THE IMPLEMENTATION OF NATURAL SCIENCE AND TECHNOLOGY CURRICULUM BY PRIMARY SCHOOL EDUCATORS IN PUBLIC SCHOOLS IN VHEMBE DISTRICT

By

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DECLARATION

I, Mathuba Ntshengedzeni Ivy, declare that this project:

'The Implementation of Natural Science and Technology Curriculum and Assessment Statement by primary school teachers',

is an original work done by me under the supervision of Dr M. Mpeta and Dr SJM Kaheru, School of Education, University of Venda, that it has not been submitted for any degree at this or any other university or institution, and that all reference material contained therein have been duly acknowledge.

Signature

2017/09/12
Date

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ABSTRACT

The study investigated the implementation of natural science and technology by primary school educators in Mvudi Circuit, Vhembe District. As stated in the Curriculum and Assessment Policy Document (CAPS), learners in science are supposed to master the three specific aims of natural sciences and technology (NST). From the researcher's observation as well as literature, the teaching and learning practices in schools might not assist learners in mastering those aims. For that reason, two schools were selected in the Circuit for this study to find out how they implement the NST curriculum. Data was collected by interviewing educators, heads of department (HODs) and principals from the two schools in order to find out their views regarding the implementation of NST-CAPS. In addition, educators were observed in classrooms to find out how they put the curriculum into practice and how they interact with learners. A checklist was used to collect data during classroom observations. The findings revealed that the teaching of NST is dominated by traditional educator-centred pedagogy, characterised by teacher talk and demonstrations. There are scanty resources in schools and insufficient knowledge by educators on practices to implement NST properly. The results highlight the need for more support to schools in terms of resources, and increased teacher training and support in strategies that involve learners more in classrooms.

Keywords: curriculum, implementation, monitoring, natural sciences, technology.

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1.1. BACKGROUND TO THE STUDY

Since its inception in 1994, the post-apartheid government of South African has undertaken a number of initiatives to transform its education system. Before 1994, the allocation of subjects per grade in phases was based on the Bantu Education system advocated by the then minister of Native Affairs Hendrick Verwoerd. He stated in 1953: "there is no place for Bantu in the European community above the level of certain form of labour... What is the use of teaching the Bantu child Mathematics when it cannot use it in practice?" (Christie, 2006:12). The new era promised, among other things, to transform South African policies to cater for the national needs of the society and to redress the imbalances of the past created by a segregated South Africa under apartheid. This compelled the post-apartheid government to structure the education system in a new way. This was achieved by, among others, changing programmes that were there such as Break Through to Learning (BTL) and the Primary School Upgrading Programme (PEUP).

The Outcomes Based Education (OBE) (DoE, 1997), was introduced to address previous imbalances that were inherent in our South Africa's education system. In National Qualification Framework (NQF) proposals, these outcomes were expressed in balances and integrated national standards, which demanded the holistic development of competence, and encompassed knowledge, skills, and attitudes. OBE as an approach in teaching and learning was implemented in Curriculum 2005. Curriculum 2005 (C2005) was phased out and replaced by Revised National Curriculum Statement, RNCS, Grades R – 9 (DoE, 2002) and National Curriculum Statement Grades 10-12 (DoE, 2002) that were finally combined to form the current National Curriculum Statement Grades R-12 (DBE, 2011a) named Curriculum and Assessment Policy statements (CAPS).

The current system addresses issues like Indigenous Knowledge System (IKS). It also advocates promotion of skills such as, identifying; solving problems; making decisions using critical and creative thinking, designing experiments (DBE, 2011b: 12). As shown in the NST-CAPS Curriculum and Assessment Policy Statement (CAPS) grades 4 to 6 (DBE, 2011b), natural science and technology encompasses the following knowledge strands: (1) earth and beyond (2) matter and materials (3) life and living, and (4) energy and change. The knowledge strands are a tool for organising the subject content (DBE, 2011b: 9). In addition

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to these knowledge strands, skills development through inquiry as well as attitudes and values to be learned are covered as part of the NST curriculum. CAPS has been in operation in schools since 2011.

1.2. PROBLEM STATEMENT

As provided in the South African NST-CAPS document, learners in science are supposed to master the three specific aims of natural sciences and technology. The introduction of this CAPS has provided educators with clearer guidance on what to teach and the pace at which the curriculum needs to be covered (DBE, 2011: 19). However, educators seem to be experiencing challenges when it comes to its implementation. The researcher's experience as a school principal and as a science educator indicates that there might be challenges with NST-CAPS implementation. For instance, learners are not given proper guidance by educators on how to do tasks such as assignments, projects, case studies and even experiments. This could be caused by lack of understanding of NST-CAPS policy by educators. Wrong curriculum interpretation may result in shallow content and skills learning for learners.

1.3 AIM OF THE STUDY

The **main aim** of this study was to investigate how educators implement the natural science and technology Curriculum and Assessment Policy Statement (CAPS) in teaching in grades 4 to 6.

In line with the main aim, **objectives** that guided this study were:

1.3.1 To describe how educators implement NSTCAPS in teaching natural science and technology in grade 4 to grade 6.

1.3.2 To determine the factors affecting the implementation of natural science and technology Curriculum and Assessment Policy Statement (CAPS) by educators in the teaching of natural science and technology.

1.4 REASEARCH QUESTIONS

In line with the aim and objectives of the study, the following main question and sub research questions were formulated:

Main question

How are primary school educators in Vhembe District, Limpopo, implementing natural science and technology Curriculum and Assessment Policy Statement (CAPS) in public primary schools?

Sub-questions

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1.4.1 How do educators implement natural science and technology Curriculum and Assessment Policy Statement in the teaching of natural science and technology?

1.4.2 What factors affect the implementation of natural science and technology CAPS?

1.5. PRELIMINARY LITERATURE REVIEW

The introduction of new curricula since 1994 in South Africa posed challenges of implementation and hence curriculum changes occurred from C2005, RNCS grades R – 9, NCS grades 10 – 12 and ultimately CAPS Grades R – 12. Introduction of new curricula was intended to overcome the curricula divisions of the past apartheid government (DBE, 2011b). However, concerns of the educators led to review of C2005 (Report of the review committee on Curriculum 2005). The review of curriculum that followed provided the basis for development of RNCS for General Education and Training (GET) grades R – 9 and NCS for grades 10 – 12. On-going implementation challenges resulted in another review in 2009, which led to the amendment of the National Curriculum Statement (NSC). Subsequently, a single comprehensive document known as the National Curriculum Statement, NCS, grades R – 12 was developed (DBE, 2011b). The curriculum comprises of CAPS.

As argued by Hopkin (1996) cited in Mosothwane (2013), sometimes developing countries make changes in their education system not directly beneficial to them but because developed countries dictate to them how to spend money. Seemingly, developing countries introduce curriculum changes to satisfy their funders without proper planning that includes training of educators. Researchers like Mohomed (2004: 3) also stated that educators express a need for more practical training that is relevant to their environment.

Challenges of implementation such as lack of adequate educator's training, lack of subject matter knowledge and incorrect interpretation of policy (NST-CAPS) seem to be contributory factors to proper curriculum implementation in schools.

In the South African context, research on CAPS science implementation, such as that by Tshiredo (2013), gives hope that challenges may be avoided or lessened with regards to curricula implementation. Incidentally, more focused NST-CAPS

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implementation approach may assist in addressing poor performance of South African learners in science. Broadband specific aims, as cornerstones for primary school NST-CAPS teaching, need to be checked and evaluated to find out how they are being implemented.

In this study, two schools from Mvudi Circuit were studied to investigate how NST-CAPS was being implemented. The following are therefore CAPS natural science and technology, curriculum implementation in relation to educator training and theoretical framework explained in the next paragraph cover the salient section of recent curriculum developments and delivery.

1.5.1. **CAPS- Natural science and technology**

CAPS, introduced by the Department of Basic Education (DBE: 2011b), builds on the previous curriculum and aims to provide clearer specifications of what is to be taught and learnt on a term-by-term basis. A brief history of curriculum changes from the era of Curriculum 2005, when Outcomes Based Education (OBE) was introduced, to the current CAPS shows that there have been problems with implementation (DBE: 2011b). According to Chisholm and Chilisa (2012), problems of implementing curriculum changes occur in other countries as well. For instance in Botswana (Mosothwana, 2013) and Lesotho (Mpeta, 2002), and the Netherlands in Europe, challenges have been observed. Furthermore, Chisholm and Chilisa (2012) indicate that both Botswana and South Africa adopted outcomes-based curricular although they differ significantly in when and how they did so, and in the content and results of change. Jansen and Christie (1999) cited in (Chisholm and Chilisa, 2012), showed that in Botswana, reform processes started with teachers training and the introduction of new qualifications to upgrade their knowledge whereas in South Africa, they began with changing curriculum documents and prescripts with which educators had to work. Educator knowledge was delegitimised, as they were asked to abandon all they knew and begin afresh. In Lesotho, the implementation of science curriculum in junior secondary schools was marred by lack of understanding of learner-centred education, among others (Mpeta, 2002). Schools which fared better were those which had a significant amount of resources, and where educators understood, to some extent, the demands of learner-centred education. In the Netherlands, problems of policy implementation were also noted by Harrie et al (2012), stating that in The Netherlands, some policy threats were noted, especially when it came to knowledge about science.

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In South Africa, changes in policies have been affected by challenges since their implementation relies on issues such as educator knowledge and proper interpretation of policies as well as subject matter knowledge. Thus, with a myriad of challenges and failures to implement curricula properly, the government introduced CAPS. The introduction of NST-CAPS as contained in the policy document (DBE: 2011b) was thus aimed at alleviating most of the challenges of implementation experienced with the previous curricula. Regrettably, the impact on proper delivery of CAPS seems to be questionable yet again.

1.5.2. **Curriculum implementation and educators' training**

The problem with curriculum changes seems to be with the implementation of those changes. For educators to implement curriculum as expected, they need to be prepared well in advance. Grayson and Rogan (2003, 1171) support the idea that curriculum changes have implications in implementation when they stated that:

> "The development of new curriculum is a common event in countries across the globe. In many cases, these curricula are well designed and the aims intended to achieve are laudable. However, all too often the attention and energies of policy-makers and politicians are focused on 'what' of desired educational change, neglecting the 'how' ".

Having taught science in primary and secondary schools, experience has taught me that educators do sometimes not welcome curriculum change. Referring to science curriculum, Dalin cited in Mosothwane (2013: 45) concurs by stating that the introduction of new science curriculum has been met with different reactions, with some teachers supporting it while others attempt to sabotage it." Therefore, for smooth implementation to occur, educators need to not only understand their role, but to also have the capacity to implement the changes. Thus, in addition to stating 'what' needs to be changed, the 'how' to change should also be mapped out by the curriculum planners.

Tawana (2009: 22) argued and said in countries like Botswana, teacher support for professional development was provided through education centres. Their main responsibility was to provide teachers with the necessary professional support for effective implementation of the new school curriculum.

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1.5.3. **Theoretical framework**

The theoretical framework adopted for this research is that of Rogan and Grayson (2003: 1183 - 1185), the profile of implementation which has been used to understand the implementation of curriculum 2005. The theory has been used in researches in other countries such as Australia, Lesotho and The Netherlands. It is therefore befitting that, even though Curriculum 2005 has been phased out and replaced by CAPS, the theory is still applicable as has been noted in other places. The theory is based on the premise that learners construct meaning of what they are learning based on their prior experiences. Rogan and Grayson came up with three constructs. "The three constructs; profile of implementation, capacity to support innovation and support from outside agencies, form the heart of the theory of science curriculum implementation (Rogan & Grayson, 2003)."

The three constructs are explained below, reflecting on how they contribute to curriculum implementation.

Firstly is the construct, the **profile of implementation**. This construct attempts to understand and express the extent to which the ideals of a set of curriculum proposals are being put into practice. This involves what the educators and learners do in class through four levels; from level one with mainly educator-centred demonstrations to level four which includes open-ended learner-centred investigations.

The second contrast, **capacity to support innovation,** is an attempt to understand and elaborate on the factors that are able to support, or hinder, the implementation of new ideas and practices in a system such as a school. This involves educator factors such as training, physical resources, learner factors and the school ecology.

Thirdly, **support from outside agencies** refers to organisations outside the school, including departments of education that interact with a school in order to facilitate innovation. In this regard, innovation relates to the implementation of new curriculum in South African educational context, and how the Department of Basic Education (DBE) and nine Provincial Education Departments support curriculum implementation.

These constructs are used in this study to understand how NST implementation is taking place in the two schools in Vhembe District in Limpopo.

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1.6. DEFINITIONS OF KEY CONCEPTS OR TERMS

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The main concepts from this study are the following:

1.6.1. **Curriculum**

Curriculum represents a 'special environment' for helping children achieve self-realisation through active participation within the school (Allan and Francis, 2009).

For the purpose of this study, curriculum means a plan reflecting what should be taught to learners and how learners should be taught.

1.6.2. **Implementation**

Swanepoel, Erasmus, and Schenk (2008: 144) define implementation as execution of strategy, which entails creating the necessary architectural configuration, including structures, systems, processes and policies. According to Fox (2007: 27) implementation refers to the tools and techniques, which are used for improvement of quality. Implementation is the realization of an application or execution of a plan, idea, model, design, specification, standard, algorithm, or policy.

In this study, implementation means the actual doing or practical part or exercising what one is supposed to do according to policy, rules, and procedures as set in South African education legislations by the leaders and managers in public schools of the Limpopo Province of South Africa.

1.6.3. **Natural science and technology**

Natural science and technology is a subject in the primary school curriculum grade 4 to grade 6 that builds a learner's investigative skills especially discovery skills when doing practical experiments and research skills using reference books and other media (DBE, 2011b: 9).

In this research natural science and technology is a subject that prepares primary school learners to improve their investigation skills; gain scientific knowledge through scientific inquiry; apply scientific approaches to solve problems; use technological skills to solve everyday problems of their level, which will prepare them for further scientific inquiry in future.

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1.6.4. **Primary schools**

According to The World Book Dictionary (2001: 682) primary schools or elementary schools are schools of six grades for pupils from about five years to about twelve years of age, followed by junior high schools preparatory phase for further education.

In this research primary schools are institutions where learners from grade R to grade 7 are admitted and learn in preparation of their secondary as well as university level education.

1.6.5. **Educator**

In The World Book Dictionary (2001: 671), 'Educator' means a person who does not pour truths or untruths into the minds of others, but draws out of others their latent abilities and stimulates them to be original and creative.' In terms of the South African School ACT, SASA, 1996 (Act 84 of 1996) **"educator"** means any person referred to in section three who teaches, educates, or trains other persons, or who provides professional educational services, including professional therapy and educational psychological services, at an institution.

In this research, an educator is a person, who has skills to teach learners, by applying relevant policies and different methodologies in order for them to achieve skills, knowledge, and values that are useful in their future lives.

1.6.6. **Learners**

'Learner' means any person receiving education or obliged to receive education in terms of the South African Education Act, SASA, 1996 (Act 84 of 1996).

In this research, 'learner' means young person who is being guided by an educator to master certain skills, knowledge; attitudes and values through unfolding the latent talents of such learner through proper implementation of policies that govern the subject concerned.

1.6.7. **Public schools**

Mothata (2000:133) defines 'public school' as a school maintained largely through funds made available by the Member of the Executive Council (MEC) in a province in terms of section 2 of the South African Schools Act (RSA, 1996a).

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1.7. RESEARCH DESIGN AND METHODOLOGY

1.7.1 Research design

Yin (2003: 21) states that a research design is a blueprint or a detailed plan the method on which one intends conducting a research. In this study, the researcher used an interpretive exploratory qualitative research design. The rationale for choosing qualitative research is that it embraces broad, interpretive research. Qualitative research uses a naturalistic approach that seeks to understand phenomenon in context-specific settings, such as "real world setting (where) the researcher does not attempt to manipulate the phenomenon of interest" (Patton, 2002: 39).

1.7.2 Population

Population refers to a group of individuals who comprise the same characters (Creswell, 2005: 595); therefore, all the primary schools in Vhembe District form the population for this study. However, not all the schools could take part in the study as there would be too many. For this reason, few schools were preferred to provide the required in-depth information about implementation of NST – CAPS. Two schools were therefore chosen for this research.

1.7.3 Sampling

The researcher used convenience sampling to select the most relevant participants who were easily accessible. According to Brewerton and Millard (2012:117) individuals are selected from a population according to the underlying interest in a particular group. Individuals or group of people were selected based on expertise, knowledge, and experience in the teaching of natural science and technology. School managers, HODs, and educators were selected as participants in the research study.

Two schools in Mvudi Circuit were sampled. In each school NST educators, HOD, and a principal were selected to take part in the research.

Selection was based on:

- Educators who teach natural science and technology.
- Natural science and technology heads of departments.
- Principals of selected schools.

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1.7.4 **Research instruments (tools for data collection)**

1.7.4.1 **Observations**

According to Cohen et al (2000:396) the distinctive features of observation as a research data collection technique is that it offers the opportunity to gather "live data" from naturally occurring situations. The researcher used the two sampled schools and collected data through observing the practical application of natural science and technology policy as stated before.

1.7.4.2 **Interviews**

Johnson and Christensen (2011:178) define an interview as a data collection method in which the interviewer asks questions from an interviewee. Interviews may be categorized according to Patton (2002:341-347) as (1) informal conversational interview (2) the interview guide or topical approach; and (3) the standardized, open-ended interview. The researcher used open-ended interviews to gather information from educators, principals and heads of department. Mock interviews were practiced through simulation with people that have expertise to ensure that the method was success. People with expertise assisted with inputs in the designing of interviews before a final document was drafted for data collection.

1.7.5 **Data analysis**

MacMillan and Schumacher (2006:364-365) state that data analysis is an on-going cyclic process that is integrated into all phases of qualitative research. According to MacMillan and Schumacher (2006:365) the steps of data analysis are:

- Data collection e.g. field work.
- Coding and categorising.
- Patterns (themes and concepts).
- Narrative structure or visual representations.

The researcher collected data through interviews by recording the responses using a voice recorder, transcribed interviews, organised data into categories and clusters and coded data into themes.

