TEACHING AND LEARNING MATHEMATICS AND SCIENCE IN ENGLISH IN PRIMARY SCHOOLS IN THE STATE OF JOHOR, MALAYSIA

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INTRODUCTION

The Government has decided to use English as the language of Science and Mathematics subjects at the primary school level to the matriculation in 2002. The implementation of the policy was initiated in 2003 in Year One and Year Four (primary school level), in Form 1, Form 4 and Form Lower 6 (secondary school level) and also in the matriculation centers. The objective behind the decision to use English as a medium of instruction is to improve the mastery of the language among educated people in this country. The mastery of English is seen as a matter of the utmost importance to ensure the development of Science and Mathematics knowledge among educated people because all the treasure of knowledge is said to be highly available in English.

Since the country's education policy was launched, many issues came into view from various parties including the politicians, academicians, parents and students, both agreeing and opposing the idea and its implementation. Some of the highlighted issues are the difficulties faced by the students in following the lessons in English, the troubles dealt by the teachers in adapting to the changes as to make the students understand better and the effects of national language mastery on students, especially at school level. People’s opinions on its implementation are also based on the language used by them in their daily lives. It is found that those who read Malay newspapers everyday and who are likely to speak in Malay oppose the idea and those who usually read English newspapers and probably speak English daily favor the implementation.

National Education Policy has implemented the use of Bahasa Melayu as the language in education. However, lately, there is a major concern among the high government officials and employers on the lack of ability of the graduates to speak well in English. This problem is also said to be a contributing factor to unemployment (Portal Pendidikan Utusan, 2003). The concern
arises when it is seen that the graduates are unable to speak proper English. The declining standard of students from public institutions of higher education (IPTA) has also been associated to their weaknesses in mastering the language (Izam Fairus, 2002).

The use of English in Science and Technology, Medicine, Trade and others is apparent, especially in the era of knowledge and globalization. In the field of Information Technology and Communication, English is widely used as it is a must to use English in order to acquire the knowledge and information. This perhaps makes English a vital language of technology (Fadhlina, 2008).

So, as teachers, they must be mentally and physically prepared to deliver knowledge to the students in the easiest form to be understood, especially when English is used for Mathematics and Science subjects. The roles of teachers and students are mutually completing each other. The key role of teachers is to translate the contents into a form of information that the students can understand through a series of appropriate learning activities (Cheah, 2004).

The Government has introduced a policy of teaching Science and Mathematics in English (PPSMI) in 2003. This act has produced many views that defend and support the idea, not to mention those who strongly oppose the proposal that has now been almost six years of its implementation. In addition, the issue is also being intensely talked about by all sorts of parties, especially parents, teachers, lecturers, students, non-government sectors, politicians and others. There are many issues being debated: the difficulties confronted by the students in catching up with the lessons, the teachers’ ability to effectively convey the knowledge and its effects on students’ mastery of the national language, especially at school level. It is unquestionably a big issue as it involves the future of the nation. The question is what have we done to our next generation? Is it appropriate for their future to be experimented just to approve a hypothesis that `teaching Science and Mathematics in English can improve the quality of the achievement of English’?

As we are all aware of, our country is moving towards the era of globalization and this requires the development of Science and Mathematics. We also realize that Science and Mathematics are the foundation and play important roles in the advancement and development of a country. More and more new discoveries in these fields occurred rapidly and the information about their developments can be accessed mainly in English. Besides being used as the language for international relations, it facilitates the acquisition of knowledge. As questioned by Malaysia’s former Prime Minister, Tun Mahathir Mohamad, “Don’t we want our nation to have the same level of advancement with the other developed nations?” Only through properly spoken words in our own national language with a shallow level of knowledge will not elevate our nation’s honor and will not enable us to compete successfully with the other developed nations. So, he introduced the Teaching and Learning Science and Mathematics in English (PPSMI).
BACKGROUND OF THE STUDY

The Special Cabinet meeting held on July 19, 2002, has decided Teaching and Learning Science and Mathematics in English (PPSMI) as a policy in Malaysia. The implementation of PPSMI will be done gradually, starting with the school session in 2003 with the pioneering students from Year 1 of the primary school and Form 1 and Form Lower 6 of the secondary school. A complete implementation was done in 2007 for the secondary school level while the primary school level was in 2008.

