DRAFT

Exploring the effects of language on students' mathematics and science achievements in Southeast Asian countries using Hierarchical Linear Modelling

Noor Azina Ismail

University of Malaya

nazina@um.edu.my

Abstract

The effect of language competence on students' achievement is an important issue and has implication for general educational and pedagogical policies. This has become a sensitive and controversial topic in many Asian countries. This paper reports on research based on a secondary analysis of the performance of pupils in three Southeast Asian countries in the Trends in International Mathematics and Science Study (TIMSS) 2007 in which students were examined via tests in mathematics and science. The aim of this study is to investigate the effect of language on students' performance in mathematics and science subjects, taking into account gender differences, socioeconomic status and attitude towards mathematics and science. Given the complexity of the data collected in TIMSS, multi-level modeling techniques are used to account for the clustering effects. School differences account for more than forty percent of the variations in student achievements in mathematics and science subjects for all Southeast Asian countries in this study with Malaysia having the highest percentages in both mathematics and science. While language has no significant effect on

achievements among Indonesia students, it had a negative effect on mathematics achievement in Malaysia and a positive effect on science achievement in Singapore.

1.0 Introduction

There is a widespread interest among Asian countries in improving the levels of mathematics and science achievements in school. The availability of a study such as Trends in Mathematics and Science Study (TIMSS), provides a venue to compare achievements in mathematics and science among students all around the world. TIMSS was conducted by the International Association for Evaluation of Educational Achievement (IEA). The results of this study were received with mixed responses among the countries involved in it. Educational policymakers in some countries were taking them seriously, changing their policy of teaching and learning accordingly and these may end up carrying out further research to identify ways in improving achievements in mathematics and science among their students. Evidence from previous research suggested certain factors relating to the students' performance can be explored in relation to the background information that was collected at the student or class/school levels (Howie & Plomp, 2001).

The effect of language proficiency on academic performance, especially in mathematics and science achievements, has been a subject of interest for many decades. Aiken (1972) summarizes the results of studies in which various measures of general and specific reading abilities have been correlated positively with scores on arithmetic and mathematics tests. Cuevas (1984) has also found that an inadequate grasp of the language of instruction is a major source of underachievement in school. These studies were conducted in the United States of America. A study conducted in South Africa (Howie, 2005) gives similar results in that students who spoke the language of the test more frequently at home appeared to attain higher scores on the mathematics test.

While language proficiency has a positive effect on achievement, there are other factors that should be taken into account in explaining the variation in mathematics or science achievements. At the student-level, home background predicted the greatest variance in achievement outcomes (Coleman et al., 1966). Coleman et al. (1966) also noted that poverty and class predicted achievement more reliably than school factors. The school-level factors, on the other hand, were found to have a low percentage of variance in studies conducted in Western Europe and the United States of America (Reynolds & Cuttance, 1992; Howie & Plomp, 2001). Specifically, class size was found by a number of studies to have a minor effect on achievement (Greenwald et al., 1996). From school effectiveness research, a number of studies (Riddell, 1997; Creemers, 1996) identified textbooks, teacher quality and time as key factors that influence achievement. Other factors, in particular, leadership, organization and management are also identified as important factors.

The above findings are mostly from studies conducted in developed and Western countries. Howie & Plomp (2001) noted that outcomes in research and factors that influence student achievement may be different between developed and less developed nations. The World Bank (1995) listed libraries, time on task, homework, textbook provision, teacher knowledge, experience and salaries, laboratories and class size as important for effective schooling in developing countries. Other researchers (Schmidt et al, 1999; Schmidt et al., 1996) found that the school mathematics curriculum in the western countries, especially in the United States of America, to be less focused and more repetitive as compared to Asian countries.

Motivated by the fact that there has not been much research done on factors affecting achievement in Southeast Asian countries and they may be different for these countries, this study seeks to investigate the effects of student and school-level factors on mathematics and science achievement in these countries. Specifically, this study aims to investigate the effect of language background on mathematics and science Four Southeast Asian countries participated in TIMSS 2007, the most recent data available from TIMSS. These countries are Singapore, Malaysia, Thailand and Indonesia. However, Thailand was excluded from this study due to a lot of missing values in the data. The three Southeast Asian countries provide very interesting situations with regards to language used in mathematics and science teaching since there exist different policies about the languages of instruction and different overall patterns of academic achievements in mathematics and science. Nonetheless, the selection of factors is limited to those collected by the Trends in International Mathematics and Science Study (TIMSS) 2007.

