

**DIFFICULTIES EXPERIENCED BY
EDUCATORS IMPLEMENTING
CURRICULUM 2005**

**A case study of grade seven Natural Science
educators in a predominantly rural district of one
region of the KwaZulu-Natal Department of
Education**

by

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**SUBMITTED IN PARTIAL FULFILMENT OF
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Education**

I.A.J. OAKES

DECLARATION

I declare that this dissertation is my own work, except where otherwise indicated.

Signed:  _____

IVAN A.J. OAKES

DECEMBER 2001

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I WOULD LIKE TO THANK THE FOLLOWING PEOPLE FOR THEIR ASSISTANCE WITH THIS DISSERTATION

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ABSTRACT

The purpose of this study was to establish what difficulties Grade Seven educators were experiencing in the implementation of Curriculum 2005, a new national outcome-based curriculum with wide ranging aims.

A qualitative approach, using a case study method, was employed and mainly in-depth interviews and observations were conducted. Six Grade Seven educators in a variety of schools were interviewed at length about the wide ranging problems they experienced in introducing C2005 into the classrooms for the first time in 2000. The interview data was supplemented by personal observations of most of these educators in their schools.

The research study was undertaken in a predominantly rural district of one region of the KwaZulu-Natal Department of Education.

The findings of the study are presented and these are interpreted and discussed under two categories: these being the kinds of difficulties enunciated by the educators and the researcher's observation of identified features of problems.

The key findings of this research study are the following:

- Educators use inappropriate teaching styles
- Educators lack a conceptual knowledge of Science ✓
- Educators lack the skill to teach practical work
- Educators avoid selected aspects of C2005
- Assessment, recording and reporting is a threat to educators
- Educators are not able to use learners' knowledge
- Educators display a waning interest in the implementation of C2005 ✓
- Educators are stressed out
- There is an increased workload on educators

- Educators lack qualification, training and teaching in outcomes – based approaches
- Educators do not have parental support
- There is a lack of guidance on what to teach
- The lack of resources is a major obstacle for the implementation of C2005
- Educators lack a commitment to teach Natural Science
- There is a lack of support from principals and school management teams

Finally, recommendations are made for the successful implementation of C2005 as well as suggestions for further research.

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LIST OF ABBREVIATIONS AND ACCRONYMS

C2005	Curriculum 2005
OBE	Outcomes-Based Education
DOE	Department of Education
NQF	National Qualifications Framework
GET	General Education and Training
INSET	In-service Education and Training
HOD	Head of Department
MIET	Media in Education Trust
READ	Read Educational Trust
IEB	Independent Examination Board
NGO	Non- governmental Organisation
PEI	President's Education Initiative

DEFINITIONS

1. Advantaged School

A school with adequate facilities and resources for effective learning and teaching.

2. Africanisation

This refers to the moving away from the Western influence on the curriculum and making it more African in nature. It is the initiative to enable learners to see black people as part of the text and vocabulary of the new curriculum.

3. Assessment Criteria

Each specific outcome in C2005 has three or four assessment criteria which establish the criteria against which a learner is assessed to have achieved the specific outcome within a learning area.

4. Assessment Methods (Procedures)

This refers to who does the assessing and how? These include self-assessment, peer-assessment, group assessment and educators assessment.

5. Assessment Tools

This refers to what records the educator keeps. This could include observation sheets, journals, assessment grids, class lists and the profiles.

6. Cascade Model of Training

This is a model of training used for the training for the implementation of C2005. It consists of several levels of training, where training will move down from the first level of training until the training is received by the educators in the classroom. Very simply put, it is where level A trains level B, level B will in turn train level C and level C will finally train level D.

7. Competency Scale

This refers to a specific scale to measure the level of competency a learner has attained towards achieving particular specific outcomes in the respective learning areas.

8. Critical Outcomes

These are the broad generic cross-curricular outcomes which underpin the constitution of South Africa and which are adopted by the South African Qualifications Authority. These outcomes are intended to ensure that learners gain the skills, knowledge and values that will allow them to contribute to their own success as well as the success of their family, community and the nation as a whole.

9. Curriculum 2005

This is the uniting vision for transforming apartheid education. The vehicle by which this will be attained is an Outcomes-Based Approach to education and training. The Department of Education, in consultation with the provinces, has set national policy that specifies the main aspects of C2005 for grade one to nine that must be adhered to in all provinces in South Africa.

10. Developmental Appraisal

Developmental Appraisal is a policy introduced by the Department of Education to facilitate the personal and professional development of educators in order to improve the quality of teaching practice and education management. It is based on the fundamental principle of life-long learning and development. This implies that one has to prioritise areas for development and growth throughout one's career in Education. This process of Development Appraisal is School- based.

11. Disadvantaged School

A school with inadequate facilities and resources for effective learning and teaching

12. Head of Department

This refers to the educator who is the head of a subject, learning area or phase. This educator has post level 2 status. This educator's job description is to engage in class teaching, be responsible for the effective functioning of the department and to organise relevant and related extra-curricular activities so as to ensure that the subject, learning area or phase and the education of the learners is provided in a proper manner.

13. Historically Disadvantaged Schools

Schools that have inherited disadvantages in terms of facilities and resources as a result of the injustices of the previous apartheid government.

14. Integration

This is the process of planning within schools where the educators of the different learning areas decide on common phase organisers and programme organisers to teach. It is also from here that the different learning area educators draw up their learning

programmes and they include specific outcomes from the other learning areas that fit into their respective learning area programmes.

15. Learning Areas

The traditional subjects have been absorbed into learning areas. There are eight learning areas in the Senior Phase of schooling. These are Language Literacy and Communication; Human and Social Sciences; Mathematical Literacy, Mathematics and Mathematical Sciences; Natural Sciences; Technology; Arts and Culture; Economics and Management Sciences and Life Orientation. These learning areas can be seen as eight groups of related knowledge, skills and attitudes.

16. Learning Programme

This is the vehicle through which the curriculum is implemented at various learning sites such as schools. They are sets of learning activities which the learner will be involved in working towards the achievement of one or more specific outcomes. The learning programme includes the specific outcomes, assessment criteria, range statements, performance indicators and notional time. It also includes the skills, values and attitudes to be learnt. Although there is integration with the other learning areas the learning programme is learning area specific.

17. Level 1 Educator

This refers to the classroom-based educator. This educator has the lowest rank in a school and that is level 1.

18. Ex - Model C School

These are all formerly “white” schools. This type of school was state-aided and run by a management body that includes the principal and parents. A prescribed number of

teacher's salaries are paid by the state, with the management body paying for the additional teachers, building maintenance, textbooks and extra-curricular activities. School resources such as grounds and buildings were transferred free of charge to the school, provided that they continued to be used for educational purposes.

19. Outcomes-Based Education

In Outcomes-Based Education clear statements are made about what knowledge, skills, values and attitudes learners should acquire as a result of their learning. These statements are called outcomes, because they say what the result (or outcome) of learning should be. Outcomes-Based Education is interpreted differently in various parts of the world where different Outcomes-Based approaches are used.

20. Performance Indicators

These are the detailed steps of the process and content that the learner should achieve and be able to demonstrate. These are prescribed and form part of the learning area document in the Policy Document. They also provide details of the learning contexts in which the learner will be engaged.

21. Phase Organisers

These are prescribed by policy for each learning area and each phase. In the Senior Phase these are Communication, Economy and Development, Personal Development and Empowerment, Culture and Society, and Environment. These phase organisers can be completed within a year or within a phase.

22. Phases of schooling

These are the three groupings of the General Education and Training Band. The three phases are the Foundation Phase, the Intermediate Phase and the Senior Phase. The

Foundation Phase includes grades 1, 2 and 3. The Intermediate Phase includes grades 4, 5 and 6. The Senior Phase includes grades 7, 8 and 9.

23. Portfolio

This is a collection of a learner's work developed over a period of time. It reflects the process through which a learner moves in acquiring the knowledge or skills related to the learning. It shows the progress the learner has made across the period agreed on, and it presents the products of the learner's learning. The portfolio contains specified items assigned by the teacher and /or suggested by the learners. It could also contain optional items which the learner chooses to include. Usually such optional items would be accompanied by a short written statement by the learner of the reasons why he or she chose to include them and why they are especially meaningful to him or her.

24. Profile

This is a panoramic representation of a learner's qualities as observed by the educators. It is an up to date database on all information that may assist the learning process, collected throughout the learner's path of schooling. It also includes records of a learner's progress collected over a period of time. It includes a wide range of activities that gives a holistic view of the nature of the learner. This would include strengths, areas that need support, achievements, etc.

25. Programme Organisers

These are " themes" chosen by educators from everyday life to reflect local social priorities and are widely advocated as the starting point for the planning of lessons. They can also be seen as the specific topics related to the phase organisers.

26. Range Statements

Each assessment criterion is described in terms of range statements which indicate the scope, level, depth and parameters of the achievement. They include indicators of the critical areas of content processes and parameters of achievement the learner should engage with to reach an acceptable level of achievement. They provide guidelines but make provision for multiple learning strategies, for flexibility in the choice of specific content and process and for a variety of assessment methods.

27. Rationalization

This is a policy introduced by the Department of Education for identifying and reducing excess staffing in schools. This process takes place within set guidelines, rules, regulations and procedures. It is linked to the process of redeployment, whereby those educators who have been identified as being in excess at particular schools are placed in other schools with shortages in staffing.

28. Rubric

A rubric is a set of criteria that is used to ensure that different parts of the task are assessed. A rubric can be designed in the form of a grid. It can, however, simply be a list of what is assessed, who assesses and what assessment key is used.

29. Senior Phase Policy Document

A prescribed document issued by the Department of Education which is to be used in all the provinces of South Africa. It contains all the requirements for the Senior Phase. It also gives the specific outcomes, assessment criteria, performance indicators and range statements of all the eight learning areas for the Senior Phase (grades 7, 8 and 9).

30. Specific Outcomes

The specific outcomes were derived from the learning areas and refer to the specification of what learners are able to do at the end of a learning experience. They are also informed by the critical outcomes. They include the skills, knowledge and values which inform the demonstration of the achievement of an outcome or set of outcomes. The specific outcomes are not grade specific.

31. Transformational Model of OBE

This model of OBE is the South African initiative aimed at transforming the education and training system so that South Africans are fully-equipped to meet the challenges of the new millennium. This initiative involves substantial change. The major change is in the focus of the education system, from content and the memorisation of statistics and facts, to a system that places its primary emphasis on the development of a inquiring spirit, leading to the acquisition of knowledge, together with the skills and attitudes to apply this knowledge in a constructive way.

32. Whole School Development

Policy introduced by the Department of Education to improve the quality of teaching and learning. It is linked to the process of Quality Assurance whereby the managers of schools will be developed to become effective managers. This policy of Whole School Development will also include the inspection of schools to give assistance where it is needed.

CHAPTER 1

BACKGROUND TO THE RESEARCH PROBLEM

1.1. INTRODUCTION

Curriculum 2005 (C2005), which uses an outcomes-based model of education (O.B.E.), was introduced into the grade seven classes for the first time in 2000, as part of the South African National Department of Education's five year plan for the implementation of C2005. The researcher had some suspicions with regards to whether educators would be able to successfully teach the Natural Science learning area as intended by the policy developers of this learning area. There were and still are many grumblings coming from educators concerning the implementation of the new curriculum.

The researcher thought that possibly a major issue of concern would be the capabilities of these educators to successfully teach the learning area of Natural Science of C2005 as well as factors such as the contextual teaching and learning conditions at schools affecting the successful implementation of the new curriculum. The formal training of most educators was geared towards the teaching of Science content only. The main method of teaching was mostly that of explaining the content of Science. Science in the old curriculum had a prescribed textbook and the educators relied heavily on it as a source of knowledge. Science was treated as a separate entity from other subjects. The educator took on the role as the master of knowledge and the learners took on the role of "empty vessels" which had to be filled with knowledge. Learners were simply passive recipients of knowledge. Much emphasis was placed on how much the learners could recall and achievement was measured accordingly. It will suffice to say that the aim of teaching Science was to teach content only. These features of the old curriculum are not particular to the teaching of Science only but are common to all the other subjects of the old curriculum (Christie, 1985). The researcher wondered how these very same educators would fare with the implementation of a much more demanding curriculum, that of C2005.

1.2. THE DEMANDS OF THE NEW NATURAL SCIENCE CURRICULUM

C2005 aims to bring about a dramatic shift in the teaching and learning of the Natural Sciences. The Natural Science Policy Document for the Senior Phase (Department of Education, 1997) spells out a set of specific outcomes, range statements, assessment criteria and performance indicators. These are not specifically for Grade seven only, but for the whole Senior Phase. There is no real prescribed textbook. Science has to be integrated with the other learning areas.

The teaching of the Natural Sciences in the new curriculum places greater demands on the educators than they have previously been accustomed to. The teaching methodology required for the successful implementation of C2005 is new to most of the educators. To mention some, the demands of the new curriculum as indicated in the Natural Science Policy Document (DoE, 1997a) include the following :

- a. Educators serve as mediators of learning by encouraging and stimulating the construction of meaning.
- b. Apply learner – centered educational approaches, including the design and planning of a variety of learning experiences for their learners.
- c. Show learners how to use the different ways of learning, note-taking, research, memory, co-operation with others and learning by doing.
- d. Understand and help learners understand how to use information critically.
- e. Help learners to solve problems and make decisions.
- f. Encourage and demonstrate critical and creative thinking.
- g. Show the benefits of developing effective communication and socialising skills.
- h. Organise and facilitate group work and collaborative work.
- i. Organise classrooms for interactive teaching and learning.
- j. Anticipate learner differences and provide separate teaching and support strategies for differing education needs.
- k. Develop effective assessment skills by using a variety of assessment methods.

- l. Write accurate and clear reports on learner outcomes, indicating progress and remedial requirements.
- m. Revise planning to enable slow learners to make faster progress.
- n. Apply democratic and non-discriminatory practices in classrooms.
- o. Create a supportive and caring atmosphere in the classroom.
- p. Identify and develop learning resources within the community.

The Norms and Standards for Educators (DOE, 2000) states that educators have to play seven roles, these being the following:

- Learning Mediator
- Interpreter and designer of learning programmes and materials
- Leader, administrator and manager
- Scholar, researcher and lifelong learner
- Community, citizenship and pastoral role
- Assessor
- Learning area / subject / discipline / phase specialist

It is evident from this document that the expectations from educators in terms of the roles they have to play, are much more demanding than before. The existing core of educators do not all have the qualifications and skills to be effective in these roles they have to play.

The researcher feels that the above – mentioned demands of the new curriculum could be a possible problem for the existing core of educators. C2005 demands a new approach to teaching and the researcher thinks that it is vital that the educators be adequately trained in terms of the added demands required for the successful implementation of the new curriculum.

1.3. DIFFICULTIES EXPERIENCED BY EDUCATORS

The researcher wishes to clarify that he started with several tentative hypotheses with regards to the difficulties experienced by educators implementing the new curriculum. These hypotheses were subject to modification in keeping with the qualitative methodology which has been applied to this research study. These hypotheses were as follows:

- The new curriculum was implemented too quickly ✓
- The educators received insufficient training for the implementation of the new curriculum ✓
- The wording of the policy document is too difficult
- Educators will have difficulties with facilitative teaching ✓
- Educators will have problems with assessment
- Many educators might not have the necessary qualifications and skills to teach the new Natural Science learning area of C2005 ✓
- The inappropriate contextual conditions of schools to implement C2005 ✓
- Educators will have difficulties meeting the demands of the new curriculum as set out in the Natural Science policy document ✓
- Educators will have difficulties making the paradigm shift required of them to implement the new curriculum ✓

Educators accustomed to the requirements of the old Science syllabus in terms of their capacities as educators would be faced with many difficulties in the teaching of the Natural Sciences learning area of C2005. The researcher suspected that many of the educators would not have the expected capacities to implement the new curriculum successfully, and so wished to research this area so as to establish what problematic issues Grade seven Natural Science educators were having with the implementation of C2005, and to make some recommendations for its successful implementation.

1.4. RESEARCH PROBLEM

As the researcher has already indicated C2005 has a completely different approach to learning and teaching from that which many educators have been accustomed to and have been trained to teach. This also applies to the experiences they have had as learners themselves and as educators. The researcher refers here to what their particular “mind sets” are as to what good Science teaching is and their attitude to teaching Science.

C2005 requires that educators should be aware of the theoretical context and interpretations of assumptions underpinning C2005 (Jansen and Christie, 1999). This means that they should be aware of the fact that learners should be regarded as active participants of learning and that learning should be of a formative and developmental nature. Learning should encompass the integration of the learning of knowledge, skills, values and attitudes. Educators should be able to recognize that the aim of C2005, especially in the learning area of the Natural Sciences, is to develop more skilled and scientifically thinking individuals, meaning that the educators should see themselves as contributors to improving the standard of scientific thinking in their learners. It seems that in its aims, the language, format and the setting out of the policy document, the requirements in terms of understanding and interpretation of the policy document, and the activities required for its successful implementation, C2005 in the learning area of the Natural Sciences makes great demands on the present educators. These demands are the demands in terms of their role as mediators of scientific knowledge and scientific skills. As already mentioned the Norms and Standards for Educators (DOE, 2000) spells out these seven roles which are much more demanding on the existing educators.

The purpose of this study was threefold :

1. To establish what difficulties the grade seven Natural Science educators were experiencing in their implementation of C2005.

2. To determine whether these difficulties were related to:
 - a. Their understanding or incomplete understanding of the Natural Science learning area content.
 - b. Personal characteristics of the educators. E.g. Educational level, training, etc.
 - c. Demands of the new curriculum in terms of resources, content, assessment, etc.
 - d. Nature of the new curriculum.

3. To determine the kinds of support that would be appropriate to facilitate the implementation of C2005.

This study addressed the following research questions:

1. What are the educators' understanding of the old Science curriculum?
 - a. Their views on what constitutes important knowledge.
 - b. The expectations of the old Science curriculum in terms of the purpose of teaching Science.

2. What principles inform the Natural Science learning area of C2005?
 - a. How are they similar to those of the old curriculum?
 - b. How do they differ from those of the old curriculum?

3. What are the educators' understanding of the Natural Science learning area of C2005 in terms of the following:
 - a. What knowledge should be taught?
 - b. What should be taught in terms of values and attitudes?
 - c. What should be taught in terms of skills?
 - d. What activities will educators need to do?
 - e. What are their capacities as mediators of learning?
 - f. What do they think they require in terms of the school and classroom resources?

4. What can educators actually do to implement C2005 and what kind of support will they need?

1.5. THE SIGNIFICANCE OF THE RESEARCH STUDY

Science as a learning area has a particular role to play in the technological development of South African society. Looking at the C2005 Natural Science learning area policy document, C2005 has the intention of encouraging better scientific thinking as the researcher has attempted to clarify in the introduction. C2005 has a framework to improve the quality of Science education, but there are several questions as to how far these outcomes in the C2005 Natural Science learning area will be effectively met. The aims of the Natural Sciences of C2005 as stated in the Natural Science Policy Document for the Senior Phase (DOE 1997) are all acceptable and commendable, but some educators have indicated that it may be too ambitious.

The researcher believes that this particular research study will be valuable for the successful implementation of C2005. If problematic issues educators are experiencing with the implementation of the new curriculum are not discovered it will not be known what corrective action to take. The researcher believes that if these difficulties are identified and addressed, then the implementation of C2005 will be successful.

1.6. THEORETICAL FRAMEWORK

The theoretical framework of this research study is based on the summarized work of Fullan (1991 and 1999).

The researcher thinks that these findings pertain greatly to his particular study as they address directly the kinds of difficulties which are anticipated by educators who have to make adjustments to their way of thinking. The researcher will state briefly the findings which are relevant to this particular study. These findings will be elaborated on later in the study and will be used to strengthen the validity of the findings in the study.

Fullan (1999) drew the following conclusions with regards to curriculum changes and innovations:

- It is extremely important that people obtain support at the early stages of attempted implementation
- The circumstance of teaching asks too much of teachers in terms of daily maintenance and student accountability and there is no time for composure i.e. that is simple time out from teaching.
- Teachers, for example, need to understand the reasons for change.
- Complex change needs to be broken up into divisible parts and / or in an incremental manner
- Teachers' personality and previous career experiences determine their motivation to implement changes
- Factors such as students lack of motivation, lack of administrative support, poor administration, incompetent teachers, poor working conditions, lack of equipment, unavailability of suitable textbooks, low budget, large class sizes affect the implementation of change greatly
- Parental and community support helps greatly with the implementation of new changes
- The principal of a school strongly influences the likelihood of change
- There has to be a balance between the content of change and the process of change
- It is important to understand how adults think and learn in order to design and carry out strategies for implementation
- Essential complex and detailed processes are overlooked in favour of stressing goals and the grand plan

This study will examine whether the findings of Fullan (1999) are also found and supported by the sample of educators in this research study.

Furthermore C2005 stresses a learner – centred approach to learning. This learner –

centred approach places emphasis on Constructivism. Marlow and Page, cited in DOE (1999) say that the Constructivist theory emphasizes that individuals construct their own meaning about issues because each individual has different experiences and understandings, interpretations and conceptual frameworks.

The researcher suspected that this shift from the traditional way of teaching which the present core of Natural Science educators are teaching to a Constructivist approach to teaching Natural Science will be problematic for these educators as the demands are much greater than they are used to.

Since the new curriculum is based on Constructivist ideologies, the researcher emphasizes that this study focuses on identifying how the selected sample of Natural Science educators are coping with this new approach to teaching and learning. The methodology and analysis of this research study will hinge around the Constructivist school of thought. The constructivist ideology does not drive the methodology and analysis of the research, but it is mentioned as it is an inherent part of the new curriculum.

1.7. STRUCTURE OF THE DISSERTATION

Chapter one gives a brief outline which introduces the reader to the whole research study, and presents a background to the research problem. The second chapter reviews the relevant literature to the study. The third chapter concerns the methodological aspect of the study, which outlines the procedures and strategies that have been applied in the study. The data collected in this study are presented in chapter four with minimal comment. The interpretation and discussion of the results of the study is done in the fifth chapter. The sixth chapter serves to draw conclusions and make recommendations that are based on the findings and conclusions made.

1.8. CONCLUSION

As already mentioned, this chapter serves to introduce the reader to the research study. The background information serves to give some insight into the research problem. The information given thus far reveals that with curriculum change, there are attendant difficulties. There are some obvious difficulties accompanying the implementation of the new curriculum, hence the researcher's interest in conducting this research study.

CHAPTER 2

LITERATURE REVIEW

2.1. INTRODUCTION

This chapter deals with the following:

- The relevant aspects of the new curriculum
- Effective ways of teaching Science
- Educators abilities in the teaching of Science
- Factors influencing curriculum changes
- Identified difficulties of the new curriculum

This chapter covers important information with regards to the new curriculum, important aspects of curriculum changes and the teaching of Science, and some attendant difficulties with the new curriculum. The researcher found very little published information on how Natural Science educators are coping with the implementation of the new curriculum. By conducting this study the researcher intended to discover what difficulties a small sample of Grade Seven Natural Science Educators in one district of the KwaZulu - Natal Department of Education were experiencing with the implementation of the new curriculum.

2.2. RELEVANT ASPECTS OF THE NEW CURRICULUM

2.2.1. MODEL OF O.B.E. BEING USED IN SOUTH AFRICAN SCHOOLS

The Department of Education (1996a) states that C2005 is a major element in the new Democratic South African government's attempt to restructure and transform education in South Africa so that education will encourage critical thinking, social transformation

and practical orientation. The new government has been striving to root out apartheid education and to implement a new vision of empowered citizens. The Department of Education (DoE, 1998) states that South Africa has chosen the transformational model of O.B.E. The DOE (1998) refers to it as a transformational model in the sense that the new curriculum is intended to transform the educational system.

2.2.2. C2005 AND ITS OUTCOMES

C2005 specifies sets of outcomes to be achieved in the different learning areas. These outcomes are much broader than what traditional subject specialized educators customarily aimed at. The formulated outcomes as well as the new spirit of the new democratic constitution, as well as the elements of African culture and traditions are to be reflected in the different learning areas of the compulsory phases of schooling.

2.2.3. THE RATIONALE OF THE NATURAL SCIENCE LEARNING AREA OF C2005

The Natural Science learning area Policy Document for the Senior Phase (DoE 1997a) states that the Natural Science learning area is committed to:

- a) broadening accessing to material resources, knowledge acquisition and conceptual development;
- b) redressing past imbalances;
- c) contributing towards socio-economic development and a better life;
- d) challenging the perception that Science is predominantly a European discipline.

It also states that the rationale of the Natural Science learning area is that the Natural Sciences, comprising the physical, life, and earth sciences, involve the systematic study of the material universe – including natural and human-made environments – as a set of related systems. A variety of methods, that have in common the collection, analysis and critical evaluation of data, are to be used to develop scientific knowledge. Learners need

to know that Science is a human activity, dependent on assumptions which change over time and over different social settings. The development of appropriate skills, knowledge, attitudes and an understanding of the principles of the Natural Sciences is also encouraged to:

- a) enable learners to make sense of their natural world;
- b) contribute to the development of responsible, sensitive and scientifically literate citizens who can critically debate scientific issues and participate in an informed way in democratic decision-making processes;
- c) conserve, manage, develop and utilise natural resources to ensure the survival of local and global environments; and
- d) contribute to the creation and shaping of work opportunities.

According to the Senior Phase policy document (DoE 1997a), in view of its potential to improve the quality of life, learning in the Natural Sciences must be accessible to all South Africans. The investigative character of knowledge acquisition in the Natural Sciences should be mirrored in education. Learners should be active participants in the learning process in order to construct a meaningful understanding of concepts which they can apply in their lives.

2.2.4. EMPOWERMENT AND EMANCIPATION OF LEARNERS

Steyn and Wilkinson (1998) state that there are four main theoretical philosophies upon which C2005 is based. These are behaviourism, (as explained by Steyn and Wilkinson (1998)), social reconstructivism, critical theory and pragmatism. These have mutual reinforcements and tensions. The researcher will only elaborate on the mutual reinforcements as the researcher considers them relevant to this particular research study.

Social reconstructivists argue in favour of the following:

- a) empowering and emancipation of learners

b) learners who should be able to construct their own meanings and knowledge.

Official documents also acknowledge social reconstructivism. (DoE 1996 b:43; 1996 c:13).

Critical theorists (Steyn and Wilkinson 1998) emphasize the fact that education should not convey knowledge only, but should enable learners to acquire critical skills and attitudes. The discussion documents on C2005 stress the critical attitudes and skills to be acquired by learners. One of the national critical outcomes is: “Collect, analyse, organise and critically evaluate information.”

According to pragmatists, learning should culminate and focus on useful actions and action-based outcomes. Pragmatism is concerned with encouraging us to seek out suitable processes and to do the things that work best to help us to achieve the desirable ends.