The goal of teaching and learning Science and Mathematics in English (PPSMI), which was introduced in 2003, is to increase students' mastery of English. With that, it is hoped that the targeted students can meet the standard of the increasingly challenging global demand. Although there is a polemic occurred in its early introduction, all parties welcomed the move.

The rational to the transition of language in PPSMI from Bahasa Melayu to English is based on the government concerns towards the development of human resources to achieve the status of a developed nation and as an early preparation to compete in the era of globalization. Despite the fact that it had been six years of its implementation, there are still voices that dispute the existence of PPSMI. Based on the findings, it is found that the Ministry is refining PPSMI, taking into account its impact on students, the teachers' readiness and also the long-term effects on the national language.

PPSMI was created to help students to self-improve their communication skills in English and to help each of them in securing a job. A question arose: is it enough in just 120 – 160 minutes a week in school learning English can help the students in mastering the language? As we are all aware of, it requires 20 – 30 years to effectively implement the teaching of Bahasa Melayu in all national schools and universities.

RESEARCH QUESTIONS

1. What are the views and opinions of the society about Teaching and Learning Science and Mathematics in English (PPSMI)?

2. To what extent does PPSMI be considered as successful in the primary schools?
RESEARCH DESIGN

In this study, researchers use a structured interview. There are three prepared items which are expected to provide answers to two research questions. The responses are recorded using technology such as a voice recorder before they are transcribed. The interview is done both formally and informally. Stacked random samples and purposive samples are used. Interviews will be conducted with twenty three school headmasters who are undergoing the Graduate Program (Management) at the University of Tun Hussein Onn Malaysia. The sessions for the interview will be determined after appointments are made. All the questions are based on the research questions and are verified by selected experts such as the content experts, presentation experts and language experts. The verification is made to determine the validity and reliability of the constructed questions so as to include the research requirements, presentation patterns and an appropriate use of language structures (Patton, 1990 & Tuckman, 1988).

In this study, once the data and information are obtained, they are actually a large amount of data that will be difficult to analyze. So, researchers need to select the most suitable method to interpret all the data. First, researchers have to make written transcripts for all the interview records. Researchers have to take a long time in the process of making copies of the interview records, because it requires a thorough attention of researchers. Despite the fact that it may be sound laborious it actually provides opportunities for researchers to familiarize themselves with the study data. Once all the collected data are transcribed, researchers will convert the data into simpler data using a coding system which is the main principle in analyzing qualitative data. Researchers use the proposals made by Marohaini Yusoff (2001) in making the coding system. Determining the code for each transcript and each segment of the transcript is essential to facilitate the process of referring the original data.

Based on the above coding system, the interviewed respondent is the first respondent, on the first interview session, conducted on the date of the interview session. The interview is to answer the first research question, asking the first interview question and the respondent’s answer is the third sentence of the whole answer for the question.
Findings and Discussion

Finding 1

A lack of English teachers is the main factor that causes the weakness of the policy of Teaching and Learning Science and Mathematics in English (PPSMI). Besides, the teachers have lack or no solid background in teaching the subjects in English as they learnt them in Bahasa Melayu. In fact, it takes up to 10 years to train the teachers to be skilful enough in teaching the subjects in English.

Finding 2

There are many schools especially in the rural areas which do not have an appropriate environment for both the teachers and students in efficiently proceed with this policy due to the lack of infrastructure and school facilities. Therefore, the implementation of PPSMI makes the students from such areas difficult to compete with those who are studying in the city. On the other hand, the Government representatives also need to regularly pay a visit to the schools especially those in the rural areas to monitor the implementation of PPSMI. Plus, the Government should listen to the views of the parents and teachers especially in the rural areas in carrying out this policy. Urging all the universities, Teacher Educational Institutions (IPG) and English specialist teachers to formulate options and alternative materials for the teaching and learning process in English must be taken into account although some of these alternatives are already available. Above all, the difference of the students’ background (e.g those from the rural areas and those from the city) should not be ignored as different approaches need to be applied to them to ensure the efficiency of this policy. There are some students who fail in Mathematics and Science simply due to their poor command of English and this particularly occurs in the rural areas.

