

TEACHERS' PERCEPTION IN TEACHING MATHEMATICS AND SCIENCE IN
BAHASA MELAYU

SOHBATINI KALADARAN

A project report submitted in partial fulfilment of
the requirements for the award of the degree of
Master of Education (Curriculum and Instruction)

Faculty of Education
Universiti Teknologi Malaysia

SEPTEMBER 2012

Dedication

To my beloved husband Brett,
My lovely children Selena Frederica and Adrian Frederic,
Family members and friends

ACKNOWLEDGEMENT

All praise and glory to God, with His grace and mercy I am able to complete this master project. I thank God for His blessing and favour.

At the same time this piece of work would not become possible without the contributions from many people and organizations. I would like to acknowledge each and every person who has contributed their effort in this study by whatever means directly or indirectly. Firstly, I would like to acknowledge my supervisor, Prof Dr. Zaitun Binti Sidin for her kind assistance and advice, beneficial criticisms and observations throughout this master project.

A special thank goes to my beloved husband Brett Chandra, my lovely children Selena and Adrian for loving and supporting me. Not to forget, my appreciation goes to my mother, mother-in-law, my sibling and other family member for their prayer, support as well as encouragement which is the greatest motivation for me to successfully finish the project.

I would also like to thank the respondents of this study that help me by filling up the questionnaire, special thanks to all of you. Your kind and generous help will always be in my mind. For the rest of the persons who I didn't mention here, who have participated in various ways to ensure my research succeeded, thank you to all of you.

ABSTRACT

The aim of this research is to investigate teachers' perception on teaching Mathematics and Science in Bahasa Melayu after having teaching both these subjects in English for eight (8) years in zone Skudai. 65 Mathematics and Science teachers in six different schools in the area of Skudai were selected as respondents of this research. The objectives of this study have been narrowed down to investigate the three aspects, namely, perceptions of the teachers using Bahasa Melayu as the medium of instruction, problems encountered by teachers in using Bahasa Melayu to teach Mathematics and Science as well as teachers' perception about the change in policy to teach Mathematics and Science in Bahasa Melayu. The data were obtained by using a set of questionnaire of 33 items, divided into two parts. The data from the questionnaires were analyzed into percentages, means, frequencies and ANOVA. The findings of this study revealed that the Mathematics and Science teachers showed moderate perception towards the teaching of these subjects in Bahasa Melayu with the mean value obtained is 3.45. Even though they are confident to teach in Bahasa Melayu, nevertheless they also have problems when using Bahasa Melayu as medium of instruction for teaching Mathematics and Science whereas the mean value obtained is 3.34. However, the highest mean value is obtained on teachers' perception about the change in the policy that is 3.65. Overall mean value revealed teachers' perception in this study is moderate.

ABSTRAK

Kajian ini bertujuan untuk mengkaji persepsi guru-guru terhadap pengajaran Matematik dan Sains dalam Bahasa Melayu selepas lapan tahun mengajar kedua-dua matapelajaran dalam bahasa Inggeris di zon Skudai. Seramai 65 orang guru-guru Matematik dan Sains dari enam buah sekolah di zon Skudai telah dipilih sebagai responden kajian ini. Objektif kajian ini telah dikhususkan untuk mengkaji tiga aspek iaitu persepsi guru-guru menggunakan Bahasa Melayu sebagai bahasa penghantar, masalah yang dihadapi oleh guru-guru dalam menggunakan Bahasa Melayu untuk mengajar Matematik and Sains dan persepsi guru-guru mengenai perubahan dalam polisi untuk mengajar Matematik dan Sains di dalam Bahasa Melayu. Data telah dikumpulkan dengan menggunakan satu set soal selidik yang mengandungi 33 item dan dibahagikan kepada dua bahagian. Data yang dikumpulkan kemudiannya dianalisis ke dalam bentuk peratusan, min, frekuensi dan ANOVA. Kajian ini mendapati responden menunjukkan persepsi yang sederhana terhadap pengajaran Matematik dan Sains dalam Bahasa Melayu dimana nilai min adalah 3.45. Walaupun mereka mempunyai keyakinan untuk mengajar dalam Bahasa Melayu, namun mereka juga menghadapi masalah dalam penggunaan Bahasa Melayu sebagai bahasa penghantar dengan nilai min yang di perolehi adalah 3.34. Walaubagaimanapun, min tertinggi diperolehi dalam persepsi guru-guru mengenai perubahan dalam polisi untuk mengajar Matematik dan Sains di dalam Bahasa Melayu adalah 3.65. Min keseluruhan menunjukkan persepsi guru-guru dalam kajian ini adalah sederhana.