1.8. **SIGNIFICANCE OF THE STUDY**

Information from the research has enabled the following:

1.8.1. Making recommendations in relation to the proper implementation of natural science and technology CAPS in teaching. The information can be useful for the Department of Education, curriculum development, and

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educational research by researchers, educators, heads of departments, and principals.

1.8.2. Enhancing knowledge about theories related to teaching of NST and contributing to that knowledge.

1.9. DELIMITATIONS OF THE STUDY

Delimitations are those characteristics that limit the scope and define boundaries of a study (Simon, 2011). For this study, the research was conducted in Mvudi Circuit, Vhembe District, Limpopo Province. Two primary schools were used for the study.

1.10. LIMITATION OF THE STUDY

Limitations are potential weaknesses in the study, which are out of control (Simon, 2011). The research was conducted in public primary schools in Mvudi Circuit in Vhembe District. With regard to this study, all possible limitations that might arise were fully addressed. Some of the factors that could have caused limitations to the study were:

1.10.1. The researcher might have been biased or subjective

Since the researcher was a principal of a primary school in the same circuit and already had some preconceived ideas about implementation of NST-CAPS, he might have been biased in conducting the research and interpreting the findings. However to avoid potential bias, data were tape-recorded and transcribed exactly as they were with no changes.

1.10.2 Research design

Because this research was based on a qualitative and interpretive design, the results may not be generalised to other schools in the Mvudi Circuit.

1.10.3 Transport

Even though convenience was one of the criteria used in the selection of research schools, it was found out during data collection that travelling to school B primary which was forty kilometres was challenging in terms of time to reach that area. During rainy season, the gravel road was difficult to drive on.

1.11. ETHICAL CONSIDERATIONS

According to Cohen et al. (2007:51), the awareness of ethical concerns in research, is reflected in the growth of relevant literature and in the appearance of

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regulatory codes of research practice, formulated by various agencies and professional bodies. Before starting with data collection for this research, an ethical clearance was sought from the University which served as a sign that the University was satisfied that the measures to be followed in the study would not pose any danger or harm to the participants. In this research, the researcher considered the following before embarking on the research.

1.11.1. **Informed consent**

The purpose of the research was stated clearly to the participants in the consent letters. Participants were informed that they were free to participate or refuse to participate in the research due to personal reasons. They could also withdraw in the middle of the research without giving reasons if they did not wish to continue.

1.11.2. **Access and acceptance**

The researcher was able to access selected schools after obtaining permission from stakeholders like the District Education Office; Circuit Offices; school principals, heads of department (HODs) and educators.

1.11.3. **Privacy and anonymity**

The researcher avoided, at all costs, violating the privacy of the participants. Interviews were conducted individually in a secluded area to ensure privacy. Codes instead of names were used during interviews and data analysis.

1.11.4. **Confidentiality**

The researcher explained the aspect of confidentiality to the respondents. This meant that their names, dates of birth, places of occupation would not be mentioned or displayed in the research report.

1.12. **TRUSTWORTHNESS OF THE RESEARCH**

According to the English Oxford Electronic Dictionary, 11th Edition trustworthiness is something that can be relied on. It is more than reliability. It is something that one can depend on. Trustworthiness, credibility, neutrality, consistency are some of the terms that are used instead of reliability in qualitative research. Lincoln and Guba (1985 cited in Cohen et al, 2005) prefer to replace 'reliability with terms such as 'credibility', 'neutrality', 'confirmability', 'dependability', 'consistency', 'applicability', 'trustworthiness', 'transferability'. In qualitative research, researchers who are researching on the same setting may come up with different

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findings that are reliable. (Cohen *et al*, 2007: 149) argues that in qualitative methodologies, reliability includes fidelity to real life, context and situation specificity, detail, depth of response and meaningfulness to the respondents, honesty and authenticity. For the data to be reliable, data collection needs to meet most of these requirements. This is in contrast to the quantitative research which assumes the possibility of replication; if the same methods are used with the same sample where the results should be the same (Cohen et al, 2007: 148).

While the credibility in quantitative research depends on the instrument used in qualitative research, according to Patton (2002:14) "the researcher is an instrument" because he participated through posing questions to the respondents.

In this research, the researcher used interviews; observations and recordings to get more valid, reliable and diverse realities from participants in their natural settings i.e. schools. The researcher availed himself to the natural settings by being part of the research during interviews and observations. In ensuring trustworthiness of the research, consistency was maintained throughout the interview session to avoid biasness.

Participants were also given an opportunity to revisit the data collected to enable them to add were they feel data were left out and to rectify the data that they consider do not properly represent their responses.

1.13. STRUCTURE OF THE REPORT

The report of this research is presented in five chapters.

Chapter 1 focuses on background information of the research, a statement of the problem, research aims and objectives, research questions, limitations of the study, preliminary literature review, methodology, definitions of concepts and bibliography. Chapter 2 describes and explains the concept natural science and technology policy, assessment, implementation, public schools and compares the information with the current situation. Chapter 3 provides a discussion on the choice of research design and method, definition of qualitative research, data collection methods or research instruments, trustworthiness, sampling procedures and statement of research ethics. In chapter 4, the researcher describes how the data were transcribed, coded, interpreted and analysed. This culminates in presentation of findings from the research. In chapter 5, the researcher summarises the main findings, formulate suggestions and conclusions as well as recommendations for further research arising from analysed data. The summary

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is done per chapter and includes the findings and recommendations.

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1.14. CONCLUSION

The chapter has outlined how the research unfolded. The background to the study, problem statement, research questions, as well as significance of the study has been laid down to give the rationale for conducting this research. The chapter also maps out the research as it is reported in the five chapters. The qualitative research design and methodology were used to address the research questions posed in this study as reflected in the methods used to collect and analyse data.

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LITERATURE REVIEW

2.1. Introduction

This chapter aims to provide context of historical account on the implementation of natural science and technology policy in public schools. Neuman (2014: 125) states that the review rests on the principle that scientific research is a collective effort, one in which many researchers contribute and share results with one another. The chapter explores literature on the implementation of natural science and technology policy in South Africa and other places in the world. It gives the path of prior research and how the current project is linked to the former. As the researcher conceptualizes the research problem, he locates it in the body of theory. Initially, he must identify and state those assumptions in a framework of theory. Neuman (2014: 125) went further by indicating that doing literature review builds on the idea that knowledge accumulates and that we can learn from and build on what others have done.

The following are covered in the chapter: curriculum processes in South Africa since 1994 with special reference to curriculum 2005, RNCS grades R-9 and NCS grades 10-12 and CAPS grades R-12, natural science curriculum reforms that involves natural and technology Curriculum and Assessment Policy Statement, as well as factors affecting implementation of curriculum (NST-CAPS) and the theoretical framework underpinning the study.

2.2. Curriculum process in South Africa since 1994

Recent changes in South African curricula have been enacted primarily because of political influences. As contained in The South African Constitution of 1994, the aim of curriculum changes is to address the societal imbalances brought about by apartheid. The following paragraphs give the background of curriculum processes in South Africa from C2005, RNCS and NCS and CAPS.

2.2.1. The onset and demise of Curriculum 2005 (C2005)

South African education system has undergone many curriculum changes since 1994. Outcomes-Based Education (OBE), as an approach of C2005 was introduced in 1997 as a system that was intended to address the past injustices of the apartheid era (DoE: 1997). The Bantu Education Act, 53, under apartheid era, was meant to divide education along racial lines where whites were given a different and more superior form of education than the Black people. Hence the

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introduction of OBE after the democratically elected government in 1994 was seen as a way of bridging that division by providing equal education to all learners.

During 1997, the minister of education, Professor Sibusiso Bengu announced the adoption of the new policy known as Outcomes-Based Education (OBE) which was internationally borrowed from standard-based national curriculum linked to formative and continuous assessment rather than summative assessment (Chisholm,2005: 80).

In some African states like Botswana, OBE was successful because educator training was taken as a priority before implementation (Chisholm & Chilisa, 2012: 381). The reform processes started with training of teachers and the introduction of new qualification to upgrade their knowledge. In South Africa, the process began with changing curriculum documents and prescripts with which teachers had to work. Teachers' knowledge was delegitimised, as they were asked to abandon all they knew and begin afresh (Jansen & Christie, 1999) cited in (Chisholm & Chilisa, 2012: 381) with the new curriculum. However, C2005 did not last in South Africa. The Review Committee established by the Minister of Education in 2000 identified features that posed problems to the implementation of this curriculum. The problems included:

- A skewed curriculum structure and design.
- Complexity of language.
- Lack of alignment between curriculum and assessment policy.
- Inadequate orientation, training and development of teachers.
- Learning support materials that are variable in quality, often unavailable and not sufficiently used in the classroom.
- Shortage of personnel and resources to implement and support curriculum 2005 (Chisholm, 2005: 87).

Due to these problems, the Department of Education was forced to review C2005 in 2000 (Tshiredo, 2012: 4), through the establishment of The Ministerial Review Committee. The committee came up with recommendations to introduce Revised National Curriculum Statement (RNCS) which was to operate in Grades R to 9 and National Curriculum Statement for Grades 10 to 12 (DBE, 2011: 4). Some of the recommendations of the Review Committee were:

- Streamlining the curriculum design features and simplifying its language through production of amended National Curriculum Statement.

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- RNCS should reduce the curriculum features from eight to three which included: critical and developmental outcomes, learning outcomes, assessment standards.
- Aligning curriculum and assessment.
- Implementation should be strengthened by improving teacher orientation and training, learning support materials and provincial support.
- The relaxation of time-frames for implementation.

The recommendations gave birth to the establishment of RNCS (DoE, 2002: 2).

2.2.2. **RNCS grades R to 9 and NCS grades 10 to 12**

The Review Committee came up with the following principles of RNCS which characterised the new curriculum (DoE, 2002: 2):

- Outcomes Based Education (OBE).
- Clarity and accessibility.
- Progression and integration.
- High level of skills and knowledge for all.
- Social Justice, a healthy environment, human rights and inclusivity.

These principles were meant to enable the realisation of social transformation and provision of equal access to education to all learners. RNCS did not last long because it also had its own challenges that included, amongst others, complex language, shortage of personnel and resources as mentioned in Chisholm (2005: 87).

2.2.3. **CAPS grades R-12**

In view of the challenges of RNCS, the Department of Basic Education again established a Review Committee in 2009 (DBE, 2011a: 12-13). A new curriculum called the National Curriculum Statement (NCS) was developed which came into operation in 2012 (DBE, 2011a: 1). The Curriculum and Assessment Policy Statement (CAPS) for Grades R to 12 was part of NCS package that was introduced.

CAPS was not intended for total eradication of RNCS, but a streamlining and strengthening of RNCS. The Department of Basic Education (states that CAPS would strengthen the implementation of OBE, human rights and inclusivity (DoE, 2002: 2). Its introduction (aims at providing clearer specifications of what is to be taught and learnt on a term-by-term basis (DBE: 2011: 14). Seemingly, the

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curriculum is intended to address the challenges of previous curricular implementation such as C2005, RNSC and CAPS.

RNCS comprised of eight learning areas which are Languages, Mathematics, natural science, technology, social sciences, arts and culture, life orientation, economic and management sciences. A learning area is defined as a field of knowledge, skills and values which has unique features as well as connections with other fields of knowledge and learning area (DoE, 2002: 9). Learning areas changed to subjects in CAPS (DBE, 2011b: 6-7). The recent CAPS for intermediate phase (grades 4 to 6) have six subjects that are home language, first additional language, mathematics, social science, life skills and natural science and technology. Each subject in CAPS has its own broad specific aims to be achieved.

CAPS is not a new curriculum, but an amendment to the National Curriculum Statement. CAPS, according to DoE (2011a: 6-7) was to be implemented in grade R-3 and grade 10 in 2012 and grade 4-9 and 11 in 2013 and grade 12 in 2014. Some of the recommendations of the Review Committee (DoE, 2011a: 12-13) were:

- Going back to subjects and essential subjects knowledge
- Producing one clear and accessible policy document
- Writing a more streamlined curriculum
- Standardising assessment (DoE, 2011a: 12-13).

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The following is a table to show transition from Learning Areas (NSC) to Subjects (CAPS) from Grade R to Grade 6:

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Table 2.1: comparison between learning areas and subjects

GRADE	LEARNING AREAS (NSC)	SUBJECTS (CAPS)
R	Home languages Numeracy Life Skills	Home languages Mathematics Life Skills
1	Languages (Home & 1st additional) Numeracy Life Skills	Languages (Home & 1st additional Mathematics Life Skills
2	Languages (Home & 1st additional) Second Additional Language Numeracy Life Skills	Languages (Home & 1st additional) Mathematics Life Skills
3	Home Language 1st Additional Language Numeracy Life Skills	Languages (Home & 1st additional) Mathematics Life Skills
4 - 6	Languages (Home &1st additional) Mathematics Social Science Natural Science Technology Economic and Management Science Life Orientation Arts and Culture	Languages (Home & 1st additional) Mathematics Natural Science and Technology Social Science Life Skills

(DBE, 2010: 26)

2.3. **Natural science curriculum reforms**

Curriculum and Assessment Policy Statement (CAPS) grades R to 12

Each subject in CAPS has its own broad specific aims to be achieved. CAPS intermediate phase (grades 4 to 6) has six subjects: home language, first additional language, mathematics, social science, life skills and, natural science and technology (NST).

In NST, the broad specific aims areas are:

- Specific aim 1, which relates to the knowing of the subject content (theory).
- Specific aim 2, which relates to doing science or practical work and investigations and to design and make practical solutions to everyday problems.
- Specific aim 3, which relates to understanding the application of science and technology in everyday life, as well as understanding the history of scientific of scientific discoveries and technological solutions

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- and the relationship between indigenous knowledge and science and technology.

Knowing of subjects includes mastering of concepts, processes, phenomena, principles, theories, laws, models. Doing science or practical work should include investigations, observations by learners to solve problems. The educator attains the status of facilitator giving learners guidance on how to do practical work. The application of science and technology covers a range of application of science in community. The learner should be able to apply and associate the knowledge gained in solving everyday problems by scientific approaches.

Indigenous knowledge and scientific discoveries should be related to indicate the development and application of the two (DBE, 2011b: 12 -19).

Learners should understand practical uses of natural sciences and technology in society and the environment and have values that make them caring and creative citizens. Science and technology studying should be relevant to the lives of learners outside the school. Leaners are able to contribute to improvement of things like food quality, water quality. This should also provide opportunities to a range of careers and jobs. Graham cited in Hoedley (2012: 231) holds a general view on curriculum definition by stating that curriculum can be distinguished by the extent to which they are narrow or broad in relation to what is included and what is excluded in any given statement.

Although there are many different perceptions by educationists on what curriculum entails, the definition by Graham cited in (Hoedley, 2012: 231) stating 'curriculum' as a term is often used to refer to formal academic programme provided by a school as reflected in subjects on the time table. The following paragraph depicts a state comprising of inquiry domains proposed by Hoedley (2012: 267). Such inquiry domains cover a wide range of CAPS requirements (DBE, 2011b:12) as embraced in his three science inquiry domains.

Hoedley (2012: 267) poses three science inquiry domains of Lower Secondary Syllabus in Singapore which are also contained in CAPS approaches (DBE, 2011b: 12-13).

The three domains of science inquiries are:

- Knowledge and understanding and application.
- Skills and processes.

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- Ethics and attitudes.

Most of the specific aims of CAPS (DBE, 2011b: 12) have been covered in Graham and Hoedley approaches:

Table 2.2: comparative table of Hoedley and CAPS approaches is given below:

Hoedley three scientific inquiry approaches	NST/CAPS curriculum implementation aims
Knowledge and understanding and application	Knowledge of the subject (Theory).
Skills and processes	Doing science or practical work.
Ethics and attitudes	Understanding the application of science and technology in everyday life.

The tailoring of CAPS is intended for a good purpose like being user friendly and focussing on the subject matter that is supposed to be learnt by learners (Moodley, 2013: 71). From my experience as a principal, educators seem to have challenges in the implement the curriculum. Educator training and resources are some of those that, for proper implementation, need to be looked into and prioritised. The following is an exposition of the interconnectedness of curriculum implementation and teacher training:

2.4. Factors affecting implementation of curriculum (NST- CAPS and educator training

The main purpose behind the introduction of new curriculum was improvement of the education system in South Africa. The curriculum changes that have taken place since 1994 to the present attest to fact that challenges in education do exist. Introduction of the new curriculum is intended to overcome the curricula divisions of the past (DBE, 2011b).

As already mentioned the Curriculum and Assessment Policy Statement (CAPS), introduced in 2012, replaced the National Curriculum Statement (NCS). CAPS is meant to be more user-friendly to educators, focusing mainly on the subject matter to be learned.

According to the Department of Basic Education, the introduction of CAPS has provided teachers with clearer guidance on what to teach and the pace at which curriculum needs to be covered (DBE, 2011b: 19). In contrast with the intended

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goals of CAPS, implementation seems to pose problems to educators due to issues like inadequate educator training, lack of resources, and lack of teacher support by the department at provincial, district and circuit levels.

Mampuru (2001: 19) contends that implementation is the most difficult phase of the change process as most of the shortcomings of the change may appear at this stage. Some, like Mata (2012: 512), holds the view that a key factor on which the success of curriculum innovation depends is the in-servicing of teachers in the use of new approaches. As such, provinces in collaboration with districts should ensure that proper curriculum training is given to educators.

Although talking about mathematics educators, the importance of educator training applies to educators of all the subjects implementing CAPS. In order for any sort of change to be successfully implemented, educators need to receive orientation and training. The reason for this is that if curriculum is imposed on educators who are not capacitated in advance, it will be difficult for educators to understand what they are supposed to do. For any curriculum change to be effectively implemented by educators, educators need to have knowledge and skills for ensuring success. Mata (2012:512) holds the same view by stating:

> "A key factor on which the success of curriculum innovation depends is the in-servicing of teachers in the use of new approaches. In order for any sort of change to be successfully implemented, educators need to receive orientation and training (Mata, 2012: 512)".

Similar suggestion has been made by some that, for the successful implementation of a curriculum like CAPS, teacher training should occur the year before implementation (Sobrayan, DBE, 2013: 26).

