

**LEARNER EXPERIENCES OF TRANSITION FROM THE GENERAL  
EDUCATION AND TRAINING BAND TO THE FURTHER EDUCATION AND  
TRAINING BAND IN SCIENCE**

by

**Makunye Joseph Peloagae**

Submitted in partial fulfilment of the requirements for the degree

**PhD**

in the

Faculty of Education

at the

University of Pretoria

Supervisor: **Dr Estelle Gaigher**

December 2009

i

## DECLARATION

I declare that this research report is my own, unaided work. It is being submitted for the degree of *Philosophae Doctor* at the University of Pretoria, Pretoria. It has not been submitted before for any degree or examination at any other University.

---

M.J. PELOAGAE

11 December 2009

## **DEDICATION**

Dedicated to my late father, Mosedi, my late mother Mmaseithuti, my wife Beatrice, my three children Onkgopotse Mosedi, Mmapelo Mmaseithuti and Katlego as well as my sisters and brothers.

## **ACKNOWLEDGEMENTS**

My sincere gratitude goes to my supervisor Dr Estelle Gaigher for her patience and dedication in guiding me through the process of compiling this thesis. Her constructive criticism of my drafts helped me to gradually develop as a philosopher of science education and to understand and realize the challenges facing researchers in science education. I would also like to extend my sincere gratitude to Dr L. Jita for his unselfish support and good advice during the initial stages of my studies.

As my study also used quantitative data, I had to rely on assistance from statisticians. I would therefore also extend my gratitude to Dr Mike Van der Linde and Dr Liebie Louw for their tireless efforts in assisting me with the descriptive data and statistical inferences.

I am grateful to the principals, physical science teachers and learners of the secondary schools in Orange Farm, Johannesburg for their cooperation during the data collection stage of this study.

My heartfelt thanks need to be accorded my family for the enormous support and prayers throughout my work on this thesis.

Finally, to the one and only God, supreme and sovereign, for the perseverance, energy and spirit of wisdom and understanding.

## SUMMARY

This dissertation is based on a four year longitudinal study into learner experiences of transition from Natural Science in the General Education and Training (GET) band to Physical Science in the Further Education and Training (FET) band at a time of curriculum change in South Africa.

The progress and experiences of sixty-one learners from a township school were followed from grade 9 to grade 12. These learners were a unique cohort. They were in grade 1 when Curriculum 2005 (C2005) was introduced in 1997 and they were schooled under this curriculum throughout the GET phase. When they entered the FET phase, C2005 had been replaced by the National Curriculum Statement (NCS).

The study employed a mixed –methods approach. Data were collected using document analysis, an interest questionnaire, lesson observations, examinations, a test on the nature of science, a diagnostic test in chemistry as well as interviews with learners.

The study revealed that the transition was characterized by misalignment of not only content knowledge but also assessment practices. Content was not prescribed by C2005, but reintroduced in the NCS. Learners entered the FET phase whilst lacking basic scientific knowledge. Not even the exit level national examination of the GET phase assessed knowledge of basic science concepts required as a foundation for the FET phase. Furthermore, the emphasis on continuous assessment during the GET did not prepare the learners for the challenges of studying for tests and examinations.

The learners experienced the transition as very difficult. Initially, there was an increase shown in interest in Physical Science from grade 9 to grade 10, particularly amongst boys, but this interest declined as learners progressed to grade 12. They performed poorly, demonstrated poor conceptual understanding and poor problem solving skills. Most learners

lamented loss of the closer student-teacher relationships of the GET phase, expressed disappointment with the teacher centred teaching strategies and the lack of opportunities to do practical work. In fact, they ascribed their difficulties to the lack of practical work. They managed this transition through desperate means: they resorted to rote learning, algorithmic problem solving and ultimately, most learners chose careers not involving Physical Science.

I contend that the 2005 Grade 9 Natural Science learners were greatly disadvantaged by C2005 that did not prepare them adequately for Physical Science in the FET phase.

