

EXPLORING THE QUALITY OF SOUTH AFRICAN NATIONAL
BIODIVERSITY INSTITUTE (SANBI) TEACHER DEVELOPMENT
WORKSHOPS IN ONE OF THE DISTRICTS OF MPUMALANGA

By

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A dissertation submitted in partial fulfilment for the degree of
Master of Education

Teacher Development Studies

School of Education

College of Humanities

UNIVERSITY OF KWAZULU NATAL

December 2014

DECLARATION

I, Charlotte Dumazile Nkosi, declare that the research reported in this thesis, except where otherwise indicated, is my original research. This thesis has not been submitted for any degree or examination at any other university.

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25 March 2015

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Date



Supervisor: Dr C.A. Bertram

25 March 2015

Date

DEDICATION

I dedicate this dissertation to my late parents Johannes and Lisbeth. I will always remember your teachings, support, guidance and unconditional love and to my late brother Mdutshwa, who always believed in me. My loving and understanding husband Graham, thank you - I wouldn't have made it without your support and sacrifices during my studies. My children, Sindile, Lifa, Phila, Phumlani (IT wizard) and little Sipehelele - thank you guys you were always there for me.

ACKNOWLEDGEMENTS

I thank my God almighty for giving me the opportunity, strength and guidance in completing this study of my dreams. I dearly thank my sisters, Sibongile, Tozane, Nomandiya, Mzonke, Thabile and Makhosazana. Thank you Thabile for letting me use your car during my studies.

I highly appreciate the following:

- My supervisor, Dr C.A. Bertram who supported and guided me with passion in such a difficult learning experience. Thank you Carol.
- UKZN lecturers who guided me through other modules.
- My two little girls, Nonhlanhla and O’ratile. Love you.
- Thanks to my sister in-law Grace Zwane for taking care of my little Sipehelele.
- Mr. and Mrs. Mvusi and lovely Siphokazi for welcoming me in your warm and lovely home during my studies: you are one of a kind. Thank you.
- The SANBI Mpumalanga staff, thank you for letting me into your organization and information whenever I needed it.
- The teachers who gladly participated in this study: without you this study wouldn’t have been a success. Thank you.
- My study mates who never forgot to support me in spite of my staying far from them (Mpumalanga).

ABSTRACT

There are different teacher development initiatives locally and internationally. The Department of Basic Education is committed to continuously developing teachers in partnership with other organizations and, as a result, a number of organizations have initiated teacher development activities (models) and have committed resources around South Africa. Teachers are expected to take part in these development activities to improve their content knowledge and pedagogical content knowledge, and to be able to apply them in their classrooms (DoE, 2007).

The South African National Biodiversity Institute (SANBI) is one of the government parastatals who initiate teacher development activities. This study aims to evaluate the effectiveness of and the knowledge learnt in SANBI workshops in order to answer these three key research questions: 1. What teacher knowledge domains are privileged in the workshops? 2. To what extent do the workshops reflect the characteristics of effective professional development workshops? 3. What knowledge and skills do teachers say that they have learnt from SANBI workshops?

This study is qualitative and data was gathered through observing and video- recording two SANBI Life Science workshops and interviewing four Life Science teachers who participated in these workshops. The observation data collected was analysed using Givvin and Santagata's (2011) seven criteria of an effective workshop; and Shuman's (1986) knowledge areas -- that is content knowledge and pedagogical content knowledge -- was used to analyse the interview data. SANBI workshops aim to develop teachers' content knowledge and pedagogical content knowledge.

The finding of this study confirms that SANBI workshops have met some of the seven criteria of an effective workshop and definitely offer teachers content knowledge and pedagogical knowledge. However, there is a need to set up follow up strategies to sustain the once-off teacher development workshops.

LIST OF ACRONYMS

ACE	Advanced Certificate in Education
B Sc	Bachelor of Science
CAPS	Curriculum and Assessment Policy Statements
CD	Compact Disc
CI	Curriculum Implementer
CK	Content Knowledge
DBE	Department of Basic Education
DoE	Department of Education
DHET	Department of Higher Education and Training
EDC	Educational Development Centre
FDE	Further Diploma in Education
FET	Further Education and Training
HET	Higher Education and Training
MSSI	Mpumalanga Secondary Science Initiative
NBG	National Botanical Gardens
NGO	Non-Governmental Organization
NPFTED	The National Policy Framework for Teacher Education and Development
PCK	Pedagogical Content Knowledge
PD	Professional Development
PLC	Professional Learning Communities
SAASTE	South African Association for Science and Technology Educators
SANBI	South African National Biodiversity Institute

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CHAPTER ONE: INTRODUCTION

1.1 Background

Teachers are the pillars of education, economic, and social development as they are the ones to educate society. In South Africa the Department of Basic Education (DBE) developed a policy called Norms and Standard for Educators (NSE) 2000 which stipulates the seven roles that teachers need to fulfill to be competent teachers, including those of being a scholar and a lifelong learner (Department of Education [DoE], 2000). This policy has been reviewed and has been replaced by the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa (Departments of Basic Education [DBE] and Higher Education and Training [DHET], 2011). The Planning Framework “retains the roles of a teacher described in the NSE 2000, but emphasises that the roles must be interpreted as functions carried out by the collective of teachers in a specific school. The roles continue to be a useful tool to assist in the design of learning programmes which, in turn, results in the development of teachers who are able to contribute to the collective work of educating children in a school at different stages of their careers”(DBE and DHET, 2011, p. 7).

The DBE is committed to continuously developing teachers in partnership with other organizations. Hence a number of organizations have initiated teacher development activities (models) and have committed resources around South Africa. Teachers are expected to participate in these development models to enhance their content knowledge and pedagogical content knowledge, and to be able to practice them in their classrooms (DoE, 2007).

This chapter describes the purpose and rationale of the study, the background of the study, the research questions and chapter delineations.

1.2 Purpose and Rationale of the Study

The purpose of this study is to describe the characteristics of the teacher development activities implemented by the South African National Biodiversity Institute (SANBI) in its workshops. This study focused on the teacher development workshops conducted by SANBI to explore the teacher knowledge domains privileged and the effectiveness of the workshops using the set of characteristics established in the literature review.

Literature has revealed that teacher development workshops are the most popular model for in-service teacher development in South Africa and internationally, yet many teachers are still negative about workshops and do not always find them useful (Clarke and Hollingsworth, 2002; Bantwini, 2009; Bertram, 2011; Bantwini, 2011; and Gulamhussein, 2013). International and national research has revealed that teachers are still work-shopped in a one size fits all, one shot strategy which does not result in effective teacher learning and teacher change (Mundry and Loucks-Horsley, 2010; Bantwini 2011; and Gulamhussein, 2013). The DBE, universities, non-governmental organizations (NGOs) and government parastatals are the major players in providing professional development initiatives for teachers in South Africa.

Researchers have been evaluating the Department's and universities' teacher development programs. Adler and Reed (2000) examined the Further Diploma in Education program offered by the University of Witwatersrand; Bantwini (2009) examined the Department's development models of introducing the new curriculum in one district in South Africa; and Mokhele (2013) examined the Mpumalanga Secondary Science Initiative (MSSI) project. In Mpumalanga there are few external evaluations of NGOs and parastatal workshops in teacher learning (the workshops and short courses), except for reports on how they provide financial muscle to the Department and to universities. The reality is that there are many NGOs and parastatal workshops and short courses conducted in South Africa and SANBI is one of the providers. Evaluation of SANBI program is done by the facilitators and teachers filling in an evaluation form after attending an activity. A report on finances, statistics and available resources is presented to the senior management of SANBI. Adler and Reed (2000) point out that most NGOs'

teacher development programs are non-certificated and informal, unlike teacher development programs from universities.

There is still an argument that the currently used teacher professional development models are grounded on "unexamined theories about the nature of knowledge and practice" (Bantwini, 2009, p. 169). Quality control measures are constantly insufficient or nonexistent (DoE, 2007). Bantwini (2009) points out that there is shortage of literature that critically evaluates the professional development models in spite of researchers' hard work and that more research is needed to determine the effectiveness of the models used.

1.3 South African National Biodiversity Institute (SANBI) Background

The South African National Biodiversity Institute was established on 1 September 2004 through the signing into force of the National Environmental Management: Biodiversity Act 10 of 2004 by then President Thabo Mbeki. The Act expanded the mandate of SANBI's forerunner, the National Botanical Institute to include responsibilities relating to the full diversity of South Africa's fauna and flora, and was built on the internationally respected programs in conservation, research, education and visitor services developed over the previous century by the National Botanical Institute.

1.3.1 National Botanical Institute

The National Botanical Institute was an autonomous, statutory organization formed by the amalgamation of the National Botanical Gardens and the Botanical Research Institute in 1989. Both these organizations were founded early in the twentieth century to conserve and study the exceptionally rich Southern African flora and both were world-renowned for their endeavours in this field. This rich legacy passed on to the NBI. With its head office at Kirstenbosch in Cape Town, the Institute had gardens and research centres throughout South Africa. It ran environmental education programs and maintained databases and libraries specializing in information on the plant life of southern Africa. On the 1 September 2004 the NBI became the South African National Biodiversity Institute (SANBI) in terms of Act 10 of 2004 (SANBI, 2004).

1.3.2 Education

Education is one of the key functions of a botanical garden. South Africa's National Botanical Gardens (NBGs) have been serving an educational role for learners, teachers and the general public for many decades. In recent years, new environmental education centres have been built in the Walter Sisulu, Pretoria, Free State and Lowveld National Botanical Gardens, allowing dedicated education staff to be housed and garden-based programs to be hosted in the various NBGs. This has allowed the expansion of the formal education programs to gardens beyond Kirstenbosch.

One of the core programs of the Education Unit is Teacher Professional Development. SANBI – Education unit, currently is known as the Biodiversity Education and Empowerment Unit, supports teachers through workshops in the integration of the environment into the current curriculum. Workshops consist of current environmental concepts like biodiversity, climate change, sustainable development and many others. SANBI teacher development workshops are now linked to careers in biodiversity in order to promote careers in this sector and enable teachers to introduce these careers to learners.

SANBI has seven centres across the country. Each centre has a target of conducting four teacher development workshops per year and also includes learners programs. There is no exact number required to attend each workshop but a minimum of fifteen teachers qualifies for the workshop to be conducted with the status of being recognized as a workshop. Workshop topics are standardized and each centre chooses topics that best suit the area needs and the available resources. All centres must include 'Careers in Biodiversity' as a compulsory topic. In Mpumalanga, the centre manager consulted the Curriculum Implementers to choose the topics and to align them with the curriculum schedule or program of the year. For Geography the topic was 'Climate Change', for Natural Science the topic was also 'Climate Change'. The topics for Life Science were 'Biodiversity and Biomes' and for Life Orientation, 'Basic Environmental Education'.

SANBI develops its own learning materials with the initiation of the different centres and the individual centre uses its own creativity and resources to contextualize the learning

materials. These workshops are aimed at developing teacher knowledge and improved classroom practice (SANBI Human Development Capital).

The findings of this study could benefit SANBI and other organizations in planning and conducting effective teacher development programs.

1.4 Research Questions, Objectives and Design

1.4.1 Questions

This study was guided by the following key research questions:

1. What teacher knowledge domains are privileged in the workshops?
2. To what extent do the workshops reflect the characteristics of effective professional development workshops?
3. What knowledge and skills do teachers say that they have learnt from SANBI workshops?

1.4.2 Objectives

1. To describe the teacher knowledge domains privileged in the SANBI workshops.
2. To examine the effectiveness of SANBI workshops using a set of characteristics established in the literature.
3. To describe the knowledge and skills that some teachers say they acquire from attending SANBI teacher development workshops.

1.4.3 Research Design

To answer the research questions, I chose to follow a case study methodology. Rule and John (2011) describe a case study as a systematic and in-depth examination of a particular case in its situation in order to produce knowledge. This study is situated in the interpretive paradigm and is qualitative in nature, focusing on the Mpumalanga SANBI teacher development workshops. According to Cohen, Manion and Morrison . (2007), the

interpretive paradigm is about the understanding and interpretation of the phenomenon under study, as well as how people understand their experiences.

In order to answer the first two key research questions, that is, exploring what teacher knowledge domains privileged and the effectiveness of the workshops, I observed two workshops to generate data on the teacher knowledge and effectiveness of the workshops. The workshops were also video-recorded to capture everything that happened during the workshops, the facilitators' presentations and teachers' responses during the presentations, and when teachers executed the activities during the workshops. The researcher in this study took the role of a complete observer as mentioned in Cohen et al. (2007, p.397) as "typified in the one-way mirror, the video-cassette, the audio-cassette and the photograph". Four teachers volunteered to participate in interviews about what they had learnt by participating in the SANBI teacher development workshops. The interviewees were individually interviewed and the interview was audio-recorded and transcribed to generate data. The four teachers were from different schools and had attended two or more SANBI workshops.

1.5 Structure of the Study Chapters

This thesis consists of six chapters.

Chapter One puts before the reader the purpose and rationale of the study in detail. Background knowledge of SANBI, the critical questions and the objectives that guided the study outcomes are provided.

Chapter Two provides the national and international literature reviewed for this study. The literature reviewed focused on defining and explaining teacher professional development, teacher learning, teacher knowledge, teacher professional development models and effective teacher professional development models. The complexity of teacher learning as defined by some academics, is discussed.

Chapter Three outlines the research methodology, research methods and data gathering methods. Research participants, access and the issues of ethics used in this study are also delineated. Data analyses procedures are explained and the study limitations are highlighted.

Chapter Four presents and describes the data collected from the workshops observations.

Chapter Five presents the data collected from participants' interviews.

Chapter Six provides an interpretation and discussion of the data, and recommendations for future research are put forward and conclusions drawn.

1.6 Conclusion

This chapter focused on introducing the reader to the dissertation structure and outlining the sequence of the chapters to follow. The next chapter will be taking the reader through the literature reviewed to determine the effectiveness and knowledge domains that may be privileged at SANBI workshops for this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This study explores teacher learning in a series of SANBI workshops offered in Mpumalanga. The key concepts that inform the study are: professional development, teacher learning and teacher knowledge domains that are privileged in the workshops. Firstly, literature is reviewed to describe the concepts of teacher development, teacher learning and teacher knowledge. Secondly, a range of teacher development models will be described, and lastly the characteristics of an effective teacher development workshop will be dealt with in a review of South African empirical teacher professional development studies.

2.2 Teacher Professional Development (PD)

Many scholars have described professional development (PD) in different ways but pointing in the same direction: that it is a process, a continuous process that changes teacher practice over a long period of time. Professional development is an individual or social deliberation to acquire skills, content knowledge, and a change of attitude and beliefs. Professional development develops professional knowledge; hence it satisfies the corporate, departmental and personal requirements in a process whereby teachers change their knowledge base (Fraser, Kennedy, Reid and McKinney, 2007; Adey, 2004). Kwakman (2003) describes teacher development as a process whereby teachers learn new knowledge, skills and values to practice more effectively. Hence teachers attend structured learning activities which, in this case is workshops, to acquire new knowledge and skills to overcome identified gaps in their practice.

Evans (2002) argues that teacher development as a concept is not exactly defined, although many writers have researched the concept. Bell and Gilbert (1994 cited in Evans, 2002) view teacher development as the process of teacher learning rather than

making teachers transform. When learning, teachers build their beliefs and ideas into their daily practice and also concentrate on their feelings about transformation.

Evans (2002) understands teacher development either as a process in progress or as happened-and-finished, which means that teachers should have acquired the anticipated outcomes at the end of a certain period. Teacher development also advances teacher knowledge, skills and classroom practice.