2.0 Academic Performance in TIMSS

Background from TIMSS Singapore, Malaysia, Indonesia and Thailand were the four Southeast Asian countries that participated in TIMSS 2007 at the eighth grade level. This cycle was the first time that both Thailand participated and the Philippines dropped from the study. Similar to previous assessments, Asian countries topped at both mathematics and science. Among the five Southeast Asian countries that ever participated or are still participating in TIMSS, only Singapore was in the top ten in both mathematics and science achievement. Singapore was also the top performing country in mathematics for 1999 and 2003 but was below Chinese Taipei and the Republic of Korea in 2007. Nevertheless, it was able to maintain a top position in science since 2003. Malaysia, on the other hand, was able to improve its position from sixteenth place in 1999 to tenth in 2003 but plunged to twentieth place in 2007 in mathematics achievement. While Malaysian students were ahead of countries like Norway and Italy in science achievement in 2003, there was a total reversal in TIMSS 2007 (Martin et al., 2004; Mullis et al., 2004; Martin et al., 2008; Mullis et al., 2008). Nevertheless, Malaysia has maintained its position in science for its first three cycles of tests. Contrastingly, in comparison with the international average, Malaysian students scored significantly lower for both mathematics and science in 2007. The results of Indonesian mathematics and science scores from TIMSS indicate that it had consistently performed below the other two countries in both subjects and the scores had always been significantly lower than the international average. Thailand participated for the first time in TIMSS in 2007 and performed better than Indonesia but lower than Singapore and Malaysia in mathematics and science achievement.

3.0 Language Policy

There are around 1000 languages spoken in the Southeast Asian nations (Enthnologue, 2005). In Indonesia, Indonesian (Bahasa Indonesia) is not only the official and national language but it is also the language of instruction at all levels of education. However, being the most linguistically diverse country in all Asia, with more than 740 languages, only about 15 percent (SEAMEO, 2009) of the population can speak Indonesian as their mother tongue but a large proportion speaks Indonesian as a second language. Despite Law No. 20 of 2003 that states that a mother tongue other than Indonesian can be used as the language of instruction, in practice, the formal education system tends to use only Indonesian as the language of instruction (SEAMEO, 2009). The non-dominant languages are used orally to create a good learning environment.

In Malaysia, however, although Malay (Bahasa Malaysia or Bahasa Melayu) is the official and national language since 1957, the Constitution allows freedom to use, teach and learn in any language (Nagarathinam, 2008). The formal primary education system has two kinds of schools, the national schools and the national-type schools. The national primary schools use Malay as the main language of instruction, the Chinese national-type primary schools use Mandarin and the Indian national-type schools use Tamil or an alternative Indian language as the main medium of instruction. In May 2002, the then Minister of Education, announced that the English medium was to be re-introduced for teaching mathematics and science (David & Govindasamy, 2007). Although the adoption of English as a medium of instruction for mathematics and science in 2003 seems desirable and progressive, it also changes the dynamics of teaching and learning mathematics and science in the classroom (Yahaya et al, 2009). Teachers who have been teaching and learning in Bahasa Malaysia were from that time forward expected to teach in English and since they have proficiency problems with the new medium of instruction, they may resort to the teaching of mathematics and science in a mixture of both languages (Yahaya et al, 2009). When the findings of TIMSS 2007 were released in 2008, Malaysia was embroiled in ongoing controversy as to whether the teaching of science and mathematics in English should continue or whether to revert to Bahasa Malaysia, the official language of Malaysia.

Singapore has four official languages: Malay, Mandarin Chinese, Tamil and English but English is the main language of instruction at all levels of education and is gaining around as the main home language among all major ethnic groups among younger generations in that country (SEAMEO, 2009).