TABLE OF CONTENTS

CHAPTER	CONTENTS	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xv
	LIST OF ABBREVIATIONS	xvi
Chapter 1	INTRODUCTION	
	1.0 Introduction	1
	1.1 Background of The Study	3
	1.2 Statement of The Problem	7
	1.3 Objectives of The Study	8
	1.4 Research Questions	9
	1.5 Importance of The Study	10
	1.5.1 Teachers	10
	1.5.2 Students	11
	1.5.3 Administrators	11

1.5.4	Ministry of Education	12
1.6	Scope of the Study	12
1.7	Operational Term	13
1.8	Conclusion	15

Chapter 2 LITERATURE REVIEW

2.0	Introduction	16
2.1	Provision of Mathematics and Science in the Curriculum Development of Education in Malaysia	17
2.2	The Aims and Importance of Mathematics Education in Malaysia	21
2.3	The Aims and Importance of Science Education in Malaysia	23
2.4	The Role of Language In Learning Mathematics and Science	25
2.5	Why teach Mathematics and Science in English?	26
2.6	Complexity of language of Mathematics and Science	27
2.7	Development in Language Across Curriculum	28
2.8	Changes in Medium of Instruction for Mathematics and Science (PPSMI)	29
2.8.1	History of PPSMI Implementation	29
2.8.2	Objectives and Rationale of PPSMI	30
2.8.3	Implementation of PPSMI	30
2.8.3.1	Special Computer Courseware For Teaching	31
2.8.3.2	Reference Books in English	31
2.8.3.3	Computers and LCDs for Teaching	32
2.8.3.4	English for Teaching Mathematics and Science (ETeMS)	32

2.8.3.5 Incentives for Teachers	33
2.8.4 PPSMI Implementation Model	34
2.9 Abolishment of PPSMI	35
2.10 Past Studies	36
2.11 Conclusion	40

Chapter 3 RESEARCH METHODOLOGY

3.1 Introduction	41
3.2 Research Design	42
3.3 Population and Sampling	43
3.4 Research Instrument	45
3.5 The Pilot Study	48
3.6 Procedures of the Study	50
3.7 Data Collection	50
3.8. Data Analysis	51
3.9 Conclusion	52

Chapter 4 RESULT OF THE STUDY

4.0 Introduction	53
4.1 Findings of the Study	54
4.1.1 Demographic Background of the Respondents	55
4.1.1.1 Gender of the Respondents	55
4.1.1.2 Ethnic of the Respondents	56
4.1.1.3 Subject Taught at School by Respondents	57
4.1.2 Results of the Study	58

	schools Perceptions of the Teachers Using Bahasa Melayu as the Medium of Instruction for Teaching Mathematics and Science	91
5.2.2	The Problems Encountered in using Bahasa Melayu to Teach Mathematics and Science	95
5.2.3	Teachers' Perception about Change in Policy to Teach Mathematics and Science in Bahasa Melayu.	97
5.3	Implication of the study. Action to be taken.	99
5.4	Recommendation for future research	100
5.5	Conclusion	101