Teacher professional development is still seen as an intervention that is aiming at addressing a deficit in teacher knowledge and skills. Clarke and Hollingsworth (2002) argue that professional development that is aiming at addressing a deficit is bound to be ineffective because of the overemphasis put to correct the deficit and neglect of the other factors contributing to development. For the past ten years the field has recognized a necessity for further suitable experimental methods to study professional development (Desimone, 2009).

Teacher professional development is critical for education transformation Education is facing constant transformations and teachers are the ones responsible for the implementation of the transformed policies to the learners. For teachers to be able to adapt to the education changes, they need continuous professional development. “This is not just about providing professional development but about providing *effective* professional development” (Gulamhussein, 2013, p. 1). Teachers need to develop the beliefs, attitudes, knowledge and skills likely to increase their effectiveness and boost their self confidence as teachers.

The concern of teacher training and professional development is one of the top priorities of political decisions in education, including forming policies that define what kind of institutions should educate teachers and under what professional and labour conditions (Pini and Gorostiaga, 2008; TALIS, 2009; DBE and DHET, 2011). In the South African context, Mestry, Hendricks and Bisschoff (2009) argue that “Since 2001 the implementation of education legislation and policies has progressively shifted the new agenda within transformation framework aimed at reconstructing the education system to

the fore. The many changes that have taken place in the education system arise out of the implementation of legislation and policies and the restructuring of the education system to align with the vision of the National Department of Education” (p. 475).

Education policy makers made it clear that ‘The key goals of teacher development must be enhanced classroom practice and improved learning outcomes’ (DBE and DHET, 2010, p. 8). A policy was developed in 2000 which clarified that a teacher is a scholar, a researcher and a lifelong learner which means that teachers should pursue ongoing personal, academic, occupational and professional growth (Norms and Standards for Educators, 2000). This policy was replaced in 2011 by the policy called Minimum Requirements for Teacher Education which “retains the roles of a teacher described in the NSE 2000, but emphasises that the roles must be interpreted as functions carried out by the collective of teachers in a specific school. The roles continue to be a useful tool to assist in the design of learning programmes which, in turn, results in the development of teachers who are able to contribute to the collective work of educating children in a school at different stages of their careers” (DHET, 2011). This document still keeps the seven roles for educators as an annexure to the new policy. Teacher professional development programs should be guided by the NPFTE (2007) legislation as it is aligned in the new Minimum Requirements for Teacher Education policy which states that:

All teachers need to enhance their skills, not necessarily qualifications, for the delivery of the new curriculum. A large majority needs to strengthen their subject knowledge base, pedagogical content knowledge and teaching skills. (p. 17)

The Strategic Plan policy (2011) also emphasises that professional development activities must be of high quality, content rich and pedagogically sound, to make it possible for teachers to advance their teaching performance.

Research has shown that teacher professional development affords teachers an opportunity to learn new knowledge and the necessary teaching strategies to improve the education quality (DBE and DHET, 2011). Teacher professional development is often

understood as a ticket to new educational reforms, which is skills and technical proficiency in implementing new curricula, standards and assessment systems (Wilson and Berne, 1998; Desimone, 2009; Flint, Zisook and Fisher, 2011).

2.3 Teacher Learning

Teacher professional development and teacher learning are sometimes used to mean the same thing and for this study I have decided to separate the two concepts. According to the literature I reviewed, the two concepts do not really mean the same, although both are described as a process. Teacher development is perceived as an organized formal process that may change teacher practice over a certain period of time and influence teacher professionalism (Thaver, 2011; Bertram, 2011). Teacher learning and professional development is not just an event but a complex system that involves many processes, mechanisms, actions and elements that makes it difficult to put before, the accurate result of every activity (Opfer and Pedder, 2011).

According to the literature I reviewed, teacher learning is considered to be what teachers learn: that is, the different kinds of knowledge, skills, attitudes, beliefs or actions teachers acquire through formal and informal learning opportunities that will result in teacher change (Kelly, 2006; Bertram, 2011; Thaver, 2011). Teacher learning is sometimes formal, when teachers attend a structured workshop, a seminar, a conference or a course; and it is informal when a teacher is reading individually, experimenting (doing a task on his/her own) in a school staffroom or when teachers are talking during tea breaks, or when interacting with students or an expert from outside and reflecting (thinking about his/ her own school matters). compared to teacher development as it happens in a formal structured situation, like a course or workshop and is policy driven (TALIS, 2009; DBE and DHET, 2011).

Teacher learning is a process whereby teachers develop themselves to better their knowledge and skills to practice in their classrooms (Fraser et al., 2007; Bertram, 2011).

Although most writers do not come up with any direct explanations of the teacher development concept, they do provide clear explanations of teacher development and teacher learning processes and how they happen (Evans, 2002). Teacher learning is a process that takes a certain period of time and which results in specific professional changes to teachers' knowledge, beliefs, skills, attitudes or actions (Fraser et al., 2007, Wilson and Berne (1998) describe teacher learning as 'puzzling' due to the fact that it is scattered and serendipitous. Teacher learning happens in many different ways as mentioned before. This study has looked at teacher learning done in a formal structured way as in SANBI workshops.

2.4 Teacher Knowledge

There is a spreading agreement that the quality of learners' schooling knowledge depends on the quality of teachers teaching them, as quality teachers know how to develop and implement a successful learning experience for the learners (Hagger, Burn, Mutton and Brindley , 2008; Mestry et al., 2009). There is "an assumption that the quality of schooling is ... primarily dependent on the quality of its teachers and their teaching" (Hagger and McIntyre, 2006, p. 1).

In South Africa, the DBE and DHET (2011) argue that teachers' poor subject matter knowledge and poor pedagogical content knowledge are significant contributors to a poor quality education system. To be able to design and implement quality learning for learners (complex analytical skills and high order thinking and performance) teachers need to be knowledgeable and to be able to sufficiently utilize the knowledge (Wood, 2007; TALIS, 2009; Mokhele, 2013).

Reed (2009) stated that, conceptualizing teacher knowledge is an issue of on-going debate. Therefore it requires continuous research and analysis.

Shulman (1986) described seven knowledge areas which he argued were important for teachers. Scholars like Cogill (2008), Bertram (2011) and Grossman (1990) further described Shulman's knowledge areas.

2.4.1. Content Knowledge

In order for teachers to be able to teach a specific subject, the teacher should have the knowledge of the subject, the understanding of the structures of the subject and be able to present the content to the learners (Shulman, 1986). Teachers need content knowledge to evaluate and choose textbooks, teaching aids and computer software.

A number of researchers working on the field of teacher development built on Shulman's (1986) knowledge areas as he was the first to describe the seven knowledge domains. Shulman (1986, p. 9) explains the concept of content knowledge as "the amount and organization of knowledge per se in the mind of the teacher". Bertram (2011) explains the importance of content knowledge for teachers, that it is a profound understanding of concepts in their subjects and not just pieces of collected information. Teachers must have the understanding of how to put the pieces of information (concepts) together in the Life Sciences to be able to organize the subject content knowledge and to be able to utilize the knowledge for the benefit of their learners. This is indicated in the CAPS policy that states:

By studying and learning about Life Sciences, learners will develop:

- their knowledge of key biological concepts, processes, systems and theories;
- an ability to critically evaluate and debate scientific issues and processes;
- greater awareness of the ways in which biotechnology and the knowledge of Life Sciences have benefited human kind;
- an understanding of the ways in which humans have impacted negatively on the environment and organisms living in it;
- a deep appreciation of the unique diversity of past and present biomes in Southern Africa and the importance of conservation;
- an awareness of what it means to be a responsible citizen in terms of the

- environment and life-style choices that they make;
- an awareness of South African scientists' contributions;
 - scientific skills and ways of thinking scientifically that enable them to see the flaws in pseudo-science in popular media; and
 - a level of academic and scientific literacy that enables them to read, talk about, write and think about biological processes, concepts and investigations (DBE, 2011, pp. 8, 9).

Sufficient content knowledge builds teacher confidence and teaching in a more dynamic and interesting manner than teaching with little content knowledge. Teachers with sufficient content knowledge do not shy away when they have to teach difficult aspects of their subjects (Cogill, 2008).

2.4.2 General Pedagogical Knowledge

Shulman defines general pedagogical knowledge as “those broad principles and strategies of classroom management and organization that appear to transcend subject matter” (Shulman, 1987, p. 8). Building on this, Bertram (2011) defines general pedagogic knowledge as a complex set, consisting of classroom organization and management, the different teaching strategies, assessment strategies and understanding of classroom communication and discourses.

2.4.3 Pedagogical Content Knowledge

Shulman was the first to describe the concept of pedagogical content knowledge (PCK), and described the concept as the one that “identifies the distinctive bodies of knowledge for teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction” (1987, p. 8). Grossman (1990, p. 9) described PCK as the “knowledge of students’ understanding, conceptions, and misconceptions of particular topics in a subject matter”. Fundamentally she believes that in order for a teacher to be able to teach the learners, he/she should have

knowledge of the learners' prior knowledge of the subject topic and what is confusing them about the topic.

The concept of PCK has been studied by a number of researchers for the past two decades. PCK is understood as the teacher's understanding of the knowledge of learners' understanding subject concepts within a specific subject matter, how to teach or translate the content knowledge for learners to understand better, and it allows teachers to conduct interesting, clear explanatory and motivating lessons (Bertram, 2011; Cogill, 2008; Grossman, 1990).

2.4.4 Curriculum Knowledge

Curriculum knowledge (CK) is “represented by the full range of programs designed for the teaching of particular subjects and topics at a given level, the variety of instructional materials available in relation to those programs, and the set of characteristics that serve as both the indications and contra-indications for the use of particular curriculum or program materials in particular circumstances” (Shulman, 1986, p. 10).

Cogill (2008, p. 5) understands CK as ‘the knowledge of what should be taught to a particular group of pupils. It requires understanding of children’s learning potential, national syllabuses, school planning documents and year group plans.’

Teachers should know the curriculum materials available for teaching a particular subject matter and also draw from the learners past studies to build their new learning (Grossman, 1990). A grade 10 Life Science teacher should know how to probe the learners' prior knowledge on biodiversity, for example, in order to be able to introduce the subject of biomes. The aim of the South African curriculum is “to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives”. (DBE, 2011, p. 4)

2.4.5 Knowledge of Learners and their Characteristics

Learners learn in different ways and the teacher should understand how the children's minds operate. Cogill (2008, p. 2) states clearly the four dominant models of the learner's mind that teachers need to understand: children as imitative learners, children as learning from didactic exposure, children viewed as thinkers and children as managers of their own knowledge

2.4.6 Knowledge of Educational Contexts e.g. Schools and the Wider Community

According to Shulman (1987, p. 8) knowledge of educational contexts extend "from the working of the group or classroom, the governance and financing of the school districts to the character of communities and cultures". Teachers should understand the specific context they practice in and adapt their teaching to that particular school setting, the type of learners and the particular community (Grossman, 1990). It is assumed that teachers attending the SANBI Life Science teacher development workshops should be able to contextualize the knowledge and skills acquired from attending those workshops; to transfer the activities to their learners according to their different contexts; and also to align them to the curriculum according to the Life Science schedule of the year.

2.4.7 Knowledge of Educational Ends Purposes and Value and their Philosophical and Historical Grounds

This knowledge area is mentioned or listed by writers as one of the seven knowledge areas established by Shulman (1986) without any explanation of what it exactly means.

This study examines the knowledge domains that are privileged in the SANBI teacher development model using Shulman's fundamental knowledge areas. All the seven areas of knowledge require further debate, but for this study I have only looked at and utilized two knowledge areas: content knowledge (CK) and pedagogical content knowledge (PCK) as building blocks to explore the knowledge domains privileged in SANBI workshops. These two knowledge domains have been chosen for this study as they are of the most interest because of their interconnectedness and their being a pillar of South African education quality. South African policy makers have also identified CK or

subject matter knowledge and PCK of teachers as key contributors to the poor quality of the education system (DBE and DHET, 2011).

It can be argued that the other knowledge domains are embedded in these two categories. As Ball, Themes and Phelps (2008, pp. 2, 3) say: “For Shulman, they acted as placeholders in a broader conception of teacher knowledge that emphasized content knowledge. The continuing appeal of the notion of pedagogical content knowledge is that it bridges content knowledge and the practice of teaching, assuring that discussions of content are relevant to teaching and that discussions of teaching retain attention to content”.

According to Givvin and Santagata (2011) PCK and CK are part of the characteristics of an effective teacher professional development model. These characteristics have also been used in this study to determine the effectiveness of the SANBI workshops conducted in one of the districts in Mpumalanga Province.

2.5 Teacher Professional Development Models

A teacher professional development model is a formal intervention aimed at assisting teachers to cope with the curriculum reforms, teacher changes and improved learner performance, as required by the state. Bantwini (2009, p. 179) states that, “The universal problem, as the literature shows, is that after developing new curricula, the attention of policy makers and politicians is focused on outcomes of the desired educational change to the neglect of the implementation process”.

Teachers engage themselves in many different learning activities and interactions because they feel they need to improve their teaching skills and content knowledge and also to improve personally, socially and emotionally as teachers (Desimone, 2009).

For the past 15 years teacher development initiatives have grown in number in South Africa, because of the continuous curriculum reform that started from the introduction of Curriculum 2005 in 1998. South Africa has initiated a number of different teacher

development models with the aim of changing teacher practice, attitude and beliefs in order to adapt to the new curriculum changes and to be good organizers of their own practice (Shezi, 2008; Bertram, 2011). In the same vein, Fore (2007) affirms that improving professional learning for teachers is a crucial step in transforming schools and achieving academic improvement. Therefore a professional teacher development initiative should aim at developing teachers as competent, systemic learning organizers for their learners.

In South Africa a number of teacher development programs are used to develop teachers as life-long learners and better practitioners. These programs include development workshops which teachers attend once off or many times; seminars of teacher associations like the South African Association for Science and Technology Educators (SAASTE); conferences; and communities of practice (school based and clusters). As mentioned by Bantwini (2009), professional development programs and models are implemented nationally and internationally annually.

An effective teacher professional development program changes teacher behaviour and student achievements; although it is not easy to measure the level of teacher change as it is measured by learner performance and it takes time to show the achieved results. More studies should be undertaken to empirically measure teacher change and learner achievement through teacher development programs. Cooperative, learning centred (active learning) and practice related (content focus) programs have been having an important effect on teachers (Givvin and Santagata, 2011; Flint et al., 2011; Mokhele, 2013). This statement also applies to the South African context: teachers need content knowledge to teach their learners and they need to be actively involved in their own learning. Similarly Bantwini (2009) suggests that effective PD models should take care of the internal and external factors that affect the particular understanding of new changes for improvement and their social practice. This means that any PD model if adopted from or designed somewhere else should be customized to suite the specific context and teachers.

Professional development models are methodical endeavours that differ in content and layout, but share a general function of changing the professional practice of teachers, their beliefs and attitudes, and the results of their learners (Guskey, 2002). Clarke and Hollingsworth (2002) argue that teacher development models are challenged by the expected teacher change to be pronounced as effective and purposeful and not considering that change is a process and not an event.

Shezi (2008) suggests that teacher professional development models should afford the learners (teachers) the opportunity to be involved in, generate, or find out different approaches or strategies that could be used in different contexts. A diversity of ways should be utilized that methodically support teachers to investigate and to be self-sufficient.

However Bantwini (2009) notes that there is a shortage of literature that critically evaluates the PD models.

