

https://dspace.org/

Towards the development of instructional strategies for teaching algebra in multilingual classrooms in South Africa :|ba study of two cases

Mparutsa, Sophie Thandiwe

2011-06-23
http://hdl.handle.net/10539/10175

Downloaded from a DSpace repository. https://dspace.org/

Abstract

This study explored instructional strategies that teachers in multilingual mathematics classrooms use to support the development of mathematical proficiency in algebra. The need for improvement of mathematics matriculation results in many multilingual schools is a well accepted concern in South Africa. The research method used was two case studies. In one case, the teacher shared a home language with all the learners. In the other case, the teacher did not share a home language with most of the learners. Data collected revealed that the teachers used language strategies as well as other strategies that would be used in any other mathematics classroom. These strategies were: Interactive Instruction; Scaffolding; Multiple Representations; Code-Switching and Language Modes. The data further revealed that the strategies were not used in isolation but in different combinations as needed, to support the learners.

Keywords:

Instructional Strategies
Interactive Instruction
Multiple Representations
Code-Switching
Language Modes
Scaffolding

Declaration

I declare that this dissertation is my own work. It is submitted for the degree of Master of Science in Mathematics Education in the University of Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any other university.

Sophie Thandiwe Mparutsa

February, 2011

Acknowledgements

My heartfelt gratitude to:

My supervisor, Professor Mamokgethi Setati, for the exceptional guidance, advice and support she gave me.

The teachers, for their willingness to be part of the research project.

Nomusa Ndlovu, for her patience in translating parts of the transcripts into English.

The principal and the learners at the school where the research was conducted.

My family, for their support and encouragement.

TABLE OF CONTENTS

PAGE

ABSTRACT ---------- i

DECLARATION ---------- ii

ACKNOWLEDGEMENTS ---------- iii

TABLE OF CONTENTS ---------- iv

LIST OF FIGURES ---------- vii

LIST OF TABLES ---------- viii

CHAPTER 1 : BACKGROUND TO THE STUDY ---------- 1

- WHY THIS STUDY? ---------- 2
- WHY NOW? ---------- 3
- WHY FOCUS ON TEACHERS AND TEACHING? ---------- 6
- WHY INSTRUCTIONAL STRATEGIES? ---------- 7
- CONCLUSION ---------- 9

CHAPTER 2: RATIONALE ---------- 11

- WHY ALGEBRA? ---------- 11
- WHY EXPONENTS? ---------- 17
- CONCLUSION ---------- 20

CHAPTER 3: THEORETICAL FRAMEWORK AND LITERATURE REVIEW -- 21

THEORETICAL FRAMEWORK ---------- 21

- CONSTRUCTIVISM ---------- 21
- ZONE OF PROXIMAL DEVELOPMENT ---------- 25

LITERATURE REVIEW ---------- 27

- LANGUAGE AS A THINKING TOOL ---------- 27
- LANGUAGE AS A TOOL FOR COMMUNICATION ---------- 30
- MATHEMATICAL LANGUAGE ---------- 32
- LANGUAGE AND LEARNING IN MATHEMATICS MULTILINGUAL CLASSROOMS ----- 33
- MATHEMATICAL PROFICIENCY ---------- 39
- INSTRUCTIONAL STRATEGIES ---------- 44