Watts (1998) reveals through his research that critical teaching is an appropriate method for educational transformation. He argues for this method, specifically, in the Science area. What comes out clearly here is that educators have to change their methods of teaching. The educator is not the socializing agent for Science, but is the agent of social transformation. The aim of education is full learner empowerment through knowledge appropriation. This kind of teaching implies making education critical, emancipatory and meaningful. Educators are encouraged to allow learners to become actively involved in controlling their own learning; educators should be encouraged to work towards the “liberation” of learners, instead of their “domestication.”

2.2.5. CULTURALLY RELEVANT CURRICULA

Jeevananthan (1999) gives valuable insights into the need for curriculum change in South Africa. If curricula are culturally relevant they impact positively on the academic performance of people as their cultural experiences are included in the educational

process. Culturally appropriate curricula are also more easily accepted by educators and learners and this will aid their implementation. Jeevananthan also raises the point of the Africanisation of C2005. The new curriculum will have to enable learners to see black people as part of the text and vocabulary of the new curriculum. This is very relevant to Science and Mathematics so that learners can see that Science and Mathematics is not only about, and for, Europeans.

2.2.6. DISJUNCTURE BETWEEN LEGISLATED RULES AND PRACTICES

Harley and Parker, cited in Jansen and Christie (1999), state that there is a disjuncture between legislated rules and practices. They speak about a break from the old South African principles of mechanical solidarity, but without sufficient subjection to new forms of moral obligation, rights and responsibilities of organic solidarity. They say that this runs the risk of creating a sense of despair and powerlessness at the very moment teachers are called upon to play a major role in transforming education and training.

The concept of mechanical solidarity when applied to education essentially means that “mechanical” schools are those schools that have strong boundaries between the school and everyday life knowledge where in the schools there are strong hierarchical structures and everything is bound closely. The concept of organic solidarity when applied to education means that in “organic” schools there are weak boundaries between the school and everyday life knowledge and open approach prevails between the two.

Harley and Parker have argued that the importation of outcomes based education and the National Qualifications Framework (NQF) may have misrecognised the nature of the relationship between school and society in South Africa, especially with respect to teachers’ personal and professional identities. They suggest that teachers and students are likely to experience a loss of structure, boundary, continuity and order in a way that will make the implementation of C2005 extremely problematic. They suggest that to implement OBE and the NQF, teachers may well need first to shift their own identities, their understanding of who they are and how they relate to others. These, they say, are the

very skills that the mechanical mills of apartheid have failed to forge.

Harley and Parker further state that the policy makers and the educators face a daunting task to transform the identities and role of teachers. They also say that the task is made more challenging by the underlying weaknesses that emerge from adopting an imported model, which emerged in very different societies with organic solidarities binding a highly advanced division of labour, into a context still dominated by mechanical solidarities.

2.2.7. THE NORMS AND STANDARDS FOR EDUCATORS

The Norms and Standards for Educators (DOE 2000) states that educators have to play the following seven roles:

- Learning mediator
- Interpreter and designer of learning programmes and materials
- Leader, administrator and manager
- Scholar, researcher and lifelong learner
- Community, citizenship and pastoral role
- Assessor
- Learning area / subject / discipline / phase specialist

The roles which are of particular concern to this research study are the educator as learning mediator, the educator as interpreter and designer of learning programmes and materials, the educator as assessor, and the educator as learning area / subject / discipline / phase specialist.

With regards to the educator as learning mediator the educator will be required to mediate learning in a manner which is sensitive to the diverse needs of learners, including those with barriers to learning. They will be required to construct learning environments that are appropriately contextualised and inspirational. They will have to communicate

effectively showing recognition of and respect for differences of others. In addition an educator will be required to demonstrate sound knowledge of subject content and various principles, strategies and resources appropriate to teaching in a South African context.

Concerning the role of interpreter and designers of learning programmes and materials, the educator will have to understand and interpret provided learning programmes, “design original learning programmes”, identify the requirements for a specific context of learning and select and prepare suitable textual and visual resources for learning. The educator will also be required to select, sequence and pace the learning in a manner sensitive to the differing needs of the subject / learning area as well as the learners. This role implies that educators will have to be able to have practical competence to “design original learning programmes so that they meet the desired outcomes and are appropriate for the context in which they occur.”

With regards to the educator as assessor the educators will be required to understand that assessment is an essential feature of the teaching and learning process and know how to integrate it into this process. The educator will be required to have an understanding of the purposes, methods and effects of assessment and be able to provide helpful feedback to learners. The educator will have to design and manage both formative and summative assessment in ways that are appropriate to the level and purposes of the learning and meet the requirements of accrediting bodies. The educator will understand how to interpret and use assessment results to feed into processes for the improvement of learning programmes.

With regards to the educator as learning area / subject / discipline / phase specialist the educator will be required to be grounded in the knowledge, skills, values, principles, methods and procedures relevant to the discipline, subject, learning area, phase of study. The educator will have to know about different approaches to teaching and learning and how these may be used in ways in which are appropriate to the learners and the context. The educator will have to have a well – developed understanding of the knowledge appropriate to the specialization.

This Norms and Standards for Educators initiative with regards to the roles and competencies of educators, as explained above, is essentially in keeping with the demands required by C2005. The researcher thinks that the new curriculum would work effectively if the present corps of educators was equipped with the competencies spelt out in the Norms and Standards for Educators (DOE, 2000).

2.3. EFFECTIVE WAYS OF TEACHING SCIENCE

2.3.1. THE ACTIVE LEARNING OF SCIENCE

Ogude and Rollnick (1999) look at ways of enhancing learner's interest in Science through the use of videos and other resources. They look at these as a way of assisting the implementation of C2005. This research revealed that videos produced by the educators and learners were effective and had a powerful effect on the learners. This research also revealed that children learn better when they are actively involved in solving problems and exchanging ideas.

2.3.2. THE INTEGRATION OF EDUCATION AND PLAY

Brooke and Solomon (1998), through their observation of primary pupils, reveal that if education and play are integrated, children will benefit more from this than from simple instructional teaching. This research discovered that if learners are allowed to experiment and practice with tools they will become "budding child experts" as has been found in most Interactive Science Centres where children happily explain to their friends how things work. Skills learned through play and practice can be utilised to solve a set of tasks. When speculations, however simple, about cause and effect are entertained by Science educators a more active curiosity which leads to investigation may flourish. It is recommended that the skill of investigation should be encouraged in learners.

2.3.3. CONSTRUCTIVISM AND THE TEACHING OF SCIENCE

Joan Solomon (1994) states that the constructivists' interpretation of the nature of Science is in opposition to the conception of Scientific investigation as being descriptive. The constructivist approach is stated as always being internal or intuitional. She states that Science experiments could be carried out in the new "constructivist classrooms" just as they had often been before. She states that it would be the ideas already in the pupils' minds, not some unobtainably objective description, that would guide their interpretation of results. The constructivist paradigm emphasizes that in the teaching and learning process, the form in which the messages are received depends crucially upon the prior constructs of the pupil and the teacher.

She also states that constructivism, in the sense that it is used within Science Education, has always skirted round the actual learning of an established body of knowledge. Constructivism, in Science Education is built on the notion that the "pupil is already a Scientist." This basically means that the pupil brings a body of knowledge (construct knowledge) from his or her own experiences which can be developed on. Constructivism also embraces the notion of active learning. Constructivism in Science Education recognises the value of ideas held that the learning child is at the same level of practising Scientists. By this they mean that the child as in individual with valuable knowledge and the ability to use this valuable knowledge in the same way that a Scientist would be able to.

The information on constructivism reveals to the researcher that the new curriculum contains to a great extent the ideology of constructivism as a theory. Examples of this is the fact that the new curriculum encourages the recognition of prior learning as well as the idea of active learning by learners.

2.4. EDUCATORS' ABILITIES IN THE TEACHING OF SCIENCE

2.4.1. EDUCATORS' INACCURATE CONCEPTIONS OF THE NATURE OF SCIENCE

Lederman (1992) conducted a review of research related to students' and educators' conceptions of the nature of Science. He discovered that educators of Science do not necessarily have clear and accurate conceptions of the nature of Science itself. He has made the following relevant findings with regards to the nature of Science:

- a) Science educators do not possess adequate conceptions of the nature of Science irrespective of the instrument used to assess understandings;
- b) techniques to improve educators' conceptions have met with some success when they have included either historical aspects of scientific knowledge or direct attention to the nature of Science.

2.4.2. EDUCATORS' LACK OF SUFFICIENT GRASP OF SCIENCE SUBJECT MATTER

Taylor and Vinjevold (1999) report that one of the most consistent findings of the President's Education Initiative projects pointed to the educators' low levels of conceptual knowledge, their poor grasp of their subjects and the range of errors made in the content and concepts presented in their teaching. The researcher suspects that the above – mentioned could be relevant to some of the educators in this study.

“What happens when educators lack sufficient grasp of Science subject content?” Harlen and Holroyd (1997), working with educators in Scotland and addressing this question, found that many educators not only lacked confidence and perceived competence to teach science, but indeed retained many misconceptions found in school learners. The research revealed that confidence was influenced by the following:

- a) Educators' own school and personal experience;
- b) the nature of initial and in-service experience;
- c) the experience of pressure and curriculum overload;
- d) the support available from colleagues and materials resources;
- e) the educators' views of their professional capability.

It was therefore revealed that levels of overall confidence are influenced by a range of factors, of which Science knowledge is a very significant one, whilst confidence in a specific area of content is closely related to knowledge of that content. Harlen and Holroyd (1997) also discovered that educators who were unable to avoid teaching the subject, Science, developed coping strategies to deal with the subject. These being teaching as little of the subject as the educator can get away with, doing more Biology and less Physical Science, placing heavy reliance on kits, prescriptive texts and learner worksheets, emphasizing expository teaching and underplaying questioning and discussion, avoiding all but the simplest practical work and any apparatus that could go wrong and depending on ideas or information from their educator colleagues in a piecemeal fashion.

Clearly, carefully designed in-service education and training is imperative to improve the situation of Natural Science educators. McGregor and McGregor (1992) point out that in-service education and training is imperative and that the message is clear that the government must improve the quality of educator education to redress inequalities and develop the skills of educators.

2.4.3. EDUCATORS' INABILITY TO ASSIST LEARNERS ATTAIN DEEP CONCEPTUAL UNDERSTANDINGS, KNOWLEDGE AND SKILLS

Reeves (1999), reporting on a group of Grade Seven Natural Science teachers in the Western Cape Province trialling a first draft of a curriculum unit based on the Natural Science Learning Area Theme, "Planet Earth and Beyond," considered teachers' subject knowledge and teaching skills. She found (Reeves 1999, p.54):

“Teachers’ efforts to engage learners with Natural Science concepts, values and processes were constrained by both their limited resources of learning area knowledge and teaching skills. Teachers struggled to engage learners with concepts and higher order process skills authoritatively and at adequate levels when they themselves had not mastered the knowledge and processes they were trying to teach. As a result, they were unable to assist learners in attaining deep conceptual understandings, knowledge and skills as opposed to surface articulation of concepts and processes.”

Within this study, all the respondents have the necessary qualifications as educators. However, adequate training in the new approaches to teaching seems to be lacking. The researcher thinks that the respondents in this study are possibly lacking in the necessary skills to implement the new curriculum. Taylor and Vinjevold (1999) state that many of PEI research projects explicitly or implicitly link the educators’ knowledge of the discipline they are teaching to their pedagogic knowledge and practices. They said, in other words, that poor conceptual knowledge is accompanied by superficial understanding of what makes for good teaching and learning. The result is that teaching is teacher centered and that there is very little engagement with learners’ conceptual development.

2.5. FACTORS INFLUENCING CURRICULUM CHANGES

2.5.1. BARRIERS TO CURRICULUM INNOVATIONS

Usually whenever change is implemented, in any field, a number of difficulties arise. These can arise from a number of reasons which can include the fear of change, resistance to change, unpreparedness for change, inappropriate working conditions for change, insufficient expertise to implement the change and many related difficulties. The education field is constantly exposed to change and is, in fact, a field which undergoes many curriculum changes. Several researchers including the following have studied the processes of curriculum change and have discovered that several difficulties arise when this process of curriculum transformation takes place.

Marsh (1992) reveals that when curriculum changes are implemented in schools the success of these changes depends much on the staff interests, organizational structures and resources. Different staff each have their own special identity based upon their attributes, informal and formal values and norms, leadership traits and organizational climate. The students of different schools will have certain characteristics in terms of socio-economic status, social orientation, norms, values and skills. The changes will therefore not fit in snugly to every school. The important reasons are that the ideas have originated from outside experts, the changes are difficult to manage, there has been inadequate planning, the changes have not been understood by the educators and the parents. Marsh also reveals that for the curriculum changes to be successful they have to be more effective in improving learning, they have to be consistent with the values, experiences and needs of the recipients, must have been pilot-tested, must be shown practically where educators can see a live demonstration with children, and the educators must have special training.

Rust and Per Dalin (1990) construct a theoretical model of the logic employed by educators and others, in deciding whether to adopt or reject some proposed change in practice. They mention that educators may be the main determinant of innovations having to do with factors such as curriculum or teaching style and that it is important that educators must play some role in all innovations affecting the school. They also mention that the educators appraise or evaluate proposals in deciding whether to adopt some innovatory change or practice. They say that the educator's decision to accept or reject is a complex one and is usually guided by one or another theoretical perception. They say that theorists such as Marx have observed that people faced with making choices, make choices in situations not of their own choosing and these choices are largely determined by the material life surrounding them. With regards to C2005, the new curriculum is policy and the educators are compelled to accept it. They can, however, be encouraged to accept it more easily.

Rust and Per Dalin (1990) also mention theorists like Karl Popper whose theory applies

to coercive situations. Popper's theory states that people can choose to comply with an order without actually doing what they are supposed to do. They would comply temporarily until the threat of punishment is withdrawn or they would also comply while covertly sabotaging the innovation (Popper, 1966, p211). Rust and Per Dalin (1990) also refer to Doyle and Ponder (1977) who say that educators use three major criteria in deciding on an innovation. These being the following:

- a) Is the innovation instrumental in terms of classroom practices?
- b) Is it in agreement with existing conditions?
- c) What are the costs involved in using these innovations?

Doyle and Ponder (1977) also mention other worthwhile considerations which are not included with their theoretical model. These being that educators choose to adopt changes using one or more of the following criteria :

- a. Information received by the educators must be perceived as adequate and accurate and there should be feedback channels for the educators to communicate their experiences to the co-ordinators of the innovation.
- b. The outcomes of the innovation must relate to the values of the educators in such a manner that they are perceived as beneficial.
- c. The innovation must be effective and reliable.
- d. The innovation must be feasible.
- e. Some kind of pilot-testing should have been done on the innovation.
- f. The innovation should be adaptable.

They mentioned also that educators' earnings, status, self esteem and working conditions often affect their ability to implement innovations. Educators are also noted as making rational decisions about the relative advantages of the innovation to them as well as to their learners. They have also noted that trying out new ideas is far more time consuming than doing what is already known. Some educators are far too busy with large classes and have no time to try out impractical ideas. It has also been noted that the low earnings and

status of educators tends to demoralize them and discourages their commitment to harder work.

Hoyle and Bell (1972) give some valuable insight into some of the barriers to curriculum change. They identify these barriers as being attitudes, resources and organizational structures. They say that attitudes can be favourable or unfavourable towards change and also refer to the positive or negative relationship towards people. They say that some innovations require that people work closely together for collaboration purposes, like in team teaching, and that the success of team teaching relies on the ability of people to work harmoniously together. They further state that innovations normally require additional resources and where these are not available it creates considerable barriers to the innovation. They state that there are many kinds of resources, but they are categorised as materials, time and facilities. They state that the lack of appropriate organizational structures for linking the sources of innovation with potential innovators causes barriers for the successful innovation. They identify conferences, courses and workshops as widely used organizational structures for linking the sources of innovation with potential innovators. They further state that for the successful implementation of change there has to be sustained contact between the curriculum initiators and the potential adopters of this change.

This information indicates that there are some consistencies with regards to the difficulties that are experienced when curriculum changes are introduced.

2.5.2. FORCES THAT IMPEDE CHANGE

Some of the forces that impede change identified by Henson (1995) are the following:

- Many educators view change as unmanageable (administrators and teachers do not believe that they can bring about purposeful change).

- Time and resources have been insufficient (time and money are not available to conduct necessary staff development and money is not available to purchase books and reading material).
- Educators are conditioned and socialized by the format of schooling they experienced and understand (they believe that school structure is not the problem).
- Educators have not been properly prepared to deal with the complexity of restructuring schools (administrators and teachers know little about organizational behaviour, conflict management and other related topics).

2.5.3. FACTORS RELATED TO SUCCESSFUL CHANGE

Fullan (1991) makes the following suggestions for the successful implementation of change :

- A clear model exists for the proposed change.
- There needs to be a strong advocate for change.
- There should be an early active initiation establishing initial commitment, as an elaborate planning stage is wasteful of energy.
- Careful orchestration: implementation requires the clear direction of many players; a group is needed to oversee the implementation plan and carry it through.
- The correct alchemy of pressure and support.
- Early rewards for implementers.
- Ongoing INSET, to maintain commitment as behaviours often change before beliefs.
- It is subject to continuous INSET for new staff, to consolidate commitment.

2.6. IDENTIFIED DIFFICULTIES OF THE NEW CURRICULUM

2.6.1. PRINCIPAL CRITICISMS OF OBE IN THE SOUTH AFRICAN CONTEXT

Jansen (1999) asserts that OBE is driven by political imperatives which have little to do with the realities of classroom life. He says that it will in fact undermine the already fragile learning environment in schools and classrooms of the new South Africa.

He gives the following reasons why he thinks “OBE will fail”:

- The language of innovation associated with OBE is too complex, confusing and at times contradictory.
- OBE as curriculum policy is lodged in problematic claims and assumptions about the relationship between curriculum and society.
- Teachers have not been allowed to conceptualise and make sense of OBE as curriculum policy.
- The management of OBE will multiply the administrative burdens on teachers.
- By organising knowledge around discrete competencies, OBE overlooks the important crosscurricular and interdisciplinary demands encountered in learning a complex task.
- For OBE to succeed requires that a number of independent innovations be included in the new educational system simultaneously.
- OBE requires a radical revision of the system of assessment.

2.6.2. FINDINGS OF THE C2005 REVIEW COMMITTEE

From the start of the implementation of the new curriculum great difficulties were experienced. In February 2000 the National Minister of Education, Professor Kader Asmal, announced the establishment of the Review Committee on C2005 to investigate C2005.

The Review Committee on C2005 (Chisholm et al. , 2000) have summarized their main findings as the following:

- Regardless of the observed flaws of C2005 there seems to be a large majority of people who support the underlying principles of C2005.
- The lack of clarity and conceptual confusion around C2005 stems from the complex language and confusing terminology used in C2005 documents, the overcrowding of the new curriculum with its many learning areas and the progression and pace.
- With regards to the progression, pace and sequencing in design there seems to be a lack of conceptual coherence and conceptual progression is relatively neglected. It has been suggested that the curriculum and its attendant documentation needs streamlining, that the design features need to be rationalised, that teaching time be reallocated to languages and foundational mathematics and the promotion of progression, pace and sequencing be enabled.
- There is a lack of alignment between curriculum and assessment. There is a need for a coherent policy document on assessment aligned with the curriculum and containing clear guidelines and procedures, and a greater attention to assessment in teacher preparation for the new curriculum.
- Attention needs to be paid to strengthening and adapting the model of training and the duration of teacher preparation, addressing the quality of the trainers and training materials and providing for follow up support for teachers.
- Learning support materials are variable in quality and often unavailable.
- Provincial Departments and school management teams provided for too little support to teachers in the classrooms.
- There are variations in the understandings of what C2005 is within and between schools, as well as amongst and between teachers, trainers and officials.
- As a result of these problems encountered by educators there is limited transfer of learning into classroom practice.
- The implementation of C2005 has been too rushed and therefore inadequate.

2.7. RESEARCHER'S COMMENTS ON THE LITERATURE REVIEW STUDY

This literature review has revealed that educator mastery of content knowledge has not been emphasized by many authors writing about curriculum change. The mastery of content has not been identified as a variable for the successful implementation of curriculum changes. Perhaps it is because these findings were discovered in contexts where this factor was not considered as a relevant variable as most of the educators had a good mastery of the subject content. This will obviously not be the case in the South African context and particularly for this research study. The mastery of subject content will obviously be a considered variable in this research study.

Without restating the researcher's tentative hypotheses it can be seen that the majority of these seem to be valid for this particular research study.

2.8. CONCLUSION

This information served to introduce the reader to the new curriculum and the attendant difficulties of curriculum innovation. It is with this information in mind that the researcher will proceed to examine what difficulties this small sample of educators in one district of the Department of Education in Kwazulu – Natal is experiencing with the implementation of the new curriculum.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter provides a detailed description of the design and the methods used in this research study. Included in this chapter is a detailed description of the research sites, the teachers involved, and the research techniques used as well as their advantages and limitations. The research tools and the data collection process is also described, as are the data analysis procedures.

3.2. RESEARCH SITE

The research study was undertaken in a predominantly rural district of one region of the KwaZulu-Natal Department of Education. It consists of five circuits. The educators who made up the sample were from two circuits. Many of the schools are disadvantaged. Their buildings are in poor conditions, with no electricity and lack many resources. The majority of the schools are located in rural tribal areas. In these tribal areas, each rural community has a demarcated settlement area (tribal area) with its own chief. In this instance these will be Zulu chiefs.

There are six schools in the main town in the area. The rest of the schools are located in the rural tribal areas of the district. In total there are 105 Primary schools and 27 combined Junior and Senior Secondary schools in the district. The Department of Education has a functioning structure with a district manager at the head and his team of superintendents, each responsible for one of the circuits. Although it has been identified as the poorest district in its region, it is a well functioning district. A point worth

mentioning is the fact that the Department of Education has begun electrifying most of the schools and most of the schools now have good fences erected around them. There still exists the problem of over-crowding with some of the schools having up to 93 learners in one class. Some grades have to share the same classroom with their backs facing one another. The department has begun to erect new classrooms in some of these schools. Some of these schools do not have proper and sufficient furniture and this creates a problem for effective teaching.

The scenario which the researcher has given above shows that the contextual situations in the schools where the study was undertaken varies. The researcher considered this situation most ideal for this particular study as the researcher thinks that it includes a wide range of contributing factors in terms of resources, teaching and learning facilities, different backgrounds of learners and educators and different attitudes to learning and teaching ability.

In this section, a broad overview is given of the areas in which educators who were involved in the research were found. All six schools visited were Primary Schools with grade seven classes. Three schools visited were in the main town and the remaining three were in the tribal rural area of the district.

School A

This school is situated in the main town. It is a former Model C School and can be called an advantaged school. It has beautiful building structures and grounds, which are well maintained. It boasts a full size soccer field with a cricket pitch. There are two tennis courts and a swimming pool. It caters for all grades from grade one to grade seven. There are three classes per grade. These grades are all housed in their own classrooms with an average enrolment of thirty five learners per class. The school has a total teaching staff of twenty one educators, some paid from school fees. The staff and learners at this school are multi – racial. This school has a very adequately stocked laboratory, a well-resourced media centre; a printing room and a technology room.

The researcher observed a very well organized and well-run school with all the educators very engrossed in the teaching of their learners.



Grade seven learners reading in the Media Centre at School A

School B

This school is situated at the bottom end of the main town adjacent to the bus and taxi rank. Its close proximity to the bus and taxi rank creates a noisy environment for teaching. The school seemed well organized and everyone was very busy with their learning and teaching. The majority of the learners are now black. This school has a multicultural staff. With a newly appointed female principal this school caters for the local population but many of their learners are from out of town. It has all grades from

grade one to grade seven. The grade seven class was unusually small with a total of only twenty learners. This school is well-resourced in terms of office machinery and equipment. It is a very old school with a very small school-yard. The playing field is ungrassed and accommodates two goal posts where the learners play soccer.

This school seemed to be well run.



A view of school B from the sports field during one of their cultural functions

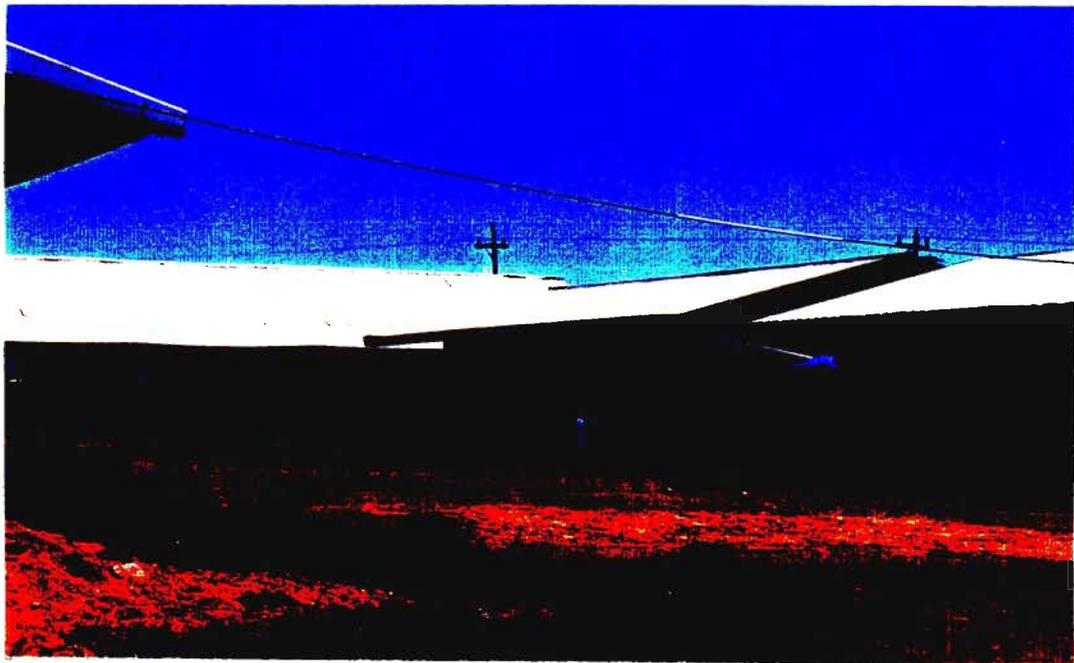
School C

This school is situated in one of the tribal areas of the district. It is located about fifty five kilometres from the main town and is about one kilometre off the main tarred road between the two main towns. Although this is a rural school it is very accessible by road and there is plenty of public transport available. The buildings are pretty old with one new section as well as a new block of pit toilets added to the school. The school does not

have electricity, although it is presently being wired for electricity. There is also no running water and the school relies on rain-water collected in tanks.

