

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

In 1997, Outcomes Based Education (OBE) was introduced to South Africa amidst much publicity (Sanders, 1999). The new curriculum, known as *Curriculum 2005*, was described as one of the most liberal and adventurous education frameworks in the world (Malcolm, 2000). According to this new approach, content was not prescribed, while teaching would be more learner-centred, activity-based and flexible. The curriculum had, however, only been introduced from reception year to grade 9 in the General Education and Training band (GET) by the end of 2005. Curriculum 2005 (C2005) soon ran into difficulties that threatened the survival of the new approach (Jansen, 1997; Tema, 1997). Teachers complained of lack of support, poor training, complex curriculum design and the pace of implementation (Chisholm, 2000; Marnewick & Spreen, 1999; Taylor & Vinjevd, 1999).

In 2002, content was reintroduced in a revised curriculum, the Revised National Curriculum Statement (RNCS) (Department of Education (DoE), 2002a). The RNCS was later renamed the National Curriculum Statement (NCS) and introduced for the first time in the Further Education and Training (FET) band in 2006. The FET is grade 10 to grade 12. The 2005 grade 9 cohort was therefore the last to complete C2005 in grade 9 and the first to enter the NCS in grade 10, complicating the transition to the FET phase. The transition to the NCS represented a potentially serious challenge for both educators and learners because it was discontinuous and inconsistent with the curricula with which educators and learners were familiar.

The curriculum that was in place in South Africa before the democratic government came into power in 1994 was described as prescriptive, content-heavy, teacher-centred, detailed and authoritarian (Ntshingila-Khosa, 2001; Jansen, 1999; Nekhwevha, 1999; Christie, 1993). Many non-governmental organisations (NGOs) had been involved for almost three decades in trying to improve science education in secondary schools in South Africa (Rogan & Gray, 1999). Despite these efforts, the country still has poorly trained teachers, teacher-centred approaches, student passivity and rote learning (Arnott, Kubeka, Rice & Hall, 1997). The

majority of schools remained disadvantaged 15 years after democracy, due to a persisting legacy of the apartheid school system (Carnoy & Chisholm, 2008; Hartshorne, 1992).

1.1.1 The scope of the study

This study focused on a transition from one phase in education to another, at a time of curriculum change in South Africa. I am a subject advisor in Physical Science and it is with this background that I undertook a four year longitudinal study of how learners experienced the transition from Natural Science in the GET band to the Physical Science in the FET band. It was a puzzle how learners would negotiate the transition, in circumstances where only 5.4% of teachers had been prepared in their initial teacher education for C2005 and its later revisions (Erasmus & Mda, 2008). Learners in this study had been exposed to OBE up to grade 9 while their teachers in grade 10 had just undergone a two weeks training on the NCS that had to be implemented for the first time in their grade 10 year. The study involved learners from two Black township schools in the Gauteng province of South Africa, both with a similar socio-economic background.

There is little literature on transitions from one phase of education to another, and a serious lack of longitudinal studies that follow the same learners throughout the period of their schooling (Galton & Morrison, 2000). Filling this gap also provided motivation for this study.

Regarding terminology, the terms ‘teacher’ and ‘educator’ were used interchangeably, as were the ‘student’ and ‘learner’.

1.1.2 Transition problems in schools

There is general agreement that transition problems do exist and that they need a joint effort by all stakeholders to deal with them uniformly (Brown, Amwake, Speth & Scott-Little, 2002; Yeboah, 2002). Kagan and Neuman (1998) define ‘transition’ as the experiences that children have between periods and between spheres of their lives. This means that for successful transition to take place there has to be continuity between the primary school and the secondary school, and in the case of this study from the GET phase to the FET phase.

According to Halpern (1994), the ultimate goal of transitions is to create opportunities for lives that are characterised by personal fulfilment. Halpern views transition as an ongoing process from childhood into adulthood and further argues that to deal effectively with the challenges of the new environment, the learner should acquire knowledge, skills and values demanded in the new setting. Patton and Dunn (1998) mention comprehensive planning as one of the key elements to successful transitions. For the transition from the GET to the FET phase, it would mean that the more the GET educator knows about the receiving environment, the better the chances for creating opportunities for effective transition to this new setting. There should be continuity in philosophies, curricula and ethos of Natural Science in the GET band Physical Science in the FET band.