4.0 Methodology

Data

The data used in this study are those collected by the International Association for the Evaluation of Educational Achievement (IEA) under the Trends in International Mathematics and Science Study (TIMSS) 2007 for the eighth grade students. TIMSS 2007 is the fourth assessment in this framework and, as mentioned earlier, provides the most recent data available in this study. The next available data will be in 2013 for TIMSS 2011. The previous assessments were conducted in 1995, 1999 and 2003. All of the variables selected in this study were from the students' questionnaire. These variables include student background (gender and language spoken at home), socio-economic status (number of books in home, fathers' and mothers' highest education level and items on a list of possessions at home) and attitude towards mathematics and science learning (time spent on homework, motivation, self-confidence and the value placed on learning mathematics or science).

Since TIMSS uses an incomplete or rotated-booklet design for testing children on the major outcome variables, this study uses plausible scores of mathematics or science which indicate what the student might have obtained had the student completed the full test, and given the measurement error associated with the test. TIMSS selects five plausible values for each student.

Due to the fact that data were collected on two levels, the student level and the school level, and students were nested within schools, multilevel modeling was undertaken using HLM 6 (Scientific Software International, 2004). Multilevel modeling allows us to distinguish between the variance explained by student-level factors and school-level factors. For Indonesia and Malaysia, TIMSS selected one class per school and so the selected class represents the school. Singapore is the only country in this study where more than one class is selected from each school. However, in this study, we have assumed that there are no significant differences between these Singaporean classes within the eighth grade and that such differences as do exist are negligible so that the analyses are consistent with the other two countries.

As an initial step, a fully unconditional (null) model was tested to investigate the variability within and between schools. Six sets of analysis were undertaken to measure the levels of variation, two for each country, taking into account each subject (mathematics or science). The null model partitions variations in the dependent variable into two components, the between and within classes. The proportion of the total variance that is between classes is called the intra-class correlation (ICC). A large between-schools variance component is an indication that the data may not come from a simple random sample and that there is a considerable variation that could be explained using school-level variables.

The next models added the covariates, such as how frequently the language of the test was spoken at home (SPEAK, 1 = always, 2 = almost always, 3 = sometimes, 4 = never), gender of student (SEX, 1 = girls, 0 = boys), variables representing socio-economic status (SES) and attitude towards mathematics or science, in sequence, one at a time. SES is represented by the number of books in home (BOOK, 1 = 0 to 10, 2 = 11 – 25, 3 = 26 – 100, 4 = 101 – 200, 5 = over 200), mother's and father's highest education background (FED and MED, 1 = ISCED 1 or did not go to school, 2 = ISCED 2, 3 = ISCED 3, 4 = ISCED 4, 5 = ISCED 5B, 6 = ISCED 5A or first degree, 7 = beyond ISCED 5A or first degree) and number of home possession items (ITEM). The maximum number of home possession items was 9 for Singapore and Indonesia; and 8 for Malaysia. Attitudes toward mathematics or science included time spent on mathematics or science homework (TH, 1 = low, 2 = medium, 3 = high), students' positive affect toward (PAT, 1 = low, 2 = medium, 3 = high) mathematics or science, students valuing (SV, 1 = low, 2 = medium, 3 = high) mathematics or science and students' self-confidence (SC, 1 = low, 2 = medium, 3 = high) in learning mathematics or science. Time spent on mathematics or science homework is represented by an index that summarized the amount of time typically devoted to mathematics homework in each country. This index assigns students to a high, medium or low level, depending on the frequency of mathematics or science homework they are assigned each week and the amount of time they spend on it. A high index level is assigned to students who were given homework at least 3 – 4 times a week and spend more than 30 minutes on each assignment. Students at the low level were assigned homework no more than twice a week and spent no more than 30 minutes on each assignment. Those with a medium level included all other response combinations.

TIMSS has also created indices to investigate how students feel about mathematics or science in terms of their positive attitude toward mathematics or science (PAT), how students place value on mathematics or science learning (SV) and students' self-confidence in learning mathematics or science (SC). To assess each of these dimensions, students were asked to respond to a number of statements based on four scale responses: agreed a lot, agreed a little, disagreed a little and disagreed a lot. The index of PAT was constructed based on students' responses to three statements about mathematics or science: I enjoy learning mathematics or science, mathematics or science is boring and I like mathematics or science. On the other hand, the index of SV is based on four statements: I think learning mathematics will help me in my daily life, I need mathematics to learn other school subjects, I need to do well in mathematics to get into the university of my choice and I need to do well in mathematics to get the job I want. Lastly, the index of SC is also based on four statements about their mathematics ability: I usually do well in mathematics, mathematics is harder for me than for many of my classmates, I am just not good at mathematics and I learn things quickly in mathematics. The same process was used to establish PAT, SV and SC for science. When constructing the index, the response categories for negative statements were reversed. For all the indices above, the high level of index was assigned to students who, on average, agreed a little or a lot with all the statements, while those who disagreed a little or a lot, on average, were assigned to the low level of index. The medium level includes all other response combinations.