There are all grades, from grade one to grade seven. Some grades have two classes per grade, as was the case with the grade seven classes I had observed. This school has a completely black staff and learner enrolment. This school does not have any sports facilities on the premises except a partially grassed school yard.

A very good learning environment otherwise prevailed at this school.



A view of school C with their water tanks.

School D

School D is located in the most picturesque area of one of the tribal areas of the district. It is situated on a hill above the valley of one of the main rivers. The researcher travelled to this school on a rainy and misty day. The researcher even had doubts as to whether he had been travelling in the right direction as he seemed to have been travelling forever into

the steep, slippery and winding hills, but was eventually pleasantly surprised to find a very modern school building in this remote, but lovely rural area. This school is situated at least fifty kilometres off the main road between two towns. The gravel road leads directly to and past the school.

The researcher was told that the bus did not come on the road leading to the school and that the only vehicles that came there were the vans. These only come once a day to collect passengers in the morning and return very late in the evenings, if they came at all. The educator the researcher observed said that she had to leave a day before to be able to attend meetings at the circuit office or the main town. Public transport was obviously a major problem for them.

The school was otherwise a reasonably well kept school and the teaching and learning seemed to be well organized. The staff and learners were all black. Besides their lovely new and well-kept classrooms this school had no other facilities. They have a small playing field on the school grounds and the learners played soccer on the open veld. The school has no electricity and running water.



A view of the entrance to School D

School E

School E is located in one of the tribal areas. It is about thirty five kilometres off the main road between the towns. It is in a very rural area, but has two trading stores as well as a liquor store. It is just off the main gravel road and there are several vans travelling back and forth on this road, which gave the researcher the impression that public transport was not such a major problem.

The school itself consists of a reasonably old building, with one new block of classrooms. It has no sports facilities, except a gravel playing field. The school does not have running water, but has electricity. This school has office and printing machinery. It has grades one to grade seven and has a completely black learner enrolment and staff.

There was a lively atmosphere at the school and a good learning environment.



A view of the entrance to School E

School F

School F is situated at the bottom end of the main town and is bordered on two sides by

busy shopping centres. There is a busy main street which passes above the school and there is the constant sound of people and especially of moving cars. This is a combined Primary and Junior Secondary School. It has grades one to grade nine. It has a completely black learner enrolment.

Most of the buildings are relatively new with the exception of the church building which is a very old stone building. The church is utilized by the school during the week. It is shared by two classes. All the classrooms are very small and each one contains large numbers of learners. The school yard is extremely small and there are no sports facilities for the learners. It has electricity and running water. The school also has office and printing machinery.

On the researcher's visit to this school there was a busy bustle at the school. It is, however, a very well run and organized school in spite of the many limitations it has.



A view of the entrance to School F

3.3. CHOICE OF EDUCATORS FOR THIS RESEARCH

The researcher chose six Grade Seven Natural Science educators of a predominantly rural

district in one region of the Department of Education of KwaZulu- Natal who were implementing C2005 for the first time in 2000. Two educators each were selected from three different kinds of schools. The three different kinds of schools were the following

- a. An advantaged urban school: School A
- b. Disadvantaged urban schools: Schools B and F
- c. Disadvantaged rural schools: Schools C, D and E

A prerequisite for the selection of these educators was that they must have undergone the Kwazulu – Natal Department of Education’s training for the implementation of C2005 in 1999.

Qualifications, experience as a Science educator and gender representivity were the other criteria used for the selection of these educators. The researcher aimed to get a varied sample of educators as this would be most suitable for the purpose of this research study, whose purpose was to establish what difficulties the Grade Seven educators of a predominantly rural district of one region of the Department of Education of KwaZulu- Natal were having with the implementation of C2005.

One of the educators who formed part of the advantaged school group fell ill and was put off sick and hence could not be included in this research study. He was replaced by the educator from School B. This educator formed part of the sample, but was excluded from the class observation part of the research as he too fell ill after a hijacking incident.

3.4. NEGOTIATING ACCESS

To obtain access to the research sites the researcher obtained permission from the District Manager. This was done by means of a letter of request from the researcher accompanied by a letter from the University of Natal – Petermaritzburg, authorising the researcher to conduct the research study. Once approval had been granted the researcher contacted each principal of the research sites telephonically and where the researcher could, principals were approached personally for permission to conduct the research at their

schools. Two schools were not able to accommodate me. The one informed that they did not have a Grade Seven Educator and the other simply said that they were not implementing C2005. The educators identified were then approached personally with the purpose of the research being explained to them. They were reassured that it was for academic purposes and that all information would be treated as confidential. This, the researcher confirmed to them by informing them that their names were not required and that their names as well as the names of their schools will not appear in the dissertation.

Once acceptance of participation was obtained from the educators, appointments to interview and observe them were made with each of the educators participating in the study. The interviews were also tape recorded.

The educators participating in the study were observed at their respective schools.

Each interview was tape recorded and there were six audio-tapes. These were transcribed onto paper for data analysis purposes.

The collection of the data was not without problems. The first major task was to get to see these educators. Three of the educators kept postponing their interviews. Eventually the researcher got to see them for the interview. By this time there had been a major delay made for this research study. The observation part was even more difficult as all the educators were hesitant to have the researcher in their classes. Eventually, only four educators were observed teaching. The remaining two were not observed teaching. One of the latter two delayed the observation so much so that by the time the researcher arrived at his school it was the examination period and he could not be observed teaching. The researcher was, however, able to observe other criteria on the observation schedule. The remaining educator of the latter two was not observed teaching at all. This educator was initially too busy with extra-curricula activities and was not able to see the researcher and appointments for observation were constantly pushed back. Eventually this educator was diagnosed unfit for work after a traumatic hijacking incident on his way to school.

3.5. METHODS

This research used qualitative approaches in a case study of six grade seven Natural Science educators. This researcher used the following:

- in - depth interviews with the selected educators
- the observation of these educators' teaching practices
- participant observation as the researcher was involved in the training of the grade eight educators of this particular district

This research study was limited to these six Grade seven Natural Science educators.

3.5.1. Interviews

Goodson (1992) states that it is imperative to listen to the voices of teachers because they carry the exact tone and feelings that are conveyed in the teachers' speech. This research study needed to hear the views of the respondents clearly so that it could be discovered how the educators were coping with the implementation of the new curriculum. This study involved in - depth interviewing of the subjects, using mostly open-ended questions so as to facilitate a diversity of responses. (See Appendix A)

3.5.2. Advantages and limitations of interviews

Borg and Gall (1979), state that interviewing involves the collection of data through direct verbal interaction between the researcher and the researched. What this essentially means is that the responses of the subjects can be used to alter the interview situation because there is immediate feedback, as contrasted with other research procedures like questionnaires.

Interviews also allow greater depth and give a truer picture of views and feelings of the subjects than do other research procedures. In an interview, the interviewee may reveal information that may not easily be revealed under other circumstances because the

interview tends to yield more complete data regarding the topic under discussion. In this study the interviews revealed much more than basic minimum answers to the questions which were asked in the interview. Educators were able to give additional information and explain their feelings more explicitly and accurately. The interviews allowed for flexibility and freedom to explore the interviewees' spontaneous remarks.

The disadvantage of the interview, according to Borg and Gall (1979), is that the adaptability gained through the interaction between the interviewee and the respondent may lead to subjectivity and possible bias. In this study this may be so because the researcher suspected that respondents wanted to support preconceived aspects of the difficulties already experienced by other educators that have been announced and published by the media to justify their own lack of implementation of C2005.

The interview is also time-consuming and, therefore, not too many subjects can be involved in the procedure. The researcher had, therefore, to limit the number of respondents. This research study had only the researcher as interviewer. The researcher is in support of the principles of the new curriculum and its effective implementation with its difficulties and wanted to help the educators being interviewed. The researcher thought that he had achieved good rapport with the educators. The researcher thought that the educators were pretty honest in their responses to the questions. The researcher could, however, identify that some of the responses were influenced by what was being reported by the media.

3.5.3. Observations

Foster (1996) states that observation is a matter of collecting information about the nature of the physical world and social world as it unfolds before us directly via the senses, rather than through the accounts of others. The purpose of the observation was for the researcher to observe exactly how the educators were coping with the implementation of the new curriculum. A qualitative approach was used where an observation schedule (See Appendix B) was used to focus the observations of the educators in their

classrooms.

The researcher was one of the trainers of the Grade eight educators in C2005 which placed the researcher in the second to last level of the cascade model of training. The researcher was, therefore, participant observer of the grade eight facilitators and educators in training for the implementation of the new curriculum. A note book in which observations were recorded was used.

3.5.4. Advantages and limitations of observations

Foster (1996) states that observations can provide detailed aspects of school life which could not be produced by other methods. For the purpose of this study what the educators were actually doing in the classrooms could not be gained from interviews alone.

Foster (1996) also states that it avoids relying on what participants tell us about their schools in interviews. This, the researcher considers as important for the validity of this study.

Another advantage is that observers may be able to “see” what participants cannot. Foster (1996) cites Delamont (1981), as saying that it may require the trained eye or the detached viewpoint of the observer to “see the familiar as strange.”

Foster (1996) states the following limitation: “It is sometimes impossible to observe the behaviour or phenomenon of interest because it is inaccessible. The observation may give only a partial view of behaviour and further information may be needed”, as was the case in this research study. “Those being observed may consciously or unconsciously change their behaviour because they are being observed”, as was the case with some of the respondents that were observed. Observation is time-consuming and a costly way of collecting data. This is true in this study as the participants were from rural areas with great distances to travel to. This limited the number of participants in this study.

3.6. RESEARCH TOOLS

3.6.1. Interview Schedule

The researcher drew up an interview schedule (See Appendix A) for use when interviewing the selected sample of educators. This interview schedule was used to address critical questions 1, 2 and 3. The research questions were the following:

1. What are the educators' understanding of the old Science curriculum?
 - a. Their views on what constitutes important knowledge.
 - b. Their expectations of the old Science curriculum in terms of the purpose of teaching Science.

2. What principles inform the Natural Science learning area of C2005?
 - a. How they similar to those of the old curriculum?
 - b. How do they differ from those of the old curriculum?

3. What is the educators' understanding of the Natural Science learning area of C2005 in terms of the following:
 - a. What knowledge should be taught?
 - b. What should be taught in terms of values and attitudes?
 - c. What should be taught in terms of skills?
 - d. What activities will educators need to do?
 - e. What are their capacities as mediators of learning?
 - f. What do they think they require in terms of the school and classroom resources?

4. What can educators actually do to implement C2005 and what kind of support will they need?

The purpose of completing this interview schedule was to collect data on the following.

- a. What were the educators' academic and professional qualifications.
- b. What Natural Science they had learnt and how they had learnt it.
- c. The educators' teaching experience to date.
- d. What their understanding of the old Science curriculum was and how they taught in the old curriculum.
- e. What their understanding of the new Science curriculum was and how was it different from the old curriculum.
- f. Some of the difficulties that these educators had with regards to the implementation of the new curriculum.
- g. What they thought would help them deal with the difficulties they were experiencing with the implementation of C2005.

3.6.2. Observation Schedule

The researcher drew up an observation schedule (See Appendix B) to be used during the observation of the selected sample of educators. The researcher visited the classes of these educators for a maximum period of one day each. The observation addressed research questions 3 and 4 (See p. 43, section 1.4). The researcher made use of a checklist in the classroom to discover the following:

- a. Kinds of learning that took place in the classroom.
- b. What learning activities the educators actually used.
- c. What assessment tasks the educators used.
- d. What school and classroom resources were actually used.
- e. What kind of support they would need.

3.6.3. Acknowledgements of the shortcomings of the observation schedule

The following criteria in section 1 of the observation schedule on "Observation of the Physical Classroom" were incorrectly included in the observation schedule as they were

not observable criteria and were therefore excluded from the observation process.

- Evidence of learner participation
- Evidence of values learnt
- Evidence of attitudes learnt
- Evidence of thinking skills promoted by C2005
- Evidence of constructive thinking processes

Section 2 of the observation schedule on “Observation of the class in Action” (pp. 157 – 164) did not work as intended as there was simply too much to look for. The researcher, therefore, simply recorded what knowledge the educators had actually taught. In this way the researcher was able to check how close or how far the educators were from completing the required knowledge which had to be taught.

Information required in sections 5, 10 and 14 of the observation schedule on “Observation of the class in Action” was combined with revised section 2, (see previous paragraph).

3.7. DATA ANALYSIS

The data collected was all qualitative and descriptive, hence they were inductively analysed. This allowed for the “bottom up theory” (Biklen , 1992). The data obtained from the audio–tapes were transcribed for the analysis process. The data from the observation schedules was also transcribed from the observation schedules in detailed description in preparation for the analysis process.

Jessop (1997) defines “coding” as “a complex process by which the researcher labels units of meaning or categories according to a system of codes, usually developed through a close reading of the data.” A thorough reading of the data was done and topics covered by the data were searched for. Emerging themes as represented in chapters 4 and 5 were also identified and phrases were written down to represent these themes. Biklen (1992),

states that these phrases are called “coding categories” and they were used as a means of sorting the descriptive data that had been collected in order to physically separate the material related to a given topic from the rest of the data.

The transcribed data were read thoroughly in order to discover codes and emerging themes around which to categorize the data. The data were also checked for incomplete and / or irrelevant data. The data were organized into meaningful chunks of information.

3.8. CONCLUSION

Since in qualitative research, data are closely related to results, the researcher has given only a brief description of the analytical procedure used. Further details together with the findings are given in chapters four and five.

CHAPTER 4

VIEWS OF EDUCATORS AND OBSERVATIONS MADE

4.1. INTRODUCTION

In this chapter the findings of the research are presented. The main data collected were qualitative in nature and consisted of six interview transcripts and five observation transcripts of information recorded using the research tools, interview schedules and observation schedules, described in chapter 3.

The researcher has included profiles of each of the educators in this section and has described each educator respectively and individually as A, B, C, D, E and F and has referred to them as such throughout the presentation of the findings of this study. The findings of the interviews and the observations with the researcher's comments on each respondent have also been presented separately. A general comment which serves to compare the educators and to highlight the findings is also given.

Descriptions and quotations from the data are presented in order to illustrate and substantiate the assertions made. The quotations are used to bring the reader closer to the study since the quotations not only reflect what was said, but also reflect how things were said.

4.2. EDUCATOR A

4.2.1. Profile of educator A

Educator A is male between the age of 31 to 40 years. He has a three year Primary Diploma in Education, obtained from Rand College of Education. He obtained it through full time study. He has between 16 to 20 years teaching experience. He has taught at over

three schools during his career as a teacher and is presently a Head of Department at his school.

4.2.2. Views on the similarities and differences between the old and the new curriculum

He said that both curricula were concerned with the acquisition of knowledge. He said that the knowledge taught was the same as what was taught in the old curriculum. He was clear that the new curriculum was outcomes orientated. He also indicated that the learning of attitudes and values had also been added. He indicated that C2005 included an interest in technology and it encouraged creative thinking in the learners.

4.2.3. What does C2005 require

He said that C2005 is about acquiring knowledge of the environment. He said that it was about linking the environment to the different cultures. He said that C2005 was lacking on the concept side and said that the curriculum designers have generalized a lot. He also said that there was no coherence with concepts. He said that the new curriculum was about learning more useful knowledge.

He said that the knowledge taught was knowledge to upgrade society and to produce scientifically thinking people. He said that the learners were learning more useful knowledge that they could use in everyday life. He also said that the new curriculum was teaching knowledge that was not aloof from others. His comment was:

“ The new curriculum expects us to teach knowledge to produce well-equipped Science thinking people. They are required to learn knowledge to be used in everyday life. They are required to learn knowledge which is not aloof from others. Science is not only for Mathematics and Science people.”

He said that knowledge was to upgrade citizens. He said that educators no longer took the leading role. He was emphatic in saying the following:

“Learners have knowledge. Activities have to be designed so that they discover knowledge for themselves.”

He said that he would like to see the coherence of concepts taught to the learners. He said that he would like to see some logical continuance from one grade to another. He made the following comment:

“After twenty years of teaching, I’m suddenly not confident in preparing lessons.”

He also said that some of the textbooks were of a pathetic quality. He made the following comment:

“I pity the learners at schools where educators have wrongly ordered a poor quality of books.”

He made the following comment with regard to what should be taught in terms of values and attitudes:

“As a whole I teach them an appreciation of the environment. I love nature and I try to develop in my learners a love for nature.”

He also spoke about the appreciation of natural resources. He said that he tried to instil this into his learners. He felt strongly about the learners being encouraged to appreciate different values in the different cultures in society. He made the following comment:

“The new curriculum encourages us to be tolerant and accepting of different values in society. These values should be fostered and we should not let them get eroded.”

He said that he was more aware of the teaching of skills and it always forms part of his planning.

He gave the following advice on the teaching of values and attitudes:

“ Educators should have positive values and attitudes towards Natural Science. Educators should be selected properly so that learners are taught the correct values and attitudes.”

He also said that learners had to learn new skills, like the use of chemicals or even electricity that they could use at home and in the work place.

He said that more workshops were needed in the area of the teaching of skills. He also suggested that the educators needed more training in the use of resources and the use of textbooks. He made the following comment:

“ Teachers with the affinity for the subject should teach Natural Science.”

4.2.4. The Educator’s views on what is Science

He said that the old syllabus was concerned basically with the teaching of knowledge. He said that he had to teach the knowledge as set out by the syllabus. He said the following:

“ The old curriculum was about getting concepts across to the learners. We basically taught knowledge. The learners learnt facts that they would never use again. This included rote – learning.”

He said that the purpose of teaching Science was to get concepts across to the learners. He made the following comment:

“ The purpose of teaching Science was to teach knowledge. Depending on the level of the learner, we had to teach them to respect the environment. Some of the information we had to teach was useful, but some of it was useless.”

He also said that when he taught, he drew from his own background and experiences.

He said that he engaged his learners in excursions of picking plants and studying animals. He said that his learners would number and count parts of these animals and plants. He said that he was confident about teaching knowledge, but he was not confident about implementing C2005.

4.2.5. What the educator said he actually did

4.2.5.1. Comments on planning

He said that he was not sticking to a hard and fast rule with regards to the planning of lessons. He said that he was given much leeway at his school. He said that he tried to make use of the available theme packs. He said that he tried to make the thematic packs fit into the programme organisers. His comment was the following:

“ Management has instructed us to run along with the new curriculum, but not to implement it fully.”

With regards to the difficulties he was experiencing with the new lesson planning process he said that the major problem was that they were not sticking to the C2005 planning procedure. He said that they were compelled to follow thematic packs. He said that he teaches too many learning areas and cannot plan properly with this workload.

He suggested that every educator should be given the freedom to plan in a way which best suits him or her. He also said that the expectations were too much at this stage.

4.2.5.2. Comments on the use of resources

He said that he used the photocopier to help him with his teaching. He said that he relies completely on the photocopier as they do not use textbooks at his school. He said that the parents pay for the photocopying. He said that he has many textbooks and theme pack worksheets to draw from. He said that they have a good media centre with enough resources to make use of. He said that he also makes use of the overhead projector, television and a fully equipped Science Laboratory.

He suggested that educators use mundane and useful resources. He said that he would like to see workshops held on the use of everyday and simple resources. He made the following comment:

“ Educators can use anything in the home. Medicine and tablet containers can be labelled and used in an improvised way.”

4.2.5.3. Comments on practical work

He said that he would engage his learners in group work and where the apparatus was sufficient, the learners engaged in individual practical work. He commented:

“ There is no place to complain about the lack of equipment. Educators can make their own apparatus from tins and containers. They could even use old measuring spoons and things like that as apparatus.”

He said that he used the self – discovery method and a practical hands on approach in his teaching. He said he makes use of experiments as he has a fully – stocked Science Laboratory. He said that practical work was encouraged at his school. He said that an inventory is kept to check that educators were using the Science equipment or not. He also said that he makes use of computers to do project work with his learners.

With regards to the assessment of practical work he said that following instructions was a priority. He said that he used precautionary measures, especially when it involved Physical Science practical work. He also said that he gave guidance and led the learners up to his expectations.

With regards to assessment tools, the educator said that he used graphical data which included the collection and representation of the data.

4.2.5.4. Comments on assessment

He said that assessment has changed and peer assessment is a major change.

He said that he used project work and had exhibitions of the learners' work. He said that some of the learners gave oral feedback to the class.

He said that there is a language problem in one of his grade seven classes as he teaches in English to the learners to whom English is a third language. He said that the result is that questions have to be interpreted and graded accordingly.

He said that he thought that the new assessment procedures were good and that it was making more creative and critical thinkers out of the learners.

4.2.5.5. Comments on recording and reporting

He said that he used a record book, although he knew he should be recording on a daily basis. He said that he had a sheet for recording specific skills and concepts learnt. He said that he did not use specific outcomes because he was not using the new curriculum. He was, however, using a competency scale.

In terms of reporting the learners' progress, he said that his school sent out a report to the parents every term. He said that his school was an ex Model C school and the parents

paid high school fees and it was for this reason that they were obliged to give quarterly reports. He also said that the H.O.D. monitors learners' note taking books.

He said that the ideal scenario would be that there should be a single educator teaching each grade seven class. He suggested that educators should improvise on their recording and reporting format. He said that educators could learn from their colleagues. He said that outdoor excursions should be made use of. He made the following comment:

“ The recording expectation is too much. Educators should make use of what works best for them”

4.2.6. Difficulties with the implementation of the new curriculum

He said that being part of management and constantly being called on for management issues, teaching time was stolen which could never be recovered. He also said that the teaching and learning policy at his school made them deviate from the new curriculum. He also said that that he teaches too many learning areas. This, he said, compounded his problems. He said that he had to prepare for the faster learners and had to also accommodate the slower learners. He also said that language was also a problem as some of his learners could not understand English well enough.

He said that C2005 is too rushed. He said that more training was needed. He said that it added to the volume of work that he had to do. He made the following comment:

“ C2005 has become a burden to me.”

He said that the number of subjects have increased. He said that subject teaching was necessary. He said that the management of schools should iron out all loopholes first before C2005 can be implemented properly.

He said that he needed help with the administration part of C2005. He suggested that there should be at least three educators per learning area so that these educators could work together. He said that this would help them cope better than what they were.

This educator's main concern was that there was no coherence of concepts. In other words he did not have guidance on what knowledge to teach.

4.2.7. The researcher's observations and comments

4.2.7.1. Knowledge taught

He had covered much knowledge. The knowledge covered was equally balanced in terms of Physical Science and Biology. The educator made use of photocopied notes as he had said. Each photocopied note had activities for each section taught. The activities he had on food chains and scientific names of animals had elements of C2005 in their design. The researcher observed that the educator used C2005 reference books as most of the activities were designed for C2005 and were of a good quality.

4.2.7.2. Learning activities done

He had evidence of C2005 charts on the wall. They showed evidence of group work and it could be seen that an OBE approach was made use of and group work skills were being learnt. There was a logical order of tasks shown on the charts. This observation was confirmed by the educator's explanation of how the activities were completed. He had several pictures of plants and animals on the walls. He also had a model of the inner structure of the plant and animal cell on the wall. Although the educator had informed me that he no longer adheres to the new curriculum, there was evidence of C2005 approaches to learning in the charts that were displayed.

4.2.7.3. Activities done in the classroom

The learners were engaged in a practical. They were asking questions, observing phenomena, giving feedback, collecting and recording data.

4.2.7.4. Activities promoting thinking skills

It was observable that the learners were able to apply knowledge to real life situations.

4.2.7.5. Activities with a cultural dimension

His learners were given the opportunity to recognise that that people have different viewpoints.

4.2.7.6. Project work that was done

There was evidence of practical project work in his class. The researcher was able to see some of the practical work.



An example of practical work done in educator A's class.

4.2.7.7. Learning programmes and lesson preparation

He was not using the new format of drawing up learning programmes and lesson preparation

4.2.7.8. Coverage of specific outcome and phase organisers

He did not use the specific outcomes as he said that his management did not emphasize these. He did not use the phase organisers, but he did have a record of the phase organiser, Environment, using the programme organiser, Water.

4.2.7.9. Seating arrangements

Although the learners were sitting in rows they were able to organise themselves very quickly into groups, with the different learners taking on their respective roles in their groups, when group work was done. He had sufficient space in his classroom.

4.2.7.10. Resources used

In his classroom there were many specimens of animals and plants on view, as well as useful teaching and learning aids of which the educator made good use. As already mentioned, his classroom was, in fact, a Science Laboratory. It was almost impossible to list the resources used by the educator. He had all the apparatus any Natural Science educator could wish for. He also had all the chemicals needed as well. He had numerous preserved specimens of animals as well as growing plants in his class. These resources were kept in the store-room attached to the classroom.

4.2.7.11. Assessment procedures and tools used

He made use of tests, project work and examinations. He also made use of self-assessment sheets and a special skills check list. He made good use of worksheets as he

had several reference books to draw from. All the worksheets were photocopied from C2005 reference books. The researcher thought that they were of a good quality. Close observation of the tests and examination question papers revealed that that they required information and not too much insightful thinking.

4.2.7.12. Learners' portfolios and profiles

He did not make use of these.

4.2.7.13. Recording and reporting

He used a mark book. Marks were recorded and converted to fit into a competency scale. C2005 reports were sent out at the end of every quarter.

4.2.7.14 Researcher's reflective comments

Educator A seems to have a very good knowledge of what is required of C2005.

His contextual situation at his school is ideal for the implementation of C2005. He has all the resources to work with. The majority of his learners are from a socio – economic background which favours their ability to work with the new curriculum.

The main reason for him not implementing the new curriculum seems to be determined by the management of his school. He has also indicated that he has too many learning areas to teach and this limits him as well. He has also indicated that some of his learners find it difficult to cope with English, which is the medium of instruction. This educator is very frustrated with the amount of administration that he has to do. He has correctly said that the extra administration makes him not confident to teach anymore.

The positive elements which are revealed by educator A are his appreciation of the environment and his enthusiasm to teach Natural Science. The researcher thinks that

these qualities make this educator capable of implementing the new curriculum. The researcher wishes to mention that this educator may not be implementing C2005 fully, but has the capability to implement it.

4.3. EDUCATOR B

4.3.1. Profile of educator B

Educator B is a male between the age of 31 and 40 years. He has a Bachelor of Arts degree obtained from the University of Durban Westville in 1991. This degree was obtained through a combination of full and part time study. He also has a Higher Diploma In Education obtained through full time study from the University of Natal - Pietermaritzburg in 1994. He has been teaching for between six to ten years. He has taught at one school and is presently a Head of Department.

4.3.2. Views on the similarities and differences between the old and the new curriculum

He said that both curricula were concerned with the acquisition of knowledge. He clearly said that the facilitation method does not work for him.

