

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**PRIMARY SCIENCE CURRICULUM IMPLEMENTATION
IN MALAYSIA:
INQUIRY AS HOPE AND PRACTICE**

A thesis presented in fulfilment of the requirements
for the degree of Doctor of Philosophy in Education
at Massey University
Palmerston North
New Zealand

Jeannie Ling Ai Yieng

1999

ABSTRACT

Malaysia is gearing towards becoming a fully industrialised country by the year 2020 as envisaged in the nation's 'Vision 2020'. The decline in the number of students taking up science in upper secondary schools over the last decade has caused great concern among many politicians and science educators over the availability of skilled manpower necessary to achieve the nation's vision. Various measures have been introduced to promote students' interest in taking up science, among which was the introduction of an inquiry-based science curriculum for all primary schools in 1995. While understanding of basic scientific concepts continues to be an important goal of the new curriculum, the curriculum also emphasises the development of thinking skills, scientific skills, scientific attitudes and moral values.

A qualitative case study methodology was employed to study the status of implementation of the inquiry-based primary science curriculum in two Malaysian schools. The study focused on five experienced teachers each observed teaching a series of lessons on 'Animal Reproduction' to primary four pupils. Semi-structured interviews were conducted to find out the teachers' views and understandings on matters related to science, science teaching and learning, and the science curriculum. Some sense of the science context in the school was established through interviews with the respective head teachers. Documents and records such as school calendars, minutes of meetings, teachers' record books, pupils' science exercise books, and science test papers were also analysed to supplement data collected from classroom observations and interviews.

The results of the study reveal that the teachers practised teacher-centred instructional strategies, presenting facts and information directly to the pupils and largely neglecting the aspects of curriculum which deal with the development of skills and attitudes. There was little opportunity for pupils to learn science concepts through practical work and inquiry. Inadequate teacher preparation, poorly designed curriculum materials, an inappropriate assessment system, incongruent socio-cultural context of learning, and lack of professional and organisational support were identified to be among the factors which contributed to the teachers' inability to effectively implement the inquiry-based science curriculum. Appropriate actions need to be urgently taken to rectify these problems. Otherwise, we may be witnessing another generation of science teaching where inquiry learning is simply an espoused aspiration. The vision of developing pupils into the self-reliant, creative and innovative individuals as advocated in the science curriculum remains distant.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank the Malaysian government for providing me with the opportunity to undertake this study. This research is made possible with a scholarship from the Malaysian Ministry of Education.

I am grateful to my supervisors, Dr. Alison St. George and Dr. Heather Ryan for their invaluable guidance, constructive criticism and encouragement which provided the challenge and motivation necessary to complete this study. Thank you very much for helping me to pull through difficult times, especially those periods of desperation and frustration in the initial stage of thesis writing.

To the head teachers, the teachers and pupils of the two primary schools where the study was undertaken, I would like to express my sincere gratitude for letting me into their classrooms, and for sharing their experiences so willingly with me. This study would not have been possible without their support and co-operation.

I would like to thank the Graduate Research Funding Committee for granting me financial assistance, enabling me to carry out the research field work and to present a paper related to my study at the 1998 Australasian Science Educational Research Annual Conference in Darwin, Australia.

I would also like to record my appreciation to Professor James Chapman, Head of the Department of Learning and Teaching, and Ms. Helen Sneddon, the Departmental Secretary, for their support. Thank you Mr. Nick Broomfield for helping me to resolve all my 'computer problems'.

Above all, I would like to thank Almighty God, who worked in His own mysterious ways, through the many people who supported me throughout my study.

This thesis is dedicated to my husband John and my three sons, Thomas, Francis and Anthony. Thank you for your love and support.

May God Bless you all.

TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	x
CHAPTER ONE: INTRODUCTION	1
1.1 The Malaysian Education System	2
1.1.1 Historical background	2
1.1.2 Overview of the Malaysian school structure	3
1.1.3 Malaysian primary education	5
1.1.4 Overview of science education in Malaysia	7
1.1.5 What does 'Education' mean to the Malaysian society?	9
1.2 Study Rationale	10
1.3 Thesis Organisation	11
CHAPTER TWO: DIRECTIONS IN SCIENCE EDUCATION	12
2.1. Views of the Nature of Science: Positivism, Post-Positivism and Constructivism	12
2.2. School Science Curriculum Development	15
2.3 Contemporary Issues in Science Education	18
2.3.1 Content and process reconsidered	18
2.3.2 Constructivist view of learning	20
2.3.3 Learners' prior knowledge	21
2.3.4 Learning as conceptual change	23
2.3.5 Inquiry learning	25
2.3.6 'Hands-on' and 'minds-on' activities	26
2.3.7 Situated learning	28
2.3.8 Cognitive apprenticeship	29
2.3.9 Science, technology and society	31
2.4 Overview of Malaysian Primary Science Curriculum	33
2.5 Summary	35