The Department of Basic Education commits itself to training the stakeholders before implementation of CAPS (DBE, 2013: 26), by stating: 'We will intensify teacher development to prepare educators for the *implementation* of CAPS and pay special attention to the training of principals, particularly those in underperforming schools.' In line with this commitment, training was done in all the nine provinces, although the extent of its impact is not clear. Training sessions took place for a period of 2-3 days per district in 2012. Short training sessions, among others, have been shown to pose problems for implementation. As Morrow (2007:6) cited in (Kamla, 2012) argues, our problem is lack of implementation of previous policies, and a pattern of late and short training sessions for teachers.

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From my experience as a science educator and principal in a primary school, although CAPS has been simplified, its implementation seems to be giving problems to educators. As cited before, expertise, training of educators and resources may not be adequate.

This research is based on how primary school educators implement natural science and technology curriculum in teaching. Improper implementation seems to be a downfall on the performance of learners in science. Literature indicates that the evaluation of numeracy and science performance by international comparisons shows that South African children are not performing up to the standards required. This view is supported by Bloch (2009: 17) who stated: "Recent performance of learners in international science and mathematics performance still reflects poor performance as before." The Trend in International Mathematics and Science report, TIMSS (2011), reflects that the very same challenge persists.

The report for assessment conducted in 2011 for grade 9 learners in mathematics and science indicate that South Africa, Botswana and Honduras were the three last performing countries out of forty countries. This is a reflection of lack of basics in subjects like mathematics and science in the three countries including South Africa.

Training plays a pivotal role in curriculum changes for proper implementation. The Department of Education has insurmountable challenges of coping with training demands while at the same time ensuring that educators and learners' study time is not compromised. As already mentioned, there is a view that training is not given enough time by the Department of Education.

When educators are confident in the subjects they teach, this will inspire public confidence in the education system. They need to be experts in the curriculum, and hence, introduction of new subjects must be preceded by skills' development. Training is therefore an essential part that precedes any practical implementation of any activity including curriculum delivery.

2.5. Theoretical framework: The profile of curriculum implementation

In this study, the researcher has opted for the theory of constructivism for curriculum implementation as described by Rogan and Grayson (2003). The theory has been used by science educators and researchers around the world. The theory of implementation is based on the learning environment, where the

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learners, educators, curriculum and educational resources meet. The focus here was on learning and instruction i.e. classroom activities taking into consideration the importance of administration and governance.

The theory recognises that the theory of constructivism has been widely embraced by science educators (Rogan & Grayson, 2013: 1198). As further stated by Rogan and Grayson (2003) constructivism is a theory of learning according to which knowledge cannot simply be poured into the mind of the learner as if in an empty vessel. Rather, for meaningful learning to take place, the learner must construct that knowledge for himself or herself by using the knowledge they already possess and their prior experiences.

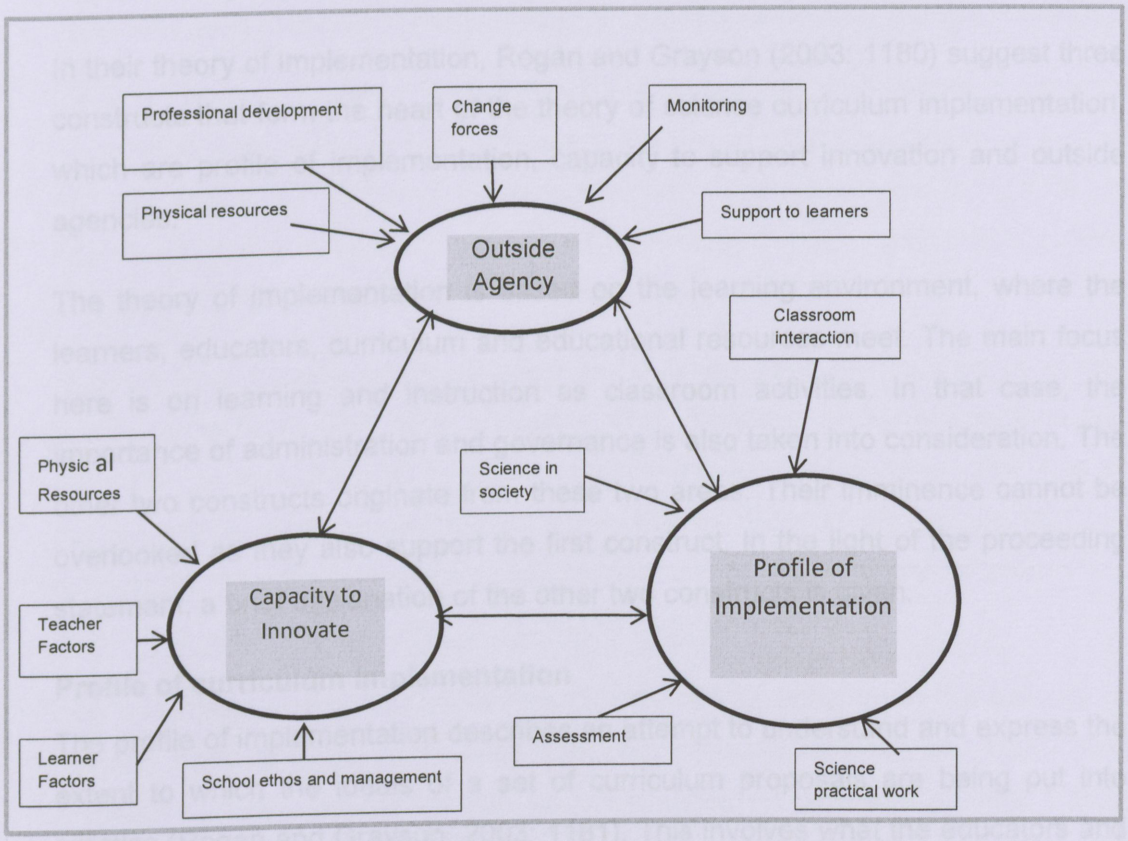


Figure 1: Rogan and Grayson's framework for analysis of curriculum implementation.

Supporting the view of constructivism, Tawana (1996: 51) made mention that from the 1970's an alternative to transmission approached has been a constructivist view of teaching and learning. Stemming from these views, the learner has become the focus for learning actively participating in meaning making.

Other researchers like Madlela (2014: 21) concur with child-centred approach by attesting that it is imperative to state that philosophers like Rosseau, Pestalozzi, Packer and others formed a solid foundation for child centred approach because

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their philosophical and conceptual framework of the child centred approach still continue to influence the education system today in many countries including South Africa.

Lin (2006: 34) is in favour of cooperative instructional learning theory. According to this theory it is a method in which learners work in small groups to accomplish a common learning goal under the guidance of the teacher.

Although cooperative instructional learning support Rogan and Grayson (2003) theory of constructivism of child centeredness, Van Wyk (2007: 218) has contrasting view because of its informal manner of bringing about a deep understanding of subject matter.

In their theory of implementation, Rogan and Grayson (2003: 1180) suggest three constructs that form the heart of the theory of science curriculum implementation, which are profile of implementation, capacity to support innovation and outside agencies.

The theory of implementation is based on the learning environment, where the learners, educators, curriculum and educational resources meet. The main focus here is on learning and instruction as classroom activities. In that case, the importance of administration and governance is also taken into consideration. The other two constructs originate from these two areas. Their imminence cannot be overlooked as they also support the first construct. In the light of the proceeding statement, a brief explanation of the other two constructs is given.

Profile of curriculum implementation

The profile of implementation describes an attempt to understand and express the extent to which the ideals of a set of curriculum proposals are being put into practice (Rogan and Grayson, 2003: 1181). This involves what the educators and learners do in the class, through the four levels i.e. from level one (educator-centred demonstrations to level four, open-ended learner centred investigations).

What constitute the dimensions of profile implementation in natural science teaching, according to Rogan and Grayson (2003: 1183) are among others, practical work, assessment, interpretation of data through graphs and tables and the use of immediate environment specimen to explain phenomena. In applying these dimensions, contextual factors of the school need to be taken into account.

Tawana (2009: 31) regards capacity factors as broad indicators coming from physical resources, teacher and learner factors affecting classroom activities such

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as teaching and learning. These are crucial structures in determining what lead to effectiveness in curriculum implementation.

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The table given by Rogan and Grayson (2003: 1183 -1185) is merely a guideline on the profile of implementation. In using the theory, the table may be adapted to suite specific needs of the school.

Lelliot et al (2009:60) confirm that Rogan and Grayson's levels need to be seen as examples, and future studies should attempt to define their own levels more exactly than rather broad categories listed in the original framework. Furthermore, they stated that there is a gap in research around the third construct, support from outside agencies, of Rogan and Grayson's (2003: 60), which we found has not attracted much research in both mathematics and science. In the same breath,

Mpanza (2013: 27), states: 'My study will not include this third construct because my focus is specifically on teacher's interpretations of RNCS curriculum as well as on the way they implement the curriculum.' The constructs of profile of implementation and capacity to support innovation seem to gain more ground than support from outside agencies by many researchers.

Support from outside agencies need to be taken seriously as part of proper curriculum delivery. The issue of support from outside agencies strengthens and boosts the morale of school curriculum implementation because the school has all the support from non-governmental organisations. Schools will ensure that the support given by these institutions are maximized in curriculum implementation for avoiding disappointments and further future assistance.

The constructs of Rogan and Grayson's may not be absolute in the delivery of science curriculum, but cover wide spectrum of natural science and technology curriculum implementation. It can be implemented in any environment that is available to an educator including rural and urban areas because it also takes into account the immediate environmental factors in teaching.

One has to adopt such theory because of its inclusiveness and flexibility as given by Rogan and Grayson's table (2003, 1183 – 1185). **See appendix B1; appendix B2 and appendix B3 on page 99; page 100 and page 101**

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Educators can also apply the same table in effective implementation of NST-CAPS because most of them are covered in the three main specific aims directly or indirectly. As contained in the NST-CAPS the three specific aims relate with profile implementation in many instances as reflected below:

Table 2.3 comparison between profile of implementation and NST-CAPS specific aims

Profile of curriculum implementation	NST-CAPS specific Aims
Learners make notes on the concepts learnt.	**Specific aim one**: relates to knowing subject content
Educator uses classroom demonstrations to help develop concept. Educator uses specimens found in the local environment to illustrate lessons	**Specific aim two**: Doing practical work and investigation to design and make practical solution to everyday problems
Educator uses examples from everyday life to illustrate scientific concepts	**Specific aim one**: Understanding application of science and technology in everyday life as well as understanding the history of scientific discoveries and technological solutions and the relationship between indigenous knowledge and science and technology

(DBE, 2011: 12)

See appendix B1 of Rogan and Grayson (2003) constructs of profile of implementation.

Profile of implementation consists of four levels as depicted in the table above. The focus here is on level one as it covers characteristics of NST-CAPS specific aim number one (DBE, 2011b: 12). Needless to say, level one embraces, amongst others, educator-centred as well as organised lessons. This involves the question and answer mode, in others words, learners' assessment is based on pen and pencil activities. Level one reflects most of the characteristics of NST-CAPS, specific aim one, which relates to the knowing of the subjects content

(DBE, 2011b: 12). In NST-CAPS specific aim one (DBE, 2011b: 13). Assessment focuses on cognitive skills as attested by the use of verbs such as explain, compare, rearrange, give example of, illustrate, and select.

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Level 2 (two) deals with science practical work. It involves doing inquiry type of demonstrations. Learners participate in (...)ts and communicate data by using graphs and tables.

Level 3 (three) is a problem-solving stage. The educator designs practical work in such a way that it encourages learner discovery of information. Assessment is multidimensional because it includes reports, reports on extra reading, creation of charts and improvised apparatus.

Level 4 (four) is an open-ended learner-centred investigation. Learners take major responsibility for their own learning. They take part in the planning and assessment of their own learning by undertaking long term and community-based investigations projects. The educator is regarded as a facilitator and assists learners in weighing different theories they try to explain. Learners try to come up with innovations of community based projects like growing of new types of crop that is heat resistant.

Each of the three NST specific aims is related to one of the four levels. Rogan and Grayson (2003: 1186) indicate that the levels are not linear. In essence, one can still operate in level one simultaneously with level three depending on the contextual factors presenting themselves at that time.

Level one, according to Rogan and Grayson (2003: 1182), is a good transmission type of lesson rather than the 'lowest type of practice' in existence unlike in developmental models. In terms of Banathy model Cited in (Rogan and Grayson, 2003: 1179), the emphasis shifts from the instructional to the learning level. The teaching of NST-CAPS specific aims should also be taught in integrated way (DBE, 2011: 17) as alluded in the four levels by Banathy, cited in (Rogan and Grayson: 2003: 1179). In NST teaching, a teacher may ensure that these levels are covered in his or her curriculum delivery. Reflection, as stated before, does not necessarily follow linear steps but can happen in an integrated manner. Although the table is based on C2005 that has changed, the basics of science teaching are still applied today.

Through experience, the foundation of science understanding originates from mastering of science concepts, principles and laws even today, both in primary and secondary levels. The issue of mastering represents level one of Rogan and Grayson (2003: 1183) constructs. NST cannot be excluded in this regard. The other levels cannot be ignored as they support the achievement of basic level one of Rogan and Grayson constructs.

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Rogan and Grayson constructs display learner-centeredness in the teaching of science especially in developing countries supported by some literatures. Although some like Lelliot (2009:60) regard these constructs as mere examples, these constructs are suitable for science teaching as they cover classroom activities; support to innovation as well as support from outside agency. Researchers like Mpanza (2013: 27) who concentrates on only the profile of implementation forget that issues like support to innovation and support from outside agencies if they are undermined could affect proper implementation. It advisable to couple implementation with the other constructs to ensure that implementation is a success.

2.6. CONCLUSION

Literature reveals that the issue of human resource capital investment as far as training of educators is concerned in curriculum changes implementation is of great significance. The South African educational policy changes are intended for positive goals. The problem is adequate time is not devoted to training according to literature and observations. This issue needs to be addressed for proper future curriculum implementation. Very good theories by researchers are in place such as Rogan and Grayson (2003), but they may fail if time and space are not given to educator training to master the aspects of curriculum implementation. The next chapter focusses on the research design and methodology.

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CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1. **Introduction**

This chapter describes the research design and methodology that were used in the study as well as data collection procedures. It also describes the population, sampling procedures and design of research instruments. Quality measures of trustworthiness and ethical considerations necessary when collecting data are also described.

3.2. **Research design**

Terre Blanche, Durrheim and Painter (2006:34) assert that a research design is a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research.

In this study, interpretative exploratory qualitative research design has been adopted. The purpose of opting for qualitative research is its naturalistic approach that seeks to understand phenomenon in a context-specific setting, such as real world setting (where) the researcher does not attempt to manipulate the phenomenon of interest (Patton, 2002: 39).

Exploratory qualitative research design has been used to get better understanding on the implementation of natural science and technology by primary school educators directly from their experiences in curriculum delivery. This type of design enabled the researcher to get a clearer understanding of how the curriculum was implemented as educators were able to express themselves freely with limited pressure from the researcher. Exploratory qualitative research design reflects a process that aligned to the theory of implementation as reflected in Rogan and Grayson (2003) theory that the researcher adapted.

Participants, namely, educators, heads of departments and principals were consulted at their different schools for data collection. Schools were their 'natural settings' where they were implementing the curriculum, therefore, in order to make them comfortable to participate and share their experiences, they were not moved to other unfamiliar places.

3.3. **Research methodology**

According to Henning, Van Rensburg and Smit (2013:38), research methodology is the coherent group of methods that complement one another and that have the

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'goodness of fit' to deliver data and findings that reflect the research and suit the purpose. The methods and approaches that fit the qualitative research design were therefore used in this research. Interviews and classroom observations were the main methods that were used to collect data. Interviews and classroom observations enable data to be collected from participants where they were given chance to express themselves freely.

3.3.1. **Population**

Creswell (2005: 595) states that a population is a group of individuals who comprise the same characteristics. Creswell's view indicates that a population consists of components called samples that bare related traits. In this research, a population is therefore a larger part from which representative samples are drawn. In this qualitative research, where homogenous groups of respondents were dealt with, a sample was taken from a population of educators, heads of departments and principals from the two schools in Mvudi Circuit. The population represented people with expertise in the field of natural science and technology CAPS. From this population, educators formed their own sample, three (3) from each school. Heads departments comprised their own, one (1) from each school as well as principals, one (1) from each school.

3.3.2. **Sampling**

To begin with, convenience sampling procedure was employed to ensure accessibility to the two schools in Mvudi Circuit. The two schools are around Thohoyandou and could be accessed by road, which is tarred in certain places and gravelled in others. The distance between the two schools is 40 kilometres.

(Cohen et al, 2007: 113-114) indicate that convenience sampling or as it is sometimes called, accidental or opportunity sampling, involves choosing the nearest individuals to serve as respondents and continuing the process until the required sample size has been obtained or happen to be available and accessible at the time. Furthermore, Brewerton and Millard (2012:117) also state that individuals are selected from a population according to the underlying interest in a particular group.

Participants were selected from two schools in Mvudi Circuit, Vhembe District. Because of its nature of needing in-depth understanding from knowledgeable people in the subject, purposive sampling was used to select the most relevant participants that are educators, heads of departments and principals. Therefore,

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from the conveniently selected schools, individuals were purposively selected based on their expertise, knowledge and experience in the teaching of natural science and technology. Sampling was done such that one school was from Thohoyandou Town and the second from a rural village 40 kilometres from Thohoyandou. The reason was to get information from town community as well as a community from rural area. Such information enabled me to have a richer understanding of the implementation of natural science and technology Curriculum and Assessment Policy Statement under different environments and perspectives. The purpose was not to compare the two schools or settings.

For purposes of anonymity, these schools are referred to as school A and school B in the report. In each school, three (3) NST educators, one (1) head of department and one (1) principal formed the research sample.

Sample size:

In this study, the total sample consisted of 6 educators, 2 heads of departments and 2 principals giving a total of 10 (ten) participants. This information is shown in table 3.1.

Table 3.1: Research participants from selected schools in Mvudi Circuit, Vhembe District

Respondents	School A	School B	Total
Educators	3	3	6
Heads of departments	1	1	2
Principals	1	1	2
Total	**5**	**5**	**10**

The selection of participants was based on

- Educators who teach natural science and technology.
- Heads of department in charge of natural science and technology.
- Principals of the selected schools.

3.4. Tools used to collect data

Data were collected through individual interviews and observations. The individual interviews were based on a one-on-one process which lasted between 20 to 30 minutes per participant. Semi-structured interviews were also used to collect data from heads of departments and principals. In the case of educators, both interviews and class observations were conducted.