He said that he does not follow a rigid syllabus. He also said that the learning of skills was different. He said that he was quite sure that nothing had changed. Although this educator said that nothing had changed, he later on pointed out several changes. He said that he used the textbook to guide him as to what to teach. He also said that he did not have a guide as to what to teach and recommended the following:

“ I feel that the grade seven, eight and nine educators should get together and decide who will teach what.”

4.3.3. What does C2005 require

He said that knowledge was much broader and more relevant. He commented:

“ The teacher can be more selective in what they want to teach. If you don’t like something, you can leave it for the grade eight educator.”

He said that other sources of knowledge could be used and that the syllabus was not to be relied on. He was quite sure that the teaching of knowledge was previously teacher – centered and he believes it is presently the same. His comment was:

“ Nothing has changed. It was previously teacher – centered and it is presently teacher – centered. The learners do not give their views and I have to do the talking.”

He said that teaching should not be geared towards rote – learning and that the children should be led to discover knowledge on their own.

He said that C2005 encouraged the teaching of positive values and attitudes towards society.

He said that a more positive attitude should be developed towards Natural Science and that learners should be guided by group work. He said that learners should learn communication skills. He said that the learning and teaching of skills is a requirement of C2005.

4.3.4. The educator’s views on what is Science

He said that he had to teach textbook knowledge. He said that he was guided by the syllabus. He also said that he used library materials because he had small numbers.

He said that the purpose of teaching Science was to teach his learners facts about Science. He said that the main purpose was to teach knowledge. He also said that the purpose was also to make them appreciate the environment.

He said that the learners would listen to him teach. They did not attempt group work. The learners were required to complete worksheets. They were also given tests where they had to answer factual questions.

In terms of his capacity as an educator he said that Natural Science was not his strong point and he was not confident to teach it in the new curriculum.

4.3.5. What the educator said he actually did

4.3.5.1. Comments on planning

He said that he cuts down on his planning. He said that he works with the programme organisers and then plans from these. His comment was the following:

“ I use the textbook for my planning. By drawing up learning programmes I’m duplicating work.”

With regards to the difficulties with the lesson planning he said that it was too time – consuming. He said that the planning was far too long and furthermore the three week long planning had to be translated into weekly and finally daily planning. He said that this was too much work and he ended up not doing it at all. He said that he was unhappy about the specific outcomes, assessment criteria and the performance indicators. He said that he did not use these. He said that he would be able to plan properly if he was only teaching Natural Science. He said that he simply had too much else to do as an educator.

With regards to the preparation of learning programmes he suggested that a uniform preparation format was needed for the whole district, so that everyone would prepare in the same way. He made the following comment:

“ The amount of preparation should be reduced. I cannot enjoy teaching with so much preparation.”

4.3.5.2. Comments on the use of resources

He said that the computer works best for him. He said that he also makes use of the duplicator. He said that he makes use of newspapers and magazines as he reads much.

He advised that a Resource Centre was needed in the local district.

4.3.5.3. Comments on practical work

He said that live specimens were brought into the classroom for study. He said that he made use of the available apparatus to do experiments.

He said he makes use of videos and information from the computer. He also said that a Science laboratory was an essential requirement.

With regards to the assessment of practical work he said that he made use of group and self – assessment tools. He made the following comment:

“Giving out self – assessment sheets was laughable. The learners themselves do not enjoy giving one another smiling faces and things like that.”

4.3.5.4. Comments on assessment

He said that assessment was a facade. He made the following comment:

“ Some learners do all the work in group work activities. We are bluffing ourselves.”

He said that he did use group work assessment procedures as well as the observation procedure.

He said that he did not enjoy using the new assessment procedures and tools. He said that they were too time – consuming and involved too much unnecessary work.

He said that there was no guidance on assessment and that there was no one checking or helping in this area.

4.3.5.5. Comments on recording and reporting

He said that he used a portfolio. He also said that he used a Science notebook. He said that assignments were done in the notebooks. He made the following comment:

“ This is how the grade eight educator will see progress.”

He said that he used marks on his assessment sheets. He also said that tests and the results of practical work were recorded in a special book. He said that each learner had a big file and that is what they would take to the next school. He said that he had met with the parents to discuss the learners’ progress.

He said that he simply checks to see whether the learners have gained skills and knowledge. He said that the specific outcomes were not important.

4.3.6. Difficulties with the implementation of the new curriculum

He said that the material had to be reviewed. He felt that assessment and planning were a problem. He also felt that the children did not talk in the classroom when they were

required to contribute during lessons. He also said that the learners were getting spoilt. He made the following comment:

“ They have been given too much freedom and this is causing discipline problems.”

He said that there was too much administration involved. He said that the Department of Education should stop chopping and changing. He said that his learners could not get their hands on OBE. He made the following comment:

“ Grade seven classes should have a proper breakdown as to what they have to learn.”

He also said that he wanted more direction as to what skills, values and attitudes to teach. He made the following comment:

“I feel tired and stressed out at school because of C2005. There is so much else to do.”

4.3.7. The researcher’s reflective comments

This educator seems to be knowledgeable about the new curriculum. He also seems to be definite about what he will and will not implement. Perhaps this educator being part of his school management team has decided that they will not implement C2005 as policy has stipulated.

He is also very frustrated with the demands of the new curriculum.

A great limitation with collecting information about educator B is that fact that the researcher was not able to observe him teaching and did not see his classroom. The researcher’s suspicion was that he was not implementing the new curriculum at all.

4.4. EDUCATOR C

4.4.1. Profile of educator C

Educator C is male between the age of 31 and 40 years. He has a Senior Primary Teachers Diploma obtained from Ntuzuma College of Education in 1991. This he obtained through full time study. He has a Higher Diploma in Education from Vista University which he obtained in 1996, through part time study. He has between six and ten years teaching experience. He has taught at two schools and is presently a post level one educator.

4.4.2. Views on the similarities and differences between the old and the new curriculum

He said that the new curriculum does not rely on the textbook as the only source of information. He said that several sources of knowledge should be used.

He said that the approach to teaching was different. He said that the new curriculum demandd much more practical work now.

4.4.3. What does C2005 require

He said that C2005 is about acquiring knowledge of the environment. He indicated that the new curriculum was giving more learners the opportunity to learn Science and to enable them to enter Scientific fields they have not been able to before. He also indicated that the new curriculum wants learners to be familiar with Science phenomena in practical situations.

He also indicated that the new curriculum involves the teaching of skills. He explained that knowledge was being taught, but now skills, values and attitudes had to come out of

the knowledge. He said that the knowledge taught had to include the appreciation of the environment.

He said that the learners had to be given the opportunity to progress at their own pace.. He also spoke about the teaching of the appreciation of our natural resources.

He said that the love of nature should be fostered in the learners and that this should be incorporated in the planning of lessons.

He advised that he simply taught different life skills. He also said that skills should be incorporated in the planning of lessons.

4.4.4. The educator's views on what is Science

He said that the old curriculum was concerned with basically the understanding of Science concepts.

He said that the main purpose of teaching Science, was to teach knowledge from textbooks. He said that their schools did not have apparatus to teach many Scientific skills. He made the following comment:

“ In our schools there was no apparatus to teach Scientific skills. Our schools, however, were able to produce a few Science thinking people. Some doctors were produced. I'm a product of the old Science Curriculum as I'm teaching Science today.”

He also said that his learners would listen to him teach. He said that he did not attempt to do experiments. They had to write test and examinations as well.

He said that he was confident in his ability to teach Natural Science, but he said that he needed more training in the new approach to teaching.

He said that he needed a well – equipped Science laboratory to help him implement the new curriculum properly.

4.4.5. What the educator said he actually did

4.4.5.1. Comments on planning

He said that he used learning programmes as part of his planning. He said that he consults different sources of information. He said that he makes use of the Natural Science Policy Document and other relevant information sources. He said that he includes activities in his planning. He said that he makes use of the specific outcomes in his planning. He said that he makes use of the spider diagram to decide on what phase organisers and programme organisers to use in his planning. He said that he tries to make the knowledge fit into the learning programmes. He said that he relies on what he has taught before in the old curriculum to direct what he has to teach.

He said that he had a problem with the terminology as it was too difficult. He said that the resources were problematic. He was not comfortable with planning for the learning of skills, attitudes and values. He said that he was having difficulty working with other educators. He said that there was no integration with the other learning areas as there was no cooperation from the other learning area educators.

He said that the planning should involve less detail.

4.4.5.2. Comments on the use of resources

He said that he uses the chalkboard and charts a lot. He said that the Department of Education should supply resources.

4.4.5.3. Comments on practical work

He said that no practical work was done. He said that some Science can be learnt outside. He said that he allows his learners to brainstorm ideas. He made the following comment:

“ I engage my learners in group work, but I intervene to clarify misconceptions.”

He also identified a Science laboratory as an essential requirement to be able to do practical work.

He said that he made use of group and self – assessment tools when he did attempt to do practical work. He said that he made use of a rubric, using symbols and stars. He made the following comment:

“ I only used it once.”

4.4.5.4. Comments on assessment

He felt that assessment procedures have changed. He also felt that peer assessment was a major change.

He said that he still used tests as part of his assessment procedures. He said that he makes use of pen and paper methods of assessment.

He said that he was not using the new assessment procedures and tools. He said that he relied on what he knew best.

He felt that more training was needed in this area. He made the following comment:

“ A simpler and less time – consuming method is needed.”

4.4.5.5. Comments on recording and reporting

He said that his learners did not have a portfolio, but he thinks that the class educator has it. He was not the class educator and he simply made an input towards the portfolio. He made the following comment:

“ I do not have their progress recorded, but I know how each child is progressing.”

He said that he had met with the parents to discuss the new curriculum with them. He said that he reported his learners' progress informally to them. He said that he did not report to the H.O.D. or the principal. He made the following comment:

“ I do not report to the H.O.D. or the principal. They do not know too much about C2005.”

He said that he needed more training in recording and reporting.

4.4.6. Difficulties with the implementation of the new curriculum

He said that his problem was that he did not have a well – equipped laboratory. He said that he finds Physical Science to be the most difficult part of Science. He made the following comment:

“ It is too practical and I cannot lecture it to the learners.”

He said that the government must look after the disadvantaged schools. He made the following comment:

“ C2005 does not suit our schools at this present moment in time.”

He said that the high enrolment in the classes was a problem. He said that the OBE principles were good, but we were not ready for it. He also said that we should have specialist grade seven Natural Science educators. He also said that these educators should not take other classes.

4.4.7. The researcher's observations and comments

4.4.7.1. Knowledge taught

He had not taught much knowledge. The activities on domestic animals and energy transformation observed did have elements of C2005 in them. He did not make use of worksheets. All the information was written on the chalkboard and the learners copied the information.

4.4.7.2. Learning activities done

His learners had worked on a chart on energy transformation which showed elements of the principles of C2005.

4.4.7.3. Activities done in the classroom

He relied greatly on the old approach of teaching. The learners were passive and attentive. The researcher got the impression that this was the norm in this classroom.

4.4.7.4. Activities promoting thinking skills

There were no activities promoting thinking skills observed in his class and a close observation of his documentation revealed that he hadn't been using such activities.

4.4.7.5. Activities with a cultural dimension

There were no activities with a cultural dimension, except for an activity on domestic animals.

4.4.7.6. Project work that was done

There was no evidence of project work done in his classroom.

4.4.7.7. Learning programmes and lesson preparation

He was the only educator who had been drawing up learning programmes and who was using the new lesson preparation format.

4.4.7.8. Coverage of specific outcomes and phase organisers

He had used the specific outcomes. He had used some of the phase organisers as well.

4.4.7.9. Seating arrangements

The learners were seated comfortably in their groups. There was sufficient space for the educator and the learners to move around. Although they were sitting in groups they were not engaged in group work.

4.4.7.10. Resources used

There was no evidence of animal and plant specimens in his class. He had a Micro – Science kit which he used to teach acids and bases. The school had only very recently received six boxes of Micro – Science kits with all the apparatus and chemicals needed for the successful teaching of Natural Science.

He had a fair amount of apparatus to work with. The apparatus was kept neatly away in the staff - room. They seemed to have been never used. The researcher thought that this educator had sufficient apparatus to work with, but did not use them.

He made use of the chalkboard extensively.

4.4.7.11. Assessment procedures and tools used

He used test and assignments. He used marks which he converted to a competency scale.

4.4.7.12. Learners' portfolios and profiles

The educator had said that he made submissions to the class educator, but these were not kept by the class educator.

4.4.7.13. Recording and reporting

Marks were recorded. The new C2005 reporting approach and reports were not being used at this stage.

4.4.7.14. The researcher's reflective comments

This educator is obviously knowledgeable about the requirements of C2005.

He was the only educator who was persistent in implementing the new curriculum as he was the only educator who continued drawing up learning programmes and preparing lessons in the new outcomes based way, but these failed to incorporate key features like the teaching of values, skills and attitudes as well as the required C2005 assessment procedures.

What is also revealing is the fact that this educator had a fair amount of Physical Science apparatus to work with, but did not make use of these. Perhaps the reason for this is a simple lack of enthusiasm or skill on the part of the educator to do practical work.

4.5. EDUCATOR D

4.5.1. Profile of educator D

Educator D is female between the age of 31 to 40 years. She has a Senior Primary Teachers Diploma obtained from Umlazi College of Education in 1998. This was obtained through part time study. She is currently studying towards a Higher Diploma in Education through the South African College of Education. This, she is completing through part time study. She has between eleven and fifteen years teaching experience. She has taught at over three schools and is a Head of Department at her present school.

4.5.2. Views on the similarities and differences between the old and the new curriculum

She said that the content has changed and that values and the appreciation of the environment was the same. She said that the learning of skills was different.

4.5.3. What does C2005 require

She said that C2005 was about acquiring knowledge of the environment. She said that it was about equipping learners with experience and skills to make use of in later life. She said that it was about ridding the image that Science was a difficult subject. She made the following comment:

“ They are trying to make it simpler and to get rid of the image that Science is a difficult subject and that everyone can do Science.”

She said that the knowledge being taught was the same as the old. She said that although the knowledge was the same, the approach to teaching the knowledge was different. She said that the learners were learning knowledge that included technical knowledge.

She said that the schools should be given textbooks so that they will have knowledge to teach their learners.

She said that the learners should be led to appreciate the environment and nature. She made the following comment:

“ I try to teach them to appreciate and love nature. I encourage them not to kill the animals they bring in as live specimens.”

In terms of values and attitudes she also said that the love of nature should be fostered in the learners and that this should be incorporated in the planning of lessons.

She said that she is more aware of the teaching of skills now. She felt that learners should learn skills that they could use at home and in the work place. She felt that the learners should be taught communication skills. She gave the following advice on the teaching of skills:

“ Skills are learnt by way of grouping. I give them different tasks to do to develop skills”

She said that skills should be incorporated in the planning of lessons.

4.5.4. The educator's views on what is Science

She said that the old curriculum was concerned with textbook knowledge and a prescribed syllabus. She said that they had to teach compulsory subjects. She also said that Science was feared as it was seen as a subject with difficult content to understand.

She said that the learners had to basically learn knowledge, but they were not helped to apply it.

She said that her learners listened to her teach and took down notes. They also answered questions orally. They did not attempt individual assignments.

She said that she was confident in her ability to implement the new curriculum, but there were many things worrying her.

4.5.5. What the educator said she actually did

4.5.5.1. Comments on planning

She said that she had chosen aspects that suited her learners. She said that she chose the appropriate programme organisers. She said that she chose the specific outcomes and the activities that she wanted to use. She also planned for the skills and attitudes to be learnt. She said that the situation was worsened by the fact that she had to work alone with everything that she did.

She said that the parents were not very helpful. She said that she could not meet with the other educators as the schools were too far apart. She also did not have textbooks for her learners.

She said that the difficult words should be left out and the paper work should be reduced.

4.5.5.2. Comments on the use of resources

She said that she relied on the chalkboard and giving notes to the learners.

She said that all schools should have the necessary resources for the effective implementation of C2005.

4.5.5.3. Comments on practical work

She said that practical work was limited to plants and animals.

She said that she allows her learners to study plants outdoors. She also said that animal specimens are brought into the classroom for study. She made the following comment:

“ We look at them, study them, but don’t kill them.”

She also said that a Science laboratory and a library were essential requirements.

She said that she thinks that the new curriculum needed fewer learners in the classroom. Her comment was the following:

“ We need fewer than 60 learners in the classroom.”

4.5.5.4. Comments on assessment

She felt that the major change had been peer assessment.

She said that she still used tests as part of her assessment procedures. She made use of group work and group work assessment procedures.

She said that she sometimes used the new assessment procedures and tools. She was not sure whether she was using them correctly. She said that the assessment procedures should be made easier.

4.5.5.5. Comments on recording and reporting

She said that she knew that the learners should have an assessment portfolio, but they did not have one. She indicated that she did keep marks in a mark book.

She said that she had met with the parents to discuss the new curriculum and the learners' progress.

She said that the departmental report could be made easier and simpler than what it presently is.

4.5.6. Difficulties with the implementation of the new curriculum

She found assessment to be a difficulty. She found the keeping of records of the learners' progress problematic. She also said that the language in the Natural Science Policy Document was too difficult.

She said that she also does not have textbooks for her learners.

She said that the language should be simplified. She suggested that some of the difficult words should be removed.

She also said that more training was needed for the implementation of C2005.

She said that the schools needed electrifying.

4.5.7. The researcher's observations and comments

4.5.7.1. Knowledge taught

She had taught much knowledge. The learners had written many notes into their note books. They had drawn diagrams of all the animals and plants, as well as the relevant diagrams for Physical Science. There seemed to be a great concern on the part of this educator to teach all these sections. The researcher thought that she could have had the requirements of the old syllabus in mind which made her want to complete all the work she knew that she had to complete from her past experiences of teaching Grade Seven.

4.5.7.2. Learning activities done

The charts, which were on the classroom walls, were labelled drawings of the animals they had studied. However, these had all been drawn by the educator.

4.5.7.3. Activities done in the classroom

During the observation by the researcher the learners were observing phenomena, giving feedback, collecting and recording data as they were engaged in practical work. This was interesting as the educator had indicated that she did not do too much practical work.

4.5.7.4. Activities promoting thinking skills

The researcher observed that the learners in her class were involved in decision making skills during the lesson she had taught. It seemed that the educator had made an effort to use the new approach to learning and teaching in this particular lesson.

4.5.7.5. Activities with a cultural dimension

She had discussed how plants, as a natural resource, could be used by different cultural groups.

4.5.7.6. Project work that was done

There was no evidence of practical work done, except for the practical work that was done in the lesson observed. She informed the researcher that the learners brought in particular live specimens when these particular animals and plants were being studied in the classroom.

4.5.7.7. Learning programmes and lesson preparation

In the interview with the researcher she had said that she prepared in the new way, but there was no evidence of this preparation. She may have initially prepared in this way.

4.5.7.8. Coverage of specific outcomes and phase organisers

Although the educator had said that she had used these there was no evidence of the use of these. She did not use these and she simply made use of the old topics.

4.5.7.9. Seating arrangements

The learners were seated comfortably in groups. There was sufficient space for the educator and the learners to move around.

4.5.7.10. Resources used

There was no evidence of animal and plant specimens, except for the plants that were used in the lesson observed.

She had very limited resources in terms of Science apparatus. The absence of these confirmed to the researcher that she could not do too much practical work. What little apparatus that was available was stored at the bottom of a cupboard in the staff - room. This apparatus seemed to have never been used.

She made use of the chalkboard extensively. She did not make use of worksheets as she did not have any photocopying or duplicating facilities.

4.5.7.11. Assessment procedures and tools used

She relied on tests and assignments. She used marks and these were converted to fit into a competency scale.

4.5.7.12. Learners' portfolios and profiles

The educator was knowledgeable about these, but did not keep these.

4.5.7.13. Recording and reporting

This educator had not been recording and reporting within the requirements of C2005.

4.5.7.14. The researcher's reflective comments

Educator D seems to be very knowledgeable about the requirements of the new curriculum.

A major problem for this educator seems to be the fact that she has to work alone as she is in an isolated area. She seems to not have any pressure from the principal of the school to implement the new curriculum.

The fact that the educator does not use the small amount of apparatus at her school shows that the educator is not enthusiastic about the teaching of practical work.

This educator does not have the essential duplicating resources to assist her with her teaching. This is furthermore worsened by the fact that she does not have textbooks to work with.

The learners taught by this educator come from a very disadvantaged background and this limits what she is able to do with them.

This educator, however, comes across as a very capable and enthusiastic educator.

4.6. EDUCATOR E

4.6.1. Profile of educator E

Educator E is female between 31 to 40 years of age. She has a Senior Primary Teachers Diploma obtained from Umbubulu College of Education in 1991. This was obtained through full time study. She also has a Higher Diploma in Education obtained from Natal College of Education in 1998 through part time study. She has between 6 to 10 years teaching experience. She has taught at two schools and is presently a Post Level One Educator.

4.6.2. Views on the similarities and differences between the old and the new curriculum

She was in agreement that both curricula were concerned with the acquisition of knowledge. She also felt that the knowledge taught was the same.

4.6.3. What does C2005 require

She said that the new curriculum required that we learn about values. She was unhappy about the value of Science as a differentiator to show high ability, being decreased. Her comment was:

“ They are decreasing the value of Science for clever people. They are decreasing its value. I feel that it is important and it should retain its top value.”

She said that we are expected to use the learners’ knowledge, but she said that she could not make use of her learners’ knowledge. She made the following comment:

“ I cannot use my learners’ knowledge. They know nothing. They don’t even know about the Olympics. They dance and sing and know nothing else.”

She also said the following:

“ We are not allowed to stand in front of the class. Knowledge is from the learners and they can use other sources of information like from textbooks or other sources.”

She also felt that the new textbooks were a good guide for what should be taught.

She said that the love of nature should be fostered in the learners and that this should be incorporated in the planning of the lessons.

She made the following comment with regards to the teaching of skills:

“ Skills were previously learnt incidentally. Presently, I know which skills I want learners to learn. These are in my mind as I teach.”

She also said that skills should be incorporated in the planning of lessons.

4.6.4. The educator's views on what is Science

She said that the learners had to learn knowledge that they could use in everyday life. She said that they also had to learn what was happening in nature.

She said that the purpose of teaching Science was to transmit knowledge to the learners. The learners had to learn knowledge which they could use later on in life.

She said that her learners listened to her teach and took down notes. Tests and examinations were also written.

She said that she was confident in her ability to teach Natural Science, but she needed training in the new approach.

She said that only class educators of Grade seven should teach their own learners. She also said that there were too many learners in the classes and the learner enrolment in the classes should be reduced. She also said that more training was needed. She made the following comment:

“ I’m confident in my ability to teach, but not confident in my ability to implement C2005. Educators need at least one full year of training to be able to cope with implementing the new curriculum.”

The fact that this educator said that educators needed a full year of training shows how much help these educators feel they need to be able to cope with the implementation of the new curriculum.

4.6.5. What the educator said she actually did

4.6.5.1. Comments on planning

She said that she prepared her lessons in her own way. Her comment was the following:

“ We’ve changed now. We are doing the old preparation. After June we begun using the old structure. The confusion came when it was announced on the radio that OBE was scrapped.”

She said that although she used the old way of preparing lessons she automatically applied the OBE principles of C2005 in her teaching.

She said that when she had been implementing C2005 she had a problem linking the activities with the programme organisers being used. She made the following comment:

“ I had to think hard to get these to go together. This resulted in me going back to the way I know best.”

She also said that she used the syllabus as a guide as to what to teach, but she taught in an OBE way. She made the following comment:

“ Mixing seemed to work for me.”

She suggested that the present expectations with regards to planning should be reduced.

4.6.5.2. Comments on the use of resources

She said that the photocopier and duplicator were most useful to her. She said that she could not manage without these. She also said that additional resources were needed.

4.6.5.3. Comments on practical work

She said that she did not do practical work for the following reason:

“ I did not do any experiments as I was not able to do these. The experiments did not work as they were supposed to from the textbook.”

She said that she used the demonstration method when conducting experiments. She commented:

“ Learners get too excited when allowed to do experiments and they break the apparatus.”

She identified a Science laboratory and electricity as being essential requirements to do practical work.

She said that she avoided practical work and therefore did not do any assessment of practical work.

4.6.5.4. Comments on assessment

She said that peer assessment has been a major change.

She said that she still used marks to assess her learners. She also said that she made use of group work and group work assessment procedures. She made the following comment:

“ I have no problem using the assessment procedures and tools. It is just that we have discontinued using these.”

She said that a simpler and less time – consuming method was needed.

4.6.5.5. Comments on recording and reporting

She said that the learners did use a portfolio and profile, but it involved too much work and it was stopped.

She said that they did send out quarterly reports and had met with the parents to discuss the learners' progress.

She said that the Departmental report for C2005 could be made easier and simpler than what it presently is.

4.6.6. Difficulties with the implementation of the new curriculum

She said that there was too much work in terms of presentation. She made the following comment:

“ I’m not used to being at the back of the classroom, whilst the learners are in the front of the classroom.”

She also said that there was too much recording and reporting involved. She felt that she would like to teach only Natural Science to a Grade Seven class and teach no other learning area. She said that she liked the new terminology, but it involved too much work. She made the following comment:

“ I like the new terminology, but it becomes overbearing as there is too much detail and repetition.”

She felt that the educators needed a longer duration of training. She also said that the Policy Document was too difficult and needed simplifying.

4.6.7. The researcher's observation

4.6.7.1. Knowledge taught

The researcher was informed by educator E's deputy principal that that there were two educators teaching the Grade Seven Natural Science class at this particular school. He said that initially there was only one educator and this educator had a preference for Biology and was teaching only Biology. The educator ignored the Physical Science section completely. He said that another educator, educator E, had to be brought in to teach the Physical Science section. This was obvious as the amount of Biology that was taught in this particular class was above that of the Physical Science. The records of work showed that there seemed to be much emphasis on teaching factual knowledge.

4.6.7.2. Learning activities done

She had no charts on the wall to show that she had done C2005 activities.

4.6.7.3. Activities done in the classroom

During the observation the learners did ask questions. They basically listened to the teacher teach.

4.6.7. 4. Activities promoting thinking skills

Activities promoting thinking skills were not observable.

4.6.7.5. Activities with a cultural dimension

She had done activities like recognising that people have different viewpoints and recognising how Science and Technology have changed our lives.

4.6.7.6. Project work that was done

She said that it was difficult to do practical work as the learners did not participate. She said that they did not bring pictures when they were requested to. She also said that the problem was compounded by the fact that the learners could not be punished.

This educator had some examples of wooden models of animals that the learners had made.

4.6.7.7. Learning programmes and lesson preparation

The educator was knowledgeable about learning programmes, but did not make use of these.

4.6.7.8. Coverage of specific outcomes and phase organisers

She concentrated on teaching content and did not make use of the specific outcomes as well as the phase organisers.

4.6.7.9. Seating arrangements

The learners were seated in rows.