There are different teacher development models taking place in South Africa and globally. Garet, Porter, Desimone, Birman and Yoon (2001) refer to them as teacher development 'activities'. These activities are workshops, seminars, cascade models and school based models. Flint et al. (2011) identified a common challenge to these development activities as the schools sending representative(s) to take information and then delivering it to colleagues at schools. They state that, "The isolated nature of these approaches have teachers passively receiving information from identified experts on strategies or approaches that they will then implement unquestioningly (and often half-heartedly or resentfully) in their classrooms" (p. 1164).

According to the literature reviewed, professional development models that concentrate on delivering pre-defined knowledge are dominant in many countries including South Africa.

The following section will describe some PD models often used in South Africa.

2.5.1 Cascade Model

In South Africa a cascade model is used frequently by the National Department of Education to train teachers in new curriculum reforms. A cascade model is when a small number of persons are trained as experts on a particular topic or policy to be trainers and they ‘cascade’ the information to many other teachers. They would be regarded as experts although they themselves are actually only trained for a short period. Shezi (2008) used the term ‘act’ as experts, as they are trained for too short a period to be real experts.

The cascade model is preferred by the National Department of Education because it is cost effective. One person can train many teachers during a short space of time and many teachers can be invited to one venue and be trained in one shot. The cascade model is criticized by researchers as it uses a top-down strategy and does not consider any individual teacher’s needs nor any contextual differences. Teachers are just expected to change their practice ability and curriculum knowledge straightaway (Desimone, Porter, Garet, Yoon and Birman, 2002; Shezi, 2008; Bantwini, 2009). This model sets out an authorized set of objectives and teachers become passive consumers of knowledge which has been constructed in a different place (Shezi, 2008; Bantwini, 2009). “The model offers short but intensive workshops, which are once-off events (rather than ongoing interaction), which are associated with tight schedules for implementation” (Shezi, 2008, p. 59).

2.5.2 School Based Model

Another type of model that is gaining popularity is the school based model. Many scholars such as Bantwini (2009), Clarke and Hollingsworth (2002) and Guskey (2002) believe that teachers learn more easily if the learning relates to the context of the individual teacher. Teachers also improve their learning in a situation where colleagues can share in the development of one another, and share teaching strategies and resources in a formal way, which could be lesson observation and critiquing one another’s lessons (Cogill, 2008; Avalos, 2010). Teachers also depend on one another for support. “Teachers serve as support groups for one another in improving practice. Collective work in trusting environments provides a basis for inquiry and reflection, allowing teachers to raise issues, take risks, and address dilemmas in their own practice” (Darling-Hammond

and Richardson, 2009, p. 2) Teachers learn from each other informally when discussing in the staffroom during break times. The school based model also affords teachers opportunities to act in school teams, be a participant not a leader, make decisions and take ownership of the school's improvement (Avalos, 2010). School based development is coherent, sustainable, inquiry-based and also boosts teacher confidence and competence compared to once-off development programs (le Grange and Reddy, 2000, cited in Shezi 2008; Bertram, 2011).

2.5.3 Workshops

Workshops are the most popular formal in-service teacher development programs in South Africa and other countries; they are even labelled by researchers as the traditional way of teacher development (Garet et al., 2001; Desimone et al., 2002; Mokhele, 2013). The cascade model also uses workshops to train teachers. The difference between the two models is that when conducting cascade workshop, a top-down method is used, meaning that a small number of people are trained in a specific area for a short period of time to cascade the information in a workshop to a large group of people. "Institutes, courses, and conferences are other traditional forms of professional development that share many of the features of workshops, in that they tend to take place outside of the teacher's school or classroom; and they involve a leader or leaders with special expertise and participants who attend at scheduled times" (Garet et al., 2001, p. 920).

A workshop is described by Garet et al. (2001, p. 920) as a "structured approach to professional development that occurs outside the teacher's own classroom. It generally involves a leader or leaders with special expertise and participants who attend sessions at scheduled times - often after school, on the weekend, or during school holidays".

Workshops as the most popular way of teacher development in South Africa and internationally and are mostly criticized by most researchers as not working as they are commonly once-off or one-shot, a one-size-fits-all and with no follow up support (Bantwini, 2009; Bertram, 2011; Mokhele, 2013). These workshops are conducted outside the school in a venue where a number of teachers attend and a special person(s)

facilitates. Bertram (2011) suggests that for the workshops to be effective, the learning processes should be structured in a coherent series of learning experiences.

There is no exact time measurement for a workshop to be effective, but follow-ups in schools can make the workshop more effective. Mundry and Loucks-Horsley (2010, p. 3) states that, “Professional development that is sustained over time is more closely linked to improved student learning than short term, one time experiences... In addition, professional development activities that are of adequate duration are more likely to have other desirable features such as coherence, content focus, and active learning.”

The literature reviewed suggests that there should be school-based classroom support if teachers are to change practice. Once-off workshops without on-going support is criticized as not always producing effective changes in teacher knowledge or practice (Hooker, 2010; Mundry and Loucks-Horsley, 2010).

Teachers are expected to learn and implement what was taught at the workshop in their different schools, although research has proved that attending a workshop does not mean the teacher has learnt new knowledge and changed practice. In the South African context, PD models are initiated by the Department of Basic Education (DBE), universities, non-governmental organisations (NGO's) and government parastatals with the aim of equipping teachers with the necessary skills and knowledge to practice in their classrooms in order to produce the type of students that are envisaged by the department. Hence this study explores the knowledge and skills acquired by teachers who have attended the SANBI Life Science teacher development workshops and the effectiveness of those workshops.

An effective teacher professional development program changes teacher behaviour and student achievements; but it is not easy to measure the level of teacher change as it is measured by learner performance and it takes time to measure the learner improvement. More studies should be undertaken to empirically measure teacher change and learner achievement through teacher development models. Cooperative, learning centred and practice related programs are reported as having an important effect on teachers

internationally (Garet et al., 2001, Givvin and Santagata, 2011, Flint et al., 2011).

Teacher professional development models should provide educators with the opportunity to engage in, create, or find out approaches in context. A diversity of ways should be utilized that methodically support teachers to investigate and to be self-sufficient (Shezi, 2008).

2.6 Effective Teacher Professional Development Models

The purpose of a teacher development model is to change the teachers' knowledge base and pedagogical skills. According to education policy in South Africa, an effective teacher professional development program "succeeds best when teachers themselves are integrally involved, reflecting on their own practice, when there is a strong school-based component, when activities are well coordinated, and when employers provide sustained leadership and support"(DoE, 2007, p. 3).

Teacher professional development programs should differ from place to place in order to fit the particular teachers and contexts and to minimize the well known characteristic of onesize fits all (Flint et al., 2011). Teacher professional development "in science has been undergoing profound change from primarily 'one size fits all' workshops and field experiences to more ongoing subject- and need-focused programs, often situated in teachers' real work, such as through examining student work, reviewing and selecting instructional materials, developing exemplary lessons, and coaching and mentoring" (Mundry and Loucks-Horsley, 2010, p. 1). In South Africa there are teacher development programs that have adopted the style of being ongoing,: teachers examine learners' work as a cluster and design lessons to be implemented in different schools and report back. The Mpumalanga Secondary Science Initiative (MSSI) is one example (Mokhele, 2013).

Researchers like Desimone (2009) and Givven and Santagata (2011, p. 440) in collaboration with other organizations and writers, reached a consensus and developed seven core principles referred to as goals or characteristics, to guide an effective professional development program as described below:

2.6.1 Driven by a well-defined image of effective classroom learning and teaching

An effective teacher development program should incorporate the context and teachers should look at issues of content and pedagogy in the context of real classroom practice (Fraser et al., 2007, Wilson and Berne, 1998). A teacher development model needs to engage teachers in conceptual thinking activities for them to be able to design conceptual thinking activities and maintain the highest standard possible for the learners. Translate knowledge into practice that means conducting investigations using the knowledge gained during a learning activity the way they would want their learners to do (Desimone et al., 2002, Givven and Santagata 2011, Mundry and Loucks-Horsley, 2010).

2.6.2 Provides opportunities for teachers to build their content and pedagogical content knowledge and to examine practice

An effective professional development model should focus on improving teacher content knowledge and pedagogical content knowledge, as discussed earlier on. The two knowledge areas are intertwined and should be the central focus of a development program. (Givvin and Santagata , 2011; Mundry and Loucks-Horsley, 2010). PD models are aimed at increasing teacher content knowledge and skills, and change of attitude, change in practice and learner achievement (Guskey, 2002; Desimone, 2009).

2.6.3 Is research-based and engages teachers as adult learners in the learning approaches they will use with their students

An effective professional development program as described by Mundry and Loucks-Horsley (2010, p. 4) should be:

Learner-centred—built from where the learners (that is teachers in this case) are and supporting them to construct their understanding;

Knowledge-centred—emphasizing the content that is most important to know and understand;

Assessment-centred—using ample structures for ongoing assessment of learning and feedback, including self-assessment; and

Community-centred—providing frequent opportunities for interaction with others in the process of learning.

Another building block of active learning engages the chance to connect the ideas introduced throughout professional development experience to the teaching environment in which teachers practice (Garet et al., 2001, Givvin and Santagata, 2011).

2.6.4 Provides opportunities for teachers to collaborate with colleagues and other experts to improve their practice

Teachers participating in a particular program should also collaborate (join forces in working towards the same goal). Teacher collaboration should be in small-group settings – both across schools in the local district and within individual school sites (Fraser et al., 2007; Wilson and Berne, 1998; Garet et al., 2001; Givven and Santagata, 2011). Follow-up activities, typically in the form of long- term support, coach in teachers’ classrooms or continuous communications with fellow teachers, should be engaged (Flint et al., 2011).

2.6.5 Supports teachers to serve in leadership roles

Teachers participating in a development program should alternate being team leaders of their peers and interactional techniques (Fraser et al., 2007; Wilson and Berne, 1998). Garet et al (2001, p. 926) state that “professional development activities may also offer teachers the opportunity to give presentations, lead discussions, and produce written work. Active participation of this kind may improve outcomes by permitting teachers to delve more deeply into the substantive issues introduced”.

2.6.6 Links to other parts of the education system

PD should try its utmost to link with the other parts of the education system to avoid clashes with other departmental activities that require the same teachers at the same time as the PD activity (Givven and Santagata , 2011; Mundry and Loucks-Horsley, 2010). In the South African context the Department of Education consists of the national, provincial, district, circuits and schools, which means that PD program developers should constantly consult with the department structures to align their activities.

A PD programme should be consistent with the local policy, teachers' objectives and the state's standards (Mundry and Loucks-Horsley, 2010). "The process of aligning professional development with state and district standards and other policies can take a number of forms. For example, professional development activities can be chosen to reflect the topics emphasized in state and district standards. Or, professional development activities can focus on the goals for student learning emphasized in state assessments or the pedagogical methods emphasized in state curriculum framework" (Garet et al., 2001, p. 928). Teachers should be given direction about what to teach and how to teach it from several resources, like materials provided in formal professional development (Garet et al., 2001).

2.6.7 Has a design based on student learning data and is continuously evaluated and improved.

A professional development model should be continuously researched to address the teachers' self-identified needs for development (Garet et al., 2001; Flint et al., 2011). PD models should be guided by learner improvement achievements given by data analyses. Research has proven that these characteristics are not far from each other, which means that they are interconnected.

This study was guided by the above seven characteristics given by Givven and Santagata, for an effective development model in exploring the effectiveness of the SANBI workshops.

Research conducted over the past ten years, recommends that professional development with all or even the majority of the above-mentioned characteristics stands a better chance of influencing teachers positively in their practice and in improved learner achievement (Desimone et al., 2002). Teacher learning programs are measured through learner performance, which is a difficult exercise to administer since the measuring tool is not clear-cut (Adler and Reed, 2000). Bantwini (2009) argues that more research is needed to fix conclusively the effectiveness of the most-used teacher development models.

2.7 Complexity of Teacher Learning

Teacher learning aims at enhancing the teacher knowledge base, at teacher change, at better practice and at improved learner performance. Teacher learning happens in many different ways and contexts. Research has shown different approaches to teacher learning activities such as once-off to longer term engagements, to formal and informal learning activities in school or out of school.

Teacher learning activities are mostly criticized for being ineffective because of other dynamics that influence the learning in those activities conducted (Opfer and Pedder ;2011 Wilson and Berne, 1998). Research in South Africa has shown the truth of “The impact of teacher development initiatives on improving the overall quality of education in South Africa is not encouraging” (Bertram, 2011, p. 4). Teachers attend professional development activities that meet most of the characteristics of an effective and frequently modified teacher development model, but still do not learn or change as required (Opfer and Pedder, 2011; Mokhele, 2013).

Clarke and Hollingsworth (2002) argue that teacher professional development activities have not yet matched the complexity of the teacher development process. They note that there has been a shift in the way teacher change is understood from “earlier conceptions of change as something that is done to teachers (that is, change as an event with teachers as relatively passive participants), to change as a complex process that involves learning” (p. 948). Bertram (2011) argues that most teacher development initiatives do not lead to teacher learning and improved practice, because they lack the understanding of the required knowledge and how to acquire that knowledge. Teachers who have attended a teacher development activity that is well researched to meet the teachers’ needs are expected to change their knowledge, attitudes and beliefs and to change learner achievement. In reality this statement is just an assumption because a number of factors can snarl the change process, as the outcomes are detailed and complex (Guskey, 2002). Opfer and Pedder (2011) believe that teacher learning has to be conceptualized as a complex system rather than as an event.

2.8 Conclusion

Teacher professional development has gained priority in most countries in the world due to the huge focus on education reform. Most countries have allocated big budgets specifically for teacher development and the initiating of teacher development activities such as workshops, seminars, conferences and courses. In the South African context, the Department of Basic Education, universities, NGO's and government parastatals are the major players in initiating, designing and implementing professional development for teachers in the form of programs and models.

For teachers to be able to withstand the constant curriculum reforms and teacher change in requirements they need continuous professional development. The most popular and quickest teacher development activity is conducting a workshop where teachers would be afforded an opportunity to learn and gain the knowledge in order to be able to execute the change in their classrooms. However, this model may not be the most effective in supporting teacher learning. The aim of this study is to address the gap in South African literature on evaluating the knowledge and effectiveness of teacher development models in South Africa, with SANBI as a case study.

The next chapter will elaborate on the methodology and methods used in this study to explore the quality of the SANBI teacher development workshops.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter elaborates on the methodology and methods used in this study and the reasons for the choice of the methodology and methods used to explore the quality of the SANBI teacher development workshops conducted in Mpumalanga province. The choice of particular participants and issues of ethics and access will be dealt with in detail. Data verification processes and the study limitations will also be discussed.

3.2 Research Methodology

This study uses a qualitative approach. According to Maree (2012) a qualitative study aims to gather rich descriptive data in regard to a particular phenomenon or context in order to develop an understanding of what is being studied. A qualitative study is more concerned with understanding why people behave as they do and how they make meaning of their experiences, in this case the teachers that are participating in the SANBI workshops. Their knowledge, attitudes and beliefs, hence the choice to utilize a qualitative approach for this study to gather descriptive data on the knowledge and skills teachers learnt in the SANBI teacher development workshops. The qualitative approach allows the participants to provide in-depth data in answering the research questions and has enabled the researcher in this case to learn more about teacher attitudes and behavioral change after attending two consecutive SANBI workshops.