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3.5. Data collection procedures

Prior to collecting data, permission was sought from Vhembe District Office as well as school principals. In order to get to schools, a car was used after permissions were granted. Suitable times and days were assigned by the school to meet firstly educators, then HODs and lastly, the principals. Besides interviewing all the participants, the educators were also observed in their respective classes to get an understanding of the practical application of NST-CAPS. A checklist for lesson observation was used to assess curriculum application in classroom situations. Findings from classroom observations were captured in a checklist while interviews were audio-taped. To facilitate data collection, indicators for each of the two sub-questions that are reflected in chapter 1 were identified:

Sub-question 1

How do educators use natural science and technology Curriculum and Assessment Policy Statement in the teaching of natural science and technology?

Perceptions and concerns of educators were identified as indicators for this question. In answering the question, it would reflect the extent at which NST/CAPS ideals are being implemented in class practice. Rogan and Grayson's (2003: 1183 – 1185) profile of implementation would be displayed during teaching practice. Rogan and Grayson practices that were observed are classroom interaction, science practical, societal and assessment practices.

The following indicators were constructed:

- What are the educators' views and concerns on the implementation of the NST/CAPS curriculum?
- To what extent are the ideals of NAST/CAPS being put into practice in classrooms in Mvudi Circuit, Vhembe District?

Sub-question 2

What factors affect the implementation of natural science and technology Curriculum and Assessment Statement?

The factors inside and outside the school that affect the implementation of the curriculum include educator factors, learner factors, physical resources and ecology and management of the school. On the other hand, the factors from

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outside that support innovation include curriculum materials, educators' participation in activities and activities from outside the school. Ultimately these factors bring an understanding of the profile of capacity to support innovations and the profile of outside support.

The following questions arise from the indicators as outlined below:

The profile of capacity to support innovations

- What is the level of influence of educators' knowledge, their perceptions and concerns about teaching NST/CAPS?
- To what extent do learners' background and environment influence learning of NST/CAPS?
- What degree of influence do physical and scientific facilities have on the implementation of science curriculum?
- How do the school ecology and management affect the implementation of natural science and technology Curriculum and Assessment Statements?

The profile of outside support

- What is the influence of curriculum materials given to schools on teaching and learning of the NST/CAPS curriculum?
- What is the influence of educator participation on professional matters in classroom exercises and learning of NST/CAPS?
- How does the involvement by communities of the schools influence learning of science?
- How do monitoring and support by departmental officials influence the implementation of NST /CAPS?

The two schools as described in Section 3.3.2 were visited for data collection. The following sections describe the methods and procedures used.

3.5.1. Semi-structured interviews

Regarding an interview, as Kvale (1996: 14) remarks, an *inter-view* is an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasises on the social situatedness of research data. Furthermore, as suggested by Creswell (2005: 214), qualitative interview occurs when researchers ask one or more participants general, open-ended questions and record their

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answers. The researcher may then transcribe and type the data into a computer file for analysis (Creswell, 2005:214).

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According to Cohen et al (2000: 105), sees an interview as an unusual method in that it involves the gathering of data through direct verbal interaction between individuals.

It is because of the naturalistic approach and the need for rich understanding of the views of participants that interviews were used as one of the instruments to collect data in this research. The interviews enabled the researcher to probe deeper into understanding the implementation of natural science and technology Curriculum and Assessment Statement by primary educators in Mvudi Circuit, Vhembe District.

To align with ethical considerations, ethical issues in research were explained to the respondents in advance. Explanation of ethical considerations such as anonymity, voluntary participation, freedom to withdraw from participation was capped by a consent form which was signed voluntarily by the participant. The explanation and signing of voluntary consent forms preceded the interview sessions and classroom observations.

Conducting the semi-structured interviews

Each individual participant had the same set of questions to respond to. The setting for conducting the interviews was a secluded area so as to limit any factors that might detract the attention of the participant or researcher such as noise, phone calls and others. The principal's office was used to avoid these distractions. To ensure fairness to respondents, allocated time to respond to questions was 20 – 30 minutes. Cohen et al. (2000: 268) cite the following advantages of interviews that were also experienced by the researcher during data collection from the respondents:

- The interviewer was allowed to probe for in-depth understanding of the research problem.
- Limits of the respondent's knowledge were tested.
- Cooperation between interviewer and respondent was encouraged in order to assist in the establishment of rapport.
- The interviewer could make a truer assessment of what the respondent really believes.
- Open-ended interview questions had no restrictions on either the content or the manner of the interviewee's reply.

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Apart from the advantages, a disadvantage of interviews experienced was:

- The interviews were time-consuming because of probing for more information by asking follow-up questions. This was done to enable participants to respond freely to questions.

3.5.2. Classroom observations

Observation is the process of gathering open-ended, first-hand information by observing people and places at a research site (Creswell, 2005: 211). There are other attractions in favour of using observations. As Robson (2001: 310) cited in Cohen et al (2000: 396) asserts, what people do may differ from what they say, they do, and an observation provides a reality check.

Educators were therefore observed during lesson presentation in classrooms which provided the teaching environment. A checklist for classroom observation was used to observe the following as reflected in Annexure: 4, Observation Checklist.

- Learning environment in the classroom.
- Availability of scientific laboratory equipment.
- Educator as a facilitator of the lesson.
- Learner participation like rising of hands to answer questions and ask questions.
- Responses given by learners when the teacher asked learners to identify prior knowledge those learners possess.
- Educator-learner relationship meaning that learners should be free to answer and raise questions. A positive relationship will ensure maximum participation by learners in the lesson.

Before commencement of a class visit, the purpose of the observation was clarified to educators. The purpose of these observations was to gather information about the implementation of natural science and technology Curriculum and Assessment Policy Statement by primary school teachers. Table 2 shows the number of visits to both school A and school B, the time taken for each interview session as well as class observations and topics covered:

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Table 3.2 the number of school visits, time taken and topics observed

A. Number of visits		
SCHOOL	**NUMBER OF VISITS**	
School A	2	
School B	2	
B. Time taken for each visit:		
School A	4,5hours (1,5hours for interview on day one and 3hours for observation on day two).	
School B	4.5hours (1,5hours for interview on day one and 3hours for observation on day two).	
C. Topics covered in each grade by each teacher in each school		
1. School A		
Grade	Teacher	Topic
4	1	Movement on land: mechanical system
5	2	Senses in animals and humans
6	3	Types of movements: linear movements
2. School B		
4	1	Movement in space
5	2	Senses in animals and humans
6	3	Types of movements: linear movements

3.6. Data analysis

The main aim of collecting data was to gain better understanding of the implementation process.

Audiotapes were played several times for transcription. Data analysis was done immediately after data were transcribed. Recordings were transcribed word for word. In the organising and presentation of data through questions, Rogan and Grayson (2003: 1180 - 1195) constructs were considered as reflected in the theoretical framework. The constructs are: capacity to support innovation, profile of implementation and support from outside agencies. Through analysis, the educators were categorised according to the four levels of each construct ranging from level one to level four. The three constructs and their relevance to the findings of classroom observations are discussed in the following paragraphs:

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Profile of implementation

According to Rogan and Grayson (2003: 1181), the construct profile of implementation, is, in essence, an attempt to understand and express the extent to which the ideals of a set of curriculum proposals are being put into practice.

Profile of implementation was observed during classroom observations as it focusses on curriculum practice in class. The four levels of profile of implementation were observed from level one which is educator-centred to level four being open-ended learner-centred. The four levels are not separate entities but interlinked. Rogan and Grayson (2003:1182) hold the same view by stating that unlike the developmental models, the profile does not imply 'progression' from one level to another. Rather the higher levels are inclusive of the lower one. Through observations of the three educators from each school A and school B, educators could be classified under the four levels of profile of implementation. Educators were classified under these levels depending on classroom interaction, science practical work, science in society and assessment techniques that the educator applied. Level four is the highest level which every educator should strive for because it reflects independency by the learner as well as innovation.

Capacity to support innovation

The construct capacity to support innovation is an attempt to understand and elaborate on the factors that are able to support, or hinder, the implementation of new ideas and practices in a system such as school (Rogan and Grayson, 2003: 1186).

The four groups that affected curriculum implementation were also cited by educators such as lack of physical resources like classrooms, educator factors where educators are overloaded with many subjects and overcrowding in classrooms, learner factors where learners have problems of assimilation because of language barriers and family background, school ecology and management where training of educators in some instance is inadequate. Capacity to support innovation also ranges from level 1 to level 4 through a progression pattern. The last level 4 represents the ultimate goal of capacity to support innovation. This level includes physical resources like excellent buildings, one or more equipped laboratory, library-centre, good teaching and learning resources and educator factors like over-qualified educators and excellent content knowledge.

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The two last factors are learner factors, ecology and management which include fluency in language by learners, learners who are willing to try new kinds of learning, shared vision among the staff. In the two schools visited, the capacity to support innovation could be classified under level 1 and level 2 for school B and level 3 for school A.

Support from outside agencies

Outside agencies are defined by Rogan and Grayson (2003: 1191) as organizations outside the school, including departments of education that interact with a school in order to facilitate innovation.

The four levels are also covered in the support from outside agencies with level four being the ultimate level displaying maximum participation by the community, the department and NGOs. From the responses of educators, support from outside agencies in the two schools visited was minimal. Comparatively speaking, one of the two schools was from deep rural area and the other from semi urban area. The semi-urban area school A was funded more than the deep rural school by NGOs school A was funded by companies like Cashbuild Hardware and Eskom for building materials and computers respectively. Parents support from the two schools was also observed to be different. Parents of the semi-urban school support the school and take ownership of their children's education by attending parents' evenings and parents meetings. They respond positively to invitations by the school on matters pertaining to learners' performance. In the deep-rural school B, a challenging factor mentioned by management was parents when invited to address learners' issues, who do not respond like their counterparts in semi-urban school do.

3.7. Ethical considerations

For the research to be authentic, the following ethical considerations were taken into account. Cohen (2007: 317) states that data collection involves the intrusion into the life of respondents. This includes their time, threat or sensitivity of questions and invasion of their privacy. Participants were made aware that the decision to be involved or withdraw from the research was entirely their own but they were encouraged to participate in the project. In addition, ethical clearance was obtained from the University of Venda in accordance with ethics requirements of the institution.

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The following were therefore the research ethics that were explained to participants and exercised during research:

- **Informed consent.** A letter with information about the research explaining the purpose of the research and describing their rights was given to potential participants. A consent form was given and explained to the participants before they signed it.
- **Privacy** refers to the individuals' right to control the disclosure of what they deem personal or non-public information about themselves. Participants were assured that privacy would be adhered to during data collection.
- **Right to withdraw at any stage**. Participants were made aware that their participation was voluntary, and that they were free to withdraw anytime from the research and that this would cause them no harm.
- **Confidentiality, anonymity.** The names and results of participants were not disclosed and that was explained to the participants in advance. The school names were also not going to be given. In all cases, pseudonyms would be used such as school A and school B. teacher A1, educator A2 and educator A3 for the three educators from school A, and similar naming for educators in school B. The principals and HODs were to be named principal A and principal B, and HOD A and HOD B from the two schools respectively.

3.8. Quality assurance measures

Trustworthiness

This is used in qualitative research instead of reliability and validity like in quantitative research. Trustworthiness is a concept used by Guba and Lincoln (1994) cited in (Bertram and Christiana, 2014: 189), for interpretivist research, which has become widespread. They suggest using concepts of credibility (do the findings reflect the 'reality' and lived experiences of the participants?), transferability (to what extent can the research be transferred to another context, dependability and conformability?). To ensure trustworthiness, participants were given the opportunity to scrutinize the data collected through interviews with the intention of adding or subtracting certain sections they feel were not part of their responses.

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Credibility

Merriam (1998) cited in (Mpanza, 2013: 45), refers to credibility as the situation when the research findings are in agreement with reality. Moodley (2013: 60) confirms this by saying that credibility criteria involve establishing that the results of qualitative research are credible or believable from the perspective of the participant in the research. It is for these reasons that participants were given a chance to read the transcripts and to comment on them.

Dependability

According to Lincoln and Guba (1985: 108–109) cited in Cohen et al (2007: 149), dependability involves member checks (respondent validation), debriefing by peers, persistent observations in the field, reflexive journals, prolonged engagement in the field which refers to identifying acceptable processes of conducting the inquiry so that the results are consistent with the data. In the same vein, Bertram and Christiana (2014: 190) state that dependability refers to the fact that the researcher can account for why there may be variations in the study, for instance between cases. It can also mean comparing this study to previous studies in the field and explain differences. Lincoln and Guba (1985: 108–109) cited in (Cohen et al 2000: 149), state that dependability involves member checks (respondent validation), persistence engagement in the field.

To ensure that results collected reflected the true responses from respondents, data were subjected to member-checking.

The data collected were given back to participants in the form of transcripts to check whether their responses were correct and rectify where they think it was not in accordance to what they responded to. Member checks were implemented where the data collected were exposed to the educators as well as the HODs and principals that participated in the research to validate the authenticity of the data in the field. Research was therefore undertaken involving participants from the two different schools where they were given a chance to check their responses. After data collection and analysis, the participants were given enough time to go through the transcripts. It was also explained to the participants that the results obtained may be used by other researchers to further their research and by curriculum implementers in the implementation and betterment of the NST curriculum implementation.

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3.9. Conclusion

In this chapter (3), Research design and methodology, I have described in detail the research design and methods utilised to identify suitable respondents for the research, select sample, collect and analyse data. Simulation method was used with people with expertise in the field by exercising mock interviews. This was to quality assure that the instruments used are not confusing to the respondents. Since the research follows an interpretive qualitative design, methods to collect data were interviews and classroom observations, so as to provide the researcher with an in-depth understanding of the implementation of natural science and technology in the classroom. The ethical measures exercised were also described to ensure that the research would not harm the participants. In addition, quality measures and issues of trustworthiness and ethical considerations were outlined. The next chapter presents a report of the findings and analysis of the data collected.

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CHAPTER 4

DATA PRESENTATION, ANALYSIS AND INTERPRETATION:

This chapter entails the presentation of data gathered from the study of participants as well as outlining how data were analysed and interpreted. Section 4.1., gives an introduction and section 4.2., describes the two schools A and B under investigation. Each school has the following information under study: general background, perceptions about CAPS, classroom practices in relation to learner-centred methods, use of practical work and incorporation of societal and contextual issues. The next section, 4.3., covers the general findings by reflecting similarities and differences between the two schools and other patterns emerging from the data. Pseudonyms of schools are known as school A and school B for the sake of anonymity.

4.1. **Introduction**

The chapter covers the findings from interviews (ANNEXURE A1-A3) and class observations, (ANNEXTURE A4).

A study of the implementation of natural science and technology Curriculum and Assessment Statement by primary school educators is presented. The study analyses the implementation as guided by Rogan and Grayson's theoretical framework covered in chapter two. Three educators, two heads of departments and two principals from each school were interviewed for comparison sake regarding the implementation of the curriculum. The three educators were observed in delivering the curriculum in the classroom. A qualitative approach was used to collect data. Bogdad and Biken (2003:45) define qualitative data analysis as synthesizing and the breaking up of data into manageable units in order to identify patterns and make the data more reliable. Patton (2003: 381) shares the same view by defining data analysis as the coding and categorizing of primary patterns in the data collected. During interviews, the recorded data collected were transcribed, coded and presented under different themes.

A summary was drawn from classroom observations by using a checklist (Annexure C) covering the three constructs by Rogan and Grayson (2003: 1180 - 1195) which are profile of implementation, capacity to support Innovation and support from outside agencies.

In interpreting data, Rogan and Grayson's (2003: 1183 - 1194) matrices (Annexure A) were used to understand the patterns and trends that emerge from the displays for classrooms observations. Matrices of Rogan and Grayson reflect

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different levels within each dimension in a construct. For the two schools, data were presented following the framework as it appears in chapter 2. Each school was analysed and rated on each of the constructs through comparison of the displays of the levels by Rogan and Grayson (2003: 1183 – 1194).

The following is a presentation of the results of the two schools for each of the three constructs of profile of implementation:

- *Background information* about the two schools
- *The profile of implementation* indicates the extent to which the ideals of a set of curriculum proposals are being implemented.

The section covers the perceptions and concerns of the educators on the new curriculum implementation and learner-centeredness approaches in curriculum delivery.

It also covers classroom practices obtained through interviews and observations. Other areas include classroom interactions, nature and the use of science practical incorporation of science in society and assessment exercise.

- The *profile of capacity of the school to support innovations* is an attempt to understand and elaborate on the factors that are able to support, or hinder, the implementation of new ideas and practices in a system.

Presentation of information is based on educator factors, learner factors, physical resources, school ecology and management.

- The *profile of support from outside agencies* which are organisations outside the school that interact with the school to give support to the school including support to learners, physical resources and supporting educators in as far as professional development opportunities and management section.

For locating a school to a particular level, tables with labels for levels summarising data are presented as determined by Rogan and Grayson matrices (Annexure A).

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4.2. School A primary

4.2.1. General background information of school A.

4.2.2. Functioning of the department.

4.2.3. The profile of implementation as well as perceptions and concerns of educators about NST/CAPS curriculum implementation and classroom practices.

4.2.4. The profile of capacity of the school to support Innovation

4.2.5. The profile of outside support.

4.2.6. Describes the analysis of data collected.

4.2.1. Background:

School A is a primary school situated in Thohoyandou Town in Vhembe District, Limpopo. At the time of collection, the school had 1034 learners and 27 educators three are NST educators. The school was established in 1988. The current principal was appointed in 2014. The head of department has a degree in natural science education. He has been in that position for five years. Three educators teach natural science and technology from grade four to grade seven. The HoD teaches natural science grade 7.

4.2.2. Functioning of the Department

There is evidence of departmental meetings that are held monthly. Controlling of educators preparations, record sheets for marks, test moderations, common tests are part of the head of the department tasks. The HoD sometimes conducts class visits. Workshops are held when there is a challenge that they encounter in curriculum delivery. In his remarks, the HoD indicates that workshops are only held when there is a problem when he says:

> *"If the educator meets a challenge, we sit together in a person to person encounter to interpret the policy."*

4.2.3. Profile of implementation at school A primary

The section starts by covering the views of educators on the implementation of the curriculum in line with the profile of implementation. Heads of departments and principal also provided their views. The feelings of educators, heads of department and principals were followed by interviews and classroom observations. The report is given in Table 4.1. The table reflects the level in which the school belongs as presented in Rogan and Grayson constructs (2003: 1183-1185).

