to keep	

	in touch with their subject	
4.Diagrams and word Charts	Concepts are written on a chart with explanations and learners are asked to copy them down and learn them by rote	
5.Interaction in the classroom	Learners writing down the answers in their notebooks and some are asking questions for further explanations.	

APPENDIX 2

INTERVIEW SCHEDULE:

AIM OF THE STUDY : : INVESTIGATION OF TEACHING STRATEGIES THAT ARE USED IN ADDITION TO CODE SWITCHING IN MULTILINGUAL GRADE 11 LIFE SCIENCES CLASSROOMS.

1.Name of Interviewer : N. Jekwa

2. Date of Interview : 21 June 2010

3. Grade : 11

4. Subject taught by the respondent : Life Sciences

5. Level of the school : High School

6. Location of the school : Semi-urban area

A. BIOGRAPHICAL DATA

1.GENDER:

F	M

2. AGE GROUP:

25 -35		44 -55	
36 -43		Over 60	

B. TEACHING EXPERIENCE:

0 - 5	
6 - 10	
11 -15	
Over 20	

1. QUALIFICATIONS:

P.T.C	
Diploma	
First Degree	
Post-graduate	

2. SPECIALIZATION IN TEACHING SUBJECTS:

XHOSA	
ENGLISH	
MATHEMATICS	
LIFE SCIENCES	
PHYSICAL SCIENCE	

3. YEARS TEACHING SCIENCE:

0-5	
6-10	
11-15	

4. TEACHER DEVELOPMENT PROGRAMME FOR TEACHERS AFTER COLLEGE:

No development after college	
Teacher development by DOE	
Upgraded studies in teaching of science	

5. TEACHER DEVELOPMENT WORKSHOPS ATTENDED:

0-5	DOE	NGO
6-10		
11-15		

APPENDIX 3

POST OBSERVATION INTERVIEW QUESTIONS: RAW DATA: TEACHER A

1. What makes you to constantly switch from the language of instruction to home language when teaching ?

2. I have observed that the learners are allowed to answer in any language that they want to use. How does this help you in your teaching ?

3. As English is the language of instruction and IsiXhosa is their home language, how do you integrate the two without denying learners access to English.

4. Life Sciences is a subject that has its own language in terms of the many concepts and processes. How do you make them understand these concepts ?

5. How do you prepare them for exams as you are not able to code switch for them during exams ?

6. The use of textbooks after you have given them a chalkboard summary, how valuable is this?

APPENDIX 4.:Pre- Observation Interview: Raw data: Teacher A

1. Which strategies are you using in your teaching?

What is a strategy, can you explain what you are asking?

(Interviewee explains what she means by strategies)

I use many methods such as textbook method, telling method, and the new ones that have been suggested in the workshops such as presentation, use of study guides.

2.Please tell me, what are your reasons for choosing the strategies you have identified?

These strategies help me to prepare the learners for examinations

3. Are they effective?

Yes , although they cause a lot of work which includes much planning.

4. How do you know that they are effective?

The learners' response and their participation

5. Which strategy do you use the most and why?

Code switching, it is a strategy that helps me to be able to teach effectively so that I am able to relate well with the learners and be at the same level with them.

6.What are other strategies you are using?

I use prepared notes, worksheets, question papers and memoranda

Will you explain how you implement these strategies and how helpful are they to your learners.

As I do not use much home language when teaching, I use other strategies to consolidate more the work we have covered like previous question papers.

APPENDIX 5

POST - OBSERVATION INTERVIEWS : RAW DATA FROM TEACHER B

1. What makes you to constantly switch from the language of instruction to home language when teaching ?

The learners have limited English, so I want to be in the same level with them when I am teaching.

2. I have observed that the learners are allowed to answer in any language that they want to use. How does this help you in your teaching ?

I want their maximum participation and not have limiting aspects.

3. As English is the language of instruction and IsiXhosa is their home language, how do you integrate the two without denying them access to English?

By using other strategies such as presentation, use dictionaries when preparing presentations and use charts.

4. Life Sciences is a subject that has its own language in terms of the many concepts and processes. How do you make them understand these concepts ?

We use different forms of assessment such as hypothesis testing, practicals, tests and assignments which gives us the opportunities to understand the concepts.

5. How do you prepare them for exams as you are not able to code switch for them during exams ?

I use previous question papers and encourage them to answer in English and sometimes I help them by writing down the answers and ask them to copy down and read them.

6. The use of textbooks after you have given them a chalkboard summary, how valuable is this?

To consolidate and use them as a reference, to let them know that they should not only depend on the notes given but read their textbooks as well