Although this study was limited to one school, it provided insight into learners' experiences of disappointment and difficulties to cope with challenges for which they were not prepared. The study highlighted the importance of matching curricula across phases at times when curricula are changed.

(Key words: transition, transfer, Natural Science, Physical Science, Curriculum 2005, National Curriculum Statement)

## **ACRONYMS AND ABBREVIATIONS**

<b>C2005</b>	<b>Curriculum 2005</b>
<b>CS</b>	<b>Commercial Sciences</b>
<b>DNE</b>	<b>Department of National Education</b>
<b>DoE</b>	<b>Department of Education</b>
<b>FET</b>	<b>Further Education and Training</b>
<b>GDE</b>	<b>Gauteng Department of Education</b>
<b>GET</b>	<b>General Education and Training</b>
<b>IQNSFS</b>	<b>Interest Questionnaire for the Natural Science Field of Study</b>
<b>JC</b>	<b>Junior Certificate</b>
<b>LOLT</b>	<b>Language of learning and teaching</b>
<b>LS</b>	<b>Life Sciences</b>
<b>MS</b>	<b>Mathematical Sciences</b>
<b>NATED 550</b>	<b>National Education 550 (Résumé of Instructional Programmes in Public Ordinary School)</b>
<b>NCS</b>	<b>National Curriculum Statement</b>
<b>NOS</b>	<b>Nature of Science</b>
<b>NSC</b>	<b>National Senior Certificate</b>
<b>NSKS</b>	<b>Nature of Scientific Knowledge Scale</b>
<b>OBE</b>	<b>Outcomes Based Education</b>
<b>PS</b>	<b>Physical Science</b>
<b>REQV</b>	<b>Relative Education Qualification Value</b>
<b>RNCS</b>	<b>Revised National Curriculum Statement</b>
<b>SACE</b>	<b>South African Council of Educators</b>
<b>StatsSA</b>	<b>Statistics South Africa</b>

## CONTENTS PAGE

<b>HEADING</b>	<b>PAGE</b>
<b>Chapter One: Introduction</b>	
1.1 Background	1
1.1.1 The scope of the study	2
1.1.2 Transition problems in schools	2
1.1.3 The profile of public school teachers in the Republic of South Africa	4
1.1.4 The plight of learners in transition to the FET phase	6
1.1.5 The plight of GET science educators	8
1.2 The General Education and Training band	9
1.3 The Further Education and Training band	10
1.4 Motivation for the study	10
1.5 Problem statement	11
1.6 Aims of the study	11
1.7 Organisation of the chapters	11
<b>Chapter Two: Literature Review</b>	
2.1 Introduction	13
2.2 International studies	13
2.2.1 Transition and transfer problems across the world	14
2.2.2 Studies of transition in science from a curriculum perspective	19
2.2.3 Studies of transition from a learner's point of view	22
2.2.4 Studies of transition from the teacher's point of view	23
2.2.5 Suggested solutions to transition problems	25
2.2.6 Attitude towards studies – another perspective on transition	28
2.2.7 Determining transitional success and failure	29
2.3 South African studies	29
2.3.1 The implementation of the Natural Science learning area of Curriculum 2005: An emerging theory	29

<b>HEADING</b>	<b>PAGE</b>
2.3.2 Previous studies on transition in science education in South Africa	31
2.3.3 Transition within transition	36
2.4 Theoretical framework	38
2.5 Way forward	40
2.6 Chapter summary	40
<b>Chapter Three: Research methodology</b>	
3.1 Introduction	42
3.2 Sample	42
3.3 Research design	42
3.4 Instruments and data collection	44
3.4.1 Documentation	45
3.4.2 Interest survey	45
3.4.3 Observation	48
3.4.4 The paper and pencil diagnostic test	49
3.4.5 The NOS questionnaire	51
3.4.6 The Grade 11 Physical Science examinations	54
3.4.7 Interviews	54
3.5 Data analysis	57
3.5.1 Document analysis	57
3.5.2 Classroom observation	57
3.5.3 Questionnaires and interviews	57
3.6 Validity and reliability	60
3.7 Triangulation	61
3.8 Ethical considerations	61
3.9 Chapter summary	62