REFERENCES	103
-------------------	------------

APPENDIX 1	109
APPENDIX 2	112
APPENDIX 3	114
APPENDIX 4	115
APPENDIX 5	123
APPENDIX 6	124

LIST OF TABLES

TABLE NO	TITLE	PAGE
3.1	Score of five Point Likert –Scale for positive questions	46
3.2	Score of five Point Likert –Scale for negative questions	47
3.3	Items Distribution in Questionnaire	47
3.4	Mean Scores and Mean Power	51
4.1	Gender of Respondents	55
4.2	Ethnic of the Respondents	56
4.3	Subject Taught at School by Respondents	57
4.4	The Perceptions of the Teachers with regard to the use of Bahasa Melayu as medium of instruction for teaching Mathematics and science in secondary schools.	59
4.5	The perceptions of subject teachers using Bahasa Melayu as medium of instruction for teaching Mathematics and Science.	63
4.6	The problems encountered in using Bahasa Melayu	

	to teach Mathematics and Science as perceived by the teachers.	68
4.7	The problems encountered in using Bahasa Melayu to teach Mathematics and Science as perceived by the subject teachers.	72
4.8	Teachers' Perception about Change in Policy to Teach Mathematics and Science in Bahasa Melayu.	77
4.9	Subject Teachers' Perception about Change in Policy to Teach Mathematics and Science in Bahasa Melayu	81
4.10	Overall Mean Value	84
4.11	Analysis of Variance (ANOVA) test for three constructs	86

LIST OF FIGURES

FIGURE NO	TITLE	PAGE
2.8.4	PPSMI Implementation Model	34

LIST OF ABBREVIATIONS

BISP	Bayaran Insentif Subjek Pendidikan
CALP	Cognitive academic language proficiency
ELTC	English Language Training Centre English Language Training Centre
ERPD	Educational Planning & Research Division
ETeMS	English for the Teaching of Mathematics and Science
IT	Information Technology
KBSM	Kurikulum Bersepadu Sekolah Menengah
KBSR	Kurikulum Bersepadu Sekolah Rendah
LCD	Light
MBMMBI	Strategi Memartabatkan Bahasa Melayu, dan Strategi Memantapkan Penguasaan Bahasa Inggeris
MOE	Ministry of Education
PAGE	Parent Action Group for Education Malaysia
PMR	Penilaian Menengah Rendah
PPD	District Education Department
PPSMI-	Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris
SPM	Sijil Menengah Malaysia
SPSS	Statistical Package for Social Science
TED	Teaching Education Division
TIMSS	Trends in International Mathematics and Science Study
UPSR	Ujian Penilaian Sekolah Rendah
UTM	Universiti Teknologi Malaysia

CHAPTER ONE

INTRODUCTION

1.0 Introduction

The Ministry of Education, Malaysia implemented a policy to teach Mathematics and Science in English effectively in 2003 for both levels of schooling, primary and secondary national schools. This policy is known as 'Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris' (PPSMI)

According to Ambigapathy Pandian & Revathi Ramiah (2003), the purpose of introducing English as the medium of teaching Mathematics and Science in national schools is to ensure that Malaysians are able to keep abreast with scientific and technological developments that are mostly recorded in the English language. At

the same time, this move is envisaged to provide opportunities for students to use the English Language and thereby increase their proficiency in the language (Ministry of Education, 2002). However, after implementing the teaching of Mathematics and Science in English for eight years, the government announced that the teaching of both these subjects will revert to Bahasa Melayu due to the poor results of the students. Deputy Prime Ministry of Malaysia, Tan Sri Muhyiddin Yasin said that in 2008 only 82.5 percent students scored grade A, B, and C for subject Science in Ujian Penilaian Sekolah Rendah (UPSR) compared to 85.1 percent in 2007. He added that the change will take effects from year 2012 onwards (www.pmo.gov.my).

This revision of policy has produced many reactions among different group in society. An important group which directly feels the impact of the change in policy is teachers. As such, this study is conducted to obtain information and feedbacks from the secondary Mathematics and Science teachers. This study will investigate their perceptions of the change in policy and the problems they may face in using Bahasa Melayu as the medium of instruction for teaching Mathematics and Science after all these years of training and courses they had gone through in order to teach in English.

1.1 Background of The Study

Teaching of Mathematics and Science in English (PPSMI), is a policy which changes the medium of instruction for these two subjects from Bahasa Melayu to English. The PPSMI was the outcome of a decision of the Malaysian government policy done by the Special Meeting of the Municipal of Ministry (Mesyuarat Khas Jemaah Menteri) on 19 July 2002. The implementation of PPSMI in national schools was done in stages, beginning in the year 2003 school session, and the pioneers of this program were all Primary One, Form One as well Form Six students. PPSMI was fully implemented at all levels of schooling by the year 2007.

