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Students' Inclination towards English Language as Medium of Instruction in the Teaching of Science and Mathematics

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Abstract

Malay language, the national language of Malaysia has been the medium of instruction for Science and Mathematics for the past four and a half decades in Malaysia. The government however changed the medium of instruction of these subjects to English in January 2003. The “Teaching and Learning of Science and Mathematics in English” (PPSMI) policy was implemented in all primary and secondary schools. It aims to improve the English language proficiency among students as well as the learning and achievement level in science and mathematics. This paper presents findings of the study on students' inclination towards English language as medium of instruction in teaching and learning of Science and Mathematics in Higher Learning Institutions in Malaysia. The respondents were 291 undergraduate students from the Faculty of Science and Technology (FST) and Faculty of Education (FPEND) of Universiti Kebangsaan Malaysia (UKM). A questionnaire pertaining to students' inclination was used as research instrument. Using descriptive statistics, ANOVA and *t*-test, the study found that undergraduate students of FST and FPEND had an inclination towards English as medium of instruction in the teaching and learning of Science and Mathematics. Using the Post-Hoc test, it is found that Indian students and students from other races than Malay and Chinese have greater inclination towards English as medium of instruction in teaching and learning of Science and Mathematics in UKM for both faculties. However, FST students who studied in Mandarin and Tamil at pre-university level (STPM) had higher inclination compared to those who used Malay language or even English.

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1. Introduction

The main aim of Teaching and Learning of Science and Mathematics in English (PPSMI) is to have students to strengthen their foundation in science and mathematics and enhance the usage of English in various technical areas. Knowing that English is the language of knowledge and international relations, the Special Ministry Meeting, on 8 May 2002, had agreed that both science and mathematics are to be taught in English. This decision was made from the study on the implementation of PPSMI by the Ministry of Education in April 2002 (Che Wan Jasimah & Norazmi 2005). Consecutively, on July 20 of the same year, the Education Minister Dato Seri Najib Tun Razak, officially announced the implementation of PPSMI to begin in year 2003. This policy was made based on the fact that science and mathematics are dynamic areas of knowledge in which all sorts of new discoveries and a large portion of information related to them are found in English (Pembina 2009).

The public and academics have shown different reactions in response to this implementation of PPSMI. To academicians, the decision made by the government did not comply with Section 17 of the Education Act 1996. The Act imposes the usage of national language as medium of instruction in all institutions of higher learning in the national education system (Pembina 2009). This decision was also deemed to be against the establishment of UKM, which was given the duty to uphold the national language as the language of knowledge. This view is consistent with the study made by Jumrang (2004). The study found that the use of scientific language in science can only be understood by learning its content. If students did not understand the delivery and lesson during the teaching and learning due to the use of the language, they will face learning difficulties. Cuevas and Beech (1983) stated that there were several issues to be considered before the implementation of teaching and learning of mathematics in English. Studies by Ellerton and Clarkson (1996) and Setati (2003) also agreed that students will benefit more if mathematics is taught in their mother tongue.

The issue of teaching and learning of science and mathematics can be viewed not only from the perspective of lecturers (Noriza *et al.* 2011) but also from the perspective of students who are directly involved in PPSMI (Zaidi *et al.* 2011). This study focuses on students' inclination towards English or Malay language as the medium of instruction in the teaching of Science and Mathematics. This research is part of UKM's main pilot research project entitled 'A Study on the Effective Implementation of PPSMI in UKM' (UKM-GP-PPKK-9-2009).

2. Methodology

The data of this research was obtained through the dissemination of questionnaires. The questionnaires were then distributed to students of the Faculty of Education (FPEND) who are majoring in Science and Mathematics, and Faculty of Science and Technology (FST). Both faculties were chosen to fulfill the objectives of the research due to the students' background where they had undergone the learning of science and mathematics since their secondary school level until their pursuance of higher studies at UKM. Thus, the perception of these students towards the implementation of PPSMI in UKM could be measured more accurately. A pilot study was conducted and the results from the findings enabled the researchers to improve the survey questions to meet the objectives of the research. The findings of the pilot study showed a Cronbach Alpha value of 0.957, which meant that a further study can be made.