4.6.7.10. Resources used

There was no evidence of animal or plant specimens in her classroom. She had a good amount of apparatus to work with and an excellent amount of chemicals needed to teach Science effectively. The Science resources were, however, very dusty and obviously never used.

She made use of the chalkboard extensively.

She made use of the photocopier and duplicator to a limited extent.

4.6.7.11. Assessment procedures and tools used

The educator relied on tests and examinations. Percentages were converted to fit into a competency scale. She also made use of group and self - assessment procedures.

4.6.7.12. Learners' portfolios and profiles

The educator was knowledgeable of these, but was not keeping these.

4.6.7.13. Recording and reporting

This educator was not recording and reporting within the requirements of C2005.

4.6.7.14. The researcher's reflective comment

Educator E seems to be a very capable educator who is knowledgeable of the new curriculum.

This educator had stopped implementing the new curriculum as it was a directive from her management team. They had heard from the media that the new curriculum was scrapped.

What is concerning, is the fact that this educator had a good amount of Science apparatus and chemicals, but these were not used. This educator indicated that she was not confident to conduct experiments. This seemed to indicate a lack of skill on the part of the educator.

A major problem for this educator is the fact the learners come from a very disadvantaged background. This is limiting for the educator as she says that that they are not very knowledgeable of the happenings of the rest of the world. She indicated that they did not even know about the Olympics.

4.7. EDUCATOR F

4.7.1. Profile of educator F

Educator F is male and between 31 to 40 years of age. He has a Senior Primary Diploma in Education from Umbubulu College of Education obtained in 1991 through full time study. He has a Library Science Diploma obtained from the University of Natal – Pietermaritzburg in 1993 through full time study. He also has a Bachelor of Education degree obtained from the University of Natal – Pietermaritzburg in 1998, through part time study. He has between 11 and 15 years of teaching experience. He has taught at more than 3 schools and is presently a Post Level One educator.

4.7.2. Views on the similarities and differences between the old and the new curriculum

He indicated that both curricula were concerned with the acquisition of knowledge. He said that the knowledge to be taught was still the same. He said that the new curriculum did not rely on the textbook as the only source of information that could be used. He made the following comment:

“ The children are given activities and they are given the freedom to look for knowledge based on the activities they have been given.”

He also indicated that the learning of values and attitudes had been added into the new curriculum.

4.7.3. What does C2005 require

He indicated that C2005 was giving more learners the opportunity to learn Science and to enable them to enter Scientific fields that they haven't been able to enter before. He also said that the new curriculum was equipping learners with experience and skills that they would be able to make use of in later life.

He was quite clear that the new curriculum was about the learners being exposed to different resources. He said that it requires that learners should find out information on their own and not to rely on the educator. He also said that the educator has to take on the role of facilitator and that the teaching process is learner – centered.

He said that the knowledge being taught was the same as the old. He also said that the new curriculum involves the teaching of skills. He said that the knowledge of the different learning areas had to be integrated. He also said that we did not have to rely on the syllabus. He said that learners could access their own information. This, he said, was a difficult task as the learners needed guidance in this area.

In terms of values and attitudes to be taught, he felt strongly that C2005 played a big part in trying to combat racism. He made the following comment in this regard:

“ I try to teach them to respect the values of other cultures and races. I try to change their attitudes towards Science. I try to show them that it is not a difficult learning area”

He said that he was aware of the teaching of skills and that it now forms part of his planning. He made the following comment:

“ I'm aware that learners should learn values and attitudes. I have them in my mind when teaching concepts”

4.7.4. The educator's views on what is Science

He said that he had to teach knowledge from the syllabus. He made the following comment:

“ We had to teach knowledge from textbooks. The knowledge was prescribed by the syllabus and textbooks. I was told to teach it and I taught it.”

He said that Science was feared as a subject. He made the following comment:

“ Science was seen as a difficult subject. Many feared it. It was only for the clever ones.”

He said that his learners listened to him teach. They took down notes. He said that he sometimes dictated notes to his learners.

He said that he was confident to implement the new curriculum as long as the conditions were conducive to the implementation of the new curriculum.

4.7.5. What the educator said he actually did

4.7.5.1. Comments on planning

He said that he used the OBE format of preparing lessons. He said that at first he worked well together with the educators, but that had stopped. He said that there was too much involved in the planning process. He made the following comment:

“ Many things should be deleted. Performance indicators are not important. My lesson preparation would include only the specific outcomes, assessment criteria and the skills to be learnt.”

He said that we should concentrate only on the programme organisers, specific outcomes, assessment criteria and skills.

4.7.5.2. Comments on the use of resources

He said that the photocopier was absolutely helpful. He said that he could not do without it.

He said that a library for educators to use was needed and that every Natural Science educator should have access to a Science laboratory. He also said that resources could be improvised.

He said that schools needed money to buy resources.

4.7.5.3. Comments on practical work

He said that he did experiments as they were part of the syllabus.

He said that he looked to see whether the learners had followed instructions when he assessed practical work.

4.7.5.4. Comments on assessment

He also felt that peer assessment had been a major change. He said that he still used marks. He said that he also used group work assessment procedures. He said that he used the question and answer method. He said that he did not use self – assessment procedures. He made the following comment:

“ I failed with it. The learners cheat”

He also indicated that he used the exhibition and demonstration method to a limited extent.

With regards to the problems he experienced he said that time was a major problem. He suggested that the Department of Education devise a new assessment strategy. He said that the Grade seven learners do not understand the assessment procedures and tools used on them. He made the following comment:

“ They don’t understand why they must give themselves low marks”

He advised that educators needed more time to implement these assessment procedures and tools. He said that they do not have the time to implement these assessment procedures in the allocated time for the learning area. He said that fewer learners were needed in the classroom.

4.7.5.5. Comments on recording and reporting

He said that he used a mark sheet where he recorded the learners’ progress. He said that his learners did not have a profile or a portfolio. He made the following comment:

“ I think my H.O.D. does not know about it.”

He said that quarterly reports were sent out and that they had met with the parents to discuss the new curriculum.

4.7.6. Difficulties with the implementation of the new curriculum

He said that he needed a Science laboratory. He said that he would like the learners to use the library, but he was not able to use it as he was not the Grade seven class educator. The learners also lived too far out of town. He said that the educators were not properly trained. He made the following comment:

“ No – one is properly trained in the implementation of C2005. Everybody is seemingly lost.”

He said that the Department of Education needs time to research this new curriculum. He said that he thought that expert help was needed in the implementation of the new curriculum. He felt that the trainers were not well informed. He made the following comment:

“ One weeks training is laughable. People should be trained for at least one year. I also think that most educators doubt whether the trainers know what they are doing.”

4.7.7. The researcher’s observations and comments

4.7.7.1. Knowledge taught

He had an equal balance of Biology and Physical Science taught. In the interview the educator had said that he used photocopied notes extensively, but there were very few of these in the learners’ books. There was much evidence of C2005 principles in the work done by the learners. This educator also seemed to be guided by the old syllabus.

4.7.7.2. Learning activities done

There were no charts on the walls. He informed me that he was not the class educator and he was not able to control how long the charts could stay up on the wall. He said that the learners had them. The researcher was thus not able to see these.

4.7.7.3. Activities done in the classroom

From the activities done in the notebooks and other documentation of the educator it was evident that the learners were given the opportunity to give feedback to the educator. The researcher was unable to see the educator teach.

4.7.7.4. Activities promoting thinking skills

Although the researcher was not able to observe the educator teach, the activities in his learners' books did not show any promotion of thinking skills.

4.7.7.5. Activities with a cultural dimension

No indication was seen of activities with a cultural dimension.

4.7.7.6. Project work that was done

An observation of his learners' workbooks showed that the only practical section this educator had done was that of acids and bases. This activity definitely included the learning of practical skills of measuring, recording, observing and concluding.

4.7.7.7. Learning programmes and lesson preparation

This educator was not using illustrative learning programmes in lesson preparation.

4.7.7.8. Coverage of specific outcomes and phase organisers

He did not use the specific outcomes. He used topics rather than the phase organisers.

4.7.7.9. Seating arrangements

The learners were seated in rows. There was hardly any space for the learners to move around, let alone the educator. The learners sat permanently in rows because of the limited space in the classroom. This educator, as well as the learners, said that they sometimes sat in groups when they needed to. Getting these learners into groups in such a small space obviously must have been an enormous task for the educator.

4.7.7.10. Resources used

There was evidence of animal and plant specimens. He had a good amount of apparatus and chemicals to work with. He had used the apparatus to teach acids and bases. This was the only evidence of the apparatus and chemicals being used. The apparatus, which were kept in the cupboard, had cobwebs and were dusty. This was an indication that the apparatus was never used.

He made use of the chalkboard extensively.

He used the photocopier and the overhead projector to a limited extent.

4.7.7.11. Assessment procedures and tools used

He relied on the use of tests and assignments. He also made use of group and self – assessment procedures. He used percentages and converted these to fit into a competency scale.

4.7.7.12. Learners' portfolios and profiles

He did not make use of portfolios as a method of assessment.

4.7.7.13. Recording and reporting

This educator was not recording and reporting within the requirements of C2005.

4.7.7.14. The researcher's reflective comments

Educator F reveals himself as a very capable educator and who is very knowledgeable of the new curriculum. This was confirmed by the fact that he had more to say about the new curriculum than all the other respondents.

What was concerning was the fact that although this educator was knowledgeable about the requirements of the new curriculum, he chose to implement only what he wanted to implement. It seems that the management of his school did not have a hand in what he was doing. It seems that the new curriculum was not being stressed at this school.

This educator also seemed to ignore practical work.

4.8. General comment on the findings

The findings of this research study have addressed the research questions that were set out for this research study. The researcher's hypotheses have also been confirmed as being relevant to this research study. The researcher will attempt to highlight the key features that stand out, but the details of these will be discussed in chapter 5 of this research study.

Looking at the findings of this research study, the researcher sees the educators as having a good theoretical understanding of the requirements of C2005. When it comes to the

implementation of C2005 these educators seem not to have the capacity to implement the new curriculum. The result is that they come up against many difficulties.

The majority of the educators in this study speak about the environment and an appreciation of the environment. This is an essential component of Science, but it seems that their conception of Science hinges mostly round the environment. In the discussions with the educators they did not refer to the essential skills of Science as was also part of the old Science curriculum. What has been revealing in this study is the fact that perhaps most of these educators have a lack of conceptual knowledge of Science as a learning area.

It must be acknowledged that the educators have attempted to implement C2005. What is concerning to the researcher is the educators disregard for the specific outcomes of the Natural Science learning area. The question that the researcher is wondering about is whether the educators have an accurate conception of the requirements of C2005 as they say they do, as revealed in the results of the interviews with these educators. There is obviously contradiction between what the educators say they do and what they actually do. In essence, without the use of specific outcomes the new curriculum is not being implemented correctly as the learners' achievement must be measured against the specific outcomes.

The educators are still teaching factual knowledge. The educators are not developing the learners' conceptual knowledge of Science. It seems that the educators themselves are having difficulty with the conceptual knowledge of Natural Science.

What is evident amongst all the respondents is the fact that the paper work involved in the planning of lessons and the assessment of learners is overwhelming for them. The result of this is that every respondent did not comply with the new assessment procedures for C2005. The educators developed coping strategies to overcome the assessment of learners. All the educators seemed to use the old assessment methods and adapted these to the new assessment procedures and tools. They simply converted marks and

percentages to fit into the competency scale of C2005. Since the educators converted marks and percentages to fit into a competency scale, the final assessment of learners cannot be true in terms of achievement at a competency level. What this essentially means is that a norm – referenced method was used to measure achievement, but recorded in a criterion referenced way without any criterion – reference assessment being done. It is obvious that there is a contradiction in what the educators said they did and what they actually did when it came to the planning of lessons and the assessment of their learners.

All the educators did not compile portfolios and profiles for their learners. It was also identified that educators had difficulty with the facilitation of group work and practical work.

The researcher thinks that this study has established what the educators think they need in terms of school and classroom resources.

It was also observed that all the educators were stuck in the paradigm of the requirements of the old syllabus.

The educators also thought that they had a lack of training to implement the new curriculum.

4.9. CONCLUSION

The difficulties that the educators have with the implementation of C2005 in the Natural Science learning area have been revealing. This chapter has served to merely present these findings and these will be discussed in greater detail in the following chapter, chapter 5.

CHAPTER 5

KEY FEATURES AND UNDERLYING REASONS

5.1. INTRODUCTION

This chapter deals with the interpretation and the discussion of the findings of this research study. The researcher has divided the discussion and interpretation of the findings into two categories, these are the kind of difficulties enunciated by the educators, and the researcher's observation of indentified features of problems.

5.2. KINDS OF DIFFICULTIES ENUNCIATED BY THE EDUCATORS

5.2.1. Educators' inability to use learners' knowledge

Most of the educators felt that the learners' knowledge was limited and they could not make use of their knowledge. Educators say that they are forced to take the leading role when they teach as the learners do not give their views. Educators blame this on the non-availability of resources for the learners to get information from. The researcher thinks that the educators want the learners to know correct facts, rather than conceptual frameworks.

5.2.1.2. Other findings and researcher's comments

Chisholm et al. (2000) refer to the Sol Plaatje Primary School's submission to the Review committee of C2005 which states that historically disadvantaged schools do not have the resources, reference and textbooks, stationery, paper, photocopyong facilities and other technologies of teaching to implement C2005 effectively.

It is clear that the educators have difficulty getting the kind of learner they are working with to engage in the kinds of activities expected of the new curriculum. The message is also quite clear that the contextual situation in these schools is not conducive for the implementation of C2005, but at the same time not impossible. The researcher thinks that the reason for this is because of their historical disadvantages as indicated by the Sol Plaatje Primary School's submission to the C2005 Review Committee.

5.2.2. Lack of resources a major obstacle for the implementation of C2005

The educators blamed the lack of resources and equipment as being a major obstacle to them teaching practical work effectively. Educators said that they did not engage their learners in practical work as they did not have apparatus to do so. The educators indicated that they would be confident to teach Natural Science as long as there were sufficient resources in their schools.

Most of the educators indicated that C2005 does not suit historically disadvantaged schools and thought that the government should look after the historically disadvantaged schools. One of the educators commented that C2005 did not suit their schools at this present moment in time. Jansen (1998) noted that Black teachers do not object to the introduction of C2005, but felt that they needed to be trained in order to implement it. The educators indicated that they were confident in teaching the new curriculum and they wished that they had fewer learners in their classrooms. In one educator's classroom there was hardly any space for the learners to move around, let alone the educator. The learners could not sit in groups as this would make movement in the classroom impossible.

5.2.2.1. Other findings and researcher's comments

Hoyle and Bell (1972) state that it is clear that innovations usually require additional resources and, where these are not available, this will contribute a very considerable barrier to innovation and may prevent it from occurring at all. They further state that

materials are necessary. They state that ultimately this is a matter of money. Money to pay personnel, to develop new curricula, money to pay for the materials used, textbooks, curriculum packages, audio - visual teaching aids, money to pay for the training of teachers in new approaches and so on. They state that the availability of material resources is a basic requirement in the innovation process. The researcher would like to confirm that this dependence of curriculum innovation on the availability of money is true since the Department of Education relies greatly on a very tight budget. This, the researcher thinks, limits the successful implementation of the new curriculum.

Doll (1989) states that studies of working conditions in schools have revealed that teachers feel satisfaction in having varieties of useable instructional materials at hand and in understanding how to use them. He states that when materials at hand accord with the requirements of the instructional program and when persons who use materials and equipment have a major part in choosing them, the usefulness of these resources is usually ensured.

Greenstein assured by Jansen and Christie (1999) believes that C2005 is not targeted at conditions in the majority of South African schools.

 Jansen (1998) points out that C2005 has the greatest likelihood of success in well - resourced schools with well - qualified teachers and better - prepared students.

The basic complaint about the lack of resources is the fact that the educators feel that they cannot implement the new curriculum with inadequate or no resources at all. The other implication coming out strongly is that C2005 does not suit the historically disadvantaged schools.

5.2.3. Lack of confidence in training and assistance to educators.

What is evident is the fact that all the educators have received a maximum of one week's in - service training on the implementation of the new curriculum. The educators feel that the training has been insufficient for a task of this magnitude. The educators make it clear that they require more training. The educators have a lack of confidence in the trainers. One of the educators felt that the trainers were not well - informed. He felt that most educators doubted whether the trainers knew what they were doing. The educators felt that there was no support from the Provincial Department of Education on the implementation of the new curriculum. They said that once the educators got back to their schools they were on their own. Educators advised that more workshops and assistance were needed in the area of the teaching of skills, values and attitudes. One educator suggested that the educators needed more training in the use of resources and the use of textbooks. Another educator said that he would like to see workshops held on the use of everyday and simple resources. The educators mentioned that they were not networking with other educators. The schools were too far apart from one another.

The majority of the educators felt that they needed more training in assessment, recording and reporting. They also indicated that the prescribed format of the report for the grade seven classes was too difficult and needed simplifying.

5.2.3.1. Other findings and researcher's comments

~~X~~ Christie (1999) says that the introduction of C2005 into schools has been poorly planned, over hasty and teachers have been insufficiently prepared. She believes that the government provided emergency training and materials to ensure that all provinces could start on the same footing, however, in - service work with teachers and schools has been minimal and resources totally inadequate.

* Themane and Mabasa (1998) deduced after their study on teachers attitudes to OBE in the Northern Province that the introduction of OBE seems to be politically motivated and its training and planning flawed. Teacher unions in the Northern Province complained that their teachers were not consulted in the preparation of the OBE workshops. They complained that these workshops were characterised by a lack of proper planning as the impact of C2005 in the schools will be greatly affected by the lack of resources. Teachers found that the workshops were not intensive and only lasted for a few hours providing no link between planning and implementation. These findings are also very true for the sample of educators in this particular study.

Hoyle and Bell (1972) state that a barrier to successful innovation is the lack of appropriate organizational structures for linking the sources of innovation with potential innovators. The most widely used structures are conferences, courses and workshops. They state that sustained interaction is probably needed between curriculum innovators and potential adapters if the process of curriculum change is to be improved.

Fullan (1991) states that the amount of training is not necessarily related to the quality of the implementation, but it can be if it combines pre - implementation training with assistance during implementation and uses a variety of trainers. He states that pre - implementation training in which even intensive sessions are used to orient people to new programs does not work. He also states that one shot workshops prior to and even during implementation are not very helpful. Workshop trainers and programme consultants are frequently ineffective. He also states that most in - service training programmes are not designed to provide the ongoing, interactive, cumulative learning necessary to develop new conceptions, skills and behaviour. He further states that failure to realize that there is a need for in - service work during implementation is a common problem. No matter how much advance staff development occurs, it is when people actually try to implement new approaches and reforms that they have the most specific concerns and doubts. It is extremely important that people obtain support at the early stages of attempted implementation.

Fullan, cited in Preedy (1989), states that it is helpful to distinguish between the content of change and the process of change and to realize that each represents distinct bodies of knowledge and expertise and each needs an appropriate implementation strategy. They are independent in the sense that it is possible to have expertise in one and not the other. It is possible, in other words, to be highly knowledgeable about a particular programme yet be a disaster in working with others to implement it. He further states that indeed those most committed to a particular innovation may be least effective in working with others to bring about change. Both elements of expertise must be present and integrated in any given change project. This is very true about the implementation of C2005.

Doll (1989) states that research and experience show that if curriculum changes are really to go into effect, varied actions must be taken to support teachers, personnel must be designated to do the supporting and ample time must be allowed for the effectuating process to be completed. There is an obvious outcry from the educators in this study that they have had insufficient training in the implementation of the new curriculum. Coupled with this is the fact that the educators are doubtful about the quality of training that they have received. The educators need assistance in developing their skills for the implementation of the new curriculum. the use of resources, their ability to network with other educators and they need assistance greatly with assessment, recording and reporting.

The discussion of the above findings (Christie (1999) and Themane and Mabasa (1998)) indicate that the educators' problems with training are not unique to themselves, they have been already reported. These findings therefore legitimize the educators' fears. Hoyle and Bell (1972), Doll (1989) and Fullan (1991) show that inadequate training can be a real problem when curriculum innovation is undertaken.

5.2.4. Increase in educator workload

Educators said that the terminology was overbearing as there was too much detail and repetition. The educators found the policy documents very difficult to read. Educators said that they needed help with the administration part of C2005 as the paperwork was too much. One educator said that the planning was too long and he ended up not doing it at all. Another educator said that many aspects of C2005 should be deleted. The educators also mentioned they did not enjoy teaching with so much preparation. They also said that the planning was too time - consuming and that there was too much involved in the planning process. The educators said that they had other demands and pressures as educators and they could not cope with the demands of the new planning procedure.

The educators have not planned for particular learning areas before and have no experience to fall back on. The planning involves the cognitive sorting out of outcomes, assessment criteria as well as assessment tasks. It also includes the collecting of teaching resources for learner activities. These are all unfamiliar to the educators because of their lack of previous practice. The educators, in fact, do not know the learning areas. The educators, therefore, feel that the volume of work has increased too much and one of the educators said that C2005 has become a burden to him. Another educator said that he was stressed out because of C2005. He said that there was too much else to do.

The fact that learners were not English speaking is problematic for the educators since the educators have to spend more time with the learners. Explaining and re - explaining was necessary, but also time - consuming.

5.2.4.1. Other findings and researcher's comments

Fullan, cited in Preedy (1989) states that the effect of overload of change projects on implementation is well known and there are frequently conflicting priorities on the agenda.

He says that one could say that the initiation of change projects represents a mixture of political and educational merit. He supports this by saying the following:

- Too many projects are initiated.
- Implementation is often attempted too early, i.e. The political process often outstrips the educational development process.
- Overly ambitious projects are adopted.
- Simultaneous multiple projects are introduced in an uncoordinated way.

He further states that the basic observation is:

“ Just because a change project is on the books does not mean that it should or could be implemented.”

He further states that no theory or strategy can do the impossible and the impossible in this case is to implement everything that is supposed to be implemented. This is, therefore, very true with regards to the implementation of the new curriculum.

Fullan (1991) states that the circumstances of teaching ask a lot of teachers in terms of daily maintenance and student accountability and give back little in the time needed for planning, constructive discussion, thinking and just plain rewards and time for composure.

Doll (1989) cites Brophy in saying that teachers do not perform successfully in setting objectives, preparing useful curriculum materials and evaluating instructional outcomes, one reason being that they lack time.

The Educator's Voice (May 19, 1998 p.3.) published an article outlining teachers' problems with OBE which states that extra work, resulting from the necessity to keep a portfolio on each learner, further raised the workload of the teachers.

Doidge (1998) stated that educator involvement in different learning areas at one time increased the workload and resulted in a overloaded time – table. Educator A in this research study is experiencing this particular problem.

Educators are feeling pressured by the extra amount of work they have to do with the introduction of the new curriculum. They attribute this increased workload to the difficult terminology of the new curriculum which is slow to read and the demand for too much detailed planning, their unfamiliarity with the new learning areas and the problem of language as a barrier. Fullan(1991) relates to a different context in Canadian schools when he speaks about the issues which increase educators workload, but his assertions apply very much to the situation of curriculum change in South Africa at this present moment in time. The reasearcher especially latches on to his idea that it is impossible to implement everything that is supposed to be implemented. The reseacher thinks of the processes of development appraisal and redeployment and rationalization which have been taking place simultaneously with the introduction of C2005 . In most cases the process of redeployment and rationalization took priority over the needs of effective implementation of the new curriculum. Doll (1989) speaks about the fact that teachers do not have time outside the teaching time for extra work . This, the reseacher thinks is very true to the South African context as the paper work demanded by the requirements of the new curriculum uses much time outside teaching time for this.

5.2.5. Lack of guidance on what to teach

Some of the educators indicated that the policy document was too difficult to read. The researcher's observations in C2005 training workshops and his observation of the educators in this study reveals that most of the educators do not read the policy documents. The educators have indicated that the policy document gives them very little direction as to what they have to teach in terms of knowledge. The educators also complained that the policy document does not have clear logical progression on what they

should teach in each grade. In other words the educator would like to know exactly what knowledge should be taught in each grade.

5.2.5.1. Other findings and researcher's comments

Fullan (1991) states that it is extremely important that people obtain some support at the early stages of attempted implementation.

The Review Committee on C2005 (Chisholm et al. 2000) makes the following recommendation regarding the Natural Science learning area and other learning areas in respect of content.

The Review Committee recommends that the curriculum documents should be simplified by producing a National Curriculum Statement for Early Child Development, General Education and Training and Adult Basic Education and Training. The National Curriculum Statement should express in clear terms what is to be learnt and at what level it is to be assessed. The Review Committee further go on to say that the emphasis should be on clear and accessible documentation and that the National Curriculum Statement should promote conceptual coherence by specifying learning outcomes and assessment standards by grade.

The educators are obviously unhappy about how the Natural Science policy document has been set out. They are unable to make sense of it as they have been used to the old syllabus. Educators want to know specifically what content they need to teach their learners in each grade. The researcher thinks, in this instance, that educators also have a lack of understanding of the requirements of the curriculum. This is understandably so because as a trainer of educators, in the Department of Education courses on C2005, the researcher knows that much of the training has concentrated on the theory of C2005 and not on classroom practice. The above recommendations of the Review Committee on C2005 will serve greatly to address this area. The section on the lack of training and assistance in this study deals with this issue more extensively.

5.3. RESEARCHER'S OBSERVATION OF IDENTIFIED FEATURES OF PROBLEMS

5.3.1. ASPECTS OF TEACHER PRACTICE

5.3.1.1. Inappropriate teaching style

The educators seemed to be pre - occupied with teaching knowledge and relied on the textbook for the knowledge. The educators still see their role as that of dominating the teaching and learning process. The educators still relied on the expository method. There were, however, exceptions to this. What was evident was the fact that activities were limited, to a large extent, to completing worksheets, doing project work, writing tests and examinations, writing notes, drawing diagrams and doing a few experiments. One of the respondents said that he did experiments because it was part of the syllabus. The educators were adhering much to the old syllabus in that very few activities promoting thinking skills and activities with a cultural dimension, suggested in the policy documents, were covered by the educators. The same applied to the kinds of topics that were suggested in the policy document.

Educators were having difficulty with the coherence of concepts in that they were wanting a document to spell out exactly what they had to teach in terms of knowledge . The educators indicated that they still used the question and answer method. The researcher observed that the learners were still expected to mostly remember factual knowledge.

5.3.1.1.2. Other findings and reseacher's comments

Fullan cited in Preedy (1989) states that successful change or successful implementation is none other than learning, but it is the adults in the system who are learning along with or more than the students. He states that thus, anything we know about how adults learn and

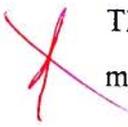
under what conditions they are most likely to learn is useful for designing and carrying out strategies for implementation.