Transition can also be seen in terms of ‘border crossing’, a metaphor first used to describe the difficulties facing students whose race and thus culture were different from those of the dominant group (Giroux 1992). Aikenhead (1996) applied the work of Giroux to school science by suggesting that when students learn science they often cross a cultural boundary from the sub-culture of their peers and family into the sub-culture of science. Difficulties encountered may be conceptualised as hazards to border crossing. Cobern and Aikenhead (1998) categorized border crossings as smooth, managed, hazardous and virtually or almost impossible depending on the degree of difficulty with which a crossing into a new sub-culture is accomplished. The transition from the GET science to the FET science could be viewed as border crossing from the sub-culture of the outcomes-based GET science to the sub-culture of the content-based FET science.

Transition problems are caused by a number of factors which, if not aligned, may cause anxiety and frustration for the learner (Jewett, Tertell, King-Taylor, Parker, Tertell & Orr, 1998; Mangione & Speth, 1998; Ramey & Ramey, 1998). The transition stage is the time when learners have to cope with changes and challenges, with success measured by their ability to adjust to the new situation. However, the question arises as to how well prepared are those in charge of the learners, i.e. the teachers. Have they been adequately equipped to help learners cope with their transition through the new curriculum? To answer the question it is first necessary to examine the profile of public school teaching in the Republic of South Africa (RSA), with particular reference to the Gauteng province.

1.1.3 The profile of public school teachers in the Republic of South Africa

The study of transitional problems in education needs to take into account the profile of teachers as they should lead learners through transitions. It is for this reason that I looked into the teacher population dynamics, teachers' level of education, teacher attrition, appointment of teachers and their preparedness for the new curricula.

Population distribution

The racial profile of the profession reflects the demographic profile of the country (Carnoy & Chisholm, 2008). Figure 1.1 shows the proportion of teachers within public ordinary schools by race in 2005.

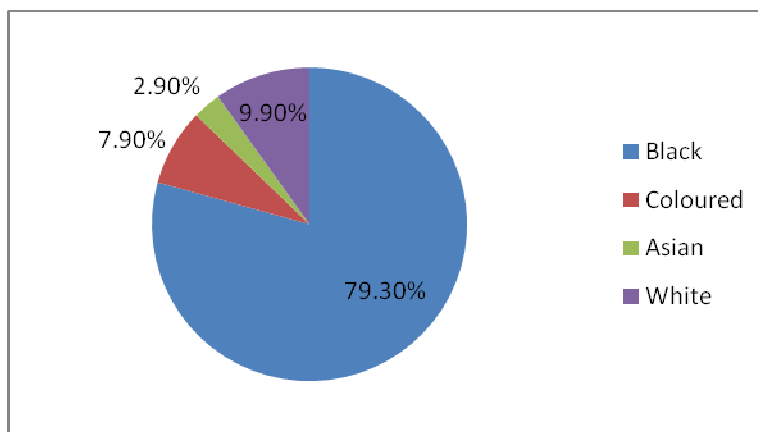


Figure 1.1 Race distribution in the ordinary school sector in 2005 (Arends, 2008)

In 2005 there were 292 484 Black (African) teachers (79.3%), 36 388 White teachers (9.9%), 29 095 Coloured teachers (7.9%) and 10792 Asian teachers (2.9%) (Arends, 2008). The 2005 gender distribution shows that female teachers made up 67.2% and male teachers made up 32.8% (Erasmus & Mda, 2008). The gender distribution in Gauteng also indicated that women dominated the profession. While it is the smallest province (only 1.4% of the land area), Gauteng is the most populous of South Africa's 9 provinces with a population of 9.6 million people (20.2 % of the total population of 47.9 million). With a teacher population of 60 121 in 2005 in the ordinary public schools, 72.1% were female and 27.9% were male (Carnoy & Chisholm, 2008).