The number of respondents involved was 291 students, in which 103 from the Faculty of Education (FPEND) and 188 from the Faculty of Science and Technology (FST). A Likert scale ranging from 1 to 10 was used to measure the inclination level of the students towards English as medium of instruction. The scale ranges from 1 that represents strongly disagree while 10 represents strongly agree to 18 questions about students' inclination. The students' inclination level towards English as the medium of instruction was then divided into three categories; namely strongly not inclined, inclined and strongly inclined. An average score of 1.00 to 3.99 showed that the students were not in favour of English as the medium of instruction. An average score ranging between 4.00 and 7.99 showed those in favour, while an average score ranging between 8.00 and 10.00 showed their high level of inclination.

A descriptive analysis was done to look at respondents' profiles based on demographic factors. Sequentially, nine hypotheses were identified to measure the students' inclination towards English. The hypotheses are as follows:

- H1 : There is no difference in students' inclination towards English as medium of instruction among genders
- H2 : There is no difference in students' inclination towards English as

- medium of instruction among races
- H3 : There is no difference in students' inclination towards English as medium of instruction based on spoken language
- H4 : There is no difference in students' inclination towards English as medium of instruction based on year of study
- H5 : There is no difference in students' inclination towards English as medium of instruction based on UKM entry qualification
- H6 : There is no difference in students' inclination towards English as medium of instruction based on Malaysian University English Test (MUET) grades
- H7 : There is no difference in students' inclination towards English as medium of instruction based on medium of instruction in primary school
- H8 : There is no difference in students' inclination towards English as medium of instruction based on medium of instruction in secondary school
- H9 : There is no difference in students' inclination towards English as medium of instruction based on medium of instruction in pre-university level

T-test and Analysis of Variance (ANOVA) were used to get some conclusions to these hypotheses.

3. Results and Discussions

3.1 Profile of Respondents

Based on the survey conducted, there were 103 respondents from FPEND. Among them were 61.2% females and 38.8% males. Respondents came from various races namely 52.4% Malay, 44.7% Chinese, 1.0% Indian and 1.9% others. In terms of spoken language at home, the languages used are Malay language (53.4%), Mandarin (40.8%), English (3.9%), and others (1.9%). The second languages used by respondents at home are English 47.6%, Malay language 9.7%, Mandarin 1.6%, and other languages 1.0%. Tamil was neither used by respondents as first nor second language and 41.8% of respondents used only one language at home.

On the other hand, there were 188 respondents from FST. Among them were 61.2% females and 38.8% males. They were of different races namely 56.4% Malay, 35.6% Chinese, 6.9% Indian, and 1.1% of other races namely Iban, Bidayuh and Indonesian. The respondents' spoken languages at home are Malay language (56.9%), English (25%), Mandarin (13.8%), Tamil (4.3%) and none for other languages.

Table 1 shows the respondents' academic background for both faculties. The majority of them are students of third year for FPEND and second year for FST. Most respondents of both faculties obtained a Malaysia University English Test (MUET) grade of at least Band 3 out of maximum band of 6. The result shows that majority of the respondents from FST underwent matriculation for their pre-university degree. Malaysia Matriculation Programme is a preparatory programme for Malaysian students to qualify them to Degree Programmes in the fields of Science and Technology in both local and overseas universities. As of 2004/2005 session all Mathematics, Sciences, Physics, Chemistry, Biology and Information Science subjects are taught in English language. Almost equal percentages of FPEND students obtained either matriculation degree or STPM. STPM stands for Sijil Tinggi Persekolahan Malaysia or Malaysian Higher School Certificate for Form 6 students. Students will sit for the STPM after taking up to two years of studies after they have finished their secondary school.

Therefore, it showed that most FST and FPEND students used Malay language as language for learning in primary and secondary school levels. However, at pre-university level, most FST students used English as the language for learning. FPEND students meanwhile has been classified into two groups; one group of students learned in Malay language while the other in English.

As a whole, the average score for FPEND students is 5.49, which shows that these students have an inclination towards the use of English as medium of instruction for science and mathematics subjects. Likewise, the average score for FST students is 6.19. On average, this shows that FST students were slightly more inclined to the English language than their counterparts in FPEND.