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Educators' responses

The general feelings of the three educators on NST/CAPS curriculum are that the curriculum is 'good.'

The three educators responded to a question on how they feel about the NST/CAPS curriculum in this manner:

Educator 1: "*I find that the implementation is not difficult except that one needs time to go through the policy to understand certain aspects.*"

Educator 2: "*It is challenging but at the same time fulfilling because it makes one grow* in *curriculum implementation strategies.*"

Educator 3: "*This is one curriculum that I find it easy to implement since the matter to be presented is clear and easy to follow.*"

The head of department and principal responses to curriculum implementation

HoD: "*Teaherss are not well trained. This subject is new and they did not do it at school.*

Interpretation is a challenge. But we make all efforts to come together when there is a problem to discuss."

Principal: "*The teachers are ready since we are dealing with this for the second year although training was done for a short period.*"

Although the educators and principal perceptions indicated that that the curriculum is 'good, 'educators, HoD and the principal still have concerns regarding lack of training.

Classroom interaction

This section covers the information from classroom observations and interviews involving the three educators, HoD and a principal in each school. It includes the question on how NST/CAPS affect teaching. Paragraph 3.5.2, Chapter 3, Table 2 on research Design and Methodology covers topics that were covered in each class.

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Learners were observed to be sitting in a traditional manner where they are arranged in rows. The classes are overcrowded with fifty learners.

The following table represents the number of classrooms visited, the number of times of visitations, topics that were covered during each visit:

Name of school	Number of classrooms visited in each school	Number of times for each visit	Grades visited
School A	3	Once for each class	Grade 4 Grade 5 Grade 6
School B	3	Once for each class	Grade 4 Grade 5 Grade 6

Science practical work

The topic, "Movement on land: mechanical system," was well demonstrated to learners. Although learners did not do the experiment themselves, they participated actively by writing notes given by the educator and answering questions. The DBE (2011, 15) NST/CAPS Specific Aim 2 requires that the learners must be able to plan and carry out investigations as well as solve problems that require some practical ability. The educator gives clear instructions to learners which is a prerequisite for practical work.

Learners were not given a chance to carry out experiments because of reasons cited by the educator such as overcrowding and lack of apparatus. "*I cannot divide them into groups, because of lack of apparatus and because they are many. It is difficult to monitor and manage learners who are overcrowded.*"

The educator resorted to level one of profile of implementation with regard to '*Science Practical Work,*' by only demonstrating to develop concepts.

Science in society

Examples from local environment are used by the teacher to explain science concept of 'mechanical systems.'

Examples include simple mechanisms used in vehicles to enable rotary motion of wheels and axles, wheelbarrows that learners use at their homes.

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Assessment

The test is supposed to cover 40% of knowing science and technology (state, name, label, list and others), 30% understanding science and technology (explain, describe, compare, plan, rearrange, give examples and others), 15% applying scientific and technology knowledge (predict, compare, design, use knowledge, demonstrate and others) and evaluating, analysing, synthesising scientific and technological knowledge (evaluate, suggest a reason).

But the test reflects more of recall and very little of comprehension. The other sections like application and higher order questions are not covered. Other forms of assessment are assignment, classwork and homework tasks.

Table 4.1 is a summary of the findings on the different dimensions of the profile of implementation.

Table 4.5.1 classroom interaction – school A

• *Content* • *Summary* • *Questions* • *Resources*	• *Well presented* • *Educator gives this to learners* • *Questions are of the level of learners understanding* • *Learners shares textbooks in one desk, no enough apparatus for practical work.*

Table 4.5.2 practical work – school A

Demonstrations	*Materials used are not sufficient.* *Conducted by the teachers while learners took some notes.*
Environmental materials	*Local materials are used.* *Not conducted.*
Investigations *Scientific report*	*Learners are not well guided because they just answer questions without following the steps of scientific report, like aim, apparatus, method, conclusion, interpretation, variables.*

Table 4.5.3 science in society – school A

Applications of science and technology.	*Not applied.*
Lesson tailed around local context.	*Partly done.*
Involving everyday life examples.	*Partly used.*

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Table 4.5.4 assessment – school A primary

Types of assessment	*tests, projects, exercises and some practical work.*
Structure of tests	*Mainly 60% of recall type and little of comprehension.*

4.2.4. Profile of capacity to support Innovation at school A Primary

Physical resources

- No laboratory but a class is used as a mini laboratory with few apparatuses
- Buildings are generally of good quality except that the classrooms are overcrowded.
- Enough water supply and ablution blocks.
- Furniture like chairs and tables are not enough. Some classes use desks which are not enough.
- Copying machines, computers and printers are available for office use only.
- Textbooks are available although they are not enough for each learner to have his/her own as required by NST/CAPS policy (DBE, 2011: 20) which states that every learner must have his/her own textbook.

Educator factors

- The head of the department teaches NS in grade seven.
- Educators further their studies at their own pace. No intensive development plans from the school, Circuit, and District.
- Out of thirty-one educators, twenty-two have qualified with Bachelor's degree. The remaining nine educators have Teacher Diploma's. The HoD has a degree in natural science.

Learner factors

- Learners are fed through National School Nutrition Programme which is a Departmental programme for Quintile 1 and 2 schools.
- Most learners have a problem of English as a second language and language of teaching and learning.

  The educator says: "*I have to switch to Home Language. I mix English with Home Language when explaining certain aspects that are difficult for the learners to assimilate.*"
- Some learners do not do homework regularly.

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- Another problem is absenteeism by learners.

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School ecology and management

Ecology:

- The school is safe because of security personnel in the school and the gate is always locked to control visitors' movement in and out of the school.
- The school governing body is active and functional and meets monthly especially the Executive Committee and Finance Committee and quarterly.
- The mission statement is visible at the school's entrance.

Management

- A general time-table is available in the staff-room and principal's office.
- Time table for division of work is available but not always adhered to.
- Policies like educators and learners code of conduct are in the file in the principal's office.

Summary of the findings of profile of capacity to innovate is given in table 4.2 below:

Table 4.2.1 physical resources – school A primary

Buildings	*Not enough*
Furniture	*Not enough for learners*
Laboratory	*Storeroom serves as laboratory as well*
Electricity and running water	*Available*
Surrounding	*Safe and well maintained.*

Table 4.2.2 educator factors – school A primary

Qualifications	*Most have Bachelor's degree*
Professional development	*No staff development plan except furthering of studies by educators on their own*

Table 4.2.3 learner factors – school A primary

Language factor	*Problem since this is their second language.*
Learning environment	*Most parents support learners at home.*
Feeding scheme	*Available and provided by the department.*
Behaviour	*Well behaved.*
Class attendance	*Sometimes problematic.*
Motivation	*Learners are motivated as they attend school regularly and low absenteeism is observed.*

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Table 4.2.4 school ecology and management – school A primary

Ecology: • *School security and access* • *School Governing Body* • *School function*	*Learners are safe because unauthorised entry is denied.* *Functional and support the school.* *Learning and teaching always takes place as scheduled.*
Management: • *Time table* • *Principal* • *Code of conduct for educators and learners*	*Properly implemented.* *Present most of the time and in regular contact with the staff.* *No disciplinary committee but code of conduct for educators and learners is kept in the principal's office.*

4.2.5. Profile of support from outside agencies at school A primary

Physical resources

According to the principal, educators and HoDs know of support of physical resources from Eskom and Cashbuild. From Cashbuild the support was money donated for building materials and Eskom donated computers for the office.

The apparatuses for the laboratory are still scarce as well as for the library.

"*The resources should be there like science kit. We tell the SMT when we are running short of something, they only check the budget to purchase, which is a problem.*"

According to the principal, there are still other needs: "*We still need a computer room with unlimited Wi-Fi, a fully-equipped laboratory with laboratory assistance and a library.*"

Professional development of educators

Educators attend internal workshops only when there is a problem of curriculum matters. They are forced to attend INSET workshops which happen over a short period from twelve to half-past two only. There is no special school programme for educator development.

Learner support

- Support classes for learners who need more time to captures concepts are assisted early in the mornings and thirty minutes after school on Tuesdays and Thursdays only. This is done in consultation with parents for advance transport arrangement as most learners come from different areas which are far from school.

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- There are educational tours that are undertaken every year. The tours are divided into foundation phase, intermediate phase and senior phase. They visit areas like Kruger National Park, Pretoria Zoo and Crown Mines.
- There is a Greenery Project which is an initiative programme by the Department of Education in collaboration with the Department of Health to ensure that learners eat balanced diet during feeding scheme.

Monitoring and control

- The HoD is responsible for lesson plans, pace setters control according to policy. This is supposed to be done fortnightly but it is not always the case. The HoD says: "*It is not easy to control this work on weekly base because I am teaching thirty subjects and I do not have enough time to check all the work. I am forced to check this sometimes once per month, which is a challenge.*"
- Class visits are done first by the HoD and then the principal once per term.
- Learner performance is analysed quarterly and discussed with educators through scheduled meetings.

Table 4.3

Table 4.3.1 physical resources – school A primary

Buildings *Laboratory apparatus* *CAPS material* *Computers*	• *No laboratory.* • *Only some few are available.* • *Books available but do not cover all learners.* • *Only available for office not for learners.*

Table 4.3.2 professional development for educators – school A primary

Internal school base professional development programme. *External professional development programme*	• *No programme. HoD only facilitates if there is a problem in curriculum matters.* • *Departmental workshops which are very short.*

Table 4.3.3 support to learners – school A primary

Support classes *Educational tours* *Greenery project*	• *Given only to time-takers.* • *Undertaken only once a year per phase.* • *Available but lacks funds for sustainability*

Table 4.3.4 monitoring and control – school A primary

School management team *Circuit and district monitoring*	• *HoD and principal* • *Circuit manager, curriculum advisors*

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4.2.6. Analysis – school A primary

The section provides a summary of the analysis undertaken at school A primary. It gives the perception and classroom delivery of NST/CAPS through interviews and classrooms observation.

Table 4.4 Brief summary on the perception about NST/CAPS – school A primary

	NST/CAPS	Learner resource materials	Learner-centred approach
Views	Educators positive	Positive	Positive
Classroom practice	Real life examples are used.	Textbooks used for guided activities.	Learners participated guided by the teachers in practical work.
Constraints	No enough time to perform experiments.	Content needs explanation to learners because of language barrier.	Learners cannot work by themselves because of lack of understanding except through guidance of the educator.

The participants display a positive attitude towards this curriculum because of its approach when they say it is easy to understand and implement. But there are hindering factors in the implementation that they cited such as lack of proper training, lack of enough resources like laboratories, language problem for learners to perform tasks like experiments. Issues like lack of laboratory with laboratory assistance and computer laboratory are also mentioned.

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The following is a presentation of a summary of the data obtained from the interviews and observations. The levels of the dimension of the construct according to Rogan and Grayson (2003: 1188 -1198) are also presented (see ANNEXURE B1 – B3).

Table 4.5

Table 4.5.1 summary on classroom practice (profile of implementation) – school A primary

Construct	Summary	Level
Classroom interaction	• The educators engage learners with questions. • Educator 1, 2 and 3 give adequate notes to learners • Learners are engaged in group work. • Leaners share textbooks to do activities. • The educators sometimes invite ideas from learners.	**2**
Science practical work	• Educator 1, 2 and 3 use classroom demonstrations to help learners develop concepts. • Learners are not given chance to perform experiments because of the large numbers in classes.	**1**
Science in society	• Educator 1, 2 and 3 use examples and applications from everyday life to illustrate scientific concepts. • Learners in all instances understand and interpret examples used from the environment.	**2**
Assessment	• Common written tests are given with recall type and part of comprehension questions. • Educators use variety of assessment strategies like classwork, homework, and projects are given to learners. These are informal diagnostic tasks. Formal tests are given as per programme of assessment supplied by the department	**1.5**

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Table 4.5.2 summary of capacity to support innovation – school A primary

Construct	Summary	Level
Physical resources	• A storeroom is used as mini laboratory with few apparatuses. • The surrounding is neat and well kept. • Chairs and desks are not enough to cater for all learners. • Electricity is available in all rooms. • There is running water.	**2.5**
Educator factors	• Three educators interviewed: one has a Senior Primary Teachers Diploma, Degree in management with Senior Primary Diploma and the last one a Senior Primary Diploma and Masters in education Managements. All educators specialised in natural science at Teachers Training Colleges.	**2**
Learners factors	• Parents support the school by attending parents meetings, responding positively when invited to attend to the learners problems at school, providing transport to and from school and also assist and encourage learner with school work. • Most learners come from supportive home background. • Learners have some proficiency in language of instruction, but several grades below grade level.	**2.5**
Ecology and management	• Teaching and learning occurs most of the times, albeit erratically because of educator union meetings. • Principal is present at school most of the time. • The school governing body is in existence and assists the school in matters of governance. • Certain management tasks are delegated to educators through HoDs.	**2**

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Table: 4.5.3 summary on outside support – school A primary

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Construct	Summary	Level
Physical resources & curriculum materials	• Textbooks are supplied by the department although not enough. A top-up model is used by the department every year to ensure that textbooks are adequate for each learner. • A kitchen has been built through donations from Cashbuild for Nutrition Programme for learners. • The school received office computers from Eskom donation. • CAPS documents are supplied by the Department.	2
Professional development	• Internal workshops are only held when there is a curriculum challenge. • External curriculum workshops are held in the afternoons for short periods.	1
Support to learners	• Support classes are given to learners who take time to captures concepts. • Parents are invited to address curriculum challenges of learners.	3
Dominant change force evoked by agency	• Civic Association is engaged in educational matters through curriculum meetings as a pre-requisite by the department of education initiative to ensure involvement by all stakeholders.	3
Monitoring and Accountability	• SMT (HoD and principal) monitor school curriculum matters and other activities. • Class visits are rarely done only once per term by the HoD and principal to check progress. • Progress of learners is reported quarterly to the Circuit through performance scheduled and accountability meetings with improvement strategies reported by principals.	3

4.2.7. Summary on school A primary

The general feeling of the educators and principal of school A primary is that the NST/CAPS curriculum is good and easy to use. The side effects include lack of resources, training and overcrowding.

The tables given above display disparity in the profiles as well as in the constructs levels as cited in Rogan and Grayson (2003, 1188 – 1194). The lowest is the profile of implementation with the lowest level of 1 and the highest level of 2. The capacity of support innovation has the highest levels.

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4.3. School B primary

The following section 4.3.1 covers the general background information of school B primary.

Sections 4.3.2, 4.3.3, 4.3.4 and 4.3.5 deal with functioning of the department, the profile of implementation, profile of capacity to innovate and profile of outside support respectively.

4.3.1. Background

School B primary is situated in the deep rural area of Vhembe District 60km from Thohoyandou Town. It has 456 learners and thirteen educators. The principal holds an Honours degree in Management. There are two HODs one for senior phase and one for foundation phase. The principal also teaches life skills in grade seven. The principal was employed in 2008. There are three NST teachers. Both have Senior Primary Teacher Diplomas and the other a degree in Management as well as Teacher Diploma. The HOD has a Senior Primary School Teachers Diploma specialising in natural science and teaches technology grade 7.

4.3.2. Functioning of the department

The HOD teaches natural science in grade seven. He does not teach any of grades four to six. Subjects meetings are sometimes held. There is no programme for such meetings. Common tests are set and written on specified dates. There is pre-moderation and post-moderation of tasks by the HoD for formal tasks only. Statistical results are discussed by the staff with the principal chairing such a meeting.

4.3.3. Profile of implementation

Perceptions and concerns about NST/CAPS

The general perception of educators, HoD and principal is that they favour the new curriculum of NST/CAPS because it easy to follow as it indicates the exact matter to be taught.

Educator 1 commented thus:

"I feel comfortable by this curriculum because there is a link with real life like the section on life and living. The work to be done each term is clearly indicated in the policy."

When educator 2 was asked how he feels about the implementation of the curriculum, he responded by saying: *"I feel very well when I prepare using the*

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CAPS documents because it shows me what to prepare. But my main concern is that I do not really understand in detail some sections of the curriculum because they require scientific knowledge."

Educator 3 responded by saying: *"Although the curriculum is new, I understand it better than the previous one. It makes things easy for me to prepare and teach learners."*

The HoD's opinion on the curriculum implementation is: "*Teachers find this curriculum easy to follow. They use pace-setters supplied by the Department to identify the exact sections to teach each term."*

As for the principal, he is positive about the new curriculum by pointing out the following: *"We are lucky because the teachers are not new to this curriculum as they have been trained ever since its inception. The curriculum advisors visit us quarterly to monitor the implementation process. The curriculum advisors were here during the first quarter."*

When asked about what he thinks about whether CAPS has brought some changes in the teaching of NST he replied: "*I am not sure because it has its own flaws. Some teachers who were here for a long time are still in their comfort zones. They still stick to the old way of teaching where the teacher is at the centre stage of teaching."*

The main concerns of educators, HoD and principal are lack of resources like laboratory, classrooms and chairs, library, computer laboratory and overcrowding.

The issue of language problem was also cited by educators.

"*Resources are not available. When I teach about temperature, there is no thermometer to show them. The number of learners also presents problems because when I teach, some are playing and not listening. It is also difficult to perform experiments."*

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Classroom interaction

- Learners have notes books where they write notes given to them by the educators.
- Experiments are sometimes demonstrated but the educators sometimes rely on the textbook as a source document for experiments where they cannot do the experiment due to lack of apparatus.
- The educators use examples from the environment to ask questions to learners to probe deeper into their level of understanding.
- There is no group-work since the space is limited for that purpose because of overcrowding:

Science practical

- Demonstrations and textbooks are used as the best way of ensuring learner participation in experiments as the teacher says: *"Overcrowding, lack of textbooks. Textbooks are not supplied according to the number of learners. Experiments cannot always be done because of lack of resources."*
- Learners do not handle apparatus as stated in CAPS document, DBE (2011: 20) because according to educators, they are still young and overcrowded.

Science in society

- Educators sometime use examples and applications from everyday life to illustrate scientific concepts.