3.3 Research style

The style of research used is 'case study'. Rule and John (2011) define a case study as a methodical and profound investigation of a particular case in its normal setting for the purpose of generating knowledge within a restricted focused setting. According to Cohen et al. (2007) case studies are able to determine causes and effects in their real context. A

case study is an enquiry conducted for a particular audience to benefit and gain more understanding (Stake, 1978).

The case study method was chosen because of the manageability of scale and in-depth data that would be generated to address the researched phenomenon. According to Rule and John (2011) a case study investigates a problem or matter within a boundary focused situation. The case study approach was also suitable for me as it allowed me to focus my study at the SANBI workshops conducted in one district in my province. According to Cohen et al. (2007, p. 256) “a case study can be undertaken by a single researcher without needing a research team”. I am the only researcher in this study and this approach was suitable for my investigation.

The case in this study is SANBI workshops. The workshops are investigated in depth to explore the knowledge domains privileged in them. These workshops were observed to explore to what extent they reflected the characteristics of an effective professional development workshop in its real natural context and the effectiveness of the workshops was determined. The unit of analysis is the SANBI workshops.

As an organization, SANBI would benefit from the understanding of the effectiveness of the teacher development workshops conducted and the knowledge domains privileged by the workshops, as well as the teacher perspectives on the workshops.

3.4 Data Gathering Methods

According to Maree (2012) qualitative study tries to gather rich descriptive data in regard to a particular phenomenon or context in order to develop an understanding of what is being studied. A qualitative study is concerned with understanding how people make meaning of their experiences. In this case I wanted to explore the knowledge -- that is content knowledge and pedagogical content knowledge, from Shulman’s (1986) seven knowledge domains, attitudes and beliefs -- of the teachers who participated in the SANBI workshops. Ryan et al. (2007) point out that in a qualitative study, the researcher

chooses and follows any number of strategies when gathering data: in-depth interviews, observations, documentary analyses, photo voice, drawings and transect walk. For this investigation the data collection methods used were in-depth interviews and observations.

3.4.1 Interviews

As this study is a qualitative case study, interviews are an appropriate method of collecting data and answering the research questions. Open-ended interviews explore the participants' ideas, views, beliefs, attitudes and allow follow-up interviews to be conducted to gather rich and descriptive data (Cohen et al., 2007). Interviews in qualitative research are mostly broad ranging, probing issues in detail.

Data was collected through open-ended interviews to explore the participants' ideas, views, beliefs, attitudes to gather rich and descriptive data on the phenomenon. Four teachers were interviewed to describe in- depth what knowledge and skills they had learnt from attending the SANBI workshops and to explore the knowledge domains available in the workshops using Shulman's (1986) framework of teacher knowledge as described in the literature review.

According to Caughlan et al. (2007), researchers can design their own instruments for the study or choose to utilize pre-designed instruments. In this study, I designed my own interview schedule to gather data from face to face interviews with the four participants. The interview schedule is attached in Appendix A. The interviews were conducted individually in different venues. All four interviewees chose to be interviewed in the afternoon. Two participants were interviewed in a restaurant, one at his home and one at his school.

As a researcher and the department's official, I had to be cautious when posing questions in order for my participants not to be intimidated by my position. I made sure they understood the purpose of the research, the consent letter and that my work position would not interfere in my research. The fact that it was their first time to participate in a research project made it more challenging for me to make them comfortable and open up.

One participant worked far from home and used public transport getting home. With a very tight work schedule, scheduling time to interview him was a challenge as he kept on postponing our appointment but finally I interviewed him at his home on a Saturday.

3.4.2 Observations

Maree (2012) defines observation as an orderly procedure of recording the behavioural patterns of partakers, objects and incidences without conversation or questioning them. Maree further explains the benefit for the researcher when using observation as a data gathering method, as a method that permits the researcher to gain a clear understanding and perception of the phenomenon under observation. In this study the SANBI workshops were being observed to establish the effectiveness of the workshops, using the set of characteristics established from the literature.

Cohen et al. (2007) point out that observations are characterized by offering the researcher a chance to collect live data from normally happening social situations. In this study observations were conducted during the workshops' proceedings to establish the effectiveness of the workshops using Gavvin and Santagata's (2011) and other scholars' characteristics of an effective workshop as highlighted in the literature review.

Observations were also recorded using a video-recorder to collect live data to substantiate the field notes. Thus I could watch the recordings in order to analyse the effectiveness and the knowledge prevalent in the workshops. I used the strategy of the observer as non-participant to look for patterns of behaviour but not to interfere nor to influence the dynamics of the workshop. Maree (2012) puts it clearly that the observer needs to play a passive role and observe things as they unfold in their own natural way.

3.5 Research Participants

According to Cohen et al. (2007) the excellence of a study stands or collapses due to the appropriateness of the sampling tactics adopted by the researcher. As this study is qualitative, participants were few in number. Qualitative research is grounded on non-

probability and purposive sampling and also the researcher is not attempting to generalize the findings (Maree, 2012). Criterion sampling was used to find the appropriate participants to be used. They needed to possess the experience and knowledge of the SANBI workshops being studied and they also needed to be willing to participate. Therefore, four FET grade 10 and 11 Life Science teachers with 8 years or more of teaching experience who had attended two or more SANBI workshops participated in this study.

After the two workshops were conducted, the four participants volunteered to participate in my research project. Pseudonyms are used to make reference to them. All four were male teachers. Their teaching experience varied from nine to twenty-three years. Three of them had been teaching in their respective schools from five to twenty years. One had relocated to a new school and had only been there for a year. They had attended four or five SANBI workshops, starting a few years previously. They were all engaged in furthering their studies with different institutions. The objective of the interviews was to describe what knowledge and skills teachers say they acquire from attending SANBI teacher development workshops.

Table 1: Biographical details of the study participants

Participant	Gender	Years of teaching experience	Workshops attended	Grade teaching
Thabang	Male	16	5	11 & 12
Ade	Male	9	5	10 – 12
Mr. Croc	Male	23	4	10
Jabu	Male	17	5	11

3.6 Access and issues of ethics

I applied for ethical clearance from the University of KwaZulu-Natal Research Office (see Appendix 1). I sought permission from SANBI to conduct a study on their teacher professional development model and a consent form was signed by the authorities of the

organization. I sought permission also from the Department of Education through the district office where the SANBI workshops were conducted and the relevant school principals. I was well aware of my position of power as a district official so I declared my research status as a Masters student at UKZN and the research's intentions. I knew the participants and anonymity was impossible. I needed to assure the participants that their true identities would not be revealed when the study is published and nobody would gain access to the raw data that would have been produced during the study process.

Participants were well informed of the purpose of the study, what sort of information was required of the participants, how the information provided by the participants would be used and the implications for the participants as contributors to the study. Participants signed a consent form. This moral principle is called autonomy. Participants signed a consent form that explained clearly the conditions of participation. Any information the participant provided was treated as highly confidential and no other person was allowed access to it except for the study supervisor. Pseudonyms were used where necessary. The participants were free to terminate their participation if they felt uncomfortable at any time. Termination of participation would not have disadvantaged the participant in any way as participation was voluntary. Participation was in interviews and workshop proceeding observations which was recorded to collect data.

3.7 Data Verification

After completing the interviews, the transcripts were submitted to the participants for them to verify that what had been transcribed was what they had said. They were afforded an opportunity to correct any factual errors. Data interpretations and findings were taken back to the participants to check and to verify. A draft copy of the findings report was also handed over to the participants to read and provide written or verbal comments on it.

3.8 Data Analysis

In this study, interview data was transcribed verbatim in order to provide full information to the reader of the transcript on what transpired during the interviews.

Both interviews and observation data were analyzed by means of interpretations and coding. Interviews data was analyzed inductively, that is, codes were developed by myself as I studied the data directly and let the codes emerge from the data. I moved back and forth until no more new codes come out of the data source (the interview transcripts). The codes were then summarized, categorized and analyzed, and the emerging themes are presented.

Observation data was analyzed using a deductive approach, meaning using pre-created codes (criteria) derived from the research literature reviewed on effective teacher professional development models. This approach is described by Maree (2012, p. 107): “As you do literature review for your study, you may identify certain codes from other empirical studies dealing with your topic”. This study used Givvin and Santagata’s (2011) seven characteristics of an effective professional development program to analyze the observation data which states that an effective teacher development model:

- (1) is driven by a well-defined image of effective classroom learning and teaching;
- (2) provides opportunities for teachers to build their content and pedagogical content knowledge and to examine practice;
- (3) is research based and engages teachers as adult learners in the learning approaches they will use with their students;
- (4) provides opportunities for teachers to collaborate with colleagues and other experts to improve their practice;
- (5) supports teachers to serve in leadership roles;
- (6) links other parts of the education system; and
- (7) has a design based on student learning data and is continuously evaluated and improved.

To analyze the knowledge domains, content knowledge and pedagogical content knowledge are the main focus of the study. Findings and recommendations are presented in Chapter Six.

3.9 Limitations of the Study

This study was conducted during the third term of the academic year. That posed a challenge in scheduling the workshops for observation. The workshops were postponed several times due to the unavailability of teachers. Getting teachers to interviews was also challenging as teachers were busy with trial exams. Two of the participants were invigilators and markers of the Life Science subject and one was a head of department who was responsible for the smooth running of the exams.

3.10 Conclusion

In this chapter I presented in detail the research methodology and the various data collection methods which were applied to get the in-depth descriptions of the SANBI workshops. The selection of participants, access and issues of ethics, data verification and analyses and the limitations of the study were also described.

The findings of the study are presented and discussed in the next chapter.

CHAPTER FOUR: WORKSHOP OBSERVATIONS

4.1 Introduction

This chapter presents the findings of the data gathered to answer the first two research questions which are:

1. What teacher knowledge domains are privileged in the workshops?
2. To what extent do the workshops reflect the characteristics of effective professional development workshops?

For this study, data was collected through workshop observations and interviews, so data presentation has been organised into two chapters. Firstly, this chapter will describe in detail the workshop observations. Secondly, in the next chapter, Chapter Five, the interviews will be described, interpreted and presented using themes to answer the third research question.

In order to analyze the workshops, this study has used two of the knowledge domains as described by Shulman (1986) -- content knowledge and pedagogical content knowledge - as well as the seven characteristics of effective teacher development workshops identified by Givven and Santagata (2011) and others.

The SANBI workshops were conducted in one of the districts in Mpumalanga province. The district is a combination of urban, semi-urban, rural, semi-rural and deep rural areas. The district consists of fourteen circuits with a total of approximately 136 secondary schools. The circuits are clustered into three sub-districts. The workshops were conducted at two different venues, on two different days.

4.2 Description of Workshop 1

The first workshop was conducted in an Education Development Centre (EDC). Attendees were from one and a half sub-districts consisting of eight circuits and approximately 70 secondary schools. Some of the Life Science teachers were responsible for more than one grade. All Life Science teachers from all the eight circuits had been invited to the workshop. Some of the teachers were also teaching Natural Science in grades eight and nine since those grades are in secondary schools.

The majority of the schools were very far apart and the EDC was quite a distance from most of the schools. The workshop was scheduled for 13h00 but started a bit late at 13h15. because teachers had a long way to travel to the workshop venue. They arrived even later and were coming in until around 14h00. The workshop was conducted during the month of September when teachers were responsible for trial exams which also contributed to their late arrival. A total number of 95 teachers attended the workshop and the venue was packed to capacity. Teachers were seated in rows as it was the only way to accommodate all of them.

Two facilitators conducted the workshop, a female senior facilitator and a male junior facilitator. The senior facilitator was an assistant director. She was responsible for the centre and its programs in Mpumalanga. She had a Masters degree in Environmental Management. She had been with SANBI for more than a decade, work-shopping teachers, taking teachers and learners for excursions in the centre's garden and developing learning materials for the centre. She was responsible for the staff, including the interns who come and go in the centre, and for the students who come for practice and research.

The junior facilitator had ample experience in Environmental Education. He had a Senior Certificate and was still studying towards an Environmental Education Diploma. He had been at the centre since 2011 and was responsible for teachers and learners workshop facilitation. Learners also visit the centre for their projects and programs, and he and the woman junior facilitator facilitate in the centre's garden. They take teachers and learners

on field trips in the garden conducting Biodiversity learning. The centre had developed its own particular program for the year. The centre is Natural Science and Life Science based. It is a learning centre where both teachers and learners can do their projects.

4.2.1 Activities

The senior facilitator introduced herself and the junior facilitator and explained the purpose of the workshop. The theme of the workshop was ‘Biomes and Biodiversity’. The purpose of the workshop was to give teachers information on Biomes as the centre was then running a program on Biomes for teachers and learners, based on an agreement between the Department of Basic Education Mpumalanga and SANBI. She appreciated the partnership and good relationship between the two organizations. One Life Science Curriculum Implementer (CI) (as they are known in Mpumalanga and called Subject Advisors in other provinces) attended the workshop. Teachers have been welcome to visit on their own as individuals or can bring their learners for practical activities.

The facilitator said that the workshop was an interactive, participatory workshop where both teachers and facilitators learn from each other. SANBI appreciated the comments and feedback from teachers to enable SANBI to improve on implementation strategies and to update learning materials used in the centre.

She then handed over to the junior facilitator. Four activities were conducted in a period of two and a half hours. The theme was ‘South African Biomes and Biodiversity’ and was in line with CAPS Life Science Strand number three which is Environmental Studies. According to the Life Science subject framework and works schedule, ‘Biomes and the Ecosystem’ is one of the Environmental Studies topics. Teachers were already teaching this topic and had knowledge of the content, but were expecting to learn more as required by the curriculum.

There are **three** broad subject-specific aims in Life Sciences which relate to the purposes of learning science. These are:

1. Specific Aim 1, which relates to knowing the subject content (‘theory’);

2. Specific Aim 2, which relates to doing science or practical work and investigations;
and
3. Specific Aim 3, which relates to understanding the applications of Life Sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science. (DBE, 2011, p. 13)

At 13h20 the first activity started. The junior facilitator did a PowerPoint presentation on biomes: the different types of biomes, their categories and threats. He was talking through the slides and did not pose any question to the teachers until the last slide. As argued by Shulman (1987, p. 18) that ‘Good lecturing is an indispensable teaching technique’. Some teachers were taking notes while others were just listening. The activity was conducted within twenty minutes and the facilitator then requested the teachers to group themselves according to their clusters for the second activity. In the South African context a cluster is a group of teachers from different schools in an area coming together to discuss and reflect on their practice. A cluster is an example of Professional Learning Communities model. “PLC is a model in which teachers work together and engage in continual dialogue to examine their practice and student performance and to develop and implement more effective instructional practices.” (Thaver, 2011, p. 26). As was explained under the school based professional development model in the literature review, this model will not be further engaged with because it is not the focus of this study.

Teachers started to move tables and chairs to form the groups and it was difficult as there was not enough space to move and the movement caused a lot of noise. Teachers were moving from one end to the next looking for their respective clusters. Seven groups were formed for the next activity.

For the second activity the facilitators distributed question papers on biomes for discussion and responses were to have been written on flipcharts that they provided for the teachers.

Questionnaire activity on biomes

The following questions were to have been answered by the teachers.

1. *Which is the most biologically diverse biome between the forest and the fynbos biome and give reason for your answer?*
2. *Compare the rainfall of the three biomes that we talked about in the power point presentation and explain what it tells us about the climate conditions of these biomes.*
3. *Discuss and list things that you can do to prevent threats to these biomes*
4. *What problems will a coffee tree have if you plant it in an artificial forest that is established in a savannah area (remember a coffee tree is indigenous to the tropical rain forest)?*
5. *Choose two biomes and list the characteristics of both biomes and compare them.*

The senior facilitator gave instructions that the responses should be written and ready to be presented in front of the others by the respective spokespersons within fifteen minutes. Some teachers were using their own various textbooks they had brought along to the workshop, to respond to the questions; some were using their subject knowledge as they had not brought along any textbook as well as the knowledge from the power point presentation. Other teachers seated at the end of the group table had to stand up to be able to see and participate in their group discussions as the groups were too big.