Finding 3
The students’ results in the public examinations such as UPSR, PMR and SPM showed an improvement in the English subject after the implementation of Teaching and Learning Science and Mathematics in English (PPSMI).

**Finding 4**

The use of a narrow–approach software caused many teachers chose not to use it although it is provided by the Curriculum Development Centre (CDC). This is because the use of the software is believed to cause delay to the teaching process while teachers must finish the entire subject syllabus within a fixed period. Supposedly, teachers and students should not be totally bound and attached to the instructions and guidelines from the Ministry of Education in terms of textbooks, modules or teaching approaches. A standardized approach on students of different abilities will not be effective.

**Finding 5**

PPSMI is actually a positive and encouraging policy. This is mainly because of the efforts being put by the Ministry of Education and the various parties in providing detailed information about PPSMI to the community. There is also an improvement in the achievement of UPSR from year to year. This shows that the students have no problems in learning Mathematics and Science in English and even if there is, our students have successfully adapted to the use of the language. So, there is no need for our students to become the victims in our obsession of battling for the importance of Bahasa Melayu. The Government should balance the use of both the languages i.e. English and Bahasa Melayu, our national language, so that the status of the languages will be competitive between one another. PPSMI should be implemented through the two-stream system approach to encounter the prolonged and existing problems. The students who are able to continue learning the subjects in English will follow the PPSMI policy, while those who find it difficult will be allowed to learn the subjects in Bahasa Melayu. If PPSMI were to be put to halt, the government will suffer major losses because the money allocated for this programme is significantly large. On the other hand, the use of Bahasa Melayu which is requested in the
private businesses will double the efforts to translate the education-related books into Bahasa Melayu.

**Finding 6**

The implementation of Teaching and Learning Science and Mathematics in English (PPSMI) should be stopped immediately because it will take away Bahasa Melayu as one of the languages used in assimilating knowledge and information in the world. PPSMI had violated the sanctity of the Federal Constitution which clearly stated the position of Bahasa Melayu as a language for the main subjects in the primary schools. PPSMI has also reduced the dominance of Bahasa Melayu as the national language and also has weakened the ability of the students from other races to master the language. The Government should review the policy of the use of English as the language of Science and Mathematics in the primary and secondary schools and the learning must be continued to be in Bahasa Melayu again. The teachers and students in Malaysia will have no difficulties in grabbing the concepts and skills of Mathematics and Science in Bahasa Melayu as Bahasa Melayu is our national language. This will result in a better achievement and understanding in the subjects which eventually allow them to further learn Mathematics and Science in depth. The Ministry should determine which subject (i.e. English or Mathematics and Science) is more important than the other and should focus more to the important ones. Learning Mathematics and Science in English will be very difficult and frustrating especially for those who are weak in the language. As a result, they will not perform well in both English and Mathematics and Science. It is suggested that the Government should review thoroughly upon this matter.

**Finding 7**

The weakness of students in Mathematics, Science and English in the primary school causes a cumulative result to the next higher level. Taking this into consideration, there is a large possibility that the number of students who intend to pursue their higher education in Science and Technology, Medical, Agricultural and Business will be reduced in the near future, particularly among the Malay and Bumiputera students. In other words, the policy (PPSMI), failed to improve the learning and performance of English especially among the Malay and Bumiputera students, thus reducing the quality of education. The cumulative effect is that more Malay and Bumiputera students do not adequately capture the concepts, knowledge and skills
of Mathematics and Science and in English as well. The use of English to enhance the learning and understanding of Mathematics and Science is causing negative effects. The students will have to struggle more in these two difficult subjects.

**Finding 8**

The time allocation for teaching English at the primary school level should be increased and effective alternative methods of teaching English should be used. A sufficient use of English at the primary school level is the basis of learning and expanding knowledge in all fields, including in the fields of Science and Mathematics.