The rationale for the change in the medium of instruction from the Bahasa Melayu to English Language for teaching Science and Mathematics was because of the government's concern regarding manpower development. This is to achieve the developed country status or to realize Vision 2020. Based on this concern, the young generation need to be equipped from early stages of schooling with skills to compete in the era of globalization. Globalization is era without boundary in economic world (Mohd. Sahandri Gani Hamzah & Saifuddin Kumar Abdullah, 2009). It was believed that mastery of English is regarded as an important mechanism for direct acquisition of knowledge in the field of science and technology (Ainan, 2003). Shahrier (2006) pointed out that with the implementation of teaching Mathematics and Science subjects in English the Ministry of Education (MOE) in Malaysia foresees that students will have a better edge in job markets, and be better prepared to meet the challenges of globalization (Shahrier Pawanchik, 2006).

To facilitate the change in the medium of instruction, the English Language Training Centre (ELTC) was given the responsibility for developing and conducting an English Language enhancement program known as English for the Teaching of Mathematics and Science (ETeMS). ETeMS is a program of training provided for teachers to develop linguistic skills necessary for teaching Mathematics and Science in English, (Ministry of Education cited in Ong & Tan, 2008). In this ETeMS program, 240 hours of instruction was delivered through face-to-face interaction and self-instructional packages. The programme was conducted in 2 phases. Each phase comprises 90 hours of face-to-face interaction and 30 hours worth of self-instructional materials. Phase 1 was delivered through 5 modules distributed over a period of 5 weeks and each module required 2 days of face-to-face interaction (www.tutor.com/etems/).

Apart from ETeMS, teachers were also supported by a "buddy system" whereby teachers can get further help from identified resource persons in their schools. Mathematics and Science teachers could seek help from English teachers in the same schools to help them with language.

The government had also allocated a total amount of RM 5 billion for the implementation of the policy for a period of seven years from 2002 to 2008 (Budget 2003, 2002). At the same time, teachers teaching both subjects were also provided with laptops, LCD projectors and software to aid the teaching of Mathematics and Science in English. Moreover teachers were also trained on how to use the software Compact Disk (CD) in Mathematics and Science with a computer and LCD projector. Teachers were trained to deliver the modules given by MOE with the use of LCD for the students to visualize and learn the subject of mathematics and science. PPSMI teachers were also given monetary incentives under Education Subjects Incentive Payment (Bayaran Insentif Subjek Pendidikan, BISP). The rates

for BISP education services officers who taught Science and Mathematics subjects in English were; five percent (5%) of basic salary for Graduate Education Services Officers, and ten percent (10%) of basic salary for Graduate Diploma Education Services Officers (Ministry of Education Circular Letter No. 3 year 2003). .

Teachers were required to teach Mathematics and Science for 200 minutes per week or 5 periods per week. A period in Malaysian secondary schools is 40 minutes. The examinations for both these subjects were conducted in bilingually. Students were given a choice to answer neither in English or Bahasa Melayu.

Mathematics is taught as a compulsory subject from pre-school to upper secondary level. Students also must pass this subject in all Malaysian major public examinations, namely UPSR PMR and SPM. For each public examination, the standardized mathematics paper and pencil test is always composed of two papers: Paper I consist of multiple choice questions while Paper II is made up of structured questions.

However, the government has now decided to abolish the teaching of Mathematics and Science in English due to some problems faced by the teachers and students in this country. Deputy Prime Ministry of Malaysia, Tan Sri Muhyiddin Yasin pointed out in his speech that students are still struggling to communicate in English after six years of PPSMI implementation. Teachers are also having difficulties in mastering the English language which made the teaching of both subjects in English difficult for teachers (www.pmo.gov.my). According to a study conducted by Aziz bin Nordin (2006) in Johor, only 9.4% students of 279

respondents scored A grade in UPSR examination while most of them (40%) scored C group. The study also showed that students' competencies in English were at low levels as only 6.5% of the respondents from this study agreed that they could speak English very well and fluently while the majority of respondents disagreed. Another study conducted by Mohd. Sahandri Gani Hamzah & Saifuddin Kumar Abdullah (2009) revealed that PPSMI teachers have average competencies only in English.