He further states that it is possible to obtain some degree of change through policy decision and the initial process of getting new structures and materials in place, but this represents the more obvious structural aspects of change rather than the new skills and understandings required of front - line implementers. In the absence of the latter he states that only superficial change is achieved. He states that the effectiveness of a change project stands or falls with the extent to which front- line implementers use new practices with degrees of mastery, commitment and understanding.

Fullan (1991) states that if educational change is to happen, it will require that teachers understand themselves and be understood by others.

Hoyle and Bell (1972) state that attitudes towards innovation vary. They further state that at the deepest level, individuals, as part of their basic personality disposition, can have attitudes which are favourable towards change in general. Where the attitudes are negative towards change, Hoyle and Bell (1972) state that they are a very powerful constraint upon the would be innovator.

The researcher's observation is that in spite of the new curriculum being promulgated and educators being compelled to introduce it, the educators are doing pretty much of what they have always been doing. The exception is that there is a little more window dressing showing that they are implementing the new curriculum.

 The researcher thinks that possible reasons for the educators teaching in the above mentioned fashion could be any or any combination of the following:

- lack of leadership (This issue is discussed separately in this study)
- Lack of training and expertise (This issue is also discussed separately in this study)

- The difficulty educators have in changing their teaching styles
- Attitude towards change
- Lack of understanding of the change
- Victim ideology - Bantu Education oppressive effect

5.3.1.2. Educators' lack of conceptual knowledge of Science

It has been revealing to see that the educators in this study have concentrated on teaching factual knowledge to the learners. As the researcher has already indicated in this study, the educators had an urgency to teach many facts to the learners. What emanates clearly from the findings of this research study is the fact that some educators tended to avoid teaching Physical Science. The researcher thinks that perhaps this avoidance of teaching the Physical Science aspect of Natural Science is because of the educators' lack of conceptual knowledge of Science.

5.3.1.2.1. Other findings and the researcher's comments

Taylor and Vinjevold (1999) mention Webb et al's study of the impact of an accredited INSET programme for under – qualified Science and Mathematics educators in which written tests and observations to investigate educators' conceptual knowledge were conducted. Taylor and Vinjevold (1999) say that the results of these tests in this study revealed that the educators' knowledge of key Mathematics and Science topics at Grade 5 to Grade 7 level is little better than their learners, and that educator knowledge is distressingly low in some topics.

Taylor and Vinjevold say that the PEI research studies strongly suggest that educators' poor grasp of the knowledge structure of Science and other subjects acts as a major inhibition to teaching and learning of these subjects, and that this is a general problem in South African schools.

The fact that the educators do not engage their learners in Physical Science activities and that they also do not talk about the skills which form an essential component of Science reveals that it is likely that the educators have a lack of conceptual knowledge of Science.

Knox (2001) reports that of 48 Bachelor of Education Students who participated in a Science Vacation Module at the University of Natal in Petermaritzburg in 1999, a great majority of these students had not used a thermometer before and had no experience in plotting line graphs to represent findings.

5.3.1.3. Educators lack skill and drive to teach practical work

Most of the educators chose to do very little practical work. The educators in most cases had apparatus, even though minimal, but chose not to do any practical work. Once again there was the exception of the educator from the well - resourced school who did much practical work. In fact, five of the six respondents in this study did not have much evidence of practical work completed. The learning of practical skills in most of the schools observed was minimal. One educator indicated that she avoided practical work because the learners got too excited and broke the apparatus. One of the educators clearly indicated that she was not capable to carry out the experiments from the textbooks. The researcher observed that the attempted practical work done was limited to Biology i.e. the study of plant and animals. The researcher observed that the educators were happy to bring in live specimen of plants and animals that were being studied, but were reluctant to attempt any Physical Science practicals. Reasons given for this, as already indicated, were the fact that Science equipment to carry out these practicals was not available and one of the educators mentioned that she was unable to carry out Physical Science practicals. The researcher also observed that the educators used the demonstration method to do practical work. Most of the educators indicated that they did practical work because it was a compulsory component of the syllabus. They did not seem to enjoy doing practical work. One of the educators indicated that it was difficult to do practical work when they attempted it as the learners did not cooperate or participate. The educators said that when

they asked their learners to bring specimens of animals and plants or pictures they did not bring these. The educators said that this problem was compounded by the fact that the learners could not be punished and they simply did not cooperate.

The fact that the natural environment is available and the educators do not make use of it to teach Natural Science is also an indicator that the educators themselves do not have an appreciation of the natural environment. One of the educators said that Natural Science was not his forte. Another educator said that educators with the affinity for the subject should teach Natural Science. The researcher thinks that perhaps most of these educators were not trained in the teaching of practical work at the training colleges they had attended.

5.3.1.3.1. Other findings and the researcher's comments

Ramphele (1997) stated the following:

“ Why are South Africans unwilling to talk about the legacy of apartheid on the quality of the human resource base? If one accepts that Bantu Education discouraged, and in some cases prevented the teaching of Mathematics and Science in most schools, one could not be surprised, let alone embarrassed to admit that most teachers would not have the requisite skills to perform at the appropriate level to prepare pupils for the 21st century's knowledge driven society.”

It seems that the majority of educators in this sample are lacking in qualification and expertise to carry out practical work. This is evident in the fact that they are not able to engage their learners in practical work. This is, however, also combined with the lack of enthusiasm to use practical work in their teaching as has already been indicated. They

choose to avoid practical work. The fact that the educators are able to get away with not doing much practical work is an indication that there is lack of support from the leadership of their schools. The aspect of the lack of leadership is discussed separately in this study.

5.3.1.4. Educators avoid selected aspects of C2005

Of all the educators studied only one of the educators used the required format for the preparation of learning programmes. Another educator used the required format once only. What this essentially means is that the educators did not have any record of planned specific outcomes, assessment criteria, performance indicators, range statements and planned skills, values and attitudes. With the exception of one of the educators, all the other educators avoided the use of the phase organisers and programme organisers. A comment made by one of the educators was that she was not comfortable with the specific outcomes, assessment criteria and performance indicators and she tried avoiding these. All the respondents observed did not have any profiles of their learners or any portfolios of their learners' work. The educators simply ignored these.

One of the educators said that the knowledge in C2005 was broader and current. He went on to say that if the educator did not like to teach something, he or she could leave it for the grade eight educator. It was observed from the contents of some of the learners' workbooks that large chunks of knowledge had been left out and with the very little time left until the end of the school year not much else could be done.

5.3.1.4.1. Other findings and researcher's comments

Fullan, cited in Preedy (1989), states that research in recent years suggests that effective change, even if voluntarily pursued, rarely happens unless there is a combination of pressure and support. He states that there has to be these two important balancing mechanisms and successful change is usually accompanied by both. He states the positive

role of pressure in change has been neglected until recently. He states that support without pressure can waste resources, pressure without support can lead to alienation.

Rasool, cited in Jansen and Christie (1999) concludes:

“ The question is not whether OBE should be implemented but rather whether sufficient support and encouragement is being given to teachers by all interested groups in education.”

The fact that the educators were able to select what they wanted to do and what they did not want to do as educators indicates to the researcher that they have much freedom to manage their classrooms as they see best. However, firstly they could be lacking in capability to carry out important and critical tasks required of the new curriculum. Secondly, they could be lacking in pressure and support to carry out these required tasks.

5.3.1.5. Assessment, recording and reporting a threat to educators

One of the educators thought that assessment activities implemented were a facade. This educator thought that he was simply window dressing for the sake of making it seem that it was working.

One of the educators indicated that he did not use the self and group assessment methods any longer as he had failed with them as the learners cheated. Another educator said that he only used the new assessment procedures once. Another educator indicated that giving out self - assessment sheets was laughable and that the learners themselves did not enjoy giving one another smiling faces and things like that. The educator complained that the learners did not understand the assessment procedures and tools used on them. One of the educators mentioned that she sometimes used the new assessment procedures and tools and that she was not sure whether she was using them correctly. The educators said that

there was no guidance on assessment and that there was no one checking or helping in this area. The educators said they needed more training in this area.

There was a great difference in what educators said they were doing with regards to assessment procedures and tools and what they were really using in their classrooms. They were still using the old assessment methods. Most of the educators still used a mark book in which they recorded marks. The educators knew what they had to do in terms of the requirements of C2005 for the recording and reporting of the learners progress, but were not implementing these as they were supposed to. One of the educators said that he did not enjoy using the new assessment procedures and tools. He said that the assessment procedures and tools were too time-consuming and involved unnecessary work. The educators recommended that a simpler and less time-consuming method was needed. One of the educators felt that they needed more time to implement these assessment procedures and tools. This educator indicated that he did not have time to implement these assessment procedures in the allocated time for the teaching of the learning area.

With the exception of the educator from the ex-model C school all the educators interviewed did not report to the management of their schools with regards to progress of C2005. The educators complained that the recording and reporting expectations were too demanding. The educators complained that they lacked guidance and training in the procedures of recording and reporting. They indicated that more training was needed in this area.

5.3.1.5.1. Other findings and researcher's comments

The Educators Voice (May 19, 1998 p.3.) published articles outlining teachers' problems with OBE. One of the problems was that assesment guidelines were lacking. Another problem was that they found the workshops to be theorectically – based.

The tasks of assessment, recording and reporting seems to be of enormous magnitude and are also exacerbated by the fact that the educators do not have too much clarity in these areas. A concern with assessment, recording and reporting was that the educators did not receive much training in these areas. The new assessment, recording and reporting procedures have increased the educators' workload. This aspect of increased workload is dealt with in the appropriate section of this particular study.

5.3.2. ASPECTS OF TEACHER MOTIVATION

5.3.2.1. Waning interest in the implementation of C2005

Some evidence from the data collected showed that the educators in this study, in early 2000, at the start of the implementation of C2005 in the grade seven classes, were eager to implement the new curriculum. As the year progressed this interest dwindled. An example is the fact that one educator had a very good example of a learning programme drawn up at the beginning of the year and nothing else for the rest of the year. Another example was that the grade seven educators had formed planning committees which were set up at the beginning of 2000 in which they seemed to work very well in at the beginning of the year. These had all fizzled out by June of the year 2000. One of the educators reported that they had discontinued implementing the new curriculum in June. The reason given was that it was announced in the media that C2005 was scrapped. This educator said that the management of her school had directed them to discontinue implementing the new curriculum. One other educator said that they were implementing the principles of C2005, but were not implementing the new curriculum on a full scale.

5.3.2.1.1. Other findings and researcher's comments

Fullan (1991) states that simple changes may be easier to carry out, but they may not make much of a difference. He states that complex changes promise to accomplish more, which is good news given the the kinds of changes in progress in the 1980's and 1990's but

they also demand more effort and failure takes a greater toll. He further states that the answer seems to be to break complex changes into components and implement them in a divisible and / or incremental manner.

Fullan, cited in Preedy (1989), speaks of a concept called brute sanity, which he describes as the tendency to overlook the complexity and detailed processes and procedures required, in favour of more obvious matters of stressing goals, the importance of the problem and the grand plan. Brute sanity, he states, over - promises, over - rationalizes and consequently results in unfulfilled dreams and frustrations which discourage people from maintaining their efforts and from taking on future projects.

Fullan (1991) states that some teachers, depending on their personality and influenced by their previous experiences and stage of career, are more self - actualised and have a greater sense of efficacy, which leads them to take action and persist in the effort to bring about successful implementation.

The fact that there has been a great amount of enthusiasm and participation on the part of the educators at the beginning of 2000 and their gradual loss of interest during the course of 2000 indicates that the educators have been discouraged from sustaining their efforts and interest. The reasons could be that the educators feel that the implementation process is too complex for them, that it is hastily politically driven and that they are not receiving the required support from leadership structures.

5.3.2.2. Educators are stressed out

The educators are feeling stressed out with the implementation of the new curriculum . One of the educators said that C2005 has become a burden to him.

5.3.2.2.1. Other findings and researcher's comments

Fullan (1991) has described some of the stressful aspects of teaching taken from King et al. (1988). The identified ones are the following:

- Time demand, too much lesson preparation.
- Student lack of motivation.
- Lack of administrative support, poor administration.
- Incompetent, poor teachers.
- Working conditions, lack of equipment, texts, low budget.
- Large class sizes.
- Ministry directive, changing curriculum.
- Lack of parental support.

He further goes on to say that stress and burnout have become common terms in the professional and public arena. This, he said, seems to aggravate teachers' problems.

Several factors are causing educator stress. Some of these Fullan (1991) has stated above. Although he has spoken about stress in a different context, most of the stressful aspects which he has described apply to the educators attempting to implement the new curriculum.

5.3.3. ASPECTS OF EDUCATOR TRAINING

5.3.3.1. Lack of qualification and training on teaching

Looking at the period (time) when the educators in this sample trained it is obvious that they all trained prior to the introduction of the new curriculum and therefore they do not have any formal training in the implementation of the outcomes-based approaches to teaching and they were not "schooled" as "pupils" in OBE.

All the educators, but one, have obtained additional qualifications. This they received through part time distance learning. The researcher thinks that even if some of these educators have studied aspects of the new curriculum in their studies they would be lacking in their ability to implement the requirements of the new curriculum because distance education normally does not cater for classroom practice skills and the researcher thinks that the educators' further studies would not have improved the quality of their teaching.

Looking at the institutions where most of these educators received their initial training as educators is also revealing. Most of these educators trained at historically disadvantaged teacher training institutions. This, the researcher thinks will have certain limitations on their training as educators and this will impact on the kind of teaching that they will engage in.

All the educators, with the exception of one, did not have a specialization in the teaching of Science as part of his or her professional qualification.

The educators seemed to be having difficulty in the following areas:

- Getting the learners to participate actively.
- The effective facilitation of group work.
- Implementation of new procedures of assessment, recording and reporting.
- The planning of lessons and the keeping of the necessary documentation for the effective implementation of C2005.
- The ability to teach skills, values and attitudes.
- The effective use of resources.
- Integration of learning areas.
- Linking activities with programme organisers.
- The utilization of reflective practice.

The researcher wishes to point out that all the above inadequacies are the result of the educators not receiving any formal training in these areas or any in-service training in the above areas. It is not only the lack of training in these areas, but also the educators' lack of experience in these areas.

5.3.3.1.1. Other findings and reserchers comments

Christie (1999) states that the procedures for designing learning programmes are complex and sophisticated if not obscure. She states that working with these principles requires well prepared teachers who are more likely to be found in historically white than historically black schools.

With regards to the effect of lack of qualification and training on teaching this can be summarized as basically being that the educators lack qualification and training in outcomes based approaches to teaching and the fact that most of the educators in this study are victims of historically disadvantaged schooling and training. To clarify this point further, is the fact that the majority of Black Educators in South African society have not received the same standard of education and training as the more previously advantaged racial groups. One of the reasons being through lower funding by the previous government to black educational institutions, resulting in inadequate learning facilities.

5.3.4. LACK OF SUPPORT TO EDUCATORS

5.3.4.1. No parental support

Five of the six respondents in this study said that the parents were not very helpful. It seemed that the learners received little, if any, help with their homework from parents. It was indicated that very few parents took a very active interest in their children's progress at school. The educators seemed not to rely on the inputs of the parents in most cases.

The fact that Aitchison, Houghton and Baatjes (2000) report that the results of the census survey done in 1996 indicated that in South Africa 4,2 million adults were illiterate, 13,2 million adults did not have grade nine and 8,5 million did not have grade seven gives one an indication as to how much support parents will be able to give to their children.

5.3.4.1.1. Other findings and researchers comments

Fullan (1991) states that studies conducted in the United States, the United Kingdom and Canada over the last decade increasingly point to the necessity of parent and community involvement for classroom and school improvement. Fullan (1991) cites Epstein (1986, 1988) who conducted systematic research throughout the past decade on parent and school interaction. He says the following:

“ There is consistent evidence that parents’ encouragement, activities, interest at home and their participation at school affect their children’s achievement, even after the students ability and family socio - economic status is taken into account. Students gain in personal and academic development if their families emphasize schooling, let their children know they do and do so continually over the years.”

The basic concern here is the lack of support that the parents give to the educators in assisting them implement the new curriculum successfully. The new curriculum requires that the learners receive much assistance as possible at home to make the educators’ task easier. Unfortunately in the majority of the schools studied the communities from which the majority of the learners come provides them with little opportunity to get much assistance from their parents. The parents of these learners are working class individuals and in the rural tribal areas the majority are labourers. The result is that the parents cannot assist their children much as they, themselves, do not know much about the new curriculum and the kind of assistance needed from these parents is in most instances beyond their academic capabilities. In most instances the parents return home late and are too exhausted to give assistance to their children. There is also the fact the parents are

poor and even if they wanted to assist their children with academic materials they are unable to.

5.3.5. NO SUPPORT FROM MANAGEMENT OF SCHOOLS

5.3.5.1. Lack of support from principals and school management teams

All the educators in the sample seemed to have difficulty in getting assistance from their principals and school management teams. It was interesting to discover that many of the principals did not know much about the new curriculum.

5.3.5.1.1. Other findings and researcher's comments

Hoyle and Belle (1972) state that there is some evidence that teachers respond to a definite lead by the head teacher in matters of school policy. They state that the successful head appears to be a person who sets a good example by working hard himself and who has a clear expectation about what he wants from teachers. At the same time he supports their efforts to be innovative and tries to encourage this.

Fullan (1991) states that all major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change, but it also indicates that most principals do not play instructional or change leadership roles. The principal has to be a curriculum leader. He further states that Berman and McLaughlin (1986) found that projects having the active support of the principal were likely to fare well.

Doll (1989) says that evidence has shown that active support by official leaders makes a real difference. The help that principals and other administrators are especially able to give includes putting teachers in contact with curriculum resources, helping teachers clarify the directions in which they wish to go with instructional projects, assisting with adaptation and development of materials and marshalling the support of other school personnel and

community members. He further states that leadership also resides in persons other than principals, curriculum co – ordinators and supervisors.

The researcher thinks that the fact that the principals are not very knowledgeable about the new curriculum, hindered their checking on what the educators were doing, and that this contributed to a large extent to the educators' difficulties with the implementation of the new curriculum.

5.3.6. CONCLUSION

Several difficulties with regards to the implementation of the new curriculum have been identified. Using the findings of other researchers the reseacher has dicussed the findings in the view of attempting to explain as well as to validate these.

CHAPTER 6

SOME CONCLUDING COMMENTS

6.1. A REFLECTIVE COMMENT

The purpose of this study was to establish what difficulties the grade seven Natural Science educators were experiencing in their implementation of C2005. This study has established many difficulties that the educators were experiencing.

The researcher's involvement as a grade seven educator as well as the researcher's participation as a facilitator in the training of the educators in the implementation of the new curriculum provided further insight to conclude that the educators were definitely having difficulties with the implementation of the new curriculum. The difficulties of the implementation have been made public by the media on many occasions during the course of 2000. Chisholm et al. (2000) have revealed some valid difficulties with the release of the findings of the Review Committee commissioned by the National Minister of Education, Professor Kader Asmal in May 2000. The summarized findings of the Review Committee on C2005 can be found in the literature review of this study. The findings of this study have revealed the kinds of difficulties that a small sample of grade seven Natural Science educators have experienced in their attempt of the implementation of the new curriculum. These are not very different to what has already been revealed by other studies (Govender, 1999 and Hiralaal, 2000) and the findings of the Review Committee. Jansen (1999) also gives many criticisms of C2005. The researcher would like to view this study as a confirmation of what has already been discovered and a revelation of other difficulties that educators are having with the implementation of C2005. These are accompanied by some recommendations that will assist in its successful implementation.

X This study has revealed that the difficulties of implementation hinge on the following areas:

- Educators' inability to use learners knowledge
- Lack of resources a major obstacle
- Lack of confidence in training and assistance to educators /
- Increase in educator workload
- Lack of guidance on what to teach ✓
- Inappropriate teaching styles ✓
- Educators' lack of conceptual knowledge in Science ✓
- Educators' lack of skill and drive to teach practical work
- Selective avoidance by educators
- Assessment, recording and reporting a threat to educators
- Non-commitment of educators to teach Natural Science
- Waning interest in the implementation of C2005
- Educators are stressed out ✓
- Educators' qualifications lacking in OBE training
- No parental support
- No support from management of schools

6.2. RECOMMENDATIONS FOR THE SUCCESSFUL IMPLEMENTATION OF C2005

The researcher acknowledges that the South African Government and the national Department of Education have committed themselves to revising the new curriculum and have begun work on this. As has already been mentioned, the Review Committee for C2005 was commissioned by the National Minister of Education to facilitate this process. The development so far is the fact that this Review Committee has made their findings and recommendations publicly known. The Ministry of Education has accepted many of

their recommendations and structures and personnel have been put into place to facilitate this process. The researcher, therefore, wishes to state that perhaps some of the recommendations of this study will already be in the process of being addressed by the Ministry of Education.

The recommendations of this study will be based on the following:

- Improvement of the training methodology.
- Simplification of the policy document.
- Assessment, recording and reporting strategies need rethinking.
- Educators need training in Science and Science teaching skills
- Training of principals and school management teams needed
- Schools need resources.
- Establishment of library services a pre-requisite for the implementation of C2005.

6.2.1. Improvement of the training methodology

The methodology used in the training has been greatly the use of the cascade model of training. The educators found many problems with the model has already been indicated by the researcher in this study. The Review Committee's report also disfavours this model of training. Other methods used have been the assistance of non – governmental organizations like MIET, READ, the IEB, and the Teacher Trust. These NGO's have developed materials for advocacy and training and trained trainers in order to strengthen the implementation of C2005.

The researcher agrees with the finding of the Review Committee on C2005 that the cascade model of training is problematic. The educators in this study have indicated that they have doubts about the capabilities of the educator trainers used in the training process. The researcher thinks that these doubts are well-founded as these educator trainers have been trained in a very short space of time themselves. The demands that are placed on them are too enormous as they themselves do not have the time to prepare for this enormous task outside their teaching time. The situation is further exacerbated by

the fact that the educators are taken away from their schools to conduct this training.

The recommendations are, therefore, the following:

- That other personnel with the necessary expertise and qualification should be employed to conduct the workshops to the educators at the school level of training.
- The number of layers in the cascade model should be reduced to avoid dilution of content.
- That the educators be given accreditation for the learning that they undergo in these training sessions.
- That the training and learning of the educators be linked effectively to the process of Developmental Appraisal and Whole School Development.
- That the duration of the initial training of educators be extended to be longer than only one week.
- That the training sessions to include training in classroom practice. This is to include the kinds of outcomes-based activities that can be used, how to prepare learning programmes, how to integrate learning areas, how to network with other educators, how to teach skills values and attitudes, how to manage group work, how to use resources effectively, how to use new assessment, recording and reporting procedures and how to compile learner profiles and portfolios.
- That training and support be conducted on an on-going basis.

The following quotation by Potenza and Monyokolo, cited in Jansen and Christie (1999) describes the need for on-going support to the educators implementing the new curriculum:

“ The challenge facing us as policy-makers, curriculum developers, teacher developers and producers of learning materials is to provide accessible ways of translating the national curriculum policy framework into practice. We need to do this because if teachers and learners are to negotiate their way successfully through C2005, to borrow from Alan Paton’s Cry The Beloved Country : ‘..... they need, for the rest of the journey, a star that will not play false to them, a compass that will not lie.’ ”

6.2.2. Simplification of the policy document

The findings of this study have revealed that the educators are having difficulty in reading the policy document. The researcher thinks that educators have come to accept the terminology and understand it to a great extent, but it is just that there is too much detail in terms of assessment criteria, range statements and performance indicators. These aspects of the policy document are confusing educators.

The recommendation is, therefore, that the policy document be set out in such a manner that these aspects are made clearer to the educators. The researcher thinks that some exemplars of how the assessment criteria, range statements and performance indicators should be used could be included in the policy document. Clearer direction should be given as to what each grade in the Senior Phase should teach. An exemplar could be provided for each grade with the emphasis that educators should be able to adapt these to suit their local situations.

6.2.3. Assessment, recording and reporting strategies need rethinking

The findings of this research study have revealed that the educators are having great difficulties with the implementation of the new assessment, recording and reporting strategies. Firstly, the educators feel that they have not been trained adequately in these areas. The fact is that the educators do not understand these new procedures. Secondly, the major complaint is that these procedures are too time-consuming and that they cannot be implemented within the allocated teaching time of the respective learning areas. Thirdly, the other complaint that was raised is the fact that there is too much paper work involved in the implementation of these new procedures and that it is increasing the educator workload.

The recommendation is, therefore, that the assessment, recording and reporting strategies need revising to reduce educator workload. The other recommendation is that some kind

of re-training accompanied by ongoing in-service training on the practical application of these procedures in the classroom be conducted.

6.2.4. Educators need training in Science teaching skills and exposure to learning theories in Science

It has also been discovered that even in those schools that have scientific apparatus, the educators are not using them as they lack practical Scientific skills. It is, therefore, clear that educators need training in practical Science skills and accompanying theoretical concepts, styles of thinking. These could be included in in-service training programmes.

Constructivism, as it is used within Science Education, revolves round the actual learning of an established body of knowledge. It is, as has already been mentioned, built on the notion that “the learner is already a Scientist.” This simply means that the learner brings knowledge into the classroom which can be developed and is capable of carrying out investigative tasks. This theory also places emphasis on active learning by the learners. It is, therefore, recommended that a constructivist approach, which is an integral part of C2005, be used for the effective teaching and learning of Natural Science.

6.2.5. Training of principals and school management teams needed

This research study has revealed that the role of principals and managers of schools has been minimal in the implementation of the new curriculum. Other research (Fullan, 1991, Hoyle and Belle, 1972, Doll, 1989) reveals that the head of a school plays a vital role in the successful implementation of change. The researcher can confidently state that in all the schools that formed part of this study the school management teams and heads of these schools were lacking in their support of the implementation of the new curriculum.

Fullan, cited by Preedy (1989), states that the process of curriculum change is complex and that the search to understand it continues. He states that if teachers are to be convinced, those in authority positions in schools must believe and understand the change sufficiently to convey its meaning. Fullan, cited by Preedy (1989) quotes a poem by the

poet Ronald Laing which captures the essence of this:

*There is something I don't know
that I am supposed to know.
I don't know what it is I don't know,
and yet am supposed to know,
and feel I look stupid
if I seem both not to know it
and not know what it is I don't know.
Therefore I pretend I know it.
This is nerve-wracking
since I don't know what I must pretend to know.
Therefore I pretend to know everything.*

The recommendation is, therefore, that principals and school managers receive adequate training so that they know exactly what is expected of the new curriculum and that they be encouraged to play supportive roles in their schools.

6.2.6. Schools need resources

Chisholm et al. (2000) state, as has been already indicated in this research study that C2005 does not suit the historically disadvantaged schools. It has also been indicated that C2005 has the greatest likelihood of success in well-resourced schools (Jansen, 1999).