Teachers' level of education

The Relative Education Qualification Value (REQV) attached to an education qualification is based primarily on the number of recognised prescribed full-time years of study (Carnoy & Chisholm, 2008). The Matriculation value is REQV 10, while higher diplomas plus bachelor degrees have an REQV value of 14. All three-year diplomas are at REQV level 13, and all honours, masters and doctoral degrees have an REQV level of 14, 15 and 16 respectively. According to the Norms and Standards for Educators that was published in 2000, a teacher with a three-year post-school qualification (REQV 13) is regarded as adequately qualified (DoE, 2005(a)). The National Policy Framework for Teacher Education (2007) set the minimum entry level at REQV 14 for all new teachers joining the teaching profession. Nationwide, 47.9% of teachers had an REQV 14 qualification in 2004 and 37.4% had an REQV 13 qualification while 14.7% were under-qualified as they had an REQV 12 or lower qualification (Carnoy & Chisholm, 2008).

Teacher attrition and shortages

The teacher attrition rate was estimated at between 5 and 5.5% nationally in 2005 (DoE, 2005, p.54). However, the analysis of DoE, the South African Council of Educators (SACE) and Statistics South Africa (StatsSA) figures at an aggregate level seem to suggest that there is no shortage of teachers (Arends, 2008; Erasmus & Mda, 2008). It must also be pointed out that this aggregated data belies the shortage of specific categories of teachers. There are few qualified teachers in the Foundation Phase, Mathematics, Science, Technology as well as Economic and Management Sciences (EMS) (Carnoy & Chisholm, 2008).

A study of 2003-2005 EMIS data by Arends (2008) compares the number of subjects or learning areas taught and the number of teachers with a formal qualification in them (Carnoy & Chisholm, 2008). In 2004, more teachers in Gauteng were teaching in learning areas than were trained in those learning areas, regardless of school type (primary, combined or intermediate and secondary) and regardless of teaching level (foundation, intermediate and senior). This suggests that teachers not trained to teach specific subjects such as Natural Science were doing so. The reasons for this misallocation are not clear. The Gauteng Department of Education (GDE) is attempting to co-ordinate the supply and demand of teachers at local level through planning around the post-provisioning model (Carnoy & Chisholm, 2008).

Appointment of teachers

According to Carnoy and Chisholm (2008), there are two types of posts available to teachers in schools. The majority of posts are provincially-funded, referred to as “funded posts”, the others being SGB posts that are established and paid for by the School Governing Body (SGB) over and above the allocation of provincial posts to schools. Poorer schools are less able than more affluent ones to afford SGB posts or teachers who are paid out of income from school fees from parents. The poorer schools are more dependent on the “vacancy” and “excess” lists created and managed by district offices for their teachers (Carnoy & Chisholm, 2008). A “vacancy” is created when a vacant post exists. An “excess” list is made up of names of permanently appointed teachers who have been declared additional to their schools’ post establishment due to operational requirements, e.g. if the subject that the teacher is offering has been phased out at that particular school, or if there has been a drop in learner numbers with the resultant new post establishment of the school offering fewer posts.

Preparedness for new curriculum

The mean age for practising teachers was 41 in 2005 (Stats SA, 2006) and 5.4% of all practising teachers were under the age of 30 in 2005 (Arends, 2008). According to Erasmus and Mda, if only 5.4% of all those practising were under the age of 30 in 2005, it can be assumed that only 5.4% had been prepared in their initial teacher education for C2005 and its later revisions. This implies that the majority of teachers were not prepared for the new curriculum by their formal teacher training, and in most cases may not have had the skills needed to interpret and implement the new curriculum.

1.1.4 The plight of learners in transition to the FET phase

High rates of failure in secondary school science classes are a problem worldwide (Fonseca & Conboy, 2006). In southern Portugal the failure rate for all secondary students is most prominent in grade 10 (Carreira & Andre, 2000).

The lack of continuity and progression between primary and secondary education has been an issue for several decades in the United Kingdom (UK) (Davies, 2004). The Observational Research and Classroom Learning Evaluation (ORACLE) project (1975-1980) and its

replication study (1996) found low levels of expectation by secondary teachers of learners' enquiry skills in the first year of secondary school in the UK (Galton et al., 1999).

Similarly, there is a general perception in Botswana, Lesotho and Swaziland that the achievement of learners in O-level is below the expected level compared to their achievement in the Junior Certificate (JC) examination (Manyatse, 1996). This was attributed to a gap between JC and O-level, one example of a phase transition in education.