As some studies showed both Mathematics and Science teachers as well as students are not proficient in English language, the implementation of PPSMI had also created an anxiety among parents and educators on the quality of Mathematics and Science education in Malaysia. This is because Mathematics and Science are core subjects in primary schools as well in secondary schools. Students going for tertiary education need to have good grades in these subjects. Both these subjects are required for entering universities or colleges.

The above discussion focused on the problems which surfaced with the implementation of PPSMI. Although there were many groups in the society who were in favour of the implementation of PPSMI, the government nevertheless decided to terminate PPSMI in 2012.

1.2 Statement of The Problem

The PPSMI had been implemented for eight years. In 2010, the government decided to change the policy. Many parties however felt that it is important to learn Mathematics and Science in English. Studies by academicians, Pandian, Ong and Tan showed that teachers perceived the importance of learning and teaching both subjects in English although they themselves were not proficient in the language.

Malaysian government however, decided to revert the teaching of Mathematics and Science in Bahasa Melayu beginning year 2012. Thus teachers are now expected to teach Mathematics and Science in Bahasa Melayu again. How would this change of policy affect the teachers? Will the change in the policy of teaching Mathematics and Science in Bahasa Melayu affect the teachers' performance? Teachers may have difficulty to perform and to teach in Bahasa Melayu for Mathematics and Science, after all the courses and training in English they had gone through. Teachers may find it difficult to find materials and teaching aids in Bahasa Melayu after seven years policy in English. Teachers need to prepare notes and teaching aids in Bahasa Melayu, whereby resources are limited specially materials from internet where most of the materials are available in English.

Teachers are the main implementers and advocate of change (Tan & Chan, 2003) and they play major role in shaping education, even though in some cases teachers are not directly involved in making or changing any policy regarding education. Hence this study attempts to focus on the teachers' perception toward the

teaching of Mathematics and Science in Bahasa Melayu especially for those who are teaching in national secondary schools in Johor Bahru.

1.3 Objectives of The Study

This study is conducted to analyse the situation following the change in policy in Johor Bahru. Specifically, this study attempts to study teachers' perception towards the change of policy to teach and learn Mathematics and Science in Bahasa Melayu. The purpose of this study is to investigate :

1.3.1 The perceptions of the teachers in using Bahasa Melayu as the medium of instruction for teaching Mathematics and Science at the secondary school level.

1.3.2 The problems encountered in using Bahasa Melayu to teach Mathematics and Science as perceived by the teachers

- 1.3.3 Teachers' perception about the change in policy to teach Mathematics and Science in Bahasa Melayu. .

1.4 Research Questions

Aligned with the above research objectives, the research questions are as follow:

- 1.4.1 What is the perceptions of teachers with regard to the use of the Bahasa Melayu as medium of instruction for the teaching of Mathematics and Science in secondary schools ?
- 1.4.2 What are the problems encountered in using Bahasa Melayu to teach Mathematics and Science as perceived by teachers ?
- 1.4.3 What are the teachers' perception about the change in policy to teach Mathematics and Science in Bahasa Melayu. ?

1.5 Importance of The Study

This study is conducted in order to obtain information about teachers' perception regarding the new policy announced by government. Therefore it is important to note the unique perception of teachers in teaching these subjects in Bahasa Melayu after undergone all the courses and training in English.

It is hoped that the data will provide some insight about teachers' perception in teaching Mathematics and Science in Bahasa Melayu after eight years of implementation of teaching Mathematics and Science in English. It is beneficial not only to the teachers, school, Ministry of Education but also to the administration and country too.

1.5.1 Teachers

The results of the study will serve as guide and reference for teachers to understand the change in government policy. Teachers can prepare themselves accordingly. At same time it can help teachers to find better and effective ways in teaching Mathematics and Science in Bahasa Melayu.

1.5.2 Students

By studying the results of the study, students can cooperate with teachers to study Mathematics and Science in Bahasa Melayu. Students will be able to understand the benefits or advantages in new policy.