The facilitators were moving around assisting the groups with clarification on the questions and greeting those they had known before. After twenty minutes, the junior facilitator requested the teachers to be ready to start presenting their answers to everybody. The facilitator went to group six, took their flipchart and pasted it on the board. The teacher-presenter stood in front for about two minutes waiting for the facilitator to let him start presenting, as other groups were still writing. The first two groups presented using the question paper to read the questions and to give answers reading from the flipchart prepared by their respective groups. After the speaker had finished presenting the answers in front, teachers were given an opportunity to comment or ask questions, but there were no comments and no questions asked because all the groups were doing the same activity resulting in the same answers for all the groups.

There was a short debate whether to continue presenting as the answers were all the same and the time was too short to conduct the three set activities. All groups wanted to present because of the time and effort given in preparing the presentations, but only four groups ended up presenting because of the time constraint. Teachers engaged with the activity, they discussed and used different textbooks to draw conclusions and wrote down answers using their flipcharts. They used different styles to write answers (columns and tables) and different times were taken to complete the task. All groups finished the task. Teachers discussed the content and comparing information from different textbooks. After eleven minutes, the presentations stopped and the senior facilitator explained the next activity.

For the third activity the teachers had to move outside, maintain their groups and do a practical activity which was also conducted by the junior facilitator. Facilitators gave them Enviro Teach magazines (for use in their schools as well) and worksheets to utilize for the activity to be conducted outside. Outside, the teachers were given a rope and a measuring tape which they shared among the groups, to measure the perimeters they were going to use to actually look for the different plant species. Each group had to choose a spot to measure and had to use the worksheet to calculate the different plant species found in that particular spot. The activity was called 'Expanding Quadrants' and the information was as follows:

Practical Activity: Expanding Quadrants

***Quadrant:** A basic sampling unit of vegetation surveys e.g. traditionally 1m² quadrants were used to sample non-woody communities. More recently circular and rectangular quadrants have been used as well as squares of all sizes. Quadrants are normally selected at random and are regarded as typical of the surrounding area.*

***Purpose:** To determine the correct quadrant size for a specific vegetation type.*

***Method:** Begin with a small quadrant e.g. 0,5m x 0,5m and count the number of different plant species. Expand the quadrant to 1m x 1m and now count the number of different*

plant species. Expand the quadrant to 1.5m x 1.5m and so on. When expanding the quadrant and result in no new species, then you know you have the correct quadrant size.

Field study: Determine the correct size of the quadrant for vegetation studies in grassland.

Complete the table below for the grassland:

<i>Quadrant dimensions</i>	<i>Quadrant size (m²)</i>	<i>Number of different plant species</i>
0.5m x 0.5m		
1.0m x 1.0m		
1.5m x 1.5m		
2.0m x 2.0m		
2.5m x 2.5m		
3.0m x 3.0m		

Take Away Task:

Use the graph paper and plot the number of different plant species (y-axis dependent variables) against the quadrant size (x-axis, independent variables).

How can you determine from the graph what the correct quadrant size is?

The participants grouped themselves into three large groups of more or less twenty five each. The facilitator explained the activity but the teachers did not understand exactly what they had to do. One teacher suggested that because of the time constraint, the ones that were doing the activity for the second time or more, might lead the others.

About twelve teachers were not participating and were standing away from the groups and about fifteen of them were even standing under the veranda as it was too hot to be outside. The Curriculum Implementer (Subject Advisor) corrected the situation by calling those teachers under the veranda and told them to participate in the activity. In that way,

every teacher joined a group and participated either by doing the measurements or identifying the species in the quadrants. All teachers were then engaged in the activity.

The two facilitators were moving around the groups explaining further how the teachers were supposed to be doing the activity. The Curriculum Implementer also helped explain the activity. The aim of the activity was to introduce teachers to how to conduct a practical activity using nature as a resource. The worksheet was also suitable for learners so teachers had been given as a resource for their learners. The activity took twenty minutes and the teachers moved back into the room to consolidate their findings.

The junior facilitator consolidated the findings from the practical activity outside. The findings were represented using a bar graph the facilitator drew on the board. This activity was part of the Life Science curriculum but the facilitator did it in a different way. Teachers were used to the method of moving a one size quadrant and sampling from different parts of an area and calculating the average number of species found. To expand the quadrant was a new method of calculating the number of different species in an area.

According to the program of the day, 'Careers on Biodiversity' was to have been the next activity. but due to the time factor it was scheduled for the next workshop and teachers would be utilizing the EnviroTeach magazine as a resource to teach careers and opportunities in the environment sector. It is a teacher's guide with classroom activities. A teacher who was said to be the organizer of the venue proposed a vote of thanks and handed over to the senior facilitator. The senior facilitator closed the workshop by thanking everybody present and promised to plan for many workshops in the following year as it was the third term and no workshops would be conducted during the fourth term. No workshop evaluation was done and everybody departed.

The table below summarizes the activities of Workshop 1.

Table 2: Summary of activities of Workshop 1

Activity	Participants	Description	Duration
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1. Introduction	Facilitator	Facilitator introduced the purpose of the workshop	10 minutes
2. Power point presentation	Facilitator	Facilitator went through the slides	22 minutes
3. Grouping	Facilitator	Participants divided according to clusters	5 minutes
4. Discussions and presentations	Facilitators and teachers	Teachers answered the question paper using flipcharts and presented their answers	35 minutes
5. Outdoor Activity	Facilitator and teachers	Teachers went out, formed 3 groups and measured the quadrants using the activity sheet to record their findings	35 minutes
6. Workshop consolidation	Facilitators	Junior facilitator drew a bar graph on the board to represent the findings of the 3 groups and senior facilitator handed out CDs and Enviro-teach magazines to teachers, thanked everybody present and closed the workshop	13 minutes
Total minutes			120 minutes

4.3 Description of Workshop 2

The second workshop was conducted at the SANBI premises. The workshop consisted of teachers from one and a half sub-districts consisting of six circuits with approximately 66 secondary schools. The district is vast. It is comprised of fourteen circuits and getting all teachers of the district to one venue was impossible. The workshops were divided into two on two different sides of the district on two different days, so that every teacher could access the nearest venue. So the two workshops were attended by two different groups of teachers. Life Science teachers from all the six circuits were invited the same way as for the first workshop. Attendance was very good as 83 teachers attended the workshop in spite of the long distances they had to travel because of the vast area where they came from..

Teachers arrived from 13h00 onwards. Tables were arranged in rows due to the high number of teachers in attendance and the venue was congested. The facilitators were busy putting materials to be used in front of every chair when the teachers started streaming in.

The attendance register was on the table next to the entrance for teachers to register themselves before sitting down. The attendance register started circulating when the workshop started and everybody was seated. The workshop was scheduled for 13h00 but was delayed and started at 13h15 while teachers were still coming in.

4.3.1 Activities

The senior facilitator welcomed the teachers and introduced the two junior facilitators (a female and a male). The two junior facilitators were responsible for conducting workshops for teachers and learners coming to visit the centre. The junior female facilitator had four years experience. She was an Environmental Officer in a permanent position at the centre. She held a degree in Environmental Science and had ample Environmental Education experience. She had not attended the first workshop at the Education Development Centre the previous day.

The senior facilitator explained the abbreviation ‘SANBI’ and the activities that take place at the centre and the purpose of the workshop -- as described in the first workshop observation. The senior facilitator took six minutes and then handed over to the junior female facilitator to facilitate the first activity while the senior facilitator was busy burning CDs to be given to cluster leaders. Cluster leaders were to use those CDs to provide feedback and recommendations on them to the centre. The cluster leaders were also expected to burn more CDs and give them to other teachers. The aim was for every teacher to have the CD and use it, even those that did not attend the workshops. They were to discuss about the activities and compile a report back during their cluster meetings. The Curriculum Implementer and the cluster leaders were the ones responsible for bringing the reports to the centre. The CDs contained the biomes presentation slides which the facilitators were going through for the workshop, slides on Biodiversity Careers, Biodiversity presentation slides, a Life Science worksheet, the Life Science Memorandum, programs for 2013, a school bookings information sheet and a school registration form for visitation. The two presentations were specifically for grade 10 Life Science learners and the rest could be used if suitable for that grade. More teachers were still joining the workshop until around 2 o'clock.

The theme of the workshop was also 'Biomes and Biodiversity'. She made a presentation using PowerPoint. The same slides were used as at the first workshop but she used her own methods of lecturing that were different from the facilitator in workshop 1. She engaged teachers through questions and answers. She asked teachers to explain the 'Biodiversity' concept, the types of biotic in Mpumalanga and the classified biomes. Most teachers were busy taking notes and not responding to the questions asked by the facilitator. During her presentation, teachers were busy signing the attendance register which was given to them by the other junior facilitator and some teachers lost concentration on the presentation and became more interested in signing the attendance register.

Teachers were reluctantly participating in answering questions at first, with only the ten teachers in the front row participating actively, but gradually teachers from all sides of the room started to actively engage in answering the questions. More teachers were coming in and the sitting space was a problem. The room became too congested and there were no more tables available for the teachers to write on. Others were seated in the passageway.

The facilitator introduced another topic: 'Grasslands'. She also asked clarity-seeking questions. The ones in front were participating actively but most were quiet, with some talking to each other or greeting each other.

The facilitator introduced the third topic: 'Fauna and flora' and dealt more on forests. She talked through the slides and teachers were listening and taking notes. She then asked short questions and the teachers chorused the answers because what was asked was what the teachers themselves asked their learners (this is not a new topic). It was difficult for those teachers seated in the corridor next to the door to actively participate in the activity because it was hard to communicate with the facilitator as she was too far away. They were moving in and out of the room. The first lecture was conducted for forty minutes

and the junior female facilitator then handed over to the junior male to facilitate the second and the third activities.

For the second activity teachers were grouped according to their clusters which resulted in six groups of more or less twelve teachers. They were given an activity sheet, the same as in the previous workshop, to work with and they also wrote their responses on flipcharts which were to be presented by the spokesperson from each group. They complained about the congestion and it was difficult for some to participate or even hear what was being discussed as the groups were too big. The teachers took twenty minutes to finish preparing their presentations and started presenting. Five presenters presented without any questions or comments from the teachers. The facilitator asked if everybody had been satisfied about the answers because she had been satisfied that all the answers were correct. The last presenter was stopped while presenting because a teacher put forward a suggestion of how the presentations could be carried out. He suggested that groups should be given different worksheets to cover more knowledge and to avoid the monotony of everybody presenting the same answers. The suggestion was accepted by the facilitators and they promised to take that route when conducting future workshops. All six groups presented within twenty two minutes. One teacher was concerned about the content knowledge of the workshop not being enough and that more research needed to have been done on the topics provided.

For the third and last activity, teachers went outside to do the activity practically. The male facilitator gave instructions and the teachers complained about there not being enough worksheets and about not understanding the facilitator's instructions. He tried his best to clarify. They did the activity in a hurry as it was already late and they still had to travel long distances. They finished the activity in fifteen minutes and went back into the workshop room. Due to time constraints, there was no consolidation made.

The senior facilitator thanked everybody present and said the presence of the Life Science Curriculum Implementer had been highly appreciated by SANBI. Teachers were promised that more workshops would be conducted but only during the following year,

since it was then towards the end of the third term and no workshops were to be conducted during the fourth term because teachers would be preparing learners for the final examinations. The workshop was officially closed as the teachers had already received their hand-outs which were the same as at the previous workshop. The teachers hurried out of the room, no workshop evaluation was done and no walk away task was given.

The table below summarises the activities in Workshop 2.

Table 3: Summary of activities in Workshop 2

Activity	Participants	Description	Duration
1.Introduction	Facilitator	Facilitator introduced the purpose of the workshop	6 minutes
2.Power point Presentation	Facilitator	Facilitator went through the slides	40 minutes
3. Grouping	Facilitator	Teachers divided according to clusters	5 minutes
4.Discussions and presentations	Facilitators and teachers	Teachers answered the question paper using flipcharts and presented their answers	52 minutes
5. Outdoor Activity	Facilitator and teachers	Teachers went out, formed 3 groups and measured the quadrants using the activity sheet to record their findings	20 minutes
6.Workshop Consolidation	Facilitators	Senior facilitator handed out CDs and EnviroTeach magazines to teachers, thanked everybody present and closed the workshop	8 minutes
Total minutes			131 minutes

4.4 Analysis of the workshops using Givvin and Santagata's indicators

The observed workshops are analyzed deductively using composite criteria from Givvin and Santagata; Desimone; and supported by other researchers like Flint et al., Mundry and Loucks-Horsley, Fraser et al. and Wilson and Berne. The two workshops were conducted in two different venues and attended by two different groups of teachers. The two junior facilitators at each workshop conducted the workshops differently although

they used the same materials. Observation data from both workshops has been used to answer the following research question:

To what extent do the workshops reflect the characteristics of an effective professional development workshop?

4.4.1 Driven by a well-defined image of effective classroom learning and teaching

The workshops conducted by SANBI for Life Science grade 10 and 11 teachers were observed to determine whether the workshop design had been driven by an image of effective classroom practice. It was assumed that the strategies used by the facilitators were the ones to be used by the teachers in their classrooms when conducting a lesson with their learners. Thus the image of an effective classroom that was portrayed by the workshop design was that the teacher would explain new concepts to the learners who would then work on practical tasks to apply these new ideas. The slide presentation was a model of a lesson plan that could be conducted in the classroom either using the same slides or teachers designing their own slides. The facilitators conducted the workshop activities the same way teachers would do with their learners. Teachers should have been engaged in conceptual thinking as mentioned in the literature review, and the workshops were rich in scientific concepts that the teachers were exposed to.

The workshops were conducted within the teachers' geographical area so that would have made it simpler for them to adapt the activities at their own schools, as this criterion says. Questions were asked by the facilitator during her facilitation and, teachers clarified concepts, gave examples and debated answers using various textbooks and even using Google (internet) to find recent information on their cell phones. Doing the practical quadrant activity (as shown on pages 42 and 43) outside gave the teachers an opportunity to translate the knowledge they had gained during the slide presentation and discussions, and to translate their prior knowledge, into practice. The workshop design assumed that teachers would offer this same activity to their own learners.

Standing in front of the others and presenting their group answers gives the teachers more confidence to stand in front of their own learners and believe in themselves to teach their

learners. It is a lesson demonstration, as they should manage their audience the same way that they manage learners in class. The facilitators required the teachers to answer questions orally and in writing, in order to ascertain their understanding.

4.4.2 Provides opportunities for teachers to build their content and pedagogical content knowledge and to examine practice critically

Content and pedagogical content are intertwined, so the SANBI workshops should have afforded the teachers the opportunity to engage with both in a real classroom context. The workshops were not conducted in a real classroom but in a venue out of school. All Life Science teachers were invited to the workshops regardless of their level of content knowledge (novice, experienced) and regardless of the grade level taught. Therefore some were seated quietly and not participating because the knowledge did not concern them since they are not teaching grade 10 Life Science. Out of the 173 teachers who attended the workshops, 140 of them were teaching grade 10 and 33 were not teaching grade 10 -- but the latter did find an opportunity to help the other teachers.