CHAPTER THREE: CURRICULUM IMPLEMENTATION	36
3.1 Current Status of Science Teaching	36
3.2 Key Factors Affecting Curriculum Implementation	38
3.2.1 Teacher	38
3.2.2 Cultural context of learning	43
3.2.3 Curriculum materials	44
3.2.4 Assessment system	47
3.3. Teacher Development and Curriculum Implementation	48
3.3.1 Teacher education programs	50
3.3.2 School-based teacher development	61
3.4 Implementation of Malaysian Primary Science Curriculum	67
3.4.1 Teacher preparation	68
3.4.2 Curriculum materials and other resources	73
3.4.3 Assessment	74
3.5 Summary	74
 CHAPTER FOUR: RESEARCH METHODOLOGY	 76
4.1 Statement of Purpose and Research Questions	76
4.2 Research Design: The Case Study Approach	76
4.3 Sample Selection	78
4.4 Participating Schools	78
4.5 Research Participants	80
4.6 Data Collection Techniques	81
4.6.1 Observation	81
4.6.2 Interviews	83
4.6.3 Documents	90
4.7 Research Procedure	91
4.8 Data Analysis	97
4.9 Ethical Issues	100
4.10 Triangulation, Validity, Authenticity and Reliability	100
4.11 Summary	103

CHAPTER FIVE: CASE STUDY REPORTS (PART I)	104
5.1 Sin Hwa Chinese Primary School	104
5.2 The Headmaster: Mr. Ong	108
5.3 Head of Science: Mrs. Lim	111
5.4 Case Study Teacher (1): Mrs. Lim	113
5.4.1 Teacher's profile	113
5.4.2 Inside Mrs. Lim's classroom	115
5.4.3 Mrs. Lim's knowledge and understanding of science and science teaching	119
5.4.4 Summary	127
5.5 Case Study Teacher (2): Mrs. Chan	128
5.5.1 Teacher's profile	128
5.5.2 Inside Mrs. Chan's classroom	130
5.5.3 Mrs. Chan's knowledge and understanding of science and science teaching	135
5.5.4 Summary	141
CHAPTER SIX: CASE STUDY REPORTS (PART II)	143
6.1 St. Elizabeth National Primary School	143
6.2 The Headmistress: Pn. Doris	145
6.3 Head of Science: Pn. Jane	147
6.4 Case Study Teacher (3): Pn. Jane	149
6.4.1 Teacher's profile	149
6.4.2 Inside Pn. Jane's classroom	150
6.4.3 Pn. Jane's knowledge and understanding of science and science teaching	153
6.4.4 Summary	162
6.5 Case Study Teacher (4): Pn. Christina	165
6.5.1 Teacher's profile	165
6.5.2 Inside Pn. Christina's classroom	166
6.5.3 Pn. Christina's knowledge and understanding of science and science teaching	168
6.5.4 Summary	174

6.6	Case Study Teacher (5): Pn. Fatimah	175
6.6.1	Teacher's profile	175
6.6.2	Inside Pn. Fatimah's classroom	175
6.6.3	Pn. Fatimah's knowledge and understanding of science and science teaching	180
6.6.4	Summary	189

CHAPTER SEVEN: DISCUSSION **190**

7.1	Discussions of Research Findings	190
7.1.1	Teachers' classroom practice	190
7.1.2	Teachers' understandings of the Malaysian Primary Science Curriculum	200
7.1.3	Teachers' conceptions of science teaching and learning	204
7.1.4	Other problems faced by the teachers	206
7.1.5	The extent to which the teachers implemented the Malaysian Primary Science Curriculum	215
7.2	Summary	217