1.5.3 Administrators

By studying the results of the study, school administrators will be able understand the progress and on-going of process of implementation in new policy. Administration can find ways to help the teachers to cope with new policy of teaching Mathematics and Science in Bahasa Melayu to achieve better result in any school examinations. This study can provide necessary help to assist students in coping with changes in the medium of instruction for Mathematics and Science.

1.5.4 Ministry of Education

This study will act as reference and guidelines to Education Department to develop suitable courses and programs in future for Mathematics and Science teaching teachers to increase their understanding in teaching these subjects. This study will be guide for Ministry of Education to prepare and equip teachers teaching Mathematics and Science with proper training.

1.6 Scope of The Study

This research is only conducted among teachers in a 6 government or national schools around Skudai only. Among all the teachers, only teachers teaching Mathematics and Science were chosen as subjects field for the research, as this is a small scale study.

1.7 Operational Term

1.7.1 Change

Change is act of making a variety, or may be substituted for another. In this study, change refers to change in the medium of instruction in teaching Mathematics and Science. The change happen when government decided to change the teaching of the Mathematics and Science from English to Bahasa Melayu.

1.7.2 Learning

According <http://www.learnersdictionary.com> learning means the activity or process of gaining knowledge or skill by studying, practicing, being taught, or experiencing something and knowledge or skill gained from learning

1.7.3 Policy

According www.thefreedictionary.com, policy refers to a plan or course of action, as of a government, political party, or business, intended to influence and determine decisions, actions, and other matters. However in this research, policy refers to policy of teaching Mathematics and Science in Bahasa Melayu.

1.7.4 Perception

Teachers' ability to see and understand the change in government policy for reversing the teaching of Mathematics and Science to Malay .

1.7.5 Problem

Problem is something difficult to deal with or solve. In this study, problem refers to problems teachers are in teaching Mathematics and Science in Bahasa Melayu.

1.8 Conclusion

This chapter 1 explain the objectives of this study, there is a need to conduct this study to have better understanding of teachers' perceptions about change in new policy. Teachers play an important role in determining a successful implementation of education policy. Therefore, any changes in policy that occurred need the support of teachers. Teachers must be prepared with any changes to carry out their responsible with successful. The abolishment of PPSMI need support from every party even some who are against the abolishment.

References

Abdul Rashid Johar (2006). *Tinjauan Terhadap Kesediaan Guru-guru Sains Dan Matematik Tingkatan Enam Di Sekolah-sekolah Menengah Negeri Johor Menggunakan Bahasa Inggeris Dalam Pengajaran Dan Pembelajaran Sains Dan Matematik*. Master, Universiti Teknologi Malaysia, Skudai.

Ambigapathy Pandian and Revathi Ramiah (2003). *Mathematics and Science in English – Teacher Voices*. ELTC ETeMS conference 2003: managing curricular change 2 – 4 December 2003.

Asiah Abu Samah (1984) *Perkembangan Kurikulum matematik sekolah di Malaysia sejak zaman penjajah*. Paper presented at the Seminar on Mathematics Education

Atikah Munirah (2010). *Persepsi Guru Matematik Di Dua Buah Sekolah Menengah terhadap Pemansuhan Ppsmi*. Degree, Universiti Teknologi Malaysia, Skudai.

Anderson, G. (1998). *Fundamentals of Education Research*. London: Falmer.

Aziz bin Nordin. (2003) *Students' Perception On Teaching And Learning Mathematics In English*. University Teknologi Malaysia. Skudai

Bishop A.J. (1991) Mathematical values in the teaching process in A.J. Bishop and S. Mellin-Olsen & J.V. Dormolen (eds.) *Mathematical knowledge : Its growth through teaching*. Kluwer Academic Press.

Cheah Li Na and Nor Azmi Mostafa, (2009). *Teacher Beliefs and the Teaching of Mathematics and Mathematics and Science*. *English Language J.*, 3: 83-101.

Crystal, D. (1997). *English as a Global Language*. NY: Cambridge University Press.

Faizah Mohamad Nor, Marzilah A. Aziz and Kamaruzaman Jusoff. (2011). Should English for Teaching Mathematics and Science (ETeMS) in Malaysia Be Abolished ?. *World Applied Sciences Journal 12 (Special Issue on Creating a Knowledge Based Society)*: 36-40.