<b>HEADING</b>	<b>PAGE</b>
----------------	-------------

### **Chapter Four: Results – Quantitative data**

4.1	Introduction	63
4.2	The grade 11 examination	64
4.3	The Interest Questionnaire (IQNSFS)	66
4.3.1	Reliability of the Interest Questionnaire	67
4.3.2	Subject preferences of grade 9 learners	72
4.3.3	Change in interest from grade 9 to grade 10	74
4.3.4	Correlation between achievement in the grade 11 examinations and interest	75
4.3.5	Summary of results of the interest questionnaire	78
4.4	The Nature of Science survey	79
4.4.1	Epistemological beliefs	79
4.4.2	Correlation between achievement and NSKS scores	85
4.4.3	Summary of the NOS survey results	86
4.5	The Diagnostic Test	87
4.5.1	Question 1	88
4.5.2	Question 2	89
4.5.3	Discussion of diagnostic test results	91
4.6	Chapter summary	92

### **Chapter Five: Results – Qualitative data**

5.1	Introduction	94
5.2	Documentation	94
5.2.1	Changes in prescribed content	95
5.2.2	Changes in time allocation	96
5.2.3	Documentation required	96
5.2.4	Additional support	97
5.2.5	Assessment	97
5.2.6	Matching GET Science with FET Physical Science	97
5.3	Classroom observation	101
5.3.1	Lesson 1 and Lesson 2	103
5.3.2	Lesson 7 and Lesson 8	106

<b>HEADING</b>	<b>PAGE</b>
5.3.3 Summary	107
5.4 Interviews	108
5.4.1 Sample interview	110
5.4.2 Favourite subject	112
5.4.3 Career choice	114
5.4.4 Attitude to science during transition	116
5.4.5 Teacher-student relationship over the transition period	119
5.4.6 Teaching strategies over the transition period	120
5.4.7 Transition – how they feel about it	121
5.4.8 Conceptual understanding – learning strategies	123
5.4.9 Summary of interview responses	129
5.5 Chapter summary	131
 <b>Chapter Six: Synthesis</b>	
6.1 Introduction	133
6.2 Triangulation of results	133
6.3 Research questions re-visited	135
6.3.1 Characterization of the transition	135
6.3.2 Learners’ experiences of the transition	136
6.3.3 Learners’ strategies for and approaches to negotiating the transition	141
6.3.4 Conclusion	143
6.4 Limitations to the study	146
6.5 Directions for further research, implications for science education and recommendations	146
 <b>REFERENCES</b>	 148
 <b>LIST OF FIGURES</b>	
Figure 1.1 Race distribution in the ordinary school sector in 2005	4

<b>HEADING</b>	<b>PAGE</b>
Figure 2.1 The repetition rate from 2001 to 2004	32
Figure 2.2 Aspects of a gap adapted from Rollnick et al., 1998	39
Figure 3.1 A diagrammatic representation of the research design	44
Figure 4.1 Scatter-plot of examination score vs. Interest score	78
Figure 4.2 Scatter-plot of examination score vs. NSKS score	86
Figure 4.3 Response patterns for Question 1	89
Figure 4.4 Response patterns for Question 2	91
Figure 5.1 Poor teaching	101
Figure 5.2 Sitting arrangement in the classroom (aerial view)	102