Assessment

- Formal tests are given according to departmental programme of assessment (DBE, 2011: 63 - 68).
- Educators use CAPS document in assessment although most questions are recall type questions like state, name, label and list which are weighted as knowing science and technology and minimum of understanding science and technology and the other two high order cognitive levels for assessment of content in grade 4, 5 and 6 (DBE, 2011: 62).
- Educators also use homework, assignments, projects and class exercises as other forms of assessment.

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- Feedback is sometimes given to learners especially with regard to formal tests and less with regard to assignments and projects.

Table 4.6 presents a summary of the information obtained from observations and interview

Table 4.6.1 classroom interaction – school B primary

Content **Summary** **Questions** **Group work**	• Lessons presented in well organised, sequenced manner according to lesson plan. • All three educators write notes for learners on the board. The educators engage learners with questions although educator 3 relies most of the time on explaining to learners where they only respond to limited questions. • Educators rarely use group-work citing reasons of overcrowding.

Table 4.6.2 practical work – school B primary

Demonstrations **Environmental materials** **Investigations** **Scientific reports**	• Educators rely on demonstrations citing reasons of overcrowding and lack of apparatuses. • Demonstrations for educator 1 and educator 2 are well planned educator 3 relies most of the time on the textbook to illustrate a phenomenon. • Educators use materials from the immediate environment. • Learners are not given the opportunity to perform practical experiments. • Educators show limited steps of how to write scientific reports living some important steps out because they consider them problematic to interpret.

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Table 4.6.3 science in society – school B primary

Application of science technology	Educators incorporate this in their teaching.
Lesson tailed around local context	Educators use everyday examples.
Involving everyday life examples	Educators use everyday examples

Table 4.6.4 assessment – school B primary

Type of assessment **Structure of tests**	Educators give the same common tests. Tests cover 40% of recall and less of 30% understanding; none of 15% of applying scientific and technology knowledge as well as 15% of evaluating, analysing and synthesising (DBE,2011: 62)

4.3.4. Profile of capacity to support innovation at school B primary physical resources

- Textbooks are not enough as learners share textbooks.
- No laboratory.
- No computer room.
- A copier machine is available but sometimes it is out of order.

Educator factors

- There is no programme of internal workshop for educators. Educators only enrol with universities and most of them are doing management courses. Workshops are only conducted but rarely by the Department of education.
- Educators have the following qualifications: of the three NST/CAPS educators, all hold Senior Primary Teachers' Diplomas. In addition, teacher 2 has a degree in Management.
- The Head of department is a science educator.

Learner factors

- Learners have a problem of English as a second language which ultimately poses problems of assimilating science concepts.
- There is a feeding scheme which motivates learners to attend school regularly minimizing absenteeism.
- Most learners are coming from villages around the school where parental care is limited as the principal indicate by saying: "*In this school we admit*

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learners from villages. They are child-headed families. They have difficulty in getting basic needs like food and clothes.

School ecology and management

Ecology:

- There is a school governing body that looks after the governance of the school.
- There is a fence but no security guards around the school yard.
- Teaching and learning occur most of the times.
- The mission of the school is only displayed in the staff room and not accessible for people from outside.

Management:

- There is a general time-table and every educator has his or her own personal time table.
- Classroom rules are available in some classes.
- There is no disciplinary committee except the SMT that deals with serious misconducts of learners.
- Educators code of conduct is in the teachers files supplied by South African Council of Educators, Act No: 31 of 2000 in accordance with the Educators Employment Act No: 76 of 1998.

Table 4.7.

Table 4.7.1 physical resources – school B primary

Buildings	• One block is a new building but all in all not enough.
Furniture	• Not enough to cater for learners. Only enough to cater for teachers.
Electricity and running water	• Water taps are there but erratic supply of water. Electricity is available but the school has problems of footing the bill for electricity regularly because of less money from Norms and Standards.
Laboratory	• No science laboratory
School Yard	• Has fence but insecure because of no security personnel due lack of funds.

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Table 4.7.2 educator factors – school B primary

Qualifications	• Minimum Diploma
Professional development	• No special programme except workshops by the department at times and further studies by teachers.

Table 4.7.3 learners factors – school B primary

Nutrition Programme	• There is a Departmental National Schools Nutrition Programme (NSNP) to feed learners.
Class attendance	• Learners attend school in spite of absenteeism.
Learning environment	• Learners are not given enough support to do homework tasks at home.
Behaviour	• Learners are well behaved and respect authority.
Language	• Language proficiency is several grades below grade level.
Motivation	• Learners are motivated as they react positively to instructions by the teachers

Table 4.7.4 school ecology and management – school B primary

Ecology: • **School security and access**	• No security personnel. • School fence available but with free entrance.
• **School governing body**	• School governing body is in existence, assists in governance. SGB meets quarterly as guided by the South African Schools Act, Act 98 of 1998.
• **School function management**	• Teaching and learning occurs most of the time.
• **Time table**	• General time-table available in the staff room and every educator has personal time-table.
• **Principal**	• Present most of the time.
• **Code of conduct for educators and learners**	• Learners Code of Conduct available but in the principal's office file. Educators Code of Conduct is in the educators files as required by EEA, Act No. 76 of 1998.

4.3.5. Profile of outside support at school B primary

The profile of outside support refers to outside agencies like organization outside the school, including departments of education to facilitate innovation. Innovations include professional development, physical resources, learners support, monitoring and evaluation. The following paragraph presents the type of support at school B primary provided by outside support agencies:

Physical resources

Both educators and the principal indicate that there is no sponsorship provided by any organisation although they tried on many occasions to apply for these. They cannot even pay for personnel security for the safety of learners. The principal responded by saying: "*We cannot use money for norms and standards given by the department because it is too little to cater for security. Sixty percent of the money should be used for curriculum matters. We exhaust the money for things like stationery, electricity and water bills.*"

Other things mentioned by educators that are lacking are computers, library, chairs, tables and laboratory.

Professional development of educators

Internal workshops programme is not in place. Departmental workshops are facilitated by curriculum advisors but they are not enough as cited by teacher 1 when she said: "*Training is not enough. Last year we were trained only once.*"

She went further by saying: "*At school we did not have workshops. We rarely attend workshops at other centres for natural science. The only workshop attended is for social sciences in term 1.*"

The response of educator 2 was: "*They encourage us to read CAPS for implementation. No internal workshops are conducted by the school management team. We sometimes attend external workshops.*" The school has no programme or plan for internal workshops.

Learner support

- The school has a Greenery Project as encouraged by the department.
- Educators make all efforts to assist time-takers.

- Educational tours are undertaken which are not that far like the Kruger National Park as it is not easy for the parents to finance long distance tours.

Monitoring and control

- The HoD uses an instrument to monitor educators work.
  This was seen in the head of the department's response: "*I have an instrument that I use for monitoring lesson plans and tests.*"
- Results are analysed after examinations in a staff meeting.
- Class visits are sometimes done by the HoD who in turn reports to the principal about progress.

Table 4.8

Table 4.8.1 physical resources – school B primary

Buildings Laboratory apparatus CAPS materials Computers	• No laboratory. • A small container with few apparatus. • Not enough textbooks. • Only two office computers.

Table 4.8.2 professional development for educators – school B primary

Internal school base professional development programme. External professional development programme	• No programme for internal workshops. • The department conducts short workshops.

Table 4.8.3 support to learners – school B primary

Support classes Educational tours Greenery Project	• Educators sometimes assist time-takers. • Local educational tours are undertaken. • Available but difficult to maintain because of lack of funds.

Table 4.8.4 monitoring and control – school A primary

School Management Team Circuit and District monitoring	• HoD and principal monitor educators' work. • Done by the circuit manager and curriculum advisors.

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4.3.6. Analysis of school B

The presentation on perceptions and classroom delivery is given in table 4.11. tables 4.11 (a) (b) and (c) presents a summary of the theory of implementation under the three profiles by Ragan and Grayson.

Table 4.9 brief summary on the perception about NST/CAPS – school B primary

	NST/CAPS	New learner resource materials for CAPS	Learner-centred approach
Views	Positive	Positive	Positive
Classroom practice	Examples from the environment are used.	Textbooks are used in class by learners in class.	Learners use textbooks for classworks and in demonstrations.
Constraints	Lack of enough time to perform experiments	Enough content that needs explanation to learners because of language problem.	Learners have challenges of working on their own as they need guidance because of being unable to interpret certain concepts.

Generally, the participants accept that the curriculum is good. Apart from the positives of the curriculum, they also cite some of the hindering aspects for proper implementation.

Such hindrances include lack of laboratory to perform experiments. The problem of implementing learner-centred approach due to overcrowding is also a challenge.

The section that follows covers the implementation of curriculum ideals in classroom situation.

The following section is a summary from interviews and observations. The levels of the dimension of constructs by Ragan and Grayson (2003: 1188 – 1198) are also presented under the last column.

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Table 4.10

Table 2.10.1 summary on classroom delivery – school B primary

Construct	Summary	Level
Classroom interaction	• Learners have difficulty in answering questions. • All three educators give notes to learners. • Learners share textbooks as they are not enough. • Leaners sometimes write activities from the textbook. • Demonstrations are done by educators 1 and 3 and educator 3 relies mostly on the textbooks to explain experiments.	1
Science practical work	• Examples from the local environment are used. • No opportunity is given to learners to perform experiments.	1
Science in society	• Educators base their lessons on specific issues faced by the community except teacher 3 who focuses on the content with little incorporation of issues faced by the community. • Educators use everyday examples to demonstrate concepts.	1.5
Assessment	• Educators give tests that comprise of recall type and little of comprehension questions. • Educators sometimes give informal tests. • Exercises, homework and projects are given. • Formal tests are given as per Departmental programme.	1.5

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Table 4.10.2 ***summary of capacity to support innovation – school B primary***

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Construct	Summary	Level
Physical Resources	• Lack of enough classrooms, tables and chairs as well as lack of laboratory. • There is a fence but no security personnel to control free movement of visitors. • Electricity is available. • There is running water sometimes supply is erratic.	1
Educators factors	• The HoD has a degree in Management as well as a Senior Primary Teachers Diploma. • Educators do sometimes attend external workshops. • Internal workshops are rarely conducted.	2
Learners factors	• Educators have good relationship with and good treatment of learners. • Language issue is problem. • There is a National School Nutrition Programme to feed learners. • Parents support is minimal. • Learners are given time to do their work at home.	1.5
Ecology and management	• Teaching and learning occurs most of the times, but sometimes erratic due to union meetings. • The principal is present most of the times. • There is a school governing body that assists in the governance of the school. • Certain tasks are delegated to the teachers.	3

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Table 2.10.3 summary on outside support – school B primary

Construct	Summary	Level
Physical resources and curriculum materials	• Textbooks are not enough although supplied by the Department. • No computer laboratory. • No donation has ever been received despite all efforts done by the school to apply for such.	1
Professional development	• Educators sometimes attend external workshops. • Internal workshops are rarely conducted.	1
Support to learners	• Learners who take time to understand phenomena are sometimes assisted after school. • Low esteem of learner support by parents. • Feeding scheme is in place for learners.	1.5
Dominant change force evoked by agency	• Traditional meetings are held annually to report on curriculum issues as per departmental policy.	3
Monitoring and accountability	• HoD sometimes does visit classes. • Curriculum advisors do monitoring for formal tests and curriculum coverage quarterly.	1.5

4.3.7 Summary of the findings for school B primary

Educators are positive about the new curriculum. The issue of lack of classrooms, chairs, textbooks and laboratory has been mentioned. There is a degree of disparity in the levels of the constructs. In ranking categories, the profile of implementation is the lowest as indicated by the highest level of 1.5 classroom interaction, science practical work and assessment are at the level of 1 each. The capacity to support innovation has level 3 for ecology and management as the highest. Profile of outside support also has the highest level of 3 in the dominant change force evoked by agency.

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4.4 Comparative analysis of school A and school B

The following section presents a comparison of the two schools under study which is based on the three constructs, namely, the profile of implementation, the profile of capacity to innovate and profile of outside support.

4.4.1 Departmental operation

In the following section, a comparison of the two schools is presented where there are common educators' activities as well as the function of the head of department.

Table 4.11 departmental structure of the school

Area	School A	School B
HoD qualification	Natural science	Natural science
Subjects in the department	Natural science and technology	Natural science and technology
Subject taught by HoD	Natural science grade	Natural science grade
Common activities	• Work schedules • Tests • Programmes of assessment	• Work schedules • Tests • Programmes of assessment
Science laboratory	None	None
Class visits	Sometimes	Sometimes
Practical work	Demonstrations	Demonstrations & textbook

The common activities among educators are the setting of common tests according to common programme of assessment, scheme of work and pace setters.

Practical work is done by educators through demonstrations. Demonstrations are done in the classrooms as there are no laboratories in the two schools. The HoDs teach subjects that are not in the level of grade four to grade 6 learners. The HoD from school A primary is teaching natural science grade seven whereas the HoD from school B primary teaches technology in grade seven.

It is doubtful as to how the HoDs are able to assist educators because they teach at different grades than their subordinates. Class visits are sometimes done once per quarter in both schools. These are rare class visits that affect monitoring as

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giving regular guidance to educators. Curriculum coverage is compromised through lack of regular visits.

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4.3.8.2. The profile of implementation

This part covers the views of teachers on the implementation, followed by the three profiles of implementation of the two schools as reflected in section 5.3.

Educators views about the implementation of curriculum ideals

All educators share the same perception that the NST/CAPS curriculum is clear and easy to implement because the content of what to teach is well presented in the policy document. Educator view the issues of training, lack of enough resources like textbooks, classrooms, Science laboratories and computer laboratories as hindering aspects in proper curriculum implementation. School A has enough computers for office work but none for learners.

The following table 4.16 covers the views of the educators of the two schools. The following codes are used to indicate the differences in perceptions: SA for school A and SB for school B. If both codes for both schools are shown, it reflects common understanding and where one code for one school is indicated then the perception of that school is the only covered.

Table 4.12 a summary of the views about NST/CAPS curriculum from the two schools, school A primary and school B primary.

	NSC/CAPS	LTSM (Learners Support Materials)	Learner–centred approach
Views	• Positive (SA, SB)	• Positive (SA, SB)	• Positive (SA, SB)
Science in society	• Everyday life science examples are used (SA, SB).	• Content is clearly designed (SA, SB).	• Learning takes place through guidance by teachers (SA, SB).
Classroom practice	• Everyday life science examples are used (SA, SB) • Practical demonstrations are used through improvisation of apparatus (SA).	• Textbook is used as reference in class (SA, SB).	• Learners do not use group work (SA, SB).
Constraints	• Proper interpretation is a challenge (SA, SB).	• Not enough support materials (SA, SB).	• No laboratories (SA, SB) • Learners do not do practical work on their own.

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The general perception in both schools is that the NST/CAPS curriculum is good and aimed at learner-centred approach as opposed to educator-centred approach. The educators cite some of hindering factors to curriculum delivery such as lack of enough textbooks, furniture, science laboratories with laboratory assistants, lack of enough training for proper interpretation, overcrowding and lack of science apparatuses.

Although there is lack of apparatus, school A primary educators and two of school B primary educators improvise by using the few apparatuses at their disposal. There is a general feeling that the supply of textbooks by the department is inadequate which negatively affects curriculum implementation.

Implementation of curriculum ideals in the classroom

The profile of implementation of the two schools under study is presented by the following table 4.17. The table also includes the levels of each school in the profile of implementation as cited in Rogan and Grayson (2003, 1183 – 1194) theoretical framework. The dimensions to be covered are classroom interaction, science practical work, science in society and assessment.

Table 4.13 analysis for the profile of implementation

School	*Classroom Interaction*	*Science practical work*	*Science in Society*	*Assessment*
School A	2	1	2	1.5
School B	1	1	1.5	1.5

School A in the profile of implementation has been categorised under level 2 because of the classroom interaction activities which range from engaging learners with questions and in groups, inviting ideas from learners and learners doing activities from textbooks they have. This is the highest level compared to school B which had been classified under level 1 due to lack of maximum participation by learners in answering questions and difficulty in doing regular activities due to lack of enough textbooks as cited by educator 3.

Both schools are classified under level 1 for science practical work. This is due to lack of practical work where educators rely on demonstrations only citing the reason of lack of apparatus and overcrowding. NST/CAPS requires that learners do practical work guided by the educator.

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For science in society, school A primary score is 2. The three educators use examples and applications from everyday life to illustrate scientific concepts and learners do understand and interpret examples used in the environment. These responses are classified under level 2 according to Rogan and Grayson (2003, 1183).

School B primary is classified as 1.5. Educator 3 rarely incorporates issues faced by the community. Educator 1 and 2 base their lessons on specific issues faced by the community.

Assessment in both schools is classified under level 1.5. The two schools, A and B have common characteristics of assessment like most questions are of recall type, the use of common tests because of common programme from the Department and giving learners exercises, homework tasks and projects.

Table 4.14 the profile of capacity to support innovations

School	*Physical resources*	*Educator factors*	*Learner factors*	*School ecology & Management*
School A	2.5	2	2.5	2
School B	1	2	1.5	2

The construct physical resources for school A primary are at level 2.5. The reason being there is a class used as mini laboratory with some science apparatus. The availability of electricity and running water are other factors that indicate that the school has capacity to support innovations. In addition, the surrounding is neat and well-kept with security personnel to control free movement of people in and out of the school. School B primary has been scored 1 because of lack of enough classroom, tables and chairs as well as a laboratory for science. Although there is a fence, security is compromised because of lack of security personnel to control free movement of people in and out of school. Running water is available sometimes although it is not always available.

Educator factors of the two schools are the same at level 2 each. All teachers are trained for Senior Primary Teacher Diploma most specialising in natural science. In school A primary most educators are furthering their studies through universities. The adverse effect is that of the three educators interviewed, two have degrees in other fields rather than science and technology related fields. The HoD has a degree in natural science education.

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School B primary HoD has a Senior Primary Teacher Diploma and degree specialising in natural science. The three educators are also qualified with the Senior Primary Teacher Diploma. They also specialised in natural science but technology not included.

Learner factor is rated at level 2.5 in school A primary. Parents of this school are involved in the school activities like attending parents meetings, attend to learners problems, cater for their children by providing transport to and from the school, most of them encourage their children to do school work at home, learners have some proficiency of language as most of them are coming from the semi-urban areas and good family background.