Table 1. Respondents' Academic Background

<i>n</i> = 291	FPEND		FST	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Year of Study				
Year 1	0	0	34	18.1
Year 2	5	4.9	107	56.9
Year \geq 3	98	95.1	47	25.0
MUET Grade				
Band 1	6	5.8	2	1.1
Band 2	18	17.5	28	14.9
Band 3	40	38.8	103	54.8
Band 4	32	31.1	47	25.0
Band 5	7	6.8	5	2.7
Band 6	0	0	2	1.1
UKM Entry Qualification				
Diploma	13	12.6	4	2.1
Matriculation	44	42.7	152	80.9
STPM	42	40.8	27	14.4
Others	4	3.9	5	2.7
Learning Language at Primary School Level				
Mandarin	3	2.9	14	7.4
English	0	0	10	5.3
Malay language	100	97.1	159	84.6
Tamil	0	0	5	2.7
Learning Language at Secondary School Level				
Mandarin	0	0	4	2.1
English	1	1	36	19.1
Malay language	102	99.0	144	76.6
Tamil	0	0.0	4	2.1
Learning Language at Pre-University Level				
Mandarin	0	0.0	4	2.1
English	48	46.6	162	86.2
Malay language	55	53.4	18	9.6
Others	0	0.0	4	2.1

Table 2 shows the average score based on respondents' background. Based on the table, the *p*-value above 0.05 shows no significant difference among genders (Hypothesis 1), the language for learning at primary school (Hypothesis 7) and the secondary level (Hypothesis 8) for both faculties in terms of their inclination towards English as medium of instruction. This proves that irrespective of gender, they have the same inclination level. Similarly, the language they used at primary and secondary school levels did not affect their level of inclination. Although there were those who did not learn Science and Mathematics in English, these students were inclined to use English at tertiary level.

Table 2. Average Score based on Respondents' Background

Respondents' Background		FPEND	FST
Gender	Male	5.38	6.12
	Female	5.57	6.24
	<i>p</i> -value	0.55	0.570
Race	Chinese	5.31	6.21
	Indian	7.83	7.17
	Malay	5.51	6.03
	Others	8.08	7.50
	<i>p</i> -value	0.043*	0.018*
Language used at home	Mandarin	5.22	6.38
	English	6.59	6.09
	Malay	5.55	6.08
	Tamil	-	7.78
	Others	8.08	-
	<i>p</i> -value	0.043*	0.006*
Year of Study	1	-	6.35
	2	5.07	6.34
	≥ 3	5.51	5.75
	<i>p</i> -value	0.553	0.037*
UKM Entry Qualification	Diploma	6.11	6.26
	Matriculation	5.89	6.03
	STPM	4.68	7.16
	Others	7.38	5.91
	<i>p</i> -value	0.000*	0.082
MUET Grade	Band 1	3.46	4.75
	Band 2	4.07	5.57
	Band 3	5.23	5.91
	Band 4	6.87	7.03
	Band 5	5.87	7.50
	Band 6	-	8.61
	<i>p</i> -value	0.000*	0.000*
Learning Medium in primary school	Mandarin	6.85	6.29
	English	-	6.74
	Malay	5.45	6.12
	Tamil	-	7.22
	<i>p</i> -value	0.135	0.174
Learning Medium in Secondary School	Mandarin	-	7.07
	English	5.35	6.06
	Malay	5.49	6.18
	Tamil	-	6.93
	<i>p</i> -value	0.930	0.370
Learning Medium at pre-university level	Mandarin	-	7.31
	English	5.96	6.24
	Malay	5.08	5.38
	Tamil	-	6.93
	<i>p</i> -value	0.105	0.015*

For Hypothesis 2, there is a significant difference among students' races in their inclination towards choosing English as medium of instruction for both faculties. The Post-Hoc test (Table 3) shows that Indian students and others from both faculties have high inclination of choosing English as medium of instruction. The same goes with the languages used at home (Hypothesis 3) and MUET grades (Hypothesis 6). The Post-Hoc test in Table 3 shows

that for the language used at home, students who used Tamil and other languages had higher inclination compared to students who used Malay language, English and Mandarin. FST students showed an increase in their inclination towards English at par with their MUET levels.