Hamidah Yamat, Nooreiny Maarof, Tengku Noorizan Tg Mohd Maasum, Effandi Zakaria and ElJafri Zainuddin (2011). Teacher's Code-Switching as Scaffolding in Teaching Content Area Subjects. *World Applied Sciences Journal*. 1818-4952(15), 18-22.

Helen Tan and Chan Swee Heng (2003). *Teaching Mathematics and Science in English: A Perspective from Universiti Putra Malaysia*. ELTC ETeMS conference 2003: managing curricular change 2 – 4 December 2003. 1

Henderson, J., & Wellington, J. (1998). Lowering the language barrier in learning and teaching science. *School Science Review*, 79 (288), pp. 35 – 46. Retrieved on Oct 11, 2011 from <http://www.enc.org/topics/equity/articles/document.shtm?input=ENC-111335-1335>

Jackson, S.L. (2009). *Research Methods and Statistics: A Critical Thinking Approach 3rd edition*. Belmont, CA: Wadsworth.

Jonas Emanuelsson and David Clarke. (2009). Contrasting comparative research on teaching and learning in mathematics

Kementerian Pendidikan Malaysia (1989) Kurikulum bersepadu sekolah menengah: Huraian sukatan pelajaran Sains menengah. Dewan Bahasa dan Pustaka. Kuala Lumpur

Kementerian Pendidikan Malaysia (1989) Kurikulum bersepadu sekolah menengah: Huraian sukatan pelajaran matematik menengah. Dewan Bahasa dan Pustaka. Kuala Lumpur

Kementerian Pendidikan Malaysia (1991) Kurikulum bersepadu sekolah menengah: Huraian sukatan pelajaran matematik Tingkatan 4 Dewan Bahasa dan Pustaka. Kuala Lumpur

Kementerian Pendidikan Malaysia. Integrated Curriculum for Secondary Schools Syllabus. Retrieved on 26, Nov 2011 from www.moe.my

Kenneth N. Ross. (2005). Educational research: some basic concepts and terminology. T. Neville Postlethwaite Institute of Comparative Education University of Hamburg. UNESCO International Institute for Educational Planning. Retrieved on December 11, 2011, from <http://www.unesco.org>

Kessler, C. & Quinn M.E. 1987. *Esl and Science Learning. ESL Through Content Area Instruction.*(ed) JoAnn Crandall, Prentice Hall, U.S.

Kober, N. (n.d.) What special problems do LEP students face in science? What can teachers and schools do? Retrieved on Oct 28, 2011 from <http://www.enc.org/topics/equity/articles/document.shtm?input=ENC-111335-1335>

Kon Yoon How, Low Bee Yan, Chong Poh Wan and Mohanakrishnan a/ Kaliappan. (2006). Think Science, Speak English: A Study of Selected Year One Primary Teachers' English Oral Fluency In The Teaching Of Science. *Journal IPBA*. 78-83. 2

Kon Yoon How. (2005). Teaching Efficacy Beliefs of Primary School Teachers in Using English to Teach Mathematics and Science. *Journal IPBA*. 3(2), 45-49.

Krashen, S. (1981). *Second Language Acquisition and Second Language Learning*. Pergamon Press, Oxford.

Language for understanding as a perspective (1997). Language for Understanding Curriculum Support Paper, Australian Capital Territory, Department of Education and Training and Children's Youth and Family Services Bureau. Retrieved on 18 Jan 2012 from

[Lim Kit Siang. \(2009\). Which is better learning maths and science in Bahasa Malaysia or in English/](http://limkitsiang.com). Retrieved on 17 May 2012 from <http://limkitsiang.com>

Mathematics Curriculum Development Centre. (2004). Ministry of Education Malaysia.

Michael Wright and Rodney Custer (1998). Why They Enjoy Teaching: The Motivation of Outstanding Technology Teachers. *Journal of Technology Education*. 9(2). Retrieved from <http://scholar.lib.vt.edu> on Aug 1, 2012.

Ministry of Education Circular Letter No. 3 year 2003. *Education Subject Incentive Payment (BISP)*. Ministry of Education, Malaysia.