School records available from the Department of Education (DoE) provide little direct information on grade repetition (Anderson, Case & Lam, 2001), especially during the 1990s. Records are available, however, for the 2000s. In the Gauteng province of South Africa, the rate of repetition in grade 10 is the highest (refer to Table 1.1). The Ministry of Education also noted in 2008 that there was a significant school dropout rate after grade 9 (Mail & Guardianonline, 2008). This seems to suggest that learners in grade 9 may not have acquired enough content knowledge to cope with knowledge demands of grade 10.

The question arose as to whether this high failure rate could be due to transition problems experienced by learners from the GET to the FET phase.

The current study investigated the transition from science in the GET phase to science in the FET phase. I investigated how the transition can be characterized, how learners experience the transition itself, and how their strategies and approaches to negotiating the transition could be understood and explained. To my knowledge, no empirical study has been conducted in South Africa to try to characterize the transition from the GET phase to the FET phase, especially with respect to the learning of the natural sciences.

Table 1.1 Repetition by grade (GDE, Annual Report 2004/2005)

Percentage (%) Repetition				
Grade	2001	2002	2003	2004
1	4,3	4,2	4,4	4,2
2	3,3	2,9	2,9	2,8
3	3,3	2,7	2,5	2,6
4	3,4	2,9	2,7	2,6
5	3,7	2,2	1,8	2,0
6	2,6	2,2	1,3	1,5
7	1,1	0,9	0,9	1,3
8	2,1	3,4	4,3	4,2
9	9,0	4,9	5,6	5,3
10	14,4	16,1	19,9	18,0
11	13,2	14,3	14,6	15,3
12	1,6	1,5	1,2	0,7
Average	5,21	4,84	5,46	2,96

1.1.5 The plight of GET science educators

The problems faced by the middle school and junior secondary educators in learning and teaching science have been the subject of considerable investigation by the educational research community for over three decades (ASTEC, 1997; Atwood & Atwood, 1996; Wallace & Loudon, 1992; Smith & Tilgner, 1990; Neale, 1989; Schoeneberger & Russell, 1986; Mittlefehldt, 1985; Shrigley, 1974, 1977). Large numbers of students enter the GET teaching pre-service course with very little science background (Fensham et al., 1991), and they are concerned about studying science themselves and teaching it to children. GET science educators often claim that they lack the time and knowledge to organise science activities and resources (Scott, 1989) and argue that they have negative experiences with group work and classroom management when teaching science (Goodrum, Cousins & Kinnear, 1992). GET teachers appear to be caught in a dilemma between making science more accessible to their learners and delivering the products of science (Abell, 2002). In summary, poor science background of teachers, combined with the low-status culture of science in schools offering the GET learning areas, confusion about teachers' roles and the

lack of science teaching role models complicates transition of learners from GET science to FET science.

As I am interested in the study of transition from the GET to the FET bands, a brief overview of these two bands is given below.

1.2 THE GENERAL EDUCATION AND TRAINING BAND

The GET band comprises Foundation Phase (grades 1-3), Intermediate Phase (grades 4-6) and the Senior Phase (grades 7-9). I am interested in the Senior Phase learner who has to make a transition to the FET band (grades 10-12).

The Natural Sciences in the GET band consists of four themes namely Energy and Change, Life and Living, Matter and Materials, Earth and Beyond. Three of these themes, Energy and Change, Matter and Materials as well as part of Earth and Beyond progress to Physical Science in the FET band. Life and Living progresses to Life Science and part of Earth and Beyond progresses to Geography. The content knowledge chosen by teachers and teaching approaches for the Natural Sciences in the GET band aim to achieve the prescribed Learning Outcomes. It will be helpful to look at the profile of the GET graduate who seems to be struggling in grade 10 as evidenced by the repetition rate in grade 10 (Table 1.1).

The Senior Phase learner is able to reason more independently about concrete materials and experiences (DoE, 1997). S/he is also able to engage in open argument and is willing to accept multiple solutions to single problems. There should be clear evidence that the learner is being prepared for life after school, i.e. life in the world of work, at institutions for further learning and for adult life in general. Learning programmes should create opportunities for the learner to be informed about career and further learning opportunities, about ways and means of realising his/her expectations for the future, and about his/her rights and responsibilities as a citizen in a democratic, multicultural society (DoE, 1997).