Table 3. Post-Hoc Results

Respondents' Background		FPEND			FST		
		gp1	gp2	gp3	gp1	gp2	gp3
Race	Chinese	5.31			6.21		
	Indian		7.83			7.17	
	Malay	5.51			6.03		
	Others		8.08			7.50	
Language used at home	Mandarin	5.22			6.38		
	English	6.59			6.09		
	Malay	5.55			6.08		
	Tamil		-				7.78
	Others		8.08				-
Year of study	1					6.35	
	2					6.34	
	3				5.75		
UKM Entry Qualification	Diploma		6.11				
	Matriculation		5.89				
	STPM	4.68					
	Others			7.38			
MUET Grade	Band 1	3.46			4.75		
	Band 2	4.07			5.57		
	Band 3		5.23		5.91		
	Band 4			6.87		7.03	
	Band 5		5.87			7.50	
	Band 6						8.61
Learning Language in pre-university	Mandarin					7.31	
	English				6.24		
	Malay				5.38		
	Tamil					6.93	

Hypotheses 4, 5 and 9 showed significant differences in only one of the faculties. For the year of study (Hypothesis 4), only FST students showed a significant difference. The Post-Hoc test showed that third year students had lower inclination level compared to first and second year. FPEND students had similar level of inclination irrespective of their year of studies. For Hypothesis 5, FPEND students who did STPM had the lowest level of inclination compared to students who did diploma and matriculation. There were four students who obtained senior high school certificates placed high level of inclination towards English as medium of instruction. On the other hand, FST students, irrespective of their UKM entry qualifications namely diploma, matriculation, STPM and others, had the same level of inclination. On the contrary, hypothesis 9, which signifies the learning language at pre-university level namely diploma, matriculation, STPM and others, showed a significant difference only for FST students. Students who studied in Mandarin and Tamil at pre-university level had higher inclination compared to those who used English or Malay language.

4. Conclusion

The study showed that the average score for the undergraduate students of FST is 6.19, which is slightly higher than the average score of FPEND students (5.49). Nevertheless, both scores showed that they are in favour of English as medium of instruction in the teaching of Science and Mathematics in UKM. This is due to the fact that these students have studied Science and Mathematics in English during their pre-university level and there are some students who preferred to be taught in English . Based on the analyses, the result showed that gender does not play

an important role in determining the level of inclination towards English language as medium of instruction in teaching and learning of Science and Mathematics. However, students from different races showed a significant difference in their inclination. Particularly, Indian students and others from both FST and FPEND faculties have high inclination towards English as medium of instruction. Results also showed that Indian students and of other races who used Tamil and other spoken languages other than Malay language, English, and Mandarin at home were more inclined to the use of English as medium of instruction in the teaching of science and mathematics in both faculties. In terms of MUET grades, the FST students' inclination towards choosing English as medium of instruction in the learning of Science and Mathematics in UKM increases parallel with their MUET grades. The result on the year of study showed that third year FST students had lower inclination level compared to first and second year. FPEND students however, had similar level of inclination irrespective of their year of studies. For the test on the UKM entry qualification, FPEND students who took STPM had the lowest level of inclination compared to students who did diploma and matriculation. On the other hand, FST students, irrespective of their UKM entry qualifications, had the same level of inclination. The learning medium in primary and secondary school did not influence the level of inclination among students in both faculties. However, the medium of instruction in pre-university level does make the level of inclination of students who studied in Mandarin and Tamil at pre-university level higher compared to those who studied in English or Malay language.

In conclusion, UKM students, particularly those studying in the Faculty of Science and Technology are the chosen and excellent ones at STPM or matriculation levels. They were among those who studied Science and Mathematics in English for 1 or 2 years in pre-university levels. This is the key explanation of the study's findings on the students' inclination towards English. These findings are supported by studies done by Tuah and Mohini (2008), which found that there is a high interest in PPSMI among students' of the Faculty of Science, and study by Jainal (2004) that showed the moderate level of readiness of the students of the Faculty of Education towards English. Factually, there are other factors that influence the success or failure of PPSMI. Among the factors are the teacher/instructor (Azizi & Fadhlina 2008), the scope of English proficiency, the teaching and learning situation, the effects of the use of English, the students' future career and attitude towards the implementation of the system (Nur Riza *et al.* 2009).

The possible recommendation for future researches is to compare between students' inclination towards a particular medium of instruction and their examination results to ensure that their inclination towards a particular language is at par with their results in the subjects. According to the study by Neville-Barton and Barton (2005), most students are not aware that they have language problems until their examination results prove them otherwise.

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