Unfortunately Indonesia did not collect information on almost all variables related to determining the attitude towards science in this study and hence, therefore this study excluded these variables in the analyses for Indonesian students. The final models that include all covariates are presented and used for discussion.

Results

Table 1 shows the distribution of language background among students in the three countries. Malaysia registers the highest percentage of students who always or almost always speak the language of the test at home. In contrast, only 35 percent and around 45 percent, respectively, of Indonesian and Singaporean students were in these categories.

Table 1: Language Background of the ASEAN Countries (%)

	Malaysia	Indonesia	Singapore
Always	46.5	21.6	23.9
Almost always	14.4	13.4	21.8
Sometimes	29.0	57.8	46.8
Never	10.1	7.1	7.6

A fully conditional (null) model was tested for mathematics and science for all three countries and the results are presented in Table 2. The between school variations in achievement in mathematics and science subjects are substantially large for all three countries. The results for Malaysia show a high level of variance at the school level for both subjects (over 60 percent). The other two countries, Singapore and Indonesia, have a slightly lower level of variance at the school level. Such a large between-school variance indicates that there are considerable variations that could be explained using school or class-level variables.

Table 2: Variance Between Levels in Mathematics and Science Achievements Explained by Two-Level HLM Models

	Malaysia		**Indonesia**		**Singapore**	
	Mathematics	Science	Mathematics	Science	Mathematics	Science
School Variance	4084.617	5095.578	3363.302	2377.884	4099.857	5404.624
Student Variance	2550.298	3246.726	4097.211	3189.891	4530.688	5376.261
ICC	0.6156	0.6108	0.4508	0.4271	0.4750	0.5013

To try to explain within-school variation in achievement, the next step in the analysis was to add the student level predictors. This step allows differences between schools to be adjusted for differences at the student level. The results in Table 3 show that the language spoken at home explained only a small amount of the between-student variance in all three countries. In fact, these amounts are almost negligible except for mathematics in Malaysia and science in Singapore. Adding the gender of students in the next step did not really substantially increase the percentages of explained variance at the student level. When mathematics achievement was adjusted for the language spoken at home and the gender of the students, the amount of variance explained at the student level increased by less than 2 percent for all three countries in both subjects.

SES appeared to be a more significant variable. The amount of variance explained at the student level increased more than 9 percent for mathematics in Malaysia when SES was added into the model. At the same time, the percentages have also improved substantially in the other two countries, with Indonesia having more than a 10 percent increase and Singapore having more than a 17 percent increase. SES played a bigger role in explaining differences in science achievement among Southeast Asian students as compared to mathematics achievement. By adding SES, the amount of variance explained at the student level increased by more than 11 percent for Malaysia and Indonesia and by almost 20 percent for Singapore. Adding attitude into the models, a substantial increase in the amount of variance could be observed for all countries in both mathematics and science.

Table 3: Variance in Mathematics and Science Achievements Explained by Two-Level HLM Models (%)

	Malaysia		Indonesia		Singapore	
	Mathematics	Science	Mathematics	Science	Mathematics	Science
SPEAK	6.08	3.26	0.78	1.08	2.49	5.51
SEX	7.00	4.87	1.56	2.58	3.45	6.73
SES	16.34	16.09	11.85	13.84	21.12	26.21
ATTITUDE	31.04	27.36	23.23	NA	43.12	41.35

The results of HLM analyses for all the three countries are shown in Table 4. For Malaysia, the language spoken at home has a negative significant effect on mathematics achievement but gives no effect on the science achievement. Interestingly, these results suggest that students who speak the language of the test less frequently do better in mathematics as compared to those who speak more frequently. As has been found in previous studies, gender has a significant negative effect on both subjects, indicating that girls' achievement levels for both subjects are still behind that of boys. The two significant SES factors are the number of books and the number of home possession items at home. Students with more books at home and those with more home possession items tend to have higher achievement levels in mathematics and science subjects. Parents' education, on the other hand, did not seem to affect achievement in both subjects. Attitudes played a big role in mathematics and science achievements among students in Malaysia. However, whether students placed a high value on mathematics or not did not affect how they performed in mathematics. For science, time spent on science homework had no association with a high level of science achievement among students in Malaysia.