According to Halpern (1994), comprehensive planning, a key element to successful transition, includes a thorough needs analysis that should take into account the needs of the individual and the setting into which the individual will be going. It is therefore important for

both the educator and the GET learner to know the setting (FET band) which s/he will be entering.

1.3 THE FURTHER EDUCATION AND TRAINING BAND

It is at this level that learners are to be prepared for higher education, vocational education, careers and self-employment. Various providers are involved in this band of education and training, e.g. senior secondary schools, technical colleges, NGOs, regional training centres, private providers and private colleges, private training centres, private companies, industry training centres and community colleges. This band is not compulsory (DoE, 1997).

The National Qualification Framework (NQF) is a framework for registering qualifications at specific levels and developing learning paths between them. It has 8 levels that are divided into three bands, namely, GET (level one), FET (levels two to four) and Higher Education (levels five to eight). The development of unit standards and curriculum for this band has to be carefully co-ordinated, as the NQF is based on the principle of integration of education, and the accumulation of credits across different institutions. These credits can consist of core units and optional units in combinations, undertaken in a variety of modes (DoE, 1997).

1.4 MOTIVATION FOR THE STUDY

Education in different countries around the world is designed in different phases, namely, pre-primary, primary, secondary and tertiary phase. In South Africa it is organised into Early Childhood Development phase, Foundation phase, Intermediate phase, Senior phase and the Further Education and Training (FET) phase.

In this study, my interest is in the transition from the Senior Phase (grade 9) to the FET phase (grade 10) and throughout the FET phase. Remaining a problem is the way learners negotiate these transitions, successfully in many cases, from one phase to another. Coupled with this is the question of content and conceptual understanding, which is troublesome in an OBE set-up. Broad learning outcomes, such as *problem solving in innovative ways* or *understanding concepts, principles and acquired knowledge in the Natural Sciences* (Curriculum 2005), do not, of themselves, recommend particular content. Yet content is very important. Questions of

the choice and sequencing of content in the curriculum are being tackled as serious research questions around the world (Fensham, 1999; Malcolm, 1999). These are questions that have also interested me as a subject advisor for Physical Science and an examiner for the Senior Certificate (grade 12 Physical Science) in the GDE. Furthermore, there is insufficient literature on longitudinal studies that follow the same learners throughout the period of their schooling (Galton & Morrison, 2000).

1.5 PROBLEM STATEMENT

Against the above background, the study explored the transition from Natural Science in the GET phase to Physical Science in the FET phase from 2005-2008. The following research questions were formulated:

- i. How can the transition from the Natural Science in the GET phase to Physical Science in the FET phase be characterized?
- ii. How do learners in the Gauteng province of South Africa experience the transition from Natural Science in the GET phase to Physical Science in the FET phase?
- iii. How can the learners' strategies and approaches for negotiating the transition be understood and explained?

1.6 AIMS OF THE STUDY

This was a four-year longitudinal study that aimed to characterize the transition from GET science to FET science, and to understand and explain how learners experienced and negotiated the transition from 2005-2008. It is hoped that the study will make a valuable contribution to the literature on transitions in education.

1.7 ORGANISATION OF THE CHAPTERS

In Chapter 2, I reviewed the literature that is relevant to the study, under the following topics: Curriculum 2005; implementation of C2005 in Natural Science; previous studies on transition in education; and the theoretical framework. The chapter concluded with directions for the research emanating from the literature review.

In Chapter 3, I gave an overview of the mixed methods approach and research instruments used in the study, namely document analysis, questionnaires; classroom observation, examination results, a diagnostic test and interviews.

In Chapter 4, I first discussed the results of the 2007 grade 11 Physical Science examination and then analysed the quantitative data emanating from the interest questionnaire, the Nature of Science questionnaire and the diagnostic test.

In Chapter 5, I analysed and discussed the qualitative data emanating from documentation, classroom observation and interviews.

In the last chapter, Chapter 6, I revisited the research questions gave the conclusions of the study. The chapter ended by pointing out the limitations of the study, directions for further research and implications for science education, with some recommendations made.