It is obvious that C2005 has a great demand for and reliance on the use of resources, like teaching apparatus, electricity, money to purchase materials like reference books and stationery and there is also the need for photocopying and duplicating machinery. It is, therefore, important that schools be provided with adequate resources in order to implement the new curriculum successfully. There has been an outcry from the educators, who formed part of this study, that they require a Science Resource Centre. The Department of Education should look into the possibility of establishing and funding the operation of Science Resource Centres in the different regions or if possible in the

Education could employ staff to man these and training workshops could be held on a planned and regular basis for Science educators. Schools could visit these for the learning of special Science projects and skills. Educators could attend developmental workshops at these Resource Centres.

6.2.7. Establishment of library services a pre-requisite for the implementation of C2005

C2005 requires that learners engage in self-study and research. In the present situation in South African rural communities like these in this particular study, the above-mentioned kind of learning is impossible to undertake.

Libraries are lacking in the rural areas. The closest library for the majority of schools in this study are approximately fifty kilometres away from their schools. All the historically disadvantaged schools do not have school libraries, let alone sufficient books available for self-study.

The National Government together with the Provincial Department of Education should look at establishing libraries in all schools or at least make library materials available to all communities so that the implementation of the new curriculum can be more effective.

6.3. LIMITATIONS OF THIS STUDY

The researcher acknowledges that as an educator implementing the new curriculum he had preconceived ideas of the new curriculum himself, and this could have caused certain biases in the research study.

As has already been mentioned in this study there are limitations with regards to the use of interviews and observations as a means of collecting information for this research study. With regards to the interviews the respondents could have supported preconceived aspects of difficulties already experienced by other educators as has been published by

the media. With regards to the observations it is true that not all information or behaviours the researcher wanted to investigate, were observable. One reason was that certain information and documentation was not available when educators were visited at their schools. The sample observed was a very small sample and not too much could have been observed in the short time these educators were observed teaching. It is also true that further information could also have been gathered. The participants could possibly also have withheld information.

The observation schedule, as also already indicated in this study, had some shortcomings which further limited the research study.

6.4. SUGGESTIONS FOR FURTHER RESEARCH

It came out very strongly in this research study that assessment, recording and reporting was extremely problematic for the educators implementing C2005. Perhaps an in depth study into the underlying causes of the problems that the educators were experiencing in this area would be useful.

This study has revealed that the principals and school management teams contribute greatly to the effective implementation of curriculum changes in schools. Since this particular study could not explore this aspect in detail, it would be useful to research the impact of the role that principals and school management teams play in the effective implementation of C2005.

This study has also revealed that the availability of resources contributes greatly towards the effective implementation of the new curriculum. A research study based on the impact that resources have on the effective implementation of the new curriculum would be v

The researcher thinks that the kind of in-service training that educators receive contributes much towards their capabilities to implement the new curriculum. A useful study could be based on what is learnt in INSET and what needs to be learnt, by whom,

to make useful changes in schools.

6.5. CONCLUSION

This particular research study has identified some pertinent difficulties which educators are having with the implementation of the new curriculum. The amount of assistance that educators are needing is revealing and concerning. Without restating the difficulties, the researcher concludes by saying that if attention is given to these, this will greatly enhance the successful implementation of the new curriculum.

APPENDICES

Appendix A	Educator Interview Schedule	Developed by Oakes
Appendix B	Educator Observation Schedule	Developed by Oakes
Appendix C	Senior Phase Natural Science Policy Document	DOE (1997)

APPENDIX A

INTERVIEW SCHEDULE FOR GRADE SEVEN NATURAL SCIENCE EDUCATORS

Background

I'm studying for an M.Ed. at the University of Natal, Pietermaritzburg and am now working on the research component of the M.Ed. programme. The title of my research topic is : **Difficulties Experienced by Grade Seven Educators Implementing Curriculum 2005.**

I'm a grade seven educator who is finding some problems in teaching the Natural Science learning area, and I don't think I'm the only one! C2005 is now being improved, and in any case we want to make it as successful as possible, to do the best that we can for our children. I'm trying to find out how other educators are getting on. I therefore need your help in this. Kindly respond to the questions that follow.

Please be reassured that the data collected from you will be used for research purposes only. Neither the school, nor the principal and educators will be named individually as sources of information. If you are willing, I would like to tape the interview so that we proceed more quickly as I won't be using up interview time writing notes, and will erase the tape once it has been transcribed.

Thank you for your willingness to assist me. I am very grateful for your time.

Ivan Oakes

M. Ed. Student

University of Natal, Pietermaritzburg

Section A : Background Information

For questions 1, tick as appropriate

1. What is your gender ? male
 - female

For question 2, tick the appropriate age category

2. What is your age ? 20 – 30
 31 – 40
 41 – 50
 51 – 60
 61+

3. *Please list your qualifications in the order in which these were obtained.*

Qualification	Year	Institution	Category	Full Time	Part Time
.....
.....
.....
.....

Other : Specify -

.....

For questions 4, 5 and 6, tick as appropriate

4. How many years teaching experience do you have ? 0 - 5
 6 – 10
 11 – 15
 16 – 20
 21+
5. How many schools have you taught at during your career ? 1
 2
 3+

6. What is your official position at your school ?
- | | |
|--------------------------------|-------|
| Level 1 educator | |
| Head of Subject | |
| Head of Senior Primary Section | |
| Head of Department | |
| Deputy Principal | |
| Principal | |

Section B : The Old Science Curriculum (Pre – C2005)

1. Having experience as a Natural Science educator of the old curriculum, I found myself adhering strictly to the Science syllabus. Please tell me what you think the rationale of the old Science curriculum was ?
- a. What did the curriculum designers want the educators to teach ?
- b. What did they want the learners to learn ?
- c. What was the purpose of teaching Science ?

Section C : The Natural Science learning area of C2005.

1. One of the aims of the Natural Science learning area of C2005 is that Science is committed to “ broaden access to material resources, knowledge acquisition and conceptual development.”

a. What do you understand C2005 requires of teachers and learners generally?

b. Why do you say so ?

2. Let us compare the two curricula.

a. How do you think they are similar ?

b. How do you think they differ ?

3. In the old curriculum educators were expected to teach specific knowledge. What knowledge do you think the new curriculum expects educators to teach ?

4. C2005 is informed by the constructivist theory of education which emphasizes that learners should be lead to construct their own meaning about issues because each individual has different experiences and understandings, interpretations and schemata (knowledge constructs) and knowledge. Furthermore, science in the new curriculum requires that learners should be more active participants in the learning process, that teaching aids such as videos and computers should be used, self-discovery experimentation methods and other resources should be used. What activities would you get your learners to engage in when you teach Natural Science in the new curriculum ?

5. C2005 requires that we move away from too much teacher talk in the classroom.

Besides this we are expected to teach our learners not only knowledge, but also skills, values and attitudes to achieve the specified outcomes.

a. What do you understand C2005 requires us to teach in terms of knowledge ?

b. What do you understand C2005 requires us to teach in terms of skills ?

c. What do you think C2005 requires us to teach in terms of values and attitudes ?

6. How does the Science educator's role in C2005 differ from what we were used to before in terms of the following :

a. The teaching of knowledge ?

b. The teaching of skills ?

c. The teaching of attitudes ?

d. The teaching of values ?

7. The way in which we have to prepare lessons has changed. We are required to draw up learning programmes within specific phase organisers and programme organisers. Could you please explain how you go about planning your lessons and tell me what works best for you ?

8. What is problematic for you in the new lesson planning process ?

9. Do you think that the assessment procedures have changed with the introduction of C2005 ?

a. What assessment procedures do you make use of generally in your teaching ?

b. What assessment procedures do you make use of in the teaching of practical work of Natural Science ?

10. What assessment tools do you make use of to assess the activities, including the practical work done in Natural Science ?

11. Are there any problems that you are experiencing with the use of the new assessment procedures and tools ?

16. What do you think would help you deal with some of the difficulties that you are experiencing with the teaching of Science in C2005 ?

17. As a Natural Science educator are you confident in your ability to teach this learning area of C2005 ?

18. If you had to give some advice to facilitate the effective implementation of C2005 in the Natural Science learning area, what advice would you give, specific to the following ?

a. The teaching of knowledge.

g. The effective use of resources.

h. Any other general issues in the implementation of C2005 .

APPENDIX B

**OBSERVATION SCHEDULE FOR GRADE SEVEN
NATURAL SCIENCE EDUCATORS**

1 OBSERVATION OF THE PHYSICAL CLASSROOM

(tick the appropriate column)

1.1 WHAT KIND OF LEARNING ACTIVITIES ARE BEING DONE?

1.1.1 Wall displays (assignment and demonstration charts)

- a) Evidence of C2005 charts on the wall
- b) Evidence of learning programmes taught
- c) Evidence of learner participation
- d) Logical order of tasks
- e) Evidence of group work
- f) Clarity of understanding the task
- g) Evidence of skills learnt
- h) Evidence of values learnt
- I) Evidence of attitudes learnt
- j) Evidence of thinking skills promoted to C2005

Much	Some	More

Comments on the wall displays (Comment on the kind of displays)

1.1.2 Project work

- a) Evidence of practical project work
- b) Evidence of learning of practical Scientific skills
- c) Evidence of learner participation
- d) Evidence of constructive thinking processes

Much	Some	More

Comments on project work

1.1.3 Visual Aids

- a) Presence of animal specimens on view
- b) Presence of plant specimens on view
- c) Presence of useful Scientific Teaching & Learning Aids

Much	Some	More

Comments on the use of Visual Aids

1.2 HOW ARE THE SEATS ARRANGED IN THE CLASSROOM?

- a) Desks arranged in rows
- b) Desks arranged in groups
- c) Discussion is afforded
- d) Sufficient space to move

Much	Some	More

Comment on the seating arrangements

1.3 WHAT RESOURCES ARE BEING USED?

- a) Measuring instruments (ruler, metre - rule etc.)
- b) Apparatus to measure volume
- c) Test tubes
- d) Thermometers
- e) Electrical apparatus (cell, bulbs, etc.)
- f) Chemicals (acids, bases, indicators, etc.)
- g) Magnets
- h) Physical objects, e.g. rocks, animal specimens, etc.
- I) Scale
- j) Magnifying glasses

Much	Some	More

Comments on availability of resources - Comment on anything else interesting, the number of equipment, whether it is sufficient, whether the learners can work in pairs or groups, and whether the educator merely demonstrates.

1.4 WHAT DO THESE RESOURCES LOOK LIKE?

- a) Clean and kept under lock and key
- b) Clean and obviously used often
- c) Dusty and obviously never used
- d) Obviously well used and accessible

Much	Some	More

Comments on the use of these resources

1.5. THE EXTENT TO WHICH THE EDUCATOR MAKES USE OF THE FOLLOWING DOCUMENTS

- a) Worksheets
- b) Examination papers
- c) Reference books

Much	Some	More

Comments on the use of these and other documents - What is there quality, suitability and what kinds of thinking is embedded in them.

2 OBSERVATION OF THE CLASS IN ACTION

2.1 WHAT ACTIVITIES IS THE EDUCATOR ENGAGED IN?

- a) Effective facilitation of work group
- b) Effective facilitation of individual work
- c) Explaining and expounding
- d) Asking the learners' questions
- e) Answering the learners' questions
- f) Writing notes and important points on the chalkboard
- g) Supervising groups and going round the classroom
- h) Facilitating practical work and experimentation

Yes	No

Comments on these activities

2.2 WHAT ACTIVITIES ARE THE LEARNERS ENGAGED IN?

2.2.1 Kinds of activities

- a) Asking questions
- b) Giving feedback
- c) Collecting and recording data
- d) Evaluation and analysis of data
- e) Brainstorming ideas
- f) Conduction of studies
- g) Design and build where appropriate usable device or technology that addresses the problem or propose a plan of action
- h) Practical work involving active learner participation
- I) Participation in skills orientated activities

Yes	No

2.2.2 Activities promoting thinking skills

- a) Involved in decision making
- b) Problem solving
- c) Applying knowledge to real life situations
- d) Identifying a problem
- e) Looking at different solutions
- f) Gathering information to make responsible decisions
- g) Considering alternatives to make responsible decisions
- h) Identifying issues to make responsible decisions
- j) Argue and reason over an issue

Yes	No

2.2.3 Kinds of topics

- a) Conservation of nature
- b) Learning about the effective use of natural resources
- c) Identifying resources
- d) Developing resources

Yes	No

2.2.4 Activities with a cultural dimension

- a) Discussing the use of resources in different cultures
- b) Identifying how products are used in different cultures
- c) Identifying how people's contribution has led to change in scientific knowledge
- d) Seeing theories in their social and historical context
- e) Recognising that people have different viewpoints
- f) Awareness that different viewpoints influence scientific developments
- g) Recognising how we use science and technology
- h) Recognising how science and technology have changed our lives

Yes	No

Comments on these activities - Learning activities rich in the learning of attitudes, learning of values and other comments.

2.3 ENERGY AND CHANGE

		Yes	No
a)	Force and movement		
b)	Energy sources		
c)	Renewable and availability of resources		
d)	Pollution		
e)	Concepts such as:		
	Heat		
	Electricity		
	Velocity		
	Homeostasis		
f)	Energy Conservation		
g)	Environmentally friendly use and transformation of energy such as:		
	Alternating energy (Electricity)		
	Water energy		
	Solar energy		
h)	Energy sources used in South Africa and outside such as:		
	Coal		
	Oil		
	hydro-electricity		
	Nuclear Energy		
l)	Design and effective use and distribution of energy such as:		
	Appropriate means of transport		
	energy distribution		
	Conservation of energy		
j)	Scientific and cultural aspects of interest such as:		
	Solar energy		
	Lightning		
k)	Theories such as:		
	Atomic Energy		
	Relativity (Basic)		
	Nuclear Energy		
l)	Allocation of funds for identification of energy sources		
m)	Technical devices or appliances such as pulleys' gears, lifts, means of transport, generators, engines, hydro-electric generators		

2.4 MATTER AND MATERIALS

	Yes	No
a) Solubility		
b) Density		
c) Magnetism		
d) Electrical properties		
e) Particular nature of matter		
f) Chemical bonding		
g) Relationship properties and use of materials		
h) Environmental impact of production and processing such as:		
Wood		
Synthetic		
Waste		
Recycling		
i) Resources used in building, manufacturing and processing such as:		
Synthetic products		
Metals		
Wood		
Natural fibres		
j) Decision on most effective use of materials such as:		
Enrichment or export of raw materials		
Purpose cost and choice of materials		
Recycling		
k) Scientific and cultural interests such as design of :		
Houses		
Clothes		
Furniture		
Tools		

5. WHAT ASSESSMENT PROCEDURES HAVE BEEN USED BY THE EDUCATORS?

6. WHAT ASSESSMENT TOOLS HAVE BEEN USED BY THE EDUCATORS?

7. COMMENTS ON THE EDUCATORS USE OF ASSESSMENT PROCEDURES AND TOOLS.

8 COMMENT ON THE EDUCATORS LEARNING PROGRAMMES AND LESSON PREPARATION

9. WHAT KNOWLEDGE HAS THE EDUCATOR TAUGHT TO HIS/HER LEARNERS?

10. COMMENTS ON THE EDUCATORS RECORDING.

11. COMMENTS ON THE EDUCATORS REPORTING.

12, COMMENTS ON THE EDUCATORS USE OF RESOURCES AND THE AVAILABILITY OF RESOURCES.

17 COMMENTS ON THE LEARNERS' PROFILES.

18. COMMENTS ON THE EDUCATORS CAPACITY AS MEDIATOR OF LEARNING.

19. COMMENTS ON MAJOR DIFFICULTIES EXPERIENCED BY THE EDUCATOR

20. ADDITIONAL COMMENTS ON THE EDUCATOR'S IMPLEMENTATION OF C2005

APPENDIX C

NATURAL SCIENCE POLICY DOCUMENT

NATURAL SCIENCES

SENIOR PHASE

NS-1

PREAMBLE

In order to make an effective contribution to education in South Africa, the Natural Sciences Learning Area is committed to:

- broaden access to material, resources, knowledge acquisition and conceptual development;
- redress past imbalances;
- contribute towards socio-economic development and a better life for all; and
- challenging the perception that Science is predominantly a European discipline.

To the reader...

This Natural Sciences document includes a number of information blocks, each of which plays a different and significant role in the framework for science education in South Africa. To develop an understanding of the Natural Sciences document, a brief explanation of each of these information blocks might be useful.

This document intends to set standards while allowing for maximum flexibility in the development of Learning Programmes.

On The Rationale:

The "Rationale" sets the scene for the kind of science education that is envisaged in outcomes-based education in South Africa. It describes the nature of science, the need for science education and the approach to science education. The Rationale also informs the set of Specific Outcomes.

On The Specific Outcomes:

The "Specific Outcomes" have been derived from the Critical Outcomes that were decided upon by the South African Qualifications Authority. Their aim is to define the essential competencies, attitudes and values which learners in the Natural Sciences should acquire and develop.

They also set a national standard for education in the Natural Sciences. The provinces use the set of Specific Outcomes - and the Assessment Criteria and Range Statements - to develop Learning Programmes that are appropriate to their situations and contexts.

On the Conceptualisation of the Natural Sciences:

There are many fields and disciplines represented in the Natural Sciences. The "Conceptualisation of the Natural Sciences" helps in identifying essential elements of these fields and disciplines. Four themes have been identified, which serve as organising principles. Each of them provides contexts which can be used to assess learning.

On the Assessment Criteria:

The "Assessment Criteria" provide information about what learners should do in order to achieve each of the Specific Outcomes. The Assessment Criteria are identical for the different phases and this implies that all learners are able to develop these abilities and competencies, but at different levels of complexity and sophistication.

The Assessment Criteria need to be similar in all Learning Programmes so that a common standard for education can be determined. The Assessment Criteria for a Specific Outcome are not hierarchical. Additional Criteria may be added by Learning Programme developers but none of the Assessment Criteria may be ignored.

On the Range Statements:

The "Range Statements" have been developed from the Assessment Criteria. The Range Statements do not always link to one particular Assessment Criterion, but at times reflect a combination of Assessment Criteria. Range Statements provide an indication of the amount and complexity of the work expected from the learners as well as the context in which this work should take place. They are different for different phases. As Range Statements, together with Assessment Criteria, determine a common standard, they need to be similar in all Learning Programmes. Additional Range Statements may be added but none of the Range Statements may be ignored.

In the Range Statements which are provided for all the Specific Outcomes, exemplars drawn from the four Themes are provided for three different levels of complexity: Foundation Phase, Intermediate Phase and Senior Phase.

On the 'exemplars' within the Range Statements:

The exemplars are neither rigid nor prescriptive and are only a limited range of possibilities amongst many others that could be identified by programme developers. The fact that some exemplars are the same for more than one phase suggest that these exemplars could be dealt with at different levels of complexity and sophistication. They leave room for cross-thematic issues and progression at various rates.

Other Considerations:

Experimental work is a defining characteristic of science and should feature prominently in science Learning Programmes. Wherever possible, practical work should involve active learner participation. The urgent need for the provision of facilities and other resources, especially in rural areas, on a need-to-have, able-to-use basis linked with in-service education, is acknowledged.

Learning Programme developers should take cognisance of the need to reduce content so that time will rather be used to develop the Specific Outcomes and their implied competencies, attitudes and values.

RATIONALE FOR THE LEARNING AREA

THE NATURAL SCIENCES

The Natural Sciences, comprising the physical, life, and earth sciences, involve the systematic study of the material universe - including natural and human-made environments - as a set of related systems. A variety of methods, that have in common the collection, analysis and critical evaluation of data, are used to develop scientific knowledge. Learners need to know that Science is a human activity, dependent on assumptions which change over time and over different social settings.

The development of appropriate skills, knowledge and attitudes and an understanding of the principles and processes of the Natural Sciences

- enable learners to make sense of their natural world;
- contribute to the development of responsible, sensitive and scientifically literate citizens who can critically debate scientific issues and participate in an informed way in democratic decision-making processes;
- are essential for conserving, managing, developing and utilising natural resources to ensure the survival of local and global environments; and
- contribute to the creation and shaping of work opportunities.

In view of its potential to improve the quality of life, learning in the Natural Sciences must be accessible to all South Africans.

The investigative character of knowledge acquisition in the Natural Sciences should be mirrored in education. Learners should be active participants in the learning process in order to build a meaningful understanding of concepts which they can apply in their lives.

**THE SPECIFIC OUTCOMES
FOR THE
NATURAL SCIENCES**

1. Use process skills to investigate phenomena related to the Natural Sciences.
2. Demonstrate an understanding of concepts and principles, and acquired knowledge in the Natural Sciences.
3. Apply scientific knowledge and skills to problems in innovative ways.
4. Demonstrate an understanding of how scientific knowledge and skills contribute to the management, development and utilisation of natural and other resources.
5. Use scientific knowledge and skills to support responsible decision-making.
6. Demonstrate knowledge and understanding of the relationship between science and culture.
7. Demonstrate an understanding of the changing and contested nature of knowledge in the Natural Sciences.
8. Demonstrate knowledge and understanding of ethical issues, bias and inequities related to the Natural Sciences.
9. Demonstrate an understanding of the interaction between the Natural Sciences and socio-economic development.

A CONCEPTUALISATION OF THE NATURAL SCIENCES

The *conceptualisation* outlines the broad interests of the Natural Sciences. The Natural Sciences have been organised around four *Themes*. *Scope statements* for the respective Themes suggest more particular interests as well as contexts and concept areas; imply links to other learning areas; and imply cross - curricular issues. The conceptualisation is intended as a new perspective on Natural Sciences, highlighting the integrated nature of the Learning Area. An integral part of this perspective is the need for practical activities and skills. Knowledge cannot

be divorced from the practical skills involved in acquiring and using this knowledge. In the same way, attitudes and values of learners - developed and used when working in science contexts - are an important part in the conceptualisation of the Natural Sciences.

THEME: The planet Earth and Beyond

SCOPE STATEMENT

Earth's structure, dynamic features and components - from core to upper atmosphere - and the delicacy of the many environments associated with the Earth must be appreciated and understood at an appropriate level. A grasp of planet Earth's place in the universe can instil a sense of wonder and stimulate the imaginations of learners. Within this theme, learning contexts should be drawn from under the Earth's surface; on the Earth's surface; above the Earth's surface; and beyond the Earth.

THEME: Life and Living

SCOPE STATEMENT

Learners must appreciate the dynamic interdependence between organisms and their respective environments; the forms of the diversity that arises; and how that diversity can be explained as arising out of the interactions of organisms within their environments - which include other organisms. It is important for learners to understand, at an appropriate level, how life processes are sustained and how these processes are affected by human activities and other factors. Within this theme, learning contexts should be drawn from interactions within environments; diversity, change and continuity; and life processes and healthy living.

THEME: Energy and Change

SCOPE STATEMENT

The concept of energy is fundamental to understanding both processes of change and life processes. Learners must understand, at an appropriate level, how energy is transferred in biological and physical systems, the resultant changes - including movement as change - in those systems; and that successive energy transfers make less energy available for useful work. Learners must appreciate human needs and aspirations that affect the choice of energy sources and the implications of those choices for the environment. Within this theme, learning contexts should be drawn from sources of energy; uses of energy; transfer of energy; and forces and movement as change.

THEME: Matter and materials

SCOPE STATEMENT

The nature of matter and its properties - both physical and chemical - are fundamental to the physical universe and phenomena that occur in it. Products of human enterprise such as agriculture and mining may be enhanced using technologies and may result in materials useful to and even essential for learners' daily lives. Procuring and processing natural materials and the manufacture of synthetics are commercially important activities whose potential to impact the environment must be appreciated. Within this theme, learning contexts should be drawn from the nature and properties of matter; change in matter and materials; production of natural and synthetic materials; and properties and uses of materials.

NATURAL SCIENCES SENIOR PHASE

SO1 Use process skills to investigate phenomena related to the Natural Sciences

This specific outcome concerns the development of investigative process skills. In the Natural Sciences the "process of investigation" is central. Learners begin to develop investigative process skills at an early age and refine them through experience and use.

Broadly, processes of investigation can have two purposes. *Explorative* processes of investigation involve general observations, the collection of wide ranging data; and may lead to descriptive findings and possibly the identification of patterns. At times, these processes of investigations may lead to more focused investigations. *Focused* processes of investigation involve initial suspicions or even hypotheses against which evidence is purposefully collected in order to draw conclusions.