Ministry of Education. 2002. English for Teaching Mathematics and Science (ETeMS) Facilitator's Notes. English Language Teaching Centre, Teacher Education Division.

Ministry of Education. 2002. *Curriculum Circular 11/2002- The Teaching and Learning of Science and Mathematics in English in National Primary Schools, National type Tamil primary schools, National Secondary Schools and Form Six beginning 2003*. Teaching and learning in mathematics. *European Journal of Social Sciences*. Volume 10, pp 197–226.

Mohamad Fadhili Bin Yahaya, Mohd Asri Bin Mohd Noor, Ahmad Azman Bin Mokhtar, Rafizah Binti Mohd Rawian, Mahmud Bin Othman and Kamaruzaman Jusoff (2009). Teaching of Mathematics and Science in English: The Teachers' Voices. *Canadian Center of Science and Education*, 1916-4750, 2.

Mohd Syahidan Abdul Aziz (2009). PPSMI. *Jurnal Institut Pendidikan Guru Malaysia* 22(5), 67-78. Retrieved on Oct 22, 2011 from www.scribd.com.

Mohd. Sahandri Gani Hamzah & Saifuddin Kumar Abdullah (2009). Teachers' Teaching Status and Achievements of Students of Teaching and Learning of Mathematics and Science in English (PPSMI) in Primary and Rural Secondary Schools. *European Journal of Social Sciences*, 10, 143-161.

Mok Soon Sang. (2003), *Falsafah Pendidikan, Kurikulum dan Profesionalisme Keguruan*. Penerbitan Multimedia Sdn. Bhd., Puchong.

Noraini Idris, Loh Sau Cheong, Norjoharuddeen Mohd. Nor, Ahmad Zabidi Abdul Razak and Rahimi Md. Saad. (2006). The Professional Preparation of Malaysian Teachers in the Implementation of Teaching and Learning of Mathematics and Science in English. *Eurasia Journal of Mathematics, Science and Technology Education*, 3(2): 101-110.

National Council for teachers of mathematics (1992) Curriculum and evaluation standards for school mathematics. National Council for the teachers of mathematics, Reston, Va. Retrieved from : <http://education.stateuniversity.com>

Norudin Mansor, Mohamed Ishak Badarudin and Azman Che Mat. (2011). Teachers Perspective of Using English As A Medium Of Instruction In Mathematics and Science Subjects. *International Journal of Instruction*. 4(2), 129-138.

Parilah Mohd Shah & Fauziah Ahmad. (2007). A Comparative Account of the Bilingual Education Programs in Malaysia and the United States. *GEMA Online Journal of Language Studies*. 7(2). 63-77 Retrieved from <http://www.ukm.my> on Aug 1, 2012.

Reimer, Joseph, Paolitto, D.R. and Hersh, R.H. (1983). *Promoting moral growth: From Piaget to Kohlberg*. New York: Longman Publishing

Robert E. Jamison. (2009). Learning The Language of Mathematics. *Journal of Language and Learning Across the Discipline*. 4, 45-54. WAC Clearinghouse.

Rosli Talif & Ain Nadzimah Abdullah. (2002). *Investigating teacher concern: Science and Mathematics in English*. Paper presented at International Conference on English Language and Development for Equity in the 21st century, 24-26 September, 2002, Kuala Lumpur organised by The International Languages Teacher Training Institute (113PA).

Siti Hamin Stapa & Abdul Hameed Abdul Majid. (2006). The use of first language in limited proficiency classes: Good, bad or ugly. *Journal e-Bangi*, 1(1), 1-12.

Ucapan, 2002 Ucapan Bajet Tahun 2003 (2002). Ucapan Bajet Tahun 2003 oleh YAB Dato' Seri Dr. Mahathir bin Mohamad Perdana Menteri dan Menteri Kewangan Malaysia. Rang Undang-undang Perbekalan 2003. Dewan Rakyat.

W. Borg & M. Borg, (1988), Educational Research: An Introduction, *Chapter 6: Population and sample*.

Wellington, J., & Osborne, J. (2001). *Language and literacy in science education*. Philadelphia, PA: Open University Press.