**Finding 9**

The percentage of students who are weak in understanding Mathematics and Science in English is increasing mainly due to their poor command of good English. This leads to the lack of ability to grasp the concepts of Mathematics and Science that are being taught in English. The fact is that the Malay students can easily understand and can better reflect the concepts of Mathematics and Science in Bahasa Melayu as they master the language. When the teachers explain the concept, information and knowledge of Mathematics and Science in Bahasa Melayu, the students can easily comprehend them. The use of Bahasa Melayu makes that particular concept even clearer and simpler to understand by the students as most teachers find it easier and more comfortable explaining the subjects in Bahasa Melayu rather than in English. This highlights the two factors that make PPSMI hard to be implemented i.e. the teachers and the students. When the teachers are unable to convey the information correctly in English, the students will gain little or no understanding upon the subjects and this happens oppositely if the teachers use Bahasa Melayu in their teaching. This is proven when the students show their low abilities in answering questions in Mathematics and Science tests given during the PPSMI implementation.

**Finding 10**

Teaching and Learning Science and Mathematics in English (PPSMI) is a policy which has its pros and cons. In fact, it is reasonable if it were to be implemented. But, what happens is that the Government straight away launched the policy without analytically evaluates the level of English possessed particularly by the Malay students. This is what we called a paradigm shift. In
my opinion, it should be implemented after establishing a good base in English among the Malay students. However, what has happened is that the Government is taking this action boldly simply because the Malay graduates are having problems during their job interviews both in the public and private sectors. Therefore, the Government thought that it is wise enough to implement such a policy in order to provoke the students so that they are aware of the problems. Besides the critics, we should see beyond this dramatic move. We can see that in the recent years, only the students with strong enthusiasm and motivation are able to confront such challenges despite the fact that some believe the scoring grade has been lowered. The best example is Nik Nur Madihah who is excellent in her SPM results although she lives in a home which does not allow her to study comfortably. All in all, after taking into consideration upon the multiple factors, including those who are unable to possess such positive and strong motivation, the Government will abolish PPSMI in 2012. Furthermore, before we jump into any solid conclusion, let us make our neighbour i.e. Japan as a model as they develop their nation without neglecting their own national language.

Finding 11

Teachers are freely forced to teach Mathematics and Science in English. Their lack of skill to teach in English makes them unable to transfer the correct concept effectively. Thus, the students will find the concept very hard to understand. Plus, they also must worry about their English. There are cases where some of the students who are excellent in Mathematics and Science, but they find it difficult to learn the subjects in English just because of the language barrier. As we know, this country faces a lack of English teachers and the subjects are being taught by teachers who are not fully able to guide the students to learn proper English. As a result, the students will be less skilful in the knowledge and the mastery of English. PPSMI can only be an appropriate policy to be established when the country is able to produce more excellent English teachers and all the students can possess a concrete base of English.

Finding 12

Teaching and Learning Science and Mathematics in English (PPSMI) does not add to the students’ ability to master their English. A new approach should involve an additional time allocated for both subjects at all levels of schools. The slots to learn either Bahasa Melayu or English should be increased to at least three hours per week starting from the primary school to
the secondary so that more time can be spent to improve their language subjects. In this way, the students who reach the age of 17 can speak in both languages with correct grammar without a mix of languages like what happens nowadays. The students in schools should be given a sufficient time to be language-developed and be able to use sophisticated and complex sentences to encourage their minds to become more open.

**Finding 13**

The implementation of teaching and learning Science and Mathematics in English will not essentially improve the students’ mastery of the language. Instead, learning both languages should be done in a better way with Bahasa Melayu be given a priority. Therefore, the approach that can be implemented by the Government to increase the students’ mastery of both languages is by adding more learning time in schools and using a teaching system that suits the students according to their age. In addition, the Government also needs to see that Bahasa Melayu and English are two different matters and they cannot be considered more or less superior than each other.