PD models are aimed at increasing teacher content knowledge, skills and at changing attitude, changing practice and at learner achievement. The aim of the SANBI workshops was to provide teachers with content and pedagogical content knowledge, although the facilitators were not trained as professional teachers. Some experienced teachers did not gain any new knowledge as they had been teaching for a long time and also because they had been trained to teach Life Science and had a good knowledge of the subject. They used various textbooks and their prior knowledge from universities and colleges.

However, they gained pedagogical content knowledge as the use of the technology by SANBI facilitators in producing the presentation slides was new and appealing to them. The slides changed the same topic they used in their teaching into a new approach that could be adopted and could yield a better understanding of biomes in this case, since they had information and pictures to prove or represent the concepts. It would be an easy and interesting method of designing and presenting a lesson that would assist students to deepen their understanding of biomes and the scientific concepts around the topic, if teachers were able to put them into practice for their learners. There were not many

novice teachers at the workshop; they were about 10 percent of the attendees. They were the ones taking notes the most, listening to others and writing groups responses on the flipcharts. The novice teachers gained content knowledge since they were still new in the field and had not yet used as many textbooks as the experienced ones. They also needed experience in pedagogical content knowledge to get a balance between theory and practice. They were still in the process of building their instructional strategies.

The activity of the expanded quadrant was also a new skill to calculate the number of different species in an area. It was assumed that teachers would be able to adapt the knowledge to the context of a real classroom, since there would be no follow-ups on their implementation. The workshops were not directed towards achieving any special knowledge or skill on biomes, so it was a combination of new content knowledge for some teachers and new teaching strategies for some, like conducting practical activities and implementing classroom management. The teachers' behaviour during the activities was how learners behave in class, so teachers learned how to manage a classroom when conducting an activity. Teachers thought of their own practices and many got confused when they had to do the expanded quadrant because they did not read the instructions with understanding. This activity drew them to the reading of instructions and not just taking an activity at face value before attempting it. They knew about quadrants but they were supposed to apply a different method of conducting quadrants in the workshop.

4.4.3 Is research based and engages teachers as adult learners in the learning approaches they will use with their students

An effective professional development program as described by Mundry and Loucks-Horsley (2010, p. 4) should be:

Learner-centred—built from where the learners are and support them to construct their understanding. The teachers completed tasks as they would require their learners to do in class. In the workshops, the teachers answered a question paper using flipcharts to write down their answers. They did an investigating activity of the different plant species in an expanding quadrant. The instructions for the expanded quadrant were a challenge to understand as it was the first time for them to be conducting an investigation using an

expanding quadrant. They were used to making a number of one size quadrants in an area and then calculating the average number of species found in that area.

Knowledge-centered—emphasizing the content that is most important to know and understand. According to this statement the PD program should investigate the level of the teachers' knowledge to be able to start where teachers are and build from there. The workshop content was not chosen by the teachers themselves and it was the first time that SANBI had conducted a workshop on biomes and with these particular teachers. So to know the level of their content knowledge was impossible. The majority of the teachers were highly experienced and that posed a challenge to the facilitators in identifying exactly the level of teacher knowledge. But the facilitators used questions and answers to at least identify how to direct the workshops presentations and what to emphasize.

Assessment-centred—using ample structures for the ongoing assessment of learning and feedback, including self-assessment. Teachers were asked oral questions to clarify concepts, and to name and differentiate the South African biomes and Mpumalanga biomes. They were also given an activity to discuss biomes, to write down answers and to present the answers to everybody.

Community-centred—providing frequent opportunities for interaction with others in the process of learning. During the workshops teachers were grouped according to their district clusters to work on activities and to provide opportunities for further interactions even after the workshops. Their cluster leaders were given CDs containing all the slide show presentations to be utilized at their cluster meetings and to help them to discuss how best they could adapt the information and strategies provided to their own contexts.

4.4.4 Provides opportunities for teachers to collaborate with colleagues and other experts to improve their practice

The interpretation of this principle is that teachers should collaborate in small groups within the same school, area or district and involve experts to facilitate their progress. Teacher collaboration opportunities are the responsibility of the schools' management teams and of the district, and this is a continuous effort and not a once off activity (Mundry and Loucks-Horsley, 2010). During the workshops, teachers were grouped according to their clusters to discuss and answer the question paper on biomes. The

groups were big. With SANBI workshops it has been assumed that teachers would collaborate after attending, so they were given CDs containing biome information in order to share ideas, content and teaching strategies in their respective clusters and with their colleagues. During the workshops teachers collaborated but the time was too limited to engage in intensive collaboration. Cluster leaders and Curriculum Implementers are their experts to assist facilitation of their cluster meetings where they collaborate with one another in a group.

4.4.5 Supports teachers to serve in leadership roles

SANBI is a parastatal organization and is not involved in the day to day running of the schools and the curriculum. Supporting teachers to serve in leadership roles is impossible and could not even be attempted as it would definitely tamper with the DBE's organization of the different schools. During the SANBI workshops, teachers were offered opportunities to lead discussions when responding to the tasks as they were to discuss and answer questions. All the groups had leaders leading the discussions and produced written work. Other teachers were chosen by their groups to present their groups' responses. The workshop time was too short to allow teachers to alternate in leadership roles.

4.4.6 Links with other parts of the education system

PD should try its utmost to link with the other parts of the education system to avoid clashes with other departmental activities that require the same teachers at the same time as the PD activity. SANBI workshops were conducted during the Matric trial exams and that posed a challenge to the teachers attending the workshops. Most of them arrived late as they were also responsible for invigilation and overseeing the smooth running of the exams. The workshops were not well aligned with the schools' time tables with the result that the same teachers were needed for the workshops and trial exams.

The workshops content was 'biomes' and it was in line with CAPS Environmental Studies strand for the third term, it would have been better if the teachers had attended the workshops during the second term so that they could have planned for the third term

teaching. The biomes knowledge and skills gained from the workshops would have been shelved for the following year as the term was already towards the end and the workshops had taken place past the work schedule for the term.

4.4.7 Has a design based on student learning data and is continuously evaluated and improved

A professional development model should be continuously researched to address the teachers self-identified needs for development. Teachers were not afforded an opportunity to comment on the workshops at the end but were to report back on their implementation after attending the workshops. However, there was no direction on how to report back. Since it was the first time for SANBI to be conducting workshops on biomes, teachers were given CDs containing the slide presentation that had been used for the workshops, to utilize in their cluster meetings and at their schools and that were free to make recommendations. This topic had been discussed and chosen by the Curriculum Implementer (Subject Advisor) and I assumed there had been a need for student learning improvement within the district, although it was not directly discussed during the workshops. I also assumed that the Curriculum Implementer would have been responsible for the report back, as he had attended both workshops. One of SANBI's objectives has been to get constant feedback from teachers in order to update the activities conducted and resources used.

4.5 The knowledge domains privileged in the workshops

Shulman's (1986) teacher knowledge domain of content knowledge and pedagogical content knowledge are used to determine the knowledge domains privileged in the workshops, responding to the following research question:

What teacher knowledge domains are privileged in the workshops?

According to the data collected, the workshops focused mainly on subject content knowledge and pedagogical content knowledge. As the two are intertwined one cannot

occur without the other. Tables 4 and 5 below show that there was more focus on content knowledge as more time was spent on it, with while pedagogical content knowledge which was used to convey the subject content knowledge, had less time spent on it.

It was not possible to ascertain if the teachers already knew the content knowledge that was taught, and thus if it had been a useful focus for these teachers. It appears that SANBI workshops have fulfilled SANBI’s mandate to provide teachers with CK and PCK when attending their workshops, however it is not possible to judge whether teachers would be able to apply this new knowledge in their own classrooms.

Table 4: Professional development activities and knowledge domains in Workshop 1

Activity and knowledge domains	Participants	Topic	Description	Duration
Slide presentation <i>Knowledge domain: content knowledge</i>	Facilitator	Biomes	Explaining the concept ‘biome’. Classification of biomes i.e. aquatic and terrestrial. Benefits of biomes. Threats to biomes.	Minutes 10 minutes 3 minutes 5 minutes
Grouping	Facilitator		Teachers divided according to clusters.	5 minutes
Discussions <i>Knowledge domain: content knowledge</i>	Facilitator and participants	Question paper	Teachers answered the question paper using flipcharts.	20 minutes
Presentations <i>Knowledge domain: content knowledge</i>	Participants		Groups’ representatives presented their answers.	15 minutes
Outdoor Activity <i>Knowledge domain: content knowledge and pedagogical content knowledge</i>	Facilitators and participants	Expanding Quadrants	Teachers moved outside. Facilitator grouped teachers into 3 groups, gave instructions and they started doing the quadrants and recording the number of different plant species in a quadrant. Teachers move back in	5 minutes 25 minutes 5 minutes

<i>content knowledge</i>			started doing the quadrants and recording the number of different plant species in a quadrant. Teachers moved back in.	5 minutes
Consolidating the workshop	Facilitator	Drawing a graph	Facilitator was supposed to draw a graph to represent the species found in the quadrant, but did not.	
Materials hand out	Facilitator	CDs and teacher magazines	Cluster leaders were given CDs and each teacher received EnviroTeach magazine. End of workshop.	5 minutes
Total minutes				120 minutes

4.6 Conclusion

This chapter has presented and analysed the workshop data. This chapter has taken the reader through the workshops observations. The main focus of the workshops was to develop teachers' content knowledge and pedagogical content knowledge. These two knowledge domains were privileged in those workshops as identified by Givvin and Santagata (2011) as characteristics of an effective workshop. There are two characteristics, namely having a design based on student learning data and being continuously evaluated and improved and, secondly, linking with other parts of the education system, were not met by the SANBI teacher development workshops. Supporting teachers to serve in leadership roles and opportunities for teachers to collaborate with colleagues and other experts to improve their practice are two characteristics that were partially met in those workshops. The criterion of having a well-defined image of an effective classroom learning and teaching was well covered because the facilitators conducted the workshops activities the same way teachers would do with their learners.

The following chapter will present the findings and analysis of the interview data.

CHAPTER FIVE: TEACHERS' VOICES

5.1 Introduction

In South Africa the curriculum has recently undergone reformation and teachers should be able to meet the new standards set by the state. The Life Science teachers attend different professional development activities with an aim to better their subject knowledge and teaching strategies to carry out the demands of the reformed curriculum. “To carry out the demands of education reform, teachers must be immersed in the subjects they teach, and have the ability both to communicate basic knowledge and to develop advanced thinking and problem-solving skills among their students” (Garet et al., 2001, p. 916).

SANBI is one of the government parastatals who initiate teacher development activities. Teachers attend workshops and field trips in the biodiversity garden. This study investigated what teachers say they have learnt in those workshops. Data was generated from interviewing four teachers who attended one of the two SANBI workshops conducted in two different venues consecutively in one of the districts of Mpumalanga Province. Four male teachers participated in this study. Their teaching experience varies from nine to twenty-three years. They have been teaching in one school from five to twenty years. They have attended more than five SANBI workshops, starting a few years ago. They are all engaged in furthering their studies with different institutions.

The objective of the interviews is to answer research question three which says:

What knowledge and skills do teachers say that they have learnt from SANBI workshops?

To answer this third research question, interviews were conducted to find out what knowledge and skills teachers say they have learnt from attending those workshops. Four

teachers participated as interviewees. They have attended one of the two workshops conducted by SANBI as described in the previous chapter.

The four teachers interviewed are well experienced and qualified as Life Science teachers. When attending a workshop they bring in their prior knowledge and expectations. They tend to look at every step of the workshop according to what they expect to gain from the workshop and also are motivated to attend because of wanting their needs to be met. The interviewed teachers voiced their different expectations and what they have learnt during the SANBI workshops. Their perceptions are first described per teacher, and then themes are drawn out of the data.

5.2 Thabang – an experienced Life Science teacher

Thabang was a male teacher in a semi-rural area. His school had a large number of learners and teachers. He had been teaching at this school since the year 2000. He had been teaching grades 11 and 12 since he started teaching sixteen years ago. He has only taught in two schools. He had a Secondary Teacher Diploma and an ACE certificate. Thabang was also a Life Science cluster leader for the district so he was responsible for all the FET grades in Life Science. As an experienced teacher he said he had this to say:

I, for one, the workshops that have been conducted within SANBI, I can say in relation to the current grades that I'm teaching the focus was more on grade 10 work. I can say nothing new that I expected to learn especially in terms of content knowledge and the fact that I am a cluster leader for the district and I am teaching grade 11 and 12.

Thabang's expectations were obviously not met as the workshops, according to him, were irrelevant to what he was teaching in grades 11 and 12. Although, as a cluster leader, he was concerned about what other teachers needed to know (content and pedagogical content knowledge) -- probably a gap he had identified during their cluster meetings. He said that: *"In terms of teaching strategies I expected to see more practical activities that will help teachers to make their lessons more learner- centred."* The curriculum is

always changing, so that is a challenge to Thabang in terms of what exactly to expect from the workshops. He expected to find something that would have maybe surprised him. *“Since this curriculum is continuously changing, we are dealing with the new CAPS now one is not quite sure what to expect, you may be surprised”*

Novice teachers were his concern; since he was a cluster leader he himself did not have a big challenge delivering a lesson. He thought the novice teachers had learnt a lot of different teaching strategies necessary for them to conduct an interesting lesson. They had also gained confidence in dealing with the different Environmental Studies topics as the curriculum demanded.

I don't have that much challenge but I think new teachers that are being introduced to the system, to gain experience on how to deliver a lesson or maybe how to teach certain topics on Environmental Studies like the one that we had on biomes. That is what I expected and that part I think it was covered.

Subject content knowledge is crucial when teaching that subject. Teachers who have enough subject content knowledge are more confident in front of their learners. Teachers attend SANBI workshops to gain that kind of knowledge. They expect to gain new content knowledge. Thabang as an experienced cluster leader had this observation:

I think people who attended especially grade 10 gained confidence on how to deal with Environmental Studies topics as these topics themselves are so broad. When you look at the work schedule and pace setter I think the teachers gained a lot according to my observation.

Clearly Thabang as an experienced teacher has also attended several workshops similar to the ones offered by SANBI. He thinks he has enough content knowledge and did not gain any new content knowledge from the two workshops conducted by SANBI. He is a participating teacher who grabs any learning opportunity coming his way. So it is clear

that he has a lot of content knowledge but he thinks SANBI has afforded other teachers the necessary content knowledge to be taught to the learners.

I must say that I have been to many workshops related to these topics apart from SANBI so to me it's almost a repetition of which other teachers won't have the same view that I have because they never had the opportunities that I had but in relation to the workshops, the content knowledge that need to be delivered to the learners, I think they did a wonderful job. It's just that for me I wouldn't say there is something new that I learnt. I participate in lesson studies and do my own research for current information apart from attending SANBI workshops, but a lot of teachers still need content knowledge that's where SANBI needs to come in.

To him SANBI workshops have proven to be in line with the curriculum (CAPS) and should also look for new topics for the curriculum. As the curriculum has changed, there are new topics on which teachers need to have work-shops and the current ones still need to add more subject content knowledge. With pedagogical content knowledge he said *'To my view it is extra information and not strategies on how to teach in class as they[the facilitators] are not teachers themselves'*.

Although Thabang did not learn any specific new content knowledge with the topics ('Biomes' and 'Biodiversity') nor any pedagogical content knowledge, attending the SANBI workshop was a good experience for him. He got revived and was afforded an opportunity to collaborate with other Life Science teachers other than those in his cluster and he shared his tremendous knowledge during group discussions and presentations. According to his statement he had an opportunity to set up a network with other teachers for further collaboration. For him the workshop created a platform to collaborate further with other teachers beyond his cluster.