CHAPTER EIGHT: SUMMARY AND CONCLUSIONS **219**

8.1	Factors Influencing Curriculum Implementation	219
8.1.1	Teachers' preparation	220
8.1.2	Curriculum materials	221
8.1.3	Assessment system	221
8.1.4	Support system	222
8.2	Contributions of the Study to the Literature	222
8.2.1	Research methodology	222
8.2.2	Factors influencing curriculum implementation	223
8.3	Recommendations for More Effective Curriculum Implementation	224
8.3.1	Review of teacher preparation programs	224
8.3.2	Review of ongoing professional support for teachers	226
8.3.3	Review of assessment system	227
8.3.5	Review and revision of curriculum materials	228
8.4	Limitations of the Study	229
8.5	Recommendations for Further Research	229
8.6	Concluding Note	230

GLOSSARY OF ACRONYMS	232
APPENDICES	233
Appendix A: Structure of the Malaysian Education System	233
Appendix B: Initiation Activities in the Implementation of Malaysian Primary Science Curriculum	234
Appendix C: Content of the Twelve Modules on Malaysian Primary Science Curriculum	235
Appendix D: Interview Protocols	
D1: Head Teacher's Interview	236
D2: Teacher's Interview-About-Instances	237
D3: Teacher's Curriculum Interview	238
Appendix E: Permission Letters	
E1: Letter To EPRD Requesting Permission to Carry out the Study	239
E2: Permission Letter from EPRD	240
E3: Letter To Sabah State Education Department Requesting Permission to Carry out the Study in the Two Schools	241
Appendix F: Information Sheets	
F1: Information Sheet For Head Teachers	242
F2: Information Sheet For Teachers	244
Appendix G: Consent Letters	
G1: Head Teacher's Consent Letter	246
G2: Teacher's Consent Letter	247
Appendix H: Questionnaires	
H1 Head Teacher's Questionnaire	248
H2 Teacher's Questionnaire	250
Appendix I: Interview and Lesson Transcripts	
I1: Mrs. Chan's Science Teaching-Learning Strategies Interview Transcript	252
I2: Mrs. Chan's Curriculum Interview Transcript	258
I3: Mrs. Chan's Interview-About-Instances Transcript	263
I4: Mrs. Chan's Stimulated-Recall Interview Transcript	268
I5: Mrs. Chan's Lesson Transcript (I)	274
I6: Mrs. Chan's Lesson Transcript (II)	277
I7: Mrs. Chan's Lesson Transcript (III)	281
I8: Pn. Doris's Interview Transcript	285

Appendix J: Letter To Research Participants Requesting Feedback on Report Findings.	288
Appendix K: Sin Hwa School Scheme of Work for Primary Four Science, 1997	290
Appendix L: Suggested Activities on ‘Animal Reproduction’ from the Teachers’ Guide (Khor, 1994b)	291
Appendix M: Objectives of ‘Animal Reproduction’ in the Teachers’ Guide (Khor, 1994b)	292
REFERENCES	293

LIST OF TABLES

Table 1.1: Number of Primary Schools, Classes, Teachers and Pupils in Malaysia as at 6 January 1997	4
Table 1.2: Number of Secondary Schools, Classes, Teachers and Pupils in Malaysia as at 6 January 1997	4
Table 1.3: Structure of Malaysian Integrated Primary Curriculum (KBSR)	6
Table 1.4: Upper Secondary Enrolment in Malaysian schools by Stream (1981 - 1991)	9
Table 3.1: Four Paradigms of Teacher Education	52
Table 3.2: Primary Four Science Orientation Course Timetable	70
Table 3.3: Syllabus Content of the Pre-service Primary Science Teacher Training Program in Malaysia	71
Table 3.4: Expenditure Incurred during the Implementation of the Malaysian Primary Science Curriculum (1994-1996)	73
Table 4.1 : Characteristics of Participating Schools	79
Table 4.2: Participating Schools' UPSR Performance (1994-1996)	79
Table 4.3: Participating Teachers' Profiles	80
Table 4.4: Documents Used in the Study	91
Table 4.5: A Summary of the Events Involved in the Research Process	95
Table 4.6: Strategies to Enhance Validity	101
Table 5.1: Sin Hwa Primary 4C Timetable	105
Table 5.2: Summary of Mrs. Lim's Lessons	116
Table 5.3: Summary of Mrs. Chan's Lessons	132
Table 6.1: Summary of Pn. Jane's Lessons	152
Table 6.2: Summary of Pn. Christina's Lessons	167
Table 6.3: Summary of Pn. Fatimah's Lessons	176
Table 7.1: Suggested Activities for 'Animal Reproduction' in the Curriculum Materials	196
Table 7.2: Orientations to Science Teaching and Learning	205
Table 7.3: Comparing Malaysian Primary Science Curriculum Emphasis and Classroom Practice	216