**Finding 14**

The mastery and understanding of knowledge, especially in Science and Mathematics, are more efficient when using Bahasa Melayu or the mother tongue of the other majority. There is an opinion that says PPSMI gambles the future of the next generation and the racial identity. In a study, the achievement of our students in Malaysia was ranked the 20th against neighbouring countries, namely Singapore and China, which are the first and second respectively last year. This should be taken into consideration as it pictures the effectiveness of PPSMI. It is also feared that PPSMI will enlarge the achievement gap between the urban and rural students which eventually will lead to the economic gap and the status of life in the future. However, the importance of mastering English is undeniable. It is proven when most Malaysians agree to include English as one of the compulsory subjects to be passed in SPM. English can be further strengthened through a variety of ways either in co-curricular activities, competitions or directly through the interactions between the teachers and students.
Finding 15

All the efforts to produce a competitive next generation in this era of globalization show that the awareness in learning English is the main foundation in the education system. However, abolishing the policy of Teaching and Learning Science and Mathematics in English (PPSMI) will not affect the goals of the education system. The use of English can be implemented through the addition of English lesson periods in schools and having qualified teachers, not to mention improving the facilities such as language laboratories and the introduction of English literature in the English lessons.

Finding 16

It is believed that if the policy were to continue, the achievement gap among the students based on ethnicity, school location and type of education will be considerably large. Eventually, this will lead to a gap in the economic state and status of life in the future. The data based on the academic achievement show that PPSMI increases the achievement gap between the urban and rural students. This indirectly develops a visible gap between the Malay and non-Malay students. The effect is devastating and may be dangerous to the generation within 10 to 20 years.

Finding 17

Teaching and Learning Science and Mathematics in English (PPSMI) that has been implemented since 2003, will finally be put to an end by the Cabinet in 2012. This drastic measure is being reviewed carefully so as to dignify Bahasa Melayu as the national language and further improve students’ English through the addition of time and instructors.

Finding 18

The requirement to pass English in SPM should be put into consideration and practice much earlier before the existence of Teaching and Learning Mathematics and Science in English (PPSMI). This should exist five years ago before the ever controversial PPSMI policy is implemented in schools. PPSMI is said to be a burden to the students and teachers that supposedly should not exist and the concerned parties need to find specific strategies to strengthen the teaching and learning of English in the primary and secondary levels. As we all
know, PPSMI is launched to improve the students’ English through the learning of Mathematics and Science in schools and thus preparing them for future employment. However, what we see today seems to fail the main purpose of PPSMI because of the lack of preparation for having skilful teachers both in English and Mathematics and Science.

**Finding 19**

Abolishing PPSMI is an act that depicts us to “run away” from the problems and directly 'succumb' to the importance of 'Cultural Nationalist' and their goals that we are familiar with. It is inappropriate by any means to use the term of ‘nationalist’ but we fail to practically prove it. In this case, it is wrong to say out loud that we love this country but we are unable to compete with ourselves and with the other countries. PPSMI may not completely eliminate our racial identity. This policy should not be seen from the point of political, racial or cultural views and national races. Instead it must be accepted as a preparation to the country in preparing the future generations to survive through the more challenging world. It is also a path full of challenges but provides promising opportunities when we were to continue the good policies of PPSMI from the primary school as it is implemented now. This is the best for our country and nation for the upcoming 50 years more. So, if we know about its advantages, then we should just accept the implementation of the policy full-heartedly. In this era of the borderless world, we cannot downgrade the ability and capacity of the rural Malay children to learn Science and Mathematics in English. PPSMI should be continued. Give them the opportunity to obtain something good for the sake of their future.

**Finding 20**

Using English teaching methods in Science and Mathematics has become a concern nowadays. PPSMI is necessary and should be implemented in schools because it indirectly familiarizes the students with English as a medium of information acquisition. However, a new policy would normally take a little time to be adapted into the learning environment. With some improvement and initiatives from the various parties (teachers, students and the Ministry), it is not impossible for us to achieve such educational goals. It is an exaggeration to say that the students in the rural areas fail to master English and so in Science and Mathematics! PPSMI brings advantages like encouraging the students to strive hard for example by referring to the dictionary to search for the terms that are not understood, making themselves familiar with the words and sentences
which are very important when they are in the secondary schools and universities. Teachers’ roles are providing interesting and creative ways of teaching and the learning methods should be able to attract the students so that the students can be more enthusiastic and most importantly, it can bring excitement to the learning.