We were afforded time to collaborate during the activity that we did inside as groups and practically outside we communicated a lot and we were allowed time

to give feedback on the activities. I talked to teachers from other clusters too after the workshop and got their comments as part of my work as a cluster leader.

According to Thabang, these workshops had contributed a lot to the novice teachers and he would like to attend some other workshops from SANBI. He said he would like to participate in closing the gap between the Department of Basic Education districts and SANBI, in aligning the two organizations' programs and activities. He had more knowledge to give to other teachers and to SANBI, than learning new knowledge.

The big number is a problem; I would suggest that people from SANBI group schools according to their localities because travelling wastes time and working with such a big number doesn't benefit teachers as they should from a workshop. Teacher participation was not spot-on because of the number of attendees and time. Rather they conduct more workshops in pockets than one big workshop.

5.3 Ade – a Natural Science and Life Science teacher

Ade was a male teacher with various experiences in education, from being a principal in a private school, an acting head of department and currently a post level one teacher in a public school. He had nine years of experience teaching in a medium-sized rural school. He had taught Natural Science Senior Phase and was currently teaching Life Science grade 10 to 12. Ade had a BSc. degree in botany and zoology education; currently he was studying social work with UNISA. He had attended four SANBI workshops. He had attended three workshops at the SANBI Botanical Gardens and the recent one at the Education Development Centre. When attending the workshop he had his expectations that actually motivated him to attend although he had a long way to travel to the venue. Ade was an experienced teacher but not as much experienced teaching in the FET phase, since he had started teaching in the senior phase. He said this.

Basically when I attend a workshop I want to learn new knowledge that I can impart to my learners that is what I always want to achieve in a workshop. Want

to do more practical activities to learn how to conduct a practical lesson with my learners and also classroom management.

According to Ade the workshop was a repetition of what had been conducted by SANBI before, so he did not get any new subject content knowledge from the workshop. He thought the novice teachers were the ones that had benefitted although there had been a very low percentage of them. He was not totally against attending the workshop as he liked meeting other Life Science teachers, debating ideas among the groups and taking a lead in doing investigations. Hence he was one of those who had helped out other teachers to do the expanded quadrant activity. He said:

Sometimes it is good to learn something you have learnt before and is good also to attend so that people who have not been in a workshop with that topic before will be able to learn from you because there are educators that are learning for the first time and they would be able to comprehend from us. I personally did not gain any new content knowledge from this workshop.

Ade liked to integrate what was being taught in the workshop with real life, what was happening around the world and in his province. During the slide presentation the facilitator showed the threats to biomes. He said he would have liked it if they have dealt more on that because the purpose of learning Life Science is to apply it in everyday life, putting the theory into practice to make people aware of what is happening around them.

We wanted to see the effects of poaching that people are not aware of and what the Government is trying to do now is to create an awareness and people must know about it. That I think will provide teachers with new knowledge, I was expecting to get new challenges and new knowledge because we went through this knowledge when we were at school so we know about it initially, we don't expect to do them again and again and again. We wanted to see something new that would give us a good picture and something that we would be able to impart to our learners, the knowledge that is not already there.

5.4 Mr Croc – an experienced Natural Science and Life Science teacher

He had 23 years experience teaching at a semi-rural area in a big school. He had been teaching at the same school for twenty years and has had ample experience teaching Life Science in ABET classes. Mr Croc had taught grades 8 and 9 Natural Science, had taught grades 11 and 12, was currently teaching grade 10 and also was responsible for grades 11 and 12 teachers as a senior teacher for Life Science. A senior teacher is equivalent to the head of department post. Although not in the school management team per se, he had responsibilities mandated to him in a management position and he was responsible for mentoring grades 11 and 12 teachers. His qualifications were a Secondary Teachers Diploma, a Post Graduate diploma in management and an incomplete BA in Psychology.

He described his expectations when invited to attend the SANBI workshop as follows:

I expected to be capacitated in terms of the subject content knowledge on the topic 'Biomes' and the teaching strategies on how to conduct an interesting lesson and how to transfer the knowledge that I will acquire in the workshop to my learners.

Since all FET Life Science teachers from the six circuits had been invited a big number of teachers attended at that one time. According to Mr. Croc, his expectations were only partially met because his sitting position had limited him from participating in group activities and he had been one of those seated in the corridor so that hearing what was said by the facilitators in front had been a challenge. The number of teachers in the workshop was too big and the seating space was not conducive to learning and teaching, as it was difficult for the facilitators to move between the groups. Professional development activity should provide frequent opportunities for interaction with others in the process of learning (Mundry and Loucks-Horsley, 2010).

The sitting space was limited and the number of participants per group was too large and that made the group work less effective to other teachers because some of us could not contribute since I was at the far end of the group. I remained silent the whole time but the topics are what I teach in grade 10 and the content covered is not enough.

As an experienced grade 10 teacher responsible for mentoring other teachers at his school, he had been looking forward to getting enough content knowledge to enable him to mentor his colleagues at school. He wrote notes as much as he could. He had attended the workshops to improve on his content knowledge and he had expected new knowledge. That was only partially achieved because he said the content knowledge had not been enough.

In a learning activity, teachers also bring their personal and contextual beliefs and behaviour which may affect their learning negatively or positively. Mr. Croc was a very shy person, it took time for him to communicate or to have a conversation with a strange person. In the workshop he had kept silent because he could not talk with the others freely when meeting them for the first time and his sitting position had made it more difficult since he had had to speak harder to be heard. This had affected him negatively since he could not collaborate with other teachers and could not actively participate, but nevertheless he said he had had a good experience being in the workshop and he had plans for further collaboration with his school based colleagues.

I cannot talk when others are talking especially if we are meeting for the first time with those people; unfamiliar faces make me uncomfortable sometimes. I collaborated very little with the other teachers during the workshop although I had something to say but it was not easy so I kept silent. I will definitely collaborate with my colleagues at school to adapt the information we learnt and make it more practical.

Mr Croc, as an experienced Life Science and a master teacher, said that he still needed SANBI to provide them with more teaching strategies and even put forward a suggestion for them to improve on the teaching strategies. *“I wish that next time when they organise such workshops they use professional people or people with teaching background because to me the facilitators need to know exactly what we do in class.”* He was concerned about the changing curriculum as it posed a challenge for teachers to always fill content knowledge gaps, as new topics were introduced every time the curriculum changes. *“I can say I have gained some content knowledge and teaching strategies but gaps are still there as our syllabus is changing now and then and I hope CAPS will not be phased out too soon.”*

Attending the workshops was a challenge to teachers because most of them had a very long way to travel to the workshop venue. Time became a big issue as they were concerned about arriving at the workshop on time and they rushed the facilitators as they had to travel long distances again going back home. Mr Croc noted that: *“We did everything in a very short space of time and rushed in such a way that the activities were cut short which also put a strain to the facilitators as they could not do as they planned to do.”*

5.5 Jabu – an experienced Natural Science, Life Science and English teacher

Jabu was a male teacher at a big semi-rural school. He had taught Natural Science in grades 6 to 9 and Life Science in grades 10 to 12. Currently he was teaching grade 11 Life Science and English. He had seventeen years experience and had been teaching at his current school for the previous six years. He was in post level one, meaning he was not in a management position at his school. Jabu had a Secondary Teachers Diploma (STD) and an Advance Certificate in Education (ACE). He had come to the workshops with expectations and had this to say:

I expected to learn more about the different plant species that are there, their economic and medicinal use and the knowledge of them according to the

curriculum (indigenous knowledge and science) and the environmental careers. Planning and implementing a lesson that is more, learner-centred, as we are moving from teacher centredness to learner centredness.

Jabu had attended other workshops at SANBI conducted by other facilitators, or experts as he called them. He thought he had learned more content knowledge and strategies in those than in the one he had last attended, as these workshops had introduced the new topics of the new curriculum. He said: *“Those workshops added value to the subject content knowledge and strategies to teach this knowledge as we are in need of it.”*

During the workshop, Jabu enjoyed collaborating with other colleagues and was even more excited to stand in front and present the work of his group with others asking him questions. He said that he had gained more skill in presenting when responding to the first activity (that is the questions on biomes) and more confidence to stand in front of his colleagues and that had also contributed to his teaching confidence.

If you are confident in front of your colleagues it is easy to be confident in front of your learners because presenting in front of your colleagues is difficult, so the workshop afforded us the opportunity to practice that skill and build our confidence, although not everybody was afforded that opportunity because of time. Now I know how to handle learners’ questions on biomes.

Jabu had inputs on how SANBI could help him and other Life Science teachers to acquire the necessary skills and content knowledge to enable them to teach their learners as required by the curriculum. The number of participants had been too big and that had hindered active participation. He had been deprived of an opportunity to learn from others. The grade content knowledge had not been the same, so, inviting all FET teachers when the content had been for a specific grade, not every teacher had benefited in those workshops. He had enjoyed the experience but had still needed more content knowledge and investigating skill. For instance, the expanded quadrant activity had been conducted in a very short space of time and everybody had been rushed. They had not got to finish

and do the graph as it was supposed to have been done. He had been looking forward to doing the graphs as it was at least in his subject content. He had this to say:

The content was for grade 10 and most teachers are not teaching grade 10. They should have invited grade 10 teachers instead of inviting all Life Science teachers and presented only grade 10 based content. It also makes it difficult to participate because you are not well knowledgeable about that particular content...you are just left out in terms of the content.

He felt that it was important that the workshops were more related to teachers' needs.

More research must be done about teachers' needs because at times workshops are conducted but do not meet our needs and solve our problems or challenges like in this one I was little accommodated in terms of content. The time was not enough for more content and more activities will make the workshop more active than listening to a lecture. There must be communication between SANBI and the department to plan the workshops because they coincide with other activities and makes it difficult to attend.

5.6 Analysis of interview data

Data is analyzed using the codes derived from the data itself. Interview data is analyzed inductively. I developed codes by myself as I studied the data directly and let the codes emerge from the data as indicated in Chapter Three. The following themes emerged from the interview data, which will be used to answer the research question three: what do teachers say they learnt (content and pedagogical content knowledge as the focus knowledge areas of the study) in those workshops. Also their suggestions for the future SANBI workshops will be further discussed in Chapter Six.

1. Very little new content knowledge was learned by these experienced teachers
2. Pedagogical content knowledge (new)

3. Collaboration in the workshop was minimal
4. Teacher needs were not established
5. Practical constraints

5.6.1 Content knowledge

As described by Bertram (2011, p. 6) “content knowledge is the knowledge of the subject content that needs to be taught”. Teachers need to continually add to their subject content knowledge to keep up to date with the subject’s new developments. A teacher development activity is expected to offer teachers new content knowledge (Cogill, 2008). The four teachers interviewed said they had gained no new content knowledge from the workshops because of their long experience teaching the subject. According to them, novice teachers were the ones that had benefited with new knowledge. They had acquired confidence in organizing and delivering the content knowledge to their learners.

The changing curriculum and addition of new topics can create a gap in content knowledge for teachers, but these experienced teachers were already familiar with this content knowledge on biomes. They said they had gained new knowledge of using technology to present a lesson. as Cogill (2008, p. 3) states that “knowledge of subject content is essential not only for teaching itself but also for the evaluation of text books, computer software and teaching aids”.

5.6.2 Pedagogical Content Knowledge

Pedagogical content knowledge as shown in the literature review, is explained by Shulman (1986, p. 9) that “it bridges content knowledge and the practice of teaching, assuring that discussions of content are relevant to teaching and that discussions of teaching retain attention to content. As such, it is the unique province of teachers - a content-based form of professional knowledge.” The interviewed teachers as presented in the data said that they had learnt a skill of presenting new information to learners when doing the expanded quadrant as it was a new method of calculating species numbers using an expanded quadrant, although it was done in a very short space of time and others could not really comprehend it. They were afforded an opportunity to put theory into

practice during the workshops, although this did not necessarily mean that they would be able to use these strategies in their own classrooms.

5.6.3 Collaboration in the workshop was minimal

Teacher collaboration should be in small-group settings – both across schools in the local district and within individual school sites (Fraser et al., 2007; Wilson and Berne, 1998; Garet et al., 2001; Givven and Santagata, 2011). Teachers say they had been afforded time to collaborate but not everybody had been, because of the big numbers in each group. The seating arrangement was a challenge to allowing teachers to collaborate. Those who were seated at the far end of the tables could not contribute during group discussions. The shy ones like Mr. Croc found it difficult to participate as he has to talk louder to be heard and that had deprived others of the knowledge he had as an experienced master teacher. According to Givvin and Santagata (2011), teachers need time to create a safe environment to be able to collaborate or they need to be guided on how to. SANBI assumed that teachers would collaborate after the workshops, so they were given CDs to share within and across the schools at cluster meetings.

5.6.4 Teacher needs were not established

What catches the attention of teachers to attend a professional development activity is their trust that it will increase their knowledge and skills, add to their growth and improve their efficacy with their students (Guskey, 2002). Teachers attended the workshops to achieve what the statement says but this cannot be achieved without addressing their needs before planning the development activities. The four teachers said they had not been consulted in designing the workshops. If they had been, they would have suggested what topics they had been struggling with, especially the newly introduced topics where they had content gaps. They were the ones who taught Life Science and they knew which topics had caused learners to struggle and what could have closed that gap. As indicated in the department's policy, teachers should be the ones designing their own professional development according to their needs and also to avoid one-size-fits-all activities.

5.6.5 Practical constraints

PD is often offered via workshops that are far too short, with minimal or no follow-up support arrangements for teachers who have to face the long-term classroom execution of the new reforms (Bantwini, 2009). The SANBI teacher development workshops happened in a very short period of time. Some activities were not conducted to the end and Mr. Croc said he had been looking forward to that activity. The ‘Careers in Biodiversity’ activity had not been conducted because of the limited time with too many activities to fit in. According to the data all FET Life Science teachers had been invited. That caused seating space shortage because too large a number of teachers attended in one venue at the same time and this affected the active participation of teachers as the groups were too large. The workshops coincided with matric trial exams and teachers came to the workshop late because they had to invigilate the exams.

5.7 Conclusion

In this chapter I have presented and described the interviews and analysed the data gathered from the four interviews I conducted. I also presented what teachers said they had gained from attending the SANBI workshops with a special focus on CK and PCK, as the two knowledge areas are the focus of this study. Another three themes have emerged from the data so the data was analysed in total of five themes.

Chapter Six explains more of what the data means, and recommendations for future research are put forward and conclusions drawn.

CHAPTER 6: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

6.1 Introduction

In this final chapter I draw on the workshop observation data presented in Chapter Four and interview data presented in Chapter Five to answer the three research questions:

1. What teacher knowledge domains are privileged in the workshops?
2. To what extent do the workshops reflect the characteristics of effective professional development workshops?
3. What knowledge and skills do teachers say that they have learnt from SANBI workshops?

This study explored SANBI workshops to establish what knowledge teachers gain from attending these workshops. Data will be discussed and conclusions drawn.

6.2 Research Question 1: What teacher knowledge domains are privileged in the workshops?

To answer this question this study draws from Shulman's (1986) knowledge areas. The workshops were observed in order to find out what knowledge domains privileged in SANBI workshops. This study used two of the seven knowledge areas (CK and PCK) as described in literature reviewed.