#### **LIST OF TABLES**

Table 1.1 Repetition by grade	8
Table 2.1 Schools in the Gauteng province according to lowest and highest grade (2006)	37
Table 3.1 The distribution of questions in the IQNSFS according to subject	47
Table 3.2 Model of Scientific Knowledge (Rubba and Anderson, 1978)	53
Table 3.3 NSKS Item Point Value Assignments	59
Table 3.4 NSKS Item-to-subscale key	59
Table 4.1a Achievement in the 2007 grade 11 Physical Science examinations (Chemistry)	65
Table 4.1b Descriptive statistics on the Physical Science examination	66

<b>HEADING</b>	<b>PAGE</b>
Table 4.2      The number of grade 9 learners in the sample	67
Table 4.3      Correlation and reliability of items for Physical Science	68
Table 4.4      Correlation and reliability of items for Life Sciences	69
Table 4.5      Correlation and reliability of items for Mathematical Sciences	70
Table 4.6      Correlation and reliability of items for Computer Sciences	71
Table 4.7      The arithmetic means, standard deviations and medians according to subject and gender	72
Table 4.8      T-test comparison of boys' and girls' interest in scientific subjects	73
Table 4.9      Change in average scores in the Physical Science interest questionnaire for learners when progressing from grade 9 to grade 10	74
Table 4.10     T-test comparison of interest in Physical Science in grade 9 and grade 10	75
Table 4.11     Interest in Physical Science versus achievement in the Physical Science examinations	76
Table 4.12     Descriptive statistics on Interest score & Examination marks	77
Table 4.13a    Exam scores, NSKS scores and belief classification of the Physical Science group	80
Table 4.13b    Descriptive statistics on the examination and NSKS scores	81
Table 4.14     NSKS scores of the Commercial Sciences group	82
Table 4.15     Descriptive statistics on the NSKS scores of the Physical Science group and the Commercial Science group	82
Table 4.16     T-test comparison of NSKS scores of the Physical Science and Commercial Science groups	83

<b>HEADING</b>	<b>PAGE</b>
----------------	-------------

Table 4.17	Descriptive statistics on NSKS scores between the Physical Science boys and girls	84
Table 4.18	T-test comparison of NSKS scores of boys and girls	84
Table 4.19	Descriptive statistics on the examination marks of Post positivists and Empiricists	85
Table 4.20	Diagnostic Test: Score per question with confidence levels in brackets	87
Table 4.21	Response patterns for Question 1	89
Table 4.22	Response patterns for Question 2	90
Table 5.1	The Common Tasks for Assessment: grade 9 Natural Science	99
Table 5.2	Analysis of the scope and depth of concepts covered in the 2005 CTA	100
Table 5.3	Physical Science lessons observed	103
Table 5.4	Scores of the 8 interviewees in the gr. 11 examinations and the NOS questionnaire	110
Table 5.5	Response codes used for interviews	110
Table 5.6	Pilot interview with Herman Pattington	111
Table 5.7	Summary of interview responses	131
Table 6.1	Triangulation of results	134

**LIST OF APPENDICES**

APPENDIX A:	Interest questionnaire for the Natural Science field of study (IQNSFS)	169
APPENDIX B:	The Frequency Procedure	174
APPENDIX C:	Nature of Scientific Knowledge Scale questionnaire (NSKS)	189

<b>HEADING</b>	<b>PAGE</b>
APPENDIX D: Diagnostic test	192
APPENDIX E: Classroom observation	196
APPENDIX F: Grade 10 Lesson Plan	199
APPENDIX G: Grade 10 Physical Science (NCS)	201
APPENDIX H: Grade 10 Physical Science Lessons 1 & 2	203
APPENDIX I: Grade 10 Physical Science Lessons 7 & 8	206
APPENDIX J: Interview transcripts	208
APPENDIX K: Examination content and weighting of LO's for grades 10 and 11	226
APPENDIX L: Natural Science – core knowledge and concepts (grade 9 NCS)	227
APPENDIX M: 2008 Grade 12 Physical Science results per province	229
APPENDIX N: The composition and pass requirements of the National Senior Certificate	230
APPENDIX O: Class of 2008	231