School B primary has been rated at 1.5 regarding learner factors. Although the educators have good relationship with learners, there are hindering factors like language problem and parents who are not supportive. The problem of language proficiency is attributed to the fact that most learners are coming from the deep rural areas and they are not exposed to the medium of instruction most of the time. From the responses of educators, the HoD and the principal, parents also have a notion that educators are the only ones that are supposed to look after the welfare of children at school. Parents think that their participation is redundant the moment their children get into the school premises.

Ecology and management of the two schools compared indicate the following: In school A primary teaching and learning occurs most of the times although erratically because of issues beyond the school's control like educators union meetings. The principal is present most of the time, school governing body exists and assists the school in governance and holds scheduled meetings as per SGB guidelines. Tasks are delegated to educators. Therefore school A primary has been classified under 2 level. School B primary has been put at level 2 because of reasons related to school A primary.

Capacity to support from outside agencies is organisations outside the school, including departments of education that interact with a school in order to facilitate innovation (Rogan and Grayson, 2003: 1191). The following are the dimensions covered under this topic: physical resources, the professional development and monitoring and accountability.

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The following Table 4.15 provides analysis the profile of outside support for the two schools

Table 4.15 analysis for the profile of outside support

School	*Physical resources*	*Professional development*	*Support to learners*	*Dominant change force evoked by agency*	*Monitoring & Accountability*
School A	2	1	3	3	3
School B	1	1	1.5	3	1.5

Physical resources and curriculum materials

School A primary scored 2 because of extra effort of getting computer donations from Eskom. The other factors like textbooks and CAPS documents are supplied by the Department of Basic Education for the two schools. School B primary scored 1 because of lack of donation of outside and other sources.

Professional development

Both schools do not have programmes of professional development for educators and therefore have been put at level 1. Educators from both schools sometimes attend external CAPS workshops for limited time.

Support to learners

The two schools resort to supporting time-takers to assist them in curriculum matters. Parents of school A primary respond positively when called to attend to their children issues while school B primary parents' response is of low level and hence level 1.5 is assigned to this dimension. Dominant change force evoked by agency for both is at level 3. The reason is that the Department of Basic Education requires that schools meet civic structures and traditional leaders to report on the performance of learners annually. The two schools held such meetings as attested by the minutes in the principal offices.

Monitoring and Accountability

School A primary and school B primary have been put under level 3. Both schools display acceptable standards of curriculum monitoring through HoDs and principals. The principals of the two schools report quarterly to the Circuit on the performance of learners and their intervention strategies to improve performance. Class visits are also administered although not regularly by both schools.

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4.5. Conclusion

The presentation, analysis and interpretation of data were covered in this chapter in a comparative manner regarding the two schools. Common areas and differences were identified through this comparison. These common areas and differences as reflected in the comparison are discussed in chapter 5 that follows as well as a presentation of recommendations.

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CHAPTER 5

DISCUSSION AND CONCLUSION

Chapter five presents the discussion, conclusion and recommendations and suggestions of the results on the research findings. Section 5.1 introduces the chapter. Section 5.2 presents the research approach. Section 5.3 covers the findings as per framework used. The last part section 5.4 deals with conclusion, recommendation and suggestions open for further research.

5.1 Introduction

The study was aimed at investigating the implementation of natural science and technology statement by primary school educators in Mvudi Circuit, Vhembe District. The past curriculum had problems of their own which had undergone many changes and hence the introduction of CAPS. Challenges of the past include lack of sufficient teacher training, lack of resources.

Interviews and classroom observations reflect certain conditions that can hinder or facilitate implementation of the curriculum. Other factors that affect curriculum implementation are capacity of the school to support innovation and support from outside agency (Rogan and Grayson, 2003: 1180). The research methods used are based on two schools from semi-urban and deep rural area to compare and understand the implementation of the curriculum and challenges they face. This also gives insight on the exercises and support practiced in the two schools.

Section 5.2 presents an exploration of experiences encountered by a research design during the study. The three profiles, the profile of implementation, the profile of capacity to support innovation, and the profile of outside support which are the profiles of the theory of implementation, are discussed under section 5.3.

5.2. The Research design

The study was aimed at gaining insight on the implementation of NST/CAPS by primary school educators in Mvudi Circuit, Vhembe District. Interviews and observations were used for this study in the two selected schools. Section 5.2.1 covers the interviews that were carried out with the respondents. Section 5.2.2 deals with observations. The time assigned to visit the two schools was two weeks.

The data collected through interviews and observations were presented in a written form. Data from each school were presented individually because of the qualitative nature of approach used. This ensured that the uniqueness and richness of the data is maintained through-out the research process.

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5.2.1 Observations

Observations focused on three educators from each school, school A and school B. This exercise covered grade 4, grade 5 and grade 6 classes in natural science and technology subjects.

School A

Three lessons were observed, in grade 4B, grade 5A and grade 6B classes. Educator 1 taught the topic on '*movement on land: mechanical system'* in grade 4A, educator 2 dealt with '*senses in animals and humans'* in grade 5B and educator 3 taught '*types of movements: linear movements'* in grade 6B. Each period lasted 30 minutes.

School B

The length of each period in school B was also 30 minutes like in school A. The topics covered by each of the three educators were as follows: educator 1 covered '*movement in space'* in grade 4 B, educator 2 taught '*senses in animals and humans*' in grade 5 A and educator 3 dealt with '*types of movements: linear movements'* in grade 6 A.

5.2.2 Interviews

Three educators, HoD and the principal from each of school A and school B were interviewed and their views and perceptions on curriculum implementation are analysed.

5.3. Results of the interview

The results presented from interviews are provided in comparison to the constructs provided in the theory of implementation by Rogan and Grayson (2003, 1183 – 1194). The constructs are the profile of implementation, the profile of capacity to innovate and the profile of outside support. Section 5.3.1 presents the profile of implementation. Section 5.3.2 explains the profile of capacity to Innovate and section 5.3.3 covers the profile of outside support.

5.3.1 Profile of implementation

The feelings and perceptions of educators are presented first followed by the profile that is reflected in classroom practices.

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The following are common understandings of teachers from the two schools:

- *There is insufficient time to perform experiments.*
- *The syllabus is good and easy to understand although there are certain sections that are difficult to interpret.*

CAPS policy requires that teaching should be learner-centred. Learners should be able to do simple experiments and handle apparatus (NST/CAPS, 2011: 17). Everyday examples should be incorporated in the teaching of NST/CAPS. By involving learners in experiments, learners become motivated. Practical work is an integral part in science teaching.

Madlela (2014: 20) share the same sentiment by stating that learners can also manage to conduct experiments successfully in the laboratory if they use collaborative approach that enables them to assist and complement each other's effort, than when they work individually.

The findings in this study indicate that educators feel positive about the NST/CAPS syllabus. They cite the fact that topics and content are easily explained in the policy. According to the educators, preparation is easy to do when using the NST/CAPS document.

Apart from its simplicity as cited by educators, they also mention that certain sections are difficult to interpret especially the areas of practical work. This is attested by educators resorting only to demonstrations during lessons rather than incorporating practical activities as well. Even in demonstrations, educators prepare demonstrations that are not at the level of learners. In school A, the educator 2 tried to demonstrate while teaching the topic on '*senses in animals and humans*' in grade 5B. Demonstration in this case should have been done through role play. Learners would touch each unaware and notice

Learners were not given the opportunity to discover science phenomenon through the guidance of the educators in practical work. Learners were regarded as young to perform experiments by themselves. This indicates that the educators doubt the latent potentials and capabilities of learners.

- *Leaners have language barriers.*
- *Learners were not allowed to do experiments because they are young.*

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Educators are also expected to develop the language ability in science by providing a platform for language development as the NST/CAPS document states that educators of natural science and technology should be aware that they are also engaged in teaching language across the curriculum. This is particularly important for learners for whom the language of learning and teaching is not their home language. It will therefore be critical to afford learners opportunities to read scientific and technological texts, to write reports, paragraphs and short essays as part of the assessment, especially (but not only) the informal assessment for learning.

While one agrees that language barrier can be a deterrent factor for learners to understand scientific concepts and participate actively in the lessons, it is also important that learners should be developed in this area during science lessons.

Understanding the implementation of the policy should help in to addressing this dimension. Educators in the two schools seemed to lack the impetus to develop the area of language development. Time and space must be given by educators to learners for language development as provided in the NST/CAPS document (2011:19).

Implementation of the curriculum ideals during classroom practice

The analysis in chapter 4 reveals that classroom practices in the two schools are at level 2. This reflects that learner-centred teaching practices exist in these schools. Rogan and Grayson (2003: 1182) state that the levels progress from learner-centred demonstrations (level 1) to open-ended learner-centred investigations (level 4). For the dimension 'science in society' which make science relevant and action-oriented in the pursuit of national goals such as socio-economic development and wise and equitable use of natural resources, the rating ranges from 1 to 2. Progression starts from a simple awareness of the role of science in everyday life to actively engaged community upliftment projects. Progression across the levels in 'classroom practice' and 'science in society', from 1 to 2 is due to certain activities that appear in level 2.

Classroom interactions in both schools are still educator-centred in the use of Rogan and Grayson's (2003: 1183) levels for classification purpose instead of *learner-centred*. Most of the activities like demonstrations are done by the

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educators. Learners are regarded as young to perform practical tasks on their own.

The NST/CAPS document (2011: 17) states that because knowledge that will be acquired in respect to Specific Aim 3 always relates to specific subject content, the content provides the context for learning about various aspects of science and technology in society. It should therefore be taught in an integrated way in order to both enhance the subject and to clarify the relationship between the subject and society. 'Science in society' should be contextualised to everyday life during classroom interaction (Rogan and Grayson, 2003: 1183). The levels according to Rogan and Grayson range from 1 to 2 in the two schools under study. Teaching is supposed to motivate learners to investigate their surrounding during the presentation of lessons. This will ultimately expand their investigative skills in order to make meaning of the link between what have been leant and real life situations.

Assessment is based on formal examinations and tests given according to the departmental programme. Tests, exercises, homeworks and projects are also given. Practical work questions are limited to oral responses that are not easy for the learners to comprehend. Learners therefore are not actively involved. Both the two schools display the same attitudes in as far as assessment is concerned. Assessment activities are only based on low order questions like recall type and less high order cognitive questions.

The following conclusions are therefore drawn from the discussion:

Learner-centred Approaches

Classroom interaction

- Educator-centred approach is being used in the two schools.
- Some demonstrations are used by educators in the two schools.
- Group-work in not applied to enforce independency and accountability among learners.

Science practical work

- Practical work is based only on demonstrations by the educators disadvantaging learners from doing practical work on their own.

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Science in everyday life

Learners are not engaged to actively undertake projects in their local community in which they apply science to tackle a specific problem or to meet a specific need. Educators only use examples and applications from everyday life to illustrate scientific concepts. This reflects that science is still between level 1 and 2. Part of level 2 by Rogan and Grayson (2003:1183) are also displayed like assisting learners to explore the explanation of scientific phenomenon by different cultural groups.

Assessment

- Most questions are recall type. Little high order questions are given.
- Lack of assessment of practical work in tests.
- Formal assessment tasks are done as per departmental programme for promotion purpose.
- Insufficient informal assessment tasks are given to learners.

Profile of capacity to support innovation

The construct capacity to support innovation is an attempt to understand and elaborate on the factors that are able to support, or hinder, the implementation of new ideas and practices in a system such as a school (Rogan and Grayson, 2003: 1186).

The indicators of the capacity to support Innovation construct are classified into four groups which are, physical resources, educator factors, learner factors, the school ecology and management.

The major factor here is physical resources because it influences capacity.

The highest score for physical resources in school A is 2.5 and school B 1. The indication here is school A has more support of physical resources than school B. Learning and teaching in school B seems to be negatively affected because of lack of sufficient physical resources.

Both school A and school B are at the same level 2 for *educator factors*. The fact that both are at level 2 indicates that teacher development is still a problem. No programme of development is in place in the two schools. The educators only discuss issues of curriculum if there are problems related to that. Collaboration among educators is an important factor in teaching as Rogan and Grayson

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(2003: 1187) put it when they say: '*Change is essentially a learning process, which will entail the willingness to try out new ideas and practices, to improvise, to be exposed to uncertainty, and to collaborate with and support one another.*' Although all the educators from the two schools have minimum qualifications for teaching natural science, they must also be further supported by quality materials for deeper understanding of related curriculum delivery issues.

Literature by Stephen (2013: 23) supports building educator capacity when he mentioned that developing quality teacher professionals and building their capacity is instrumental in the development not only of education but also society.

Learner factors at school A reflect a community that is supportive. Parents respond positively when called to address learners' issues. The community is financially stable and provides funds for their children for school trips as well as transport to and from the school. Although some learners do not do their homework regularly, parents assist them at their homes. Level 2.5 is assigned to this school since it displays some of the characteristics of Rogan and Grayson that belong to levels 2 and 3.

The activities in school B show lack of commitment by parents which filters down to learners. The fact that the school is in a deep rural area is given as an excuse for such behaviours. Language proficiency by learners is a sustaining factor for poor curriculum delivery. The school is classified under level 1.5 displaying part of the lowest level as given by Rogan and Grayson (2003: 1188) constructs.

Ecology and management in the schools provide a condition conducive to learning and teaching environment. The school management team shares the vision with all stakeholders including teachers which render it easy for the smooth running of the school.

Conclusions drawn from the constructs:

- Some physical resources are available but not adequate and more resources can be provided.
- The attitudes towards the curriculum are positive.
- Learners support from the two schools is not at the same level. Parents of School A are more supportive than of school B because of different family backgrounds which renders school A learners to perform better than school B.

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- Running of the two schools: The school management teams are well organised. There is room for improvement for both schools such as establishment of learning environmental areas like posters as well as botanical gardens.

Profile of outside support

As stated by Rogan and Grayson (2003: 1191), outside agencies are organizations outside the school, including departments of education that interact with a school in order to facilitate innovation.

Types of encouragement and support

Support from outside agencies at the two schools indicates low levels. Level 2 is the highest level for school A where the school was supported once by Eskom by donating computers for office use only.

School B has level 1 support because no donation has ever been received from any company despite of many applications rendered. The other issue is related to the Department of Education which provides few workshops and monitoring processes to support educators.

Dominant change force evoked by agency

Educational matters are regarded as societal issues by the department, hence the meetings held by the two schools annually with civic associations and traditional leaders. High levels are recorded here because of the interaction between educational institutions and the community. This is a departmental programme which fosters collaboration between stakeholders to engage the community in educational matters, report on the challenges and successes faced by schools for the community to assist where possible with long-lasting solutions.

Monitoring mechanisms and accountability

A high level is also displayed in this construct. The HoDs do the monitoring by pre-moderation, post-moderation of formal tasks. Setting of common test is also facilitated by the HoDs in school A and school B. Exercising class visits is a quarterly practice in both schools. Although the practice of class visits is not enough to support educators, there is evidence of class visit by HoDs. The principals rely on the information from the HoDs. Another area of monitoring mechanisms and accountability is done by principals during reporting sessions to circuit managers. This is not enough because circuit managers should be hands-

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on assisting educators either through curriculum advisors or regular personal visits. Curriculum advisors sometimes visit schools for monitoring and support.

Conclusions for the profile of outside support

- Little support is rendered from outside for physical resources.
- Educators are not adequately exposed to professional development by outside agencies.
- Support to learners is minimal since it is only given to leaners who take time to capture phenomena.
- Monitoring and accountability from outside agencies is inadequate. School visits by the department for monitoring and support happens only after a long time.

5.4. Conclusions

The study provided an understanding of the implementation of the NST/CAPS curriculum in the two schools, school A and school B. The information collected is covered in the following sections: 5.4.1 educator's views and 5.4.2 the process of implementation including the three profiles. These sections reflect on the conclusions from the findings with regard to each of the profiles. The conclusion is followed by recommendations for implementation and proposals for further research by other researchers.

5.4.1 Educators' views

The views of educators on the new curriculum, NST/CAPS are positive. According to educators the curriculum is easier to implement when compared to the previous Curriculum 2005 (C2005) and RNCS. Their perceptions indicate that the curriculum is learner-centred involving societal issues and examples from the immediate environment. According to educators it provides for better learner participation because it is easy to understand.

Implementation in the two school

Classroominteraction

Implementation in classroom revolves around the educator. This can be classified as educator-centred approach. Educators still have challenges of implementing a learner-centred approach due to reasons stated before like learners still being young, language barriers and overcrowding. Even though some of these aspects

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can be improvised, educators seem to be unable to implement the approach correctly.

In addition to educator-centred approach Mahira and Azamat (2013: 1) indicate that in contrast, traditional teaching method is teache-centred with teachers as the source of knowledge while learners are passive receivers that must memorize things

Practical work

The teaching of science demands that practical-work should be learner-centred. However in the two schools under study, educators focus on demonstrations which are regarded as educator-centred.

This practice denies learners the opportunity to explore through hands on activities for them to be able to attach meaning to the new phenomenon at their disposal. Internal and external workshops by the department can be administered as means improving practical work strategies.

Lelliot et al (2009: 53) argues that if learners bring their everyday knowledge and concerns into the classroom and they are used to develop themes that are relevant to their lives, learners take ownership of content, participate more freely and develop confidence and contribute to the design of the model.

Assessment

Assessment guidelines are provided in the NST/CAPS document, DBE (2011: 60 – 70). The percentages for the different cognitive levels are given in the document that educators should adopt. In the two schools, educators resort to mainly recall type questions and few of high order questions. Educators need to be properly trained and guided through workshops and INSET (In-service Training) on how to include all cognitive levels as provided in CAPS documents

Science in society

Educators make efforts to include science in society in the classroom but at a lower level. Incorporation should be pitched to a level where learners actively undertake a project in their community in which they apply science to tackle a specific problem or to meet a specific need. Learners should be involved in solving some of the societal problems through scientific approaches.

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The effect of resources and factors on the implementation

Physical resources

Physical resources in the schools are inadequate. The shortage of physical resources has negative impact on the implementation of the curriculum. Enough resources like science apparatus need to be provided to ensure the effectiveness of practical work by learners. The availability of more resources will alleviate the problem of distrust of learners by teachers to do practical work by themselves because they can be divided into smaller manageable groups.