Shulman (1986, p. 9) explains that **content knowledge** should be understood and that "Teachers must not only be capable of defining for students the accepted truths in a domain. They must also be able to explain why a particular proposition is deemed warranted, why it is worth knowing, and how it relates to other propositions, both within the discipline and without, both in theory and in practice."

Teachers are to use **pedagogical content knowledge** to convey the content knowledge to the learners which is described by Shulman (1986, p. 9) as the knowledge "which goes

beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching. I still speak of content knowledge here, but of the particular form of content knowledge that embodies the aspects of content most germane to its teachability.”

These two knowledge domains are the domains privileged in the SANBI workshops and are analyzed below.

6.2.1. Content Knowledge

When attending any development activity teachers hope to gain more content knowledge. From the data collected it emerged that the workshops do focus on content knowledge but not enough to cater for every teacher present in the workshop because 90% of the teachers were experienced and only 10% were novices. As a result, not every teacher gained new content knowledge. The experienced teachers pointed out that they needed more knowledge and that could have been achieved if they had done different activities in their groups in order to cover more content knowledge during the workshops.

The content was congested into a few hours which was a disadvantage to the teachers because they were learning under the pressure of limited time. The time constraint led the facilitators to lecture and ask recall questions when conducting the workshops. This statement adds to the point that workshops are not effective if they are conducted once off, because teachers attended to deepen their subject knowledge and that does not happen in a short space of time (Givvin and Santagata, 2011). The findings revealed that it was assumed that teachers would have been able to adapt the knowledge gained, into the context of a real classroom since there would be no follow-ups on their implementation.

The slide presentation on ‘Biomes Classification and Threats’ enhanced the teachers’ content knowledge, particularly for the novice teachers. The workshops topic on biomes is in line with the curriculum that is CAPS Life Science strand, which is Environmental Studies. Therefore the teachers needed more content knowledge because the curriculum had recently changed in South Africa.

Activities were conducted but some not to the end, like the graph not being drawn during the second workshop because of time. Teachers said they had been looking forward to that knowledge. As pointed out by Mokhele (2013, p. 78), “Longer activities are more likely to encourage in-depth discussions of content, student conceptions and misconceptions”. The teachers in each workshop did not receive equal content knowledge.

6.2.2 Pedagogical Content Knowledge

PCK is understood as the teacher understanding of the knowledge of the learners’ understanding of subject concepts within a specific subject matter (which is biomes in this case). It involves how to teach or translate the content knowledge for learners to understand better, and it allows teachers to conduct interesting, clear explanatory and motivating lessons (Bertram, 2011, Cogill, 2008, Grossman, 1990).

The findings in this study indicate that participants had seen a new way of presenting the content, that is the slide presentation and the way those slides were designed (interesting and explanatory) presenting the same content in a different way. Although the groups were too big, participants practiced the skill of conducting group work and presentations, considering the fact that, as long experienced teachers, they were not trained in conducting group work at tertiary level training. The novice teachers gained practical experience in bridging the gap between theory and practice.

The expanded quadrant activity was a new skill of calculating the number of different species in an area, as the teachers had been used to calculating this using a number of different quadrants in an area. The teachers had to read and understand the instructions, communicate with one another and take a decision on how to do the activity. Teachers were interested in the new skill and promised the facilitator that they would adopt the method with their learners and even use the same document that they had used themselves.

6.3 Research Question 2: To what extent do the workshops reflect the characteristics of effective professional development workshop?

SANBI adopted and has been using a workshop model as a professional development activity for teachers on topics of the environment, as required by the South African curriculum (CAPS). This model has strengths and weaknesses as discussed below in the analyses of the workshops observed; and recommendations are suggested.

This study has used Givvin and Santagata's (2011) indicators to determine the effectiveness of SANBI workshops conducted in one of the districts of Mpumalanga Province of South Africa.

6.3.1 Driven by a well-defined image of effective classroom learning and teaching

Findings show that the SANBI workshops were a once off activity conducted in two different venues with the same learning materials in both venues and with activities conducted by two facilitators. The facilitators used different styles of conducting the Biomes slide presentation. One presented the slides in a form of a lecture and he managed to get attention from the teachers as they were writing notes on what he was saying. The other one used question and answers to conduct the slide presentation and engaged the teachers in the activity to 'recall facts and describe concepts' as required by CAPS.

The practical activity (expanded quadrant) conducted outside connected what the slides presented theoretically to practical examples as mentioned by Givvin and Santagata (2011, p. 444) that 'students profit from the opportunity to make connections between facts, procedures, and concepts.' This activity engaged teachers in investigating science as learners would do.

6.3.2 Provides opportunities for teachers to build their content and pedagogical content knowledge and examine practice critically

PD models are intended to increase teacher content knowledge, skills and to change attitude, to change practice and to increase learner achievement (Guskey, 2002; Desimone 2009). The aim of the workshops is to provide teachers with content and pedagogical content knowledge. This study investigated the knowledge domains

privileged in the SANBI workshops focusing on CK and PCK because the two are intertwined.

Successful professional development programs engage teachers in learning the content they will teach and the approaches for teaching that content, as pointed out by Mundry and Loucks-Horsley (2010). The data indicates that all FET Life Science teachers were invited for the workshops. Whilst some teachers were not teaching grade 10 and were not going to teach the content knowledge they had learned, they could use the strategies of conducting a science investigation and a power point presentation. The data confirms the difficulty of tailoring a single teacher development activity that would cater for all FET Life Science teachers with regard to content knowledge and pedagogical content knowledge.

6.3.3 Is research based and engages teachers as adult learners in the learning approaches they will use with their students

The interpretation of this principle is that in the learning activity, teachers themselves should conduct the same scientific investigations and complete tasks they will require their learners to do (Givvin and Santagata, 2011). The findings confirm that the teachers were involved in discussions and in completing a task they would want their learners to discuss and complete, because they had discussed and completed the Biomes questions and presented answers. The teachers also conducted a practical investigation of different plant species in an area using an expanded quadrant instead of the traditional 1m² quadrants. Facilitators guided them the same way the teachers would guide their learners.

Data revealed that there had been no research done by SANBI on the teachers' level of content knowledge and student achievements on this topic of Biomes. SANBI was only guided by the district Life Science Curriculum Implementer on how to conduct a workshop for teachers on biomes. Considering the fact that SANBI is a Biodiversity Institute, they have the knowledge and the necessary resources to conduct such a workshop.

6.3.4 Provides opportunities for teachers to collaborate with colleagues and other experts to improve their practice

According to the literature reviewed teacher collaboration is the responsibility of the school and the district because it is not a once off but a continuous activity. The findings confirm that there were minimal collaborations during the workshops because of time and because the activity was conducted once. It is assumed that teachers would collaborate further in their clusters and schools.

6.3.5 Supports teachers to serve in leadership roles

The findings revealed that SANBI did not attempt to support teachers on leadership roles as the workshops were a once off activity conducted within a short space of time.

6.3.6 Links with other parts of the education system

The workshops were conducted during the trial examinations time and that posed a challenge to teachers to attend as they were also responsible for invigilation and overseeing the smooth running of the exams. According to the Life Science work schedule, the teachers had already taught biomes and the knowledge gained in the workshops would only be used after a long time, in the third term of the following year.

6.3.7 Has a design based on student learning data and is continuously evaluated and improved

The data confirmed that there was no student learning data available at the workshops so this principle did not apply to SANBI workshops at that stage.

6.4 Research Question 3: What knowledge and skills do teachers say that they have learnt from SANBI workshops?

To answer this question I used the five themes that emerged from the data gathered from interviewing the four teachers. The five themes are discussed as follows:

6.4.1 Very little new content knowledge was learned by these experienced teachers

The data confirms that teachers said they had learned very little new content knowledge from the workshops. The content knowledge they discussed was what they already knew, what was in their various textbooks and also what they had acquired through practice. They were expecting to gain new content knowledge regardless of their long experience teaching Life Science. They said the content knowledge was new for the novice teachers.

6.4.2 Pedagogical Content Knowledge

Pedagogical content knowledge ‘enables teachers to ease the learning for students through use of clear explanations, appropriate analogies and presenting learning in interesting, motivating and even entertaining ways’ (Cogill, 2008, p. 8).

Jabu said he gained PCK during the workshops through practical activities especially confidence by presenting in front of his colleagues, he will feel more at ease in front of his learners and handle their questions on Biomes in a different way than before. The expanded quadrant was a new skill of calculating species numbers which the interviewed teacher said they had gained, and which would enable them to deliver the content differently.

6.4.3 Collaboration in the workshop was minimal

Teachers need opportunities to collaborate and a safe environment should be created for them to do so. Mr. Croc said he cannot talk freely to people he did not know which had hindered his collaboration with other teachers during the workshop although the opportunity was there during group discussions. He plans to collaborate more with his colleagues at school. Teacher collaboration was a challenge because of the large group numbers and seating positions of some teachers. SANBI assumed that the teachers would collaborate after the workshops on the activities conducted because they had their clusters as a platform and had been given the learning materials to do so.

6.4.4 Teacher needs were not established

It is evident from the findings that teachers had not been consulted before the topic for the workshops was chosen. The four interviewees said their needs were not met because

their needs were not known to the workshops designers. According to them, they would have chosen other topics which they felt they struggled with especially currently when they had been dealing with a new curriculum where they had experienced content and pedagogical knowledge gaps. They said the workshop had come late because they had already finished teaching biomes for the year.

6.4.5 Practical constraints

It is evident from the data that the number of teachers who attended the workshops was rather too big to be in one venue. Although the workshops were divided into two venues on two consecutive days, the numbers were still very large and hindered the active participation of the teachers who had to be seated in the corridor. The groups which they formed were also large and some teachers could not contribute to the discussions because they were seated at the far end of their groups. Time was limited and groups were many, so that resulted in some groups not presenting their group work.

6.5 Recommendations

For SANBI teacher development workshops to be most effective the following recommendations may be considered.

To tailor a learning activity, teachers should be consulted for them to put forward what should be included in the activity. Teachers are the ones teaching learners in class. They know their own needs and, as described in the literature, they should take responsibility of their own learning and identify their own needs. Experienced teachers, master teachers and cluster leaders can be used in tailoring a development activity that will enhance teacher content knowledge and pedagogical content knowledge.

It would be useful to offer different workshops for novice and experienced teachers, and to offer teachers a range of workshops which focus on different curriculum topics. Novice teachers should be workshopped as a group to enhance mentoring because they are still in the process of building their content knowledge and instructional strategies.

There should be thorough planning by SANBI to align the workshops with the curriculum and teachers' work schedule, to avoid topics being conducted after they have already been implemented by the teachers. Workshops should not coincide with DBE major activities like examinations, because it makes it challenging for teachers to honour the invitation as they are also responsible for the exams.

The teachers recommended that workshops be conducted in smaller groups to enable a relaxed atmosphere with teachers less concerned about time because they have to travel far going back. A large number of participants makes it difficult for teachers to actively participate in a learning activity and the travelling distance result in teachers coming late and wanting to leave early.

6.5.1 Strengths and weaknesses of the workshops

The workshops were focused on content and pedagogical content knowledge and that addresses the teachers' first needs when attending a professional development activity. Therefore the novice teachers especially, who are still in the process of strengthening their teaching skills and content knowledge, gained new knowledge. Teachers were introduced to new teaching strategies e.g. the expanded quadrant and teaching biomes using a slide show. These were the strategies teachers said they were going to translate to their colleagues who did not attend the workshops.

The content was not well researched with the teachers and that posed a challenge in addressing teachers' knowledge gaps and needs. The workshops are a one-size-fits-all because all FET teachers were invited while the content was specifically for grade 10 teachers. Numbers were too big to allow every teacher active participation as required by the characteristics of an effective workshop. Teachers were supposed to alternate the leadership roles but because of time that did not happen and very few were afforded the opportunity to present. Rushing activities disadvantaged some of the teachers.

6.6 Conclusion

The purpose of this study was to explore the knowledge domains privileged in and the effectiveness of SANBI workshops including what teachers said they had learnt. From the findings it is evident that the SANBI workshops have some of the characteristics of an effective teacher development activity. Rather than as a once off activity, it is suggested that the workshops should be conducted regularly to address the short comings of the previous one conducted. The aim of the workshops is to provide content and pedagogical content knowledge and because of the large number of teachers attended, the presence of highly experienced and novice teachers in one activity makes it difficult to design a suitable activity that will cater for everybody. The findings also revealed that teachers should be involved in designing a development learning activity for them to identify their actual needs, especially after the introduction of the new curriculum. It is also evident that teachers should be grouped according to the grades they are teaching and not a phase because the content knowledge is not the same in all the grades. Teachers prefer to be developed in what they are going to do in class with their learners

This study will assist SANBI and other organisations who conduct teacher development activities to plan and conduct effective teacher learning programs by considering the characteristics that will make the learning activity effective. The activity developers should also have clear and attainable aims and objectives for the teacher learning activity.

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APPENDIX 1: UKZN ethical clearance letter



05 December 2014

Ms Charlotte Dumazile Nkosi (971200168)
School of Education
Pietermaritzburg Campus

Dear Ms Nkosi,

Protocol reference number: HSS/0821/013M
Project title: Exploring the quality of SANBI teacher development workshops

Retrospective – Expedited Approval

With regards to your application for ethical clearance received on 16 August 2013. The documents submitted have been accepted by the Humanities & Social Sciences Research Ethics Committee and **FULL APPROVAL** for the protocol has been granted.

Any further violation of the UKZN Code of Ethical Conduct will result in a disciplinary process.

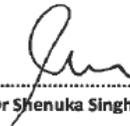
Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully



.....
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Carol Bertram
cc Academic Leader Research: Professor P Morojele
cc School Administrator: Ms Bongzi Bhengu

Humanities & Social Sciences Research Ethics Committee

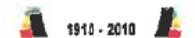
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APPENDIX 2: Interview schedule

INTERVIEW SCHEDULE

For this study, data was gathered using the following questions for interviews:

1. How long have you been teaching?
2. What grades have you been teaching?
3. How long have you been teaching at your current school?
4. What is your post level?
5. What is your highest qualification?
6. Have you attended any SANBI workshops before?
7. What did you expect to learn from these workshops and why? Probe: what kind of content knowledge did you expect to learn? What kind of teaching strategies did you expect to learn?
8. You have attended the three workshops, in which one do you think you learnt more content knowledge and why? In which one do you think you learnt more teaching strategies of how to teach the content (PCK)?
9. Describe what you learnt from these workshops that you did not know before.
10. During these workshops how were you afforded an opportunity to collaborate with your colleagues? In what ways was this a useful learning experience?
11. You have been teaching Life Science for many years and identified gaps in your practice (i.e. things that you still need to learn). Can you describe those gaps and how were they closed by attending these workshops?
12. How easy has it been for you to make changes in your practice due to attending these workshops? What are some of the barriers to changing practice?
13. In these workshops what was more challenging to you and why?
14. To what extent do you think that these workshops met your professional development needs? For these workshops to be able to meet your needs, what do you think should be done?
15. Now that you have attended the three workshops, what are your plans for your learners and your school?

OBSERVATION SCHEDULE

This study used semi-structured observations to collect data. These observations were directed by the indicators from Desimone and Givven and Santagata. The following questions will be asked by the researcher:

1. What is the image of effective classroom practice that informs the workshop?
2. How does the workshop build content knowledge? What is the nature of the content knowledge?
3. Does the workshop engage teachers as adult learners?
4. In what ways does the workshop provide opportunities for collaboration? What is the nature of this collaboration? How effective is it to enhance teacher learning?
5. In what ways did the workshop focus on changing attitudes? From what attitude to what new attitude?