Processes of investigations encompass a number of different process skills such as questioning; observing; hypothesising; predicting; the collection, recording, analysis, evaluation and interpretation of data, and the communication of findings and/or conclusions. Planning and carrying out the investigation may be done individually or in groups. Data may be collected with the help of instruments and devices

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners conduct explorative investigations in which:</i></p> <ol style="list-style-type: none"> 1. Phenomena are identified 2. Investigative questions are formulated 3. A plan of action is formulated 4. Data are collected 5. Data are analysed, evaluated and interpreted 6. Findings are communicated <p><i>Learners conduct a focused investigation in which:</i></p> <ol style="list-style-type: none"> 1. Phenomena are identified and questions are posed 2. Situations are analysed and investigative questions are formulated 3. Observations are made 	<p><i>In developing their work, learners:</i></p> <ul style="list-style-type: none"> • Access a wide variety of sources of information on phenomena, data-analysis etc. • Formulate investigative questions which are relevant to the phenomena and ensure a comprehensive investigative process • Use a wide variety of instruments or devices to collect, measure, analyse and present data and findings • Use individual and group work strategies to formulate detailed plans of action which outline responsibilities, identify priorities and specify methods for the collection and recording of data or evidence • Evaluate and analyse data in terms of validity and appropriateness of methods and techniques used (fair testing) • Communicate their findings in a variety of ways, 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • select a phenomenon by accessing a variety of sources of information • identify specific features of, or factors related to the phenomenon • formulate investigative questions about these features/factors • debate various possible plans and discuss their feasibility • identify the priorities of the action steps, the control of variables, and the specific methods of data collection

<p>4. Hypotheses are formulated 5. Predictions are made 6. Investigative plans of action are formulated 7. Evidence is collected and recorded 8. Evidence is analysed, evaluated and interpreted 9. Conclusions are communicated</p>	<ul style="list-style-type: none"> • each of which show logic, coherence and consistency of methods and reasoning <p><i>Learners will conduct investigations in each of the four Themes - taking either separate Themes, or a combination - and do at least one explorative and one focused investigation:</i></p> <ul style="list-style-type: none"> • Phenomena selected should be relevant to learners and appropriate to their life experience. Investigations of the selected phenomena should lend themselves to the use of as many aspects of investigations as possible ◊ Earth and Beyond: phenomena such as planetary motion and time; geological time-scale; mining; weather ... ◊ Life and Living: phenomena such as ecosystems; the human body; plant and/or animal populations; plant physiology; relationships between structure and function ... ◊ Energy and Change: phenomena such as force and movement; energy sources: renewability, availability, pollution... ◊ Matter and Materials: phenomena such as solubility, density, magnetism; electrical properties... 	<ul style="list-style-type: none"> • specify their individual responsibilities • collect data using a wide variety of available technologies and sources of information for collecting data, measuring and analysing • present data in ways which facilitate analysis and interpretation; e.g. graphs which show relationships • critically evaluate different interpretations • determine the appropriate formulae, graphs and other presenting styles and forms • use different ways of communicating in structured reports/presentations which justify procedures used and indicate the validity of findings
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S02 Demonstrate an understanding of concepts and principles, and constructed knowledge in the Natural Sciences

This specific outcome is central to the Learning Area of the Natural Sciences. Its concern is to make learners familiar with the developing array of knowledge, concepts and principles within the Natural Sciences. However, the demonstration of a learner's understanding of these concepts and principles should be seen as happening most meaningfully in those specific contexts which involve learners' activities. Theoretical knowledge is necessary but not sufficient. The ability to apply knowledge is essential. The range of learners' actions to attain this outcome is therefore related to the other specific outcomes. These other outcomes relate the Natural Sciences and its array of knowledge, concepts and principles to practical daily-life situations and issues. It is through the ability to use, extend and apply knowledge that a learner can be said to "understand" concepts and principles in the Natural Sciences.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <p>1. Scientific knowledge, concepts and principles are used to inform actions</p>	<p><i>In developing their work learners:</i></p> <ul style="list-style-type: none"> • Construct and develop knowledge and an understanding of scientific concepts and principles - including laws and formulae - (see also S.O. 1, 3, 4, 5, 6 and 8 which concern activities such as investigation, problem solving and decision making in everyday contexts) <p><i>Learners will develop their understanding of concepts and principles in each of the four Themes, separately or in combination:</i></p> <ul style="list-style-type: none"> • Key concepts and principles, laws and formulae within the four themes are understood, applied in investigating, problem solving and decision making in contexts from either the learners' direct environment, or from environments not directly falling within the learners' day-to-day interests but which are of general importance to learners ◊ Earth and Beyond: key concepts such as land forms, galaxies, climate ... 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • identify and select relevant scientific concepts, principles, formulae and laws • demonstrate an understanding of these concepts, principles, formulae and laws when using and applying them in a variety of tasks such as problem solving, investigating, decision-making

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| | <ul style="list-style-type: none">◇ Life and Living: key concepts such as ecosystems, heredity, effect of environment on life-processes, population dynamics ...◇ Energy and Change: key concepts such as force, heat, electricity, velocity, homeostasis ...◇ Matter and Materials: key concepts such as particulate nature of matter, chemical bonding, relationship between properties and uses of materials... | |
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SO3 Apply scientific knowledge and skills to problems in innovative ways

This specific outcome concerns the development of the capacity of learners to work on problems using scientific knowledge and skills. The outcome is related to specific outcomes 1 and 5. The emphasis, however, in specific outcome 3 is the solving of problems. In the solving of problems, investigations have to be conducted and decisions have to be made. It is therefore necessary to consider specific outcome 3 in connection with the assessment criteria and range statements of specific outcomes 1 and 5.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which.</i></p> <ol style="list-style-type: none"> 1. Problems are identified 2. Relevant information is gathered 3. Relevant scientific knowledge is selected 4. Relevant scientific and mathematical skills are selected 5. The problem is re-evaluated 6. Innovative options are generated 7. Decisions are made 8. Possible plan of action is communicated 	<p><i>In developing their work learners:</i></p> <ul style="list-style-type: none"> • Access a wide variety of sources to gather information on problems, scientific knowledge and skills through activities such as practical investigations, using various media and interview-techniques • Use scientific skills for investigations (see also SO1, Senior Phase) • Use individual and group work strategies to make a detailed plan of action, outlining responsibilities, priorities and an ordered step-wise plan of work which could include experiments • Re-evaluate the problem through group or class presentations, discussions and debates, possibly developing a new perspective in view of all of the information gathered • Brainstorm to generate and debate innovative options and solutions to the problem • Decide on the best option, clearly justifying the choice on the basis of ordered and clearly presented scientific evidence • Communicate conclusions and recommendations in a variety of ways, each of which show a logical build-up, coherency and consistency in methods and reasoning • Design and build - where appropriate - a usable 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • identify a problem and formulate it in an assessable form • identify points of view related to the issues that emerge from the problem • gather information relevant to the issues that emerge, from all available sources without guidance from the teacher • select scientific principles and formulate them in terms of the problem and issues • select and use relevant scientific skills in planning and designing their solution process (this might include hypothesising, experimenting, predicting, measuring, and drawing graphs) • re-evaluate the problem through brainstorming and debate to find out what the strengths and weaknesses of

	<p>device or technology that addresses the problem, or propose a plan of action</p> <p><i>Learners will be involved in problem solving activities in each of the four Themes, separately or in combination:</i></p> <ul style="list-style-type: none"> • The problems identified could be of some general (e.g. provincial or national) importance, and its solution or way of addressing it could have an impact both within and outside the learners' direct environment ◊ Earth and Beyond: Effects over time of human activities on the earth's surface in South Africa, or elsewhere such as mining, farming ◊ Life and Living: Factors that affect life processes such as mining, farming ◊ Energy and Change: Energy conservation or environmentally friendly use and transformation of energy such as alternative energy sources: water, solar ◊ Matter and Materials: Environmental impact of production and processing such as wool, synthetics, waste, recycling 	<p>the proposed process are</p> <ul style="list-style-type: none"> • build on the strengths and improve on the weaknesses • propose and prioritise new options or solutions • decide on the best option by using the scientific information and the knowledge gathered • design a new plan of action supported by the scientific information and knowledge gathered • communicate a coherent, structured and detailed plan that addresses the problem • execute, if possible, the proposed plan of action
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SO4 Demonstrate an understanding how scientific knowledge and skills contribute to the management, development and utilisation of natural and other resources

Specific outcome 4 concerns the development the awareness that resources are contested and that the view that they are limited, depends on what one's purpose for the utilisation of the resource is. In the Natural Sciences the emphasis is on scientific considerations regarding this issue. However, the social, economic and political factors cannot be ignored. Particular attention is given to the idea of renewable and non-renewable resources, the need for recycling, resource management and how scientific input is of use here.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which</i></p> <ol style="list-style-type: none"> 1. The importance of sound management practices for resources is acknowledged 2. Natural and other resources are identified 3. Relevant scientific information is gathered 4. Non-scientific information is acknowledged 5. Management, development and utilisation practices are investigated 6. Science aspects within contested areas of management, development and utilisation of resources are explored 7. Alternative strategies and responsible decision making regarding renewable and non-renewable resources are explored 8. Findings and conclusions are communicated 	<p><i>In developing their work learners:</i></p> <ul style="list-style-type: none"> • Access information from various sources and brainstorm to identify natural and other contested resources • Access a wide variety of sources of information on the management, development and utilisation of those resources • Identify and acknowledge relevant scientific and other factors such as human, social, economic and political • Investigate and try to predict the consequences of decisions regarding the management, development and utilisation of renewable and non-renewable resources • Communicate their findings, decisions and conclusions in a variety of ways, showing a grasp of the relation between various factors that are in contest with one another regarding the development, utilisation and management of resources considered <p><i>Learners consider different resources from each of the four Themes, separately or in combination:</i></p>	<p><i>This is evident when learners.</i></p> <ul style="list-style-type: none"> • formulate and apply criteria to classify resources • describe resource-cycles found in the world and universe • explain the significance of sound management in relation to these cycles • gather scientific information on identified resources, from a variety of sources • argue the relevance of this information • identify human, social, economic and political dimensions to the management, development and utilisation of resources • acknowledge and evaluate the impact of these dimensions on local, national and global level

	<ul style="list-style-type: none"> • Contested resources to be considered should be present locally, but be of general (national or global) importance and include living resources and physical resources ◊ Earth and Beyond: Resources in the earth, on the surface or beyond such as minerals, soil, solar energy, water catchment ... ◊ Life and Living: Living resources in South Africa but with wider relevance such as forests, biodiversity, food production, medicinal plants, wild life and domestic animals ... ◊ Energy and Change: Energy sources used in South Africa and outside such as coal, oil, hydro-electric, nuclear ... ◊ Matter and Materials: Resources used in building, manufacturing and processing such as synthetic products, metals, wood, natural fibres ... 	<ul style="list-style-type: none"> • assess impacts of technologies on environments • describe social and ethical issues • investigate ways of sustaining life now and in the future • distinguish between mainly science related notions and ideas which stem mainly from social, political and economic considerations • recognise that science is also influenced by social, political and economic considerations • describe environmental relationships (cause and effect and others) at regional and global level • predict possible changes and consequences regarding renewable and non-renewable resources • discuss how decisions need to take all interests into account in order to have a degree of responsibility • communicate findings within the school environment • communicate their findings through other media (such as local newspapers, petitions and letters)
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SO5 Use scientific knowledge and skills to support responsible decision making

This specific outcome concerns the development - in learners - of the capacity for making informed and responsible decisions, recognising the use of scientific knowledge in the process of making decisions, and seeing that making decisions has consequences. The outcome is related to other specific outcomes, most notably numbers 1, 3 and 4. In these outcomes highlight aspects related to decision making - such as investigating and problem solving. Specific outcome 5 emphasises decision making as an important part of using scientific knowledge and skills in everyday life. Important is that learners develop an understanding of how decisions are reached, how information gathering is important, and that scientific knowledge and skills must play a role throughout the process.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <ol style="list-style-type: none"> 1. Issues are identified 2. Scientific information relevant to the issues is gathered 3. Information is prepared for the decision making process 4. Non-scientific issues are acknowledged 5. Alternatives are considered 6. Reasons for decisions are communicated 	<p><i>In developing their work, learners:</i></p> <ul style="list-style-type: none"> • Brainstorm, discuss and debate - using a wide variety of information sources - to identify issues • Access scientific information related to the issues from sources such as textbooks, libraries, television, interviews, pamphlets • Work individually or in a group to identify the critical and essential viewpoints, attitudes and values related to the issue • Reflect and argue how scientific input and other input generate action plans or alternatives • Communicate - in a variety of ways - decisions and possible consequences, relating viewpoints and scientific input in a consistent way <p><i>Learners will be involved in decision-making in each of the four Themes, separately or in combination:</i></p> <ul style="list-style-type: none"> • Decision-making will take place in a context that might relate to learners' direct experience or might relate to issues that also reflect a more general - but for the learners relevant - national or international concern 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • identify scientific issues of national or provincial relevance • distinguish between issues of a mainly scientific nature and issues of an other nature (e.g political, social or economic) • gather and prepare scientific information from a variety of sources • argue the relevance of the information gathered • prioritise information by identifying critical and essential viewpoints, attitudes and values • consider alternatives by arguing and reflecting how scientific and other input generate an action plan • generate alternative decisions that

	<ul style="list-style-type: none"> ◇ Earth and Beyond: Establish criteria for environmentally sensitive projects such as dams, town, industry ... ◇ Life and Living: Make judgements on actions affecting life and life-forms such as family planning, health, land-use for different types of farming purposes ... ◇ Energy and Change: Decide on effective use and distribution of energy such as appropriate means of transport, energy distribution, conservation of energy ... ◇ Matter and Materials: Decide on most effective use of materials such as enrichment or export of raw materials, purpose cost and choice of materials, recycling... 	<p>accommodate different input</p> <ul style="list-style-type: none"> • develop communications about their decisions and justify these decisions in a consistent way • use these communications within and, where possible, outside the school
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SO6 Demonstrate knowledge and understanding of the relationship between science and culture

Specific outcome 6 is concerned with the development of an understanding that science is not a neutral discipline but that it is influenced by the culture in which it takes place. Furthermore, science cannot necessarily be seen as the only way of making sense of the world around us. Other cultural means of clarifying the world, such as through language, religion or art, should be seen as having a validity and benefit, just as science has.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <ol style="list-style-type: none"> 1. The pursuit of science as influenced by cultural factors is acknowledged 2. Science is acknowledged as but one way of looking at and explaining phenomena 	<p><i>In developing their work, learners:</i></p> <ul style="list-style-type: none"> • Access a wide variety of information on different kinds of methods, aims and uses of science in different cultures such as African, Eastern, European ... • Work individually or in groups to identify and discuss different ways of observing, describing and explaining phenomena such as religious, scientific, artistic ... <p><i>Any two or three examples of scientific work and thinking in different cultures and relating to any Theme or Themes can be chosen:</i></p> <ul style="list-style-type: none"> ✓ Earth and Beyond: scientific and cultural aspects of interests such as astronomy, geography, climate and weather ... ✓ Life and Living: scientific and cultural aspects of interests such as agriculture, health, medicinal plants and uses of animals .. ✓ Energy and Change: scientific and cultural aspects of interests such as solar energy, lightning ✓ Matter and Materials: scientific and cultural interests such as design of houses, clothes, furniture and tools ... 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • describe, discuss and exhibit examples of methods, aims and uses of science in different cultures and at different times (E.g. African, Eastern, European, modern, medieval, ancient) • identify and discuss examples of religious, scientific, artistic, etc. ways of describing and explaining phenomena. • give appropriate examples of how science influences culture and culture influences science

S07 Demonstrate an understanding of the changing and contested nature of knowledge in the Natural Sciences

Specific outcome 7 aims at developing an understanding of some essential features of science, its methods and products. Science can be seen too easily as a body of immutable truths and therefore as absolute and without change. Learners need to know that science is a human activity, dependent on assumptions which change over time and over different social settings. By realising the changing nature of scientific knowledge both learner and teacher will be supported in their aim of linking everyday knowledge with scientific interpretations, and so create a better understanding of the world.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <ol style="list-style-type: none"> 1. Peoples' contributions to science through the ages are identified 2. Scientific theories are seen in their context 3. Contributions to a scientific theory by scientists from different backgrounds are acknowledged 4. Scientific explanations of phenomena are acknowledged as open to change 	<p><i>In developing their work, learners:</i></p> <ul style="list-style-type: none"> • Access a wide variety of sources of information available at school or anywhere outside on scientific theories and their changes and development • Use individual and group work to discuss and organise their findings • Communicate their findings in any suitable form such as essay, presentation, poster, time-line ... clearly showing various factors and contributions that have contributed to the change in a theory <p><i>Learners will look at a scientific theory in each of the four Themes:</i></p> <ul style="list-style-type: none"> • The theory identified should be one that has developed and changed significantly over time as a result of contributions and the changed thinking of scientists from different ethnic-groups, cultures or genders ◊ Earth and Beyond: Theories such as the expansion of the universe, continental drift, ozone depletion ... 	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • provide examples of peoples' contributions to science through the ages • link the development of scientific theories to the needs and beliefs of a society at a certain time and place • give examples of the work of scientists from different cultural backgrounds • give examples of and discuss the essential features of scientific theories • show changes that have taken place in examples of specific scientific theories

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| | <ul style="list-style-type: none">◇ Life and Living: Theories about the origin of species, heredity, embryonic development ...◇ Energy and Change: Theories such as atomic energy, relativity ...◇ Matter and Materials: Theories such as on the particulate nature of matter, atom and molecule models ... | |
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SO8 Demonstrate knowledge and understanding of ethical issues, bias and inequities related to the Natural Sciences

Specific outcome 8 concerns the development of an awareness that science is not value-free and can be misused or abused. On the one hand science can create inequities and show bias, on the other hand science can also help to redress such situations. Ethical issues often have a science component to them; learners need to develop the ability to use scientific perspectives among other perspectives to evaluate ethical issues. The outcome reflects a wish to create an awareness of various viewpoints and issues, rather than propagate any specific viewpoint

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <ol style="list-style-type: none"> 1. A variety of viewpoints are acknowledged 2. A variety of origins of bias and inequity are considered 3. Scientific inputs are used 4. Arguments are presented and evaluated 	<p><i>In developing their work, learners</i></p> <ul style="list-style-type: none"> • Brainstorm, discuss or read to identify an ethical issue of interest • Argue and reason about an issue with respect for different viewpoints • Use a wide variety of sources of information to identify situations that reflect or highlight bias and inequity and possible origins for these • Independently identify and use scientific inputs related to the issues being considered • Communicate findings in a variety of ways, showing a clear grasp of the relationship between ethical and scientific considerations <p><i>Learners will be involved in considering issues from each of the four Themes, separately or in combination:</i></p> <ul style="list-style-type: none"> • Issues considered are of global as well as local concern and of relevance to the lives, thinking and actions of learners <p>Earth and Beyond: Issues such as space exploration and its cost, global differences in resource allocation and availability ...</p>	<p><i>This will be evident when learners</i></p> <ul style="list-style-type: none"> • argue, reason and analyse issues of bias and inequity related to the use and development of science • support their arguments from information of a variety of sources • give examples of origins of bias and inequity in the use and development of science coming from: specific beliefs and/or (mis-)information • communicate the analysis of their arguments showing a clear grasp of relationships between ethical and scientific considerations

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| | <ul style="list-style-type: none">◦ Life and Living: Issues such as genetic manipulation, abortion, cloning, bio-diversity, allocation of health-care services ...◦ Energy and Change: Issues such as nuclear energy, allocation of funds for identification of energy sources ...◦ Matter and Materials: Issues such as chemical warfare, priorities for research funding ... | |
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SO9 Demonstrate an understanding of the interaction between the Natural Sciences and socio-economic development

Specific outcome 9 concerns the development of an holistic understanding that the Natural Sciences contribute towards socio-economic development and improvements to the lives of people. The contribution of science is through the activities of people and often through technological developments. Learners should understand how, in contributing to socio-economic development, the Natural Sciences are often linked to technologies. An important way in which education in the Natural Sciences can contribute to socio-economic development is through the development of a scientifically literate nation. Scientific literacy involves the ability to apply scientific concepts and principles to everyday life and being able to recognise their use or non-use in a variety of contexts. Further, an ability to communicate effectively is essential in the Natural Sciences and scientific literacy is enhanced when it is accessible to learners. Therefore language development is crucial for both science education and scientific literacy.

ASSESSMENT CRITERIA	RANGE STATEMENTS	PERFORMANCE INDICATORS
<p><i>Learners show work in which:</i></p> <ol style="list-style-type: none"> 1. Evidence is provided of how science and technology are used in society 2. The way in which scientific and technological developments have changed the lives of people is analysed 3. The impact of technological innovations on scientific work is explored 4. The link between scientific ideas and technological devices is explored 5. Roles and consequences of science in society are communicated 	<p><i>In developing their work, learners:</i></p> <ul style="list-style-type: none"> • Conduct a study in which they explore the scientific principles used in the development of a specific technological device or process and analyse how this affects development (industrial, agricultural, small business etc.), job opportunities and society • Analyse how accessible - in terms of being familiar, understandable and usable - the technology and related scientific principles are to various groups of people • Communicate their findings in reports and group presentations that show a clear grasp of the use of science and technology and their effect on society <p><i>Learners will perform at least two studies, each within a different Theme or combination of Themes:</i></p>	<p><i>This will be evident when learners:</i></p> <ul style="list-style-type: none"> • provide examples of how scientific principles have been used in the development of specific technological device or process • demonstrate a basic grasp of how science and technology influence each other by considering the need for both technological developments and developments of scientific concepts and ideas • provide reports that show a clear grasp of the use and effects of science and technology on society

	<ul style="list-style-type: none"> ◊ Earth and Beyond: devices such as satellites, mining, mineral extraction ... ◊ Life and Living: processes such as production of antibiotics, drugs and food additives, bio-genetic engineering, in vitro fertilisation ... ◊ Energy and Change: technological devices or appliances such as pulleys, gears, lifts, means of transport, generators, engines, hydro-electric generators ... ◊ Matter and Materials: technological products such as time-pieces, photography, telecommunication, plastics, paints, paper ... 	<ul style="list-style-type: none"> • give examples and describe how scientific and technological developments have changed the lives of people in the areas of jobs, living standards, communication etc.
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REFERENCES

Aitchison J, Houghton T and Baatjes I. (2000) University of Natal Survey of Adult Basic Education and Training: Pietermaritzburg - South Africa : Centre for Adult Education.

Berman P. & Mc Laughlan (1986) Implementation of Educational Innovation. Educational Forum, 40 (3), 345 – 370.

Biklen, B. (1992) Qualitative Research: An Introduction to Theory and Methods. Boston: Allyn and Bacon.

Borg, W.R. and Gall, M.D. (1979) Educational Research: An Introduction. New York; Longman.

Brooke H. and Solomon (1998). From playing To Investigating: Research in an interactive Science Centre for primary pupils. Centre for Science Education, Open University, U.K.

Chisholm L. et al. (2000). A South African Curriculum for the 21st Century. Report of the Review Committee on C2005. Department of Education. Pretoria. 143 pp.

Christie P. (1985). The Right to learn. Raven Press, Cape Town.

Delamont (1981) All too familiar?, Educational Analysis, Vol.3 No.1, pp. 69 – 84.

Department of Education (1996) Lifelong Learning through a National Qualification Framework: Report of the Ministerial Committee For Development Work on the NQF Pretoria: Government Printer.

Department of Education (1997a) Curriculum 2005. Lifelong Learning for the 21st century. Pretoria: Government Printer.

Department of Education (1997b) . Senior Phase Policy Document . Pretoria:
Government Printer.

Department of Education (1998). Curriculum 2005 – Implementing OBE – Philosophy:
lifelong Learning for the 21st Century. Pretoria: Government Printer.

Department of Education (1999) Curriculum 2005: Towards a Theoretical Framework.
33pp. Pretoria: Government Printer.

Doidge M.C. (1998) Preparing Physical Science and Biology Students for teaching in the
Natural Sciences Learning Area.

Doll R.C. (1989) Curriculum Improvement - Decision Making and Process (7th Ed.)
Boston, Mass. Allyn and Bacon - A division of Simon and Schuster.

Doyle W. and Ponder G. (1977) The practicality ethic in teacher decision making.
Interchange, 8,1 – 12.

Epstein J. L. (1986) Parents' Reactions to teacher practices of parent involvement.
Elementary School Journal, 86 (3), 277 – 94.

Foster P. (1996) Observing Schools: A Methodological Guide. Paul Chapman, London

Fullan M. (1999) Change Forces: The Sequel. London: Falmer Press

Fullan M. (1991) The new Meaning of Educational Change . (2nd Ed.) Cassell, London.

Goodson I. (1992) Studying teachers' Lives. Routledge, London.

Govender D. (1999) The perceptions and experiences of some grade one teachers implementing Curriculum 2005. Masters in Education Thesis. University of Natal, Pietermaritzburg.

Government Gazette (2000) Norms and Standards For Educators. Pretoria: Government Printer. Vol. 415.

Harlen W. and C. Holroyd (1997) Primary Teacher's Understanding of Concepts of Science : Impact on Confidence and Teaching. International Journal of Science Education. Vol. 19, No.1, pp. 93 - 105.

Henson K.T. (1995) Curriculum Development for Education Reform. Eastern Kentucky University. New York.

Hiralaal A. (2000) The attitudes of grade one teachers in Pietermaritzburg to the training they have received on outcomes-based education. Masters in Education Thesis. University of Natal, Pietermaritzburg.

Hoyle E. and R. Bell (1972) Problems of Curriculum Innovation 1, Open University Press, Walton Hall, Blechley, Bucks. U.K.

Jansen J. (1998) Curriculum Reform in South Africa : A critical analysis of OBE. Cambridge Journal of Education. 28 (3), pp. 321 - 331.

Jansen J. (1999) Why Outcomes - Based Education Will Fail. pp. 145 - 154 in : Jansen J. and Christie P : The Changing Curriculum. Juta. Cape Town.

Jeevananthan L.S. (1999) Towards Curriculum 2005: Proposals for Curriculum Change. South African Journal of Education, Vol. 19 (1) pp. 49 - 54.

Jessop T.S. (1997) Towards Grounded Theory of Teacher Development: A Study of the Narratives of Rural Primary Teachers in KwaZulu- Natal. (Unpublished Thesis: Doctor of Philosophy) King Alfred's University College, University of Southampton.

King A.J. Warren W. and Pearl M. (1988) The Teaching Experience. Toronto; Ontario Secondary School Teacher Federation.

Knox D.A. (1999) Personal Communication.

Lederman N.G.(1992). A Review of the Research – Science and Mathematics Education ; Oregon State University. Journal of Research in Science Teaching, Vol. 29. Pp. 331 – 357.

Marsh C.J. (1992). Key Concepts For Understanding Curriculum. The Falmer Press. London.

McGregregor R. and A. McGregor (1992). McGregors Education Alternatives. Rustica Press, Ndabeni, Cape Town.

Ogude N.A. and M. Rollnick (1999) Adressing Primary School Science Through Materials Developed by Science Educators and Drama in Education Specialists. South African Journal of Education. Vol. 19 (4) pp. 251 – 256.

Popper K.R. (1996). The Open Society and its Enemies: Hegel and Marx. Vol.2 Princeton University Press. (cited in Rust and Per Dalin 1990).

Potenza E. and Monyokolo (1999) A Destination Without a Map: Premature Implementation of C2005? in Jansen J. and Christie P. (1999) The Changing Curriculum. Juta, Cape Town.

Preedy M. (1998) Management in Education - Approaches to Curriculum Management. Open University Press. Philadelphia.

Rasool M. (1999) Critical Responses to “ Why OBE will Fail in Jansen J. and Christie P. (1999). The Changing Curriculum. Juta, Cape Town.

Reeves C, (1999) Are Teachers likely to achieve the Natural Sciences outcomes for Curriculum 2005? Journal of Education 24 : 45 - 46.

Rust V.D. and Per Dalin (1990) Teachers and Teaching in the Developing World. Garland Publishing Inc. New York and London.

Solomon J. (1994) The rise and Fall of Constructivism : Studies in Science Education, 23 (1 - 19).

Steyn P. and Wilkinson (1998). Understanding the Theoretical Assumptions of Outcomes - Based Education as a Condition of Meaningful Implementation. South African Journal of Education, Vol. 18 (4), pp. 203 - 208.

Taylor and Vinjevold (1999). Getting Learning Right: Report of the President's Education Initiative Research Project. Joint Education Trust. Republic of South Africa.

The Educator's Voice (May 19. 1998) p.3. The Paper for Teacher by Teachers / South African Democratic Teacher Union (1997 - 1999).

Themane M.J. and Mabasa L.T. (1998) C2005 : Hitherto. Paper presented at the National Subject Didactics Learning Area Symposium at the University of Stellenbosch, 1998.

Vinjevold P. and Roberts J. (1999) External Evaluation Report: Provision of Learning Materials - Grade Seven Pilot Project - Wits: Joint Education Trust, commissioned by DoE, Pretoria.

Watts M. (1998). Towards Critical Constructivist Teaching. International Journal of Science Education. Vol.20 No.2, pp. 173 – 185.