Educator factors

All educators possess minimum qualification for teaching natural science. This is an advantage since all educators understand the pedagogical approaches. Although they do not always apply pedagogical approaches as expected, this can be used as the starting point to develop teachers professionally in the application of these approaches. The heads of the departments will have specific roles of dealing directly with curriculum issues instead of being involved in lot of administrative duties assigned to them by the principal.

Learner factors

It emerged from the study that those learners from school A have more support for learning than their counterpart from school B families. Learners from supportive families are motivated to learn. Those from poor family background are not always focused because of reasons like poor feeding, doing manual work at home and lack of parental involvement. Educators should strive to involve all learners in the planning of their learning as well as showing confidence by providing opportunities to do tasks on their own.

Management and ecology

The management of the two schools is well-organised and support the implementation process. Monitoring and support can be improved and strengthened by regular class visits to understand the activities that happen in class. Awareness in the form of sign boards and other signs can be implemented to strengthen responsibility among learners.

Profile of outside support

Profile of outside support is also very low. Outside agencies are not that supportive.

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Physical resources

Only school A has had office computers donated by Eskom once. The other school has not received a single donation from any company. It can thus be said that there is no support from outside agencies at the two schools.

Professional development

The department gives minimum support to educators through rare workshops and INSET. Science needs continual support as there are new innovations and approaches to be implemented. High institutions of learning can assist in this regard because they always research on best practices of science teaching.

According to Mata (2012: 512) training is an essential key factor on which the success of curriculum innovation depends is the in-servicing of teachers in the use of new approaches.

Support to learners

Support is given to time-takers only but irregularly. No programmes are in place indicating how and when support is given to learners. Enrichment programmes can also be given to learners who perform well in the subject.

Monitoring and accountability

Heads of the departments monitor educators work through class visits, controlling of lesson plans, formal tasks like pre-moderation and post-moderation. Support is only given when there is a problem of curriculum interpretation through unscheduled subject meetings. Principals are expected to report to the circuit managers on the performance of learners and curriculum coverage quarterly. Systems should be in place for regular class visits and support by HoDs and the department to strengthen curriculum delivery.

Conclusion

The educator being a facilitator of learning should be aware of the resources available, the kind of learners he or she is working with to promote learning. Tawana (2009: 38) points out that lack of opportunities to learn are associated with learners or teachers minimal participation in learning activities. This could also be interpreted to include the correct use of tools, resource, teaching strategies or non-engagement in teaching setting.

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Chisholm (2005: 87) proposes that attention be paid to implementation weaknesses related to resourcing manageable time frames and regular monitoring and review. The statements support the fact that shortage of resources and inadequate laboratories are factors that need to be taken into account because they have negative effects on teaching and learning in schools. Apart from these two, the educator must also be well versed with the techniques to employ when teaching for better assimilation by learners. He or she is at a delivery point of content and should be prepared in advance before teaching.

It is therefore essential for the educator to be assisted in the development of these factors for proper implementation of the curriculum.

Educators of natural science and technology need to adopt the approaches by Rogan and Grayson (2003) constructs as they are adapted in the implementation of science curriculum in developing countries as well as South Africa.

5.5 Recommendations

Throughout the discussion of the findings and conclusions around the profiles, many recommendations have been covered. The following recommendations are given for emphasis purpose:

- Heads of department should engage on monitoring and support for professional development of educators.
- Professional development programme should be in place to assist educators in the interpretation and implementation of the curriculum in order to master the learner-centred approach.
- Programme of assisting learners for support as well as enrichment purpose need to be set.
- Principal should also be hands-on on curriculum matters by also visiting classes to check the level of curriculum implementation and interpretation.
- Support to facilitate learner experiments is necessary.

Suggestions for further research

- A study on why second language speaking learners with regard to understanding what is required in have NST/CAPS would be significant.
- A study on the effect of not doing practical work by primary school learners in science.

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ANNEXURE: A1

Investigation of the implementation of Natural Science and Technology Curriculum and Assessment Policy Statement (NST-CAPS) by primary school educators in teaching in Mvudi Circuit, in Vhembe District.

Interview questions for educators

The purpose of this interview is to gain insight into how NST-CAPS curriculum is implemented by primary school educators in teaching in Mvudi Circuit, Vhembe District.

Kindly answer all the questions to the best of your ability and as objectively as possible.

1. Describe how you feel about the new NST-CAPS in as far as its implementation is concerned.

2. Briefly explain how NST-CAPS affected your way of teaching.

3. How adequately do you feel you received training in the implementation of NST-CAPS?

4. What factors in your school affect NST-CAPS implementation?

5. How confident are you about the knowledge you have of interpreting the policy on NST-CAPS?

6. What are the challenges you encounter when implementing NST-CAPS in the classrooms?

7. What support do you receive from the SMT and the HOD towards the implementation of NST-CAPS?

8. Please give some suggestions on how to improve NST-CAPS implementation at your school.

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ANNEXURE: A2

Interview questions for heads of department

1. What are the challenges that the educators face in the implementation of Natural Science and Technology Curriculum and Assessment Policy Statement at school?

2. What support do educators receive from the Department of natural sciences for proper implementation of NST-CAPS?

3. Briefly explain how you monitor NST-CAPS curriculum implementation by educators.

4. Please give suggestions on how implementation of NST-CAPS can be improved.

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ANNEXURE: A3

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Interview questions for principals

1. How ready are educators for the implementation of natural science and technology Curriculum and Assessment Policy Statement?

2. Do you think the CAPS curriculum has brought some changes in the teaching of NST?

3. What is the attitude of educators with regard to the implementation of NST-CAPS?

4. Describe the kind of support given to educators by the SMT and how often they receive such support in relation to NST-CAPS implementation.

5. What are the challenges that the school faces with regard to NST-CAPS curriculum implementation

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ANNEXURE: A4

OBSERVATION CHECKLIST

		Yes	No
1	**Conducive learning environment in the classroom:**		
	Is there enough furniture for all the learners to sit and work?		
	Is the classroom fitted with science-related attractions such as posters?		
2	**Availability of scientific laboratory equipment:**		
	Hand lenses, Bunsen burners, microscopes, slides available		
	Other examples:		
3	**Teacher as a facilitator of the lesson**		
	Does the educator introduce the lesson in an interesting manner?		
	Engages learners in a variety of activities		
	Engages learners in activities which promote problem-solving and critical thinking		
	Invites ideas from learners		
	Promotes collaboration among learners by engaging them in group activities		
	Does the teaching address the aims of NST-CAPS?		
	Educator has knowledge of concepts in the curriculum.		
	Does the educator show positive attitude towards NST-CAPS?		
	Assesses learners according to NST-CAPS policy		
	Does the ducator use a variety of assessment strategies? Diagnostic, formal, and informal?		
4	**Learners:**		
	Do they understand the approaches by indicating active participation in groups; individually; in experiments and observations?		
	Are learners participating actively during lessons?		
	• As individuals?		
	• In groups?		
	• In experiments?		
	• In observations during experiments and educator demonstrations?		
5	Teaching and learning activities: Activities are learner-centred		

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ANNEXURE: B1

Profile of Implementation (adapted from Roberts and Grayson, 2003)

Level	Classroom interaction	Science Practical work	Science in Society	Assessment
1	**Teacher:** Presents content in a well organised, correct and well sequenced manner, based on a well-designed lesson plan. Provides adequate notes. Uses textbook effectively. Engages learners with questions. **Learners:** Stay attentive and engaged. Respond to and initiate questions.	Teacher uses classroom demonstrations to help develop concepts. Teacher uses specimens found in the local environment to illustrate lessons.	Teacher uses examples and applications from everyday life to illustrate scientific concepts. Learners ask question about science in the context of everyday life.	Written tests are given that cover topic adequately. While most questions are of recall type, some require higher order thinking. Tests are marked and returned promptly.
2	**Teacher:** Textbooks are used along with other resources. Engage learners with questions that encourage in depth thinking. **Learners:** Use additional (to text book) sources of information in compiling notes. Engage in meaningful group work. Make own notes on the concepts learned from doing these activities.	Teacher uses demonstrations to promote a limited form of inquiry. Some learners assist in planning and performing the demonstrations. Learners participate in closed (cook-book) practical work. Learners communicate data using graphs and tables.	Teacher bases a lesson (or lessons) on a specific problem or issue faced by the local community. Teacher assists learners to explore the explanation of scientific phenomena by different cultural groups.	Written tests include at least 50% of the questions that require comprehension, application and analysis. Some of the questions are based on practical work.
3	**Teacher:** Probes learners' prior knowledge. Structures learning activities along 'good practice' lines (knowledge is constructed, is relevant, and is based on problem solving techniques). Introduces learners to the evolving nature of scientific knowledge. **Learners:** Engage on minds-on learning activities. Make own notes on the concepts learned from doing these activities.	Teacher designs practical work in such a way as to encourage learner discovery of information. Learners perform 'guided 'guided discovery' type practical work in small groups, engaging in hands-on activities. Learners can write a scientific report in which they can justify their conclusions in terms of the data collected.	Learners actively investigate the application of science and technology in their own environment, mainly by means of data gathering methods such as surveys. Examples here might include an audit of energy use or career opportunities that require a scientific background.	Written test include questions based on seen or unseen 'guided discovery' type activities. Assessment is based on more than written tests. Other forms of assessment might include: reports on activities undertaken; creation of charts and improvised apparatus; reports on extra reading assignments.
4	**Teacher:** Facilitates learners as they design and undertake long-term investigations and projects. Assists learners to weigh up the merits of different theories that attempt to explain the same phenomena. **Learners:** Take major responsibility for their own learning; partake in the planning and assessment of their own learning. Undertake long term and community-based investigations projects	Learners design and do their own 'open' investigations. They reflect on the quality of the design and collected data, and make improvements. Learners can interpret data in support of competing theories or explanations	Learners actively undertake project in their local community in which they apply science to tackle a specific problem or meet a specific need. An example might be on growing a new type of crop to increase the income of the community. Learners explore the long term effects of community projects. For example, a project may have a short-term benefit but result in long term detrimental effects.	Performance on open investigations and community-based projects are included in the final assessment. Learners create portfolios to represent their 'best' work.

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ANNEXURE: B2Profile of Capacity to Support Innovation (adapted from Rogan & Grayson, 2003)

Level	Physical Resources	Teacher factors	Learner factors	School ecology and management
1	Basic buildings – classrooms and one office, but in poor condition. Toilets available. Some textbooks – not enough for all	Teacher is under-qualified for position, but does have a professional qualification	Learners have some proficiency in language of instruction, but several grades below grade level.	**Managements:** A time-table, class lists and other routines are in evidence. The presence of the principal is felt in the school at least half the time, and staff meetings are held at times. **Ecology**: School functions i.e. teaching and learning occur most of the time, albeit erratically. School is secure and access is denied to unauthorized personnel.
2	Adequate basic buildings in good condition. Suitable furniture – adequate and in good condition. Electricity in at least one room. Textbooks for all. Some apparatus for science.	Teacher has the minimum qualification for position. Teacher is motivated and diligent. Enjoys his/her work. Teacher participated in professional development activities. Teacher has a good relationship with and treatment of learners.	Learners are reasonably proficient in language in language of instruction. Learners attend school on a regular basis. Learners are well nourished. Learners are given are given adequate time away from home responsibilities to do school work.	**Management**: Teacher attends school/classes regularly. Principal is present at school most of the time and is in regular contact with his/her staff. Timetable properly implemented. Extramural activities are organized in such a way that they rarely interfere with scheduled classes. Teacher/learners who shirk their duties or display deviant behaviour are held accountable. **Ecology:** Responsibility for making the school function is shared by management, teachers and learners to a limited extent. A school Governing Body is in existence. Schools functions all the time i.e. learning and teaching always take place as scheduled.
3	Good buildings, with enough classrooms and a science room. Electricity in all rooms. Running water. Textbooks for all learners and teachers. Sufficient science apparatus. Secure premises. Well - kept grounds.	Teacher is qualified for position and a sound understanding of subject matter. Teacher is an active participant in professional development activities. Conscientious attendance of class by teacher. Teacher makes an extra effort to improve teaching.	Learners are proficient in language instruction. Learners have access to quiet, safe place to study. Learners come from a supportive home environment. Learners can afford textbooks and extra lessons. Parents show interest in their children's progress.	**Management:** Principal takes strong leadership role, is very visible during school hours. Teachers and learners play an active role in school management. **Ecology:** Everyone in the school is committed to making it work. Parents play active role in School Governing Bodies and supporting the school in general.
4	Excellent buildings. One or more well equipped science laboratory. Library or resource centre. Adequate curriculum materials other than textbooks. Good teaching and learning resources (e.g. computers, models) Attractive grounds. Good copying facilities.	Teacher is over-qualified for position and has excellent knowledge of content matter. Teacher has extraordinary commitment to teaching. Teachers show willingness to change, improve and collaborate, and has a vision of innovation. Teacher shows local and national leadership in professional development activities.	Learners are fluent in the language of instruction. Learners take responsibility for their own learning. Learners are willing to try new kinds of learning.	**Ecology:** There is a shared vision. The school plans for, supports and monitor change. Collaboration of all stakeholders is encouraged and practised. **Management:** There is a visionary, but participatory, leadership at the school.

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ANNEXURE B3

Profile of Outside Support (adapted from Rossouw & Grayson (2003)

Level	Types of encouragement and support			Dominant change force evoked by agency	Monitoring mechanisms and accountability
	Physical resources. Categories of resources: buildings, apparatus, curriculum materials (print and electronic), Computers, etc.	Design of Professional Development	Direct support to learners		
1	Provision supplements what exists, but not enough to support the intended changes. Provision is in one category only.	Information on policy and expected changes are presented to school based personnel. Typical mode is short, one short workshop.	Provision of basic needs, are catered for in form of extra lessons.	Bureaucratic. Change is brought about by top down directives to bring about change.	Inspections by authorities are undertaken.
2	Provision completely covers what is required to effect the intended change in one category, or partly sufficient in two categories	Examples of 'new 'practices as suggested by policies are presented to school based personnel, who are given an opportunity to engage in these practices in a simulated situation. Typical mode is a series of short workshops lasting for one year.	Basic academic needs are catered for in the form of extra lessons.	Charismatic. Change is brought about by top-down inspiration and encouragement.	Inspections are undertaken in collaboration with school-based personnel.
3	Provision completely covers what is required to effect the intended change in three categories and is partly sufficient in all four categories.	Professional development is designed by school based personnel depending on which new practices they wish to implement, and implemented using both inside and outside support. Typical mode consists of both external and school-based INSET for two to three years.	Enriched academic needs are catered for in the form of field trips and other enrichment type activities.	Professional. Change is brought about by encouraging role players to embrace codes of conduct and standards of teaching and learning.	School-based personnel monitor own progress, but report to authorities.
4	Provision completely covers what is required to effect the intended change in three categories, or covers two categories and is partly sufficient in all four categories.	Communities of practice take full responsibility for their own continued professional growth, and for school governance and curriculum implementation, calling on outside support as appropriate. Typical mode consists of ongoing school-based and directed professional INSET.	Completely academic and personnel support is provided, usually in the form of bursaries.	Learning Community. Change is brought about by developing communities that develop shared values and goals regarding educational practice and a commitment to put these into practice.	All monitoring is undertaken by school-based personnel.

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COPY OF INFORMED CONSENT

CONSENT FOR PARTICIPATION IN INTERVIEW RESEARCH

1. I volunteer to participate in a research project conducted by Mr N.I.Mathuba from Univen. I understand that the project is designed to gather information about The Implementation of Natural science and Technology Curriculum and Assessment Policy Statement by primary school teachers in teaching. I will be one of the 10 being interviewed.

2. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one from my school will be told.

3. I understand that if I feel uncomfortable in any way during interview session, I have the right to decline to answer any question or end interview.

4. Participation involves being interviewed by Mr N.I. Mathuba from Univen. The interview will last approximately 30 – 60 minutes. An audio tape of the interview and subsequent dialogue will be made. If I don't want to be taped, I will not participate in the interview.

5. I understand that the research will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which will protect the anonymity of individuals and institutions.

6. The principal and Head of the Department will neither be present nor have access to raw notes or transcripts. This precaution will prevent my individual comments from having any negative repercussions.

7. I understand that this research study has been reviewed and approved by Univen.

8. I have read and understand the explanation provided to me and voluntarily agree to participate in this study.

_____ _____

Signature of participant Date

_____ _____

Printed Name of Participant Signature of Researcher

For further information, please contact:
Mr N.I. Mathuba(Researcher)
0608072430

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LIMPOPO PROVINCE

REF: 14/7/R
ENQ: J.MAGUGUMELA

MATHUBA N.I
PO BOX 403
SHAYANDIMA
0945

PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

1. The above matter refers.
2. Permission to conduct research on the topic "The implementation of National Science and Technology Curriculum and Assessment Policy Statement by Primary School Educators in Mvudi Circuit" has been granted.
3. You are advised that normal teaching and learning should not be disturbed.
4. You are further advised to ensure that you must communicate with the Circuit Manager and Principals of concerned schools prior to your visits.
5. We wish the best in your studies.

DISTRICT SENIOR MANAGER

05/09/2014
DATE

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ANNEXURE R6

REQUEST FOR PERMISSION TO CONDUCT A REASEARCH

Mr Mathuba N.I

Cell No: 060 807 3430

P.O. Box 403

Shayandima

0945

2014-08-14

The District Manager

APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH.

I, Mr. Ntshengedzeni Ivy Mathuba, am studying for a Master's Degree in Curriculum Studies through Univen under the supervision of Dr. M. Mpeta.

My research topic is: THE IMPLEMENTATION OF NATURAL SCIENCE AND TECHNOLOGY CURRICULUM AND ASSESSMENT STATEMENT (CAPS) BY PRIMARY SCHOOL TEACHERS IN PUBLIC SCHOOLS IN VHEMBE DISTRICT.

I would like to conduct a research at your schools. Up to 5 participants representing grades 4 – 6 will be interviewed and observed in class during suitable times. Every effort will be made not to disrupt the daily functioning of the school. Confidentiality and anonymity of participants will be maintained at all levels during this research project.

I am confident that my request will be viewed favourably.

Yours faithfully

_____

N.I. Mathuba (Student Number: 14002804)

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