STRATEGIES THAT SUPPORT AN ENABLING CLASSROOM ENVIRONMENT ---------- 47
STRATEGIES THAT PROMOTE UNDERSTANDING AND COMPREHENSION ---------- 50
CONCLUSION ---------- 60
CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY ---------- 61
WHY QUALITATIVE STUDY? ---------- 61
THE SAMPLE ---------- 63
DATA COLLECTION ---------- 64
RIGOUR IN THE RESEARCH ---------- 66
VALIDITY ---------- 67
RELIABILITY ---------- 70
ETHICAL CONSIDERATIONS ---------- 71
DATA ANALYSIS ---------- 72
CONCLUSION ---------- 74
CHAPTER 5: ANALYSIS ---------- 75
DESCRIPTIONS OF STRATEGIES IN LESSONS ---------- 75
STRATEGIES USED BY JEAN ---------- 75
LESSON 1 ---------- 75
LESSON 2 ---------- 77
LESSON 3 ---------- 80
LESSON 4 ---------- 82
STRATEGIES USED BY DAVID ---------- 84
LESSON 1 ---------- 85
LESSON 2 ---------- 87
LESSON 3 ---------- 91
CONCLUSION ---------- 94
CHAPTER 6: ANALYSIS ---------- 95
EXPLORING STRATEGIES ---------- 95
MULTILPLE REPRESENTATIONS ---------- 96
INTERACTIVE INSTRUCTION ---------- 102
LANGUAGE MODES ---------- 112
CODE-SWITCHING ---------- 120

SCAFFOLDING INSTRUCTION ---------- 128
CONCLUSION ---------- 133
CHAPTER 7: FINDINGS OF THE STUDY ---------- 135
INSTRUCTIONAL STRATEGIES USED IN MULTILINGUAL CLASSROOMS ---------- 135
HOW INSTRUCTIONAL STRATEGIES ARE USED IN MULTILINGUAL CLASSROOMS ---------- 140
RECOMMENDATIONS ---------- 143
LIMITATIONS OF THE STUDY---------- 144
CONCLUSION ---------- 145
REFERENCES ---------- 146
APPENDIX A: MATRIC EXAMINATIONS QUESTIONS (2008) ON EXPONENTS ---------- 161
APPENDIX B: CONSENT FORMS ---------- 164
APPENDIX C: CATEGORIES USED FOR NALYSING DATA ---------- 168
APPENDIX D: TRANSCRIPTS OF LESSONS ---------- 170
APPENDIX D1: JEAN LESSON 1 ---------- 170
APPENDIX D2: JEAN LESSON 2 ---------- 177
APPENDIX D3: JEAN LESSON 3 ---------- 184
APPENDIX D4: JEAN LESSON 4 ---------- 192
APPENDIX D5: DAVID LESSON 1 ---------- 197
APPENDIX D6: DAVID LESSON 2 ---------- 206
APPENDIX D7: DAVID LESSON 3 ---------- 212
APPENDIX E: TEACHER INTERVIEWS ---------- 216
APPENDIX E1: INTERVIEW WITH JEAN ---------- 216
APPENDIX E2: INTERVIEW WITH DAVID ---------- 219

LIST OF FIGURES

FIGURE 3.1 ***Interaction of Language forms in Multilingual Classrooms*** ---------- **31**

FIGURE 3.2 ***Routes from speaking mathematics to writing mathematics*** ---------- **33**

FIGURE 3.3 ***Percentage of South African pupils that answered free-response items correctly*** ---------- **35**

FIGURE 3.4 ***Alternative routes from informal spoken to formal written mathematics language (Setati, 2002)*** ---------- **38**

FIGURE 3.5 ***Graphical solution of when and where the friends meet*** ---------- **56**

FIGURE 7.1 ***Part of the diagram of "Alternative routes from informal spoken (in main language) to formal written (in English) mathematics language"(Setati, 2002)*** ---------- **140**

FIGURE 7.2 ***Combinations of Instructional Strategies*** ---------- **142**

FIGURE 7.3 ***Percentage of learners who share a home language with teacher*** -------- **145**

LIST OF TABLES

TABLE 2.1 ***Percentage of examination questions involving exponents (2002-2007)*** **--- 19**

TABLE 2.2 ***Percentage of examination questions involving exponents in 2008*** **-------- 19**

TABLE 2.3 ***Distribution of exponents in learning outcomes of the new FET Curriculum*** **---------- 20**

TABLE 4.1 ***Mathematics Proficiency Strands and corresponding Indicators*** **---------- 74**