**Finding 21**

PPSMI policy should be implemented at the school level due to the short of excellent graduates from the local universities as their command of English is weak. This scenario becomes more complicated as the employers tend to prefer their recruits to be able to speak in English well. However, the policy should suit every student especially the students from the rural areas as it is feared that they might not be able to catch up with Mathematics and Science. They must first be exposed to English learning methods that are more effective at this level and the Ministry should train the teachers to improve their teaching methods before its implementation.

**Finding 22**

Science and Mathematics are the core aspects to the development of technology. The use of the foreign language in this field in schools especially at the lower level will affect the use of Bahasa Melayu in the field of technology. This will result in the use of the language itself being removed from the field of learning and teaching. Malaysians should be proud of our national language and lift it up parallel to the technological advancement. The information sources especially the books should be translated into Bahasa Melayu. This is also consistent with the 5th National Principle which is Courtesy and Morality. The Malays are very famous among the foreigners for having their life full of customs, politeness and morality. The society plays an important role to elevate and raise Bahasa Melayu among the foreigners. The Japanese have been particularly successful in making their progression in the high technology without glorifying the foreign language. We should emulate them by maintaining our own language without ignoring the technological development.
Finding 23

Among the rationales why Science and Mathematics should be taught in English must be viewed from the aspect of national development and the ability to struggle in the era of globalization. To achieve this goal, the human development is a very important agenda. Human development here means the student generation. The Government aims to develop a new generation of students who are able to master Science and Technology at a higher level and capable of generating new knowledge and technology in these areas in the future and thus contributing to the number of our intellectuals.

As we know, the development of knowledge and information in both areas are very fast and many innovations and new discoveries occur almost every day through the research and development. At present, most of the information in this field in either electronic or non-electronic is available in English. With this, the early exposure to Science and Mathematics in English will enable the students to access the information and discover it. Therefore, PPSMI is the best step for realizing the goals of this country.

PPSMI is also conducted to facilitate the understanding and avoid the misunderstanding of many terms in Science and Mathematics among students.

Besides focusing on the students, PPSMI also emphasizes on the teachers. PPSMI aims to enhance the teachers’ mastery of English and self-confidence thus producing superior teachers to teach and educate in Science and Mathematics. For these purposes, the Ministry provides intensive short-term and long-term courses and weekend courses, learning modules and a self-based on-line website to the teachers and not to mention providing information communication technology infrastructure (ICT) such as a laptop computers, LCD projectors, screens and interactive materials to the schools to facilitate the process of P & P.

Finding 24

PPSMI can be put into practice, but not 100%. This is because the students with less skill in English will have to bear the burden of learning the language and the scientific subjects at the same time. The main purpose is actually to grab and apply the knowledge, not to master the language. Here, it is proven that the knowledge should be prioritized, rather than the language. PPSMI can be implemented by familiarizing the students with the important terms (in
Mathematics and Science) in English. These terms must be introduced in two languages, namely English and Bahasa Melayu. This is important to avoid any confusion when a term is translated from English to Bahasa Melayu or vice versa. The communication language must also be in Bahasa Melayu, because the majority can understand the language.

SUMMARY OF FINDINGS

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generation in the era of globalization

16 PPSMI will cause larger achievement gap among students

17 PPSMI abolishment has been reviewed

18 Passing requirement of English in SPM should be implemented before the existence of PPSMI

19 Abolishing PPSMI is an act of running away from the reality

20 English teaching methods in Science and Mathematics become an issue

21 PPSMI policy should be implemented at school level

22 Science and Mathematics are the core aspects to the advancement of technology

23 PPSMI implementation must be viewed from the aspect of national development and the ability to compete

24 PPSMI is possible to be implemented but must be practiced gradually

CONCLUSION

The government’s policy should be focused on the strength of mastering Mathematics and Science in the primary and secondary school level until to the level of SPM. This has been successfully implemented through the use of Bahasa Malaysia as the teachers and students have a good command in the language. That is why it is easier for them to learn Science and Mathematics in Bahasa Malaysia effectively. To use English as the language to learn Mathematics and Science will not make the learning process simpler and will not improve the students’ achievement in Mathematics and Science. As a second alternative, after analyzing and examining the findings, we can also try to use both languages which are Bahasa Malaysia and English for the teaching and learning of Mathematics and Science.
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