In Indonesia, language background and most measured elements of socio-economic background were not significant in explaining the variation in mathematics and science achievements. While the result shows that Indonesian boys did better in science compared to the girls, the effect of gender was not significant in mathematics achievement. It should also be noted that fathers' highest education level, rather than mothers' as in findings of studies in other countries, has a positive effect on both subjects for Indonesian students. Similarly to its neighbour, Malaysia, attitude also had significant effects on mathematics achievement in Indonesia in terms of TH, PAT and SC. However whether students placed a high value on mathematics (SV) or not did not affect how they performed in mathematics.

Language background has a positive effect on science achievement in Singapore, indicating that those who always speak the language of the test at home did better in science as compared to those who seldom spoke or did not speak the language of the test at home. Notwithstanding, in terms of mathematics achievement, language background did not have a significant effect. Socio-economic status played a big role in achievement in both subjects among Singaporean students, with all of the variables within this dimension showing positive effects, except for the highest level of education of fathers. The estimates of these variables are smaller than for Malaysian students and less significant for Indonesian students.

Table 4: Multi Level Analysis of the ASEAN Countries TIMSS 2007 Data with Mathematics and Science Test Scores as Dependent Variables (Weighted Data)

	Malaysia		Indonesia		Singapore	
	Math	Science	Math	Science	Math	Science
Intercepts	484.359***	487.015***	412.535***	401.102	620.623***	574.392***
SPEAK	-9.823***	0.097	-3.876	-0.710	0.688	6.850***
SEX	-3.860*	-9.128**	3.395	-7.235*	1.763	-5.507
SES						
BOOK	4.207***	4.565***	-2.660	-2.461	6.760***	7.776***

MED	-0.830	1.175	-1.004	-3.262	-0.872	-1.032
FED	-0.335	0.061	6.936**	7.389***	1.484*	2.807**
ITEM	3.261***	3.403*	2.273	2.087	5.899***	8.240***
ATTITUDE						
TH	4.451*	-0.655	8.403**		14.938***	7.404***
PAT	6.051***	6.197***	7.560*		7.220***	9.193***
SV	3.310	10.377***	7.927		2.382	12.528***
SC	17.092***	11.495***	14.044**		24.534***	11.907***

Discussion

The findings of this study suggest that a large number of variations in mathematics and science achievements in Southeast Asian countries are due to school factors. One possible explanation is due to pupil management practice where many Southeast Asian countries stream the classes in their schools after students complete the primary level, so students within each school are arranged into classes according to their academic achievement.

This study does not take into account prior achievement differences due to the unavailability of such information in the TIMSS data. Since the aim of this study is to investigate the effect of language background, differences due to teachers and school factors are not included either.

The language background did not a play a big role in maths and science achievement for Grade 8 students Southeast Asian countries in the 2007 TIMSS study since it only explains a very small extent of variation in mathematics and science achievements. Futhermore, the effects of language are negligible in Indonesia and only significant in explaining the differences in mathematics for Malaysia and science for Singapore. Since the language of instruction was recently changed from Bahasa Malaysia to English, it was expected that language would be significant in explaining the variation of achievement in Malaysian students in both subjects. In fact, language was shown to have a negative effect in mathematics achievement. The results show the counterintuitive finding that students who did not always speak the language of the test at home do better at mathematics than those who always did. This study also shows that language is not significant in explaining the variation in science. Since language would appear to have a greater effect in science learning rather than mathematics, this result would suggest that further investigation should be carried out on the effect of language in mathematics learning and there may be factors other than language that have affected the results.

In Singapore, there does appear to be a difference in science achievement for students who speak the language of the test at home compared with those who do not. However, a similar pattern cannot be observed in mathematics achievement. Furthermore, language explained around 5 percent of the total variance at the student level and hence, it can be concluded that there is a relationship between the frequency of the factor that the language of the test is spoken in home and science achievement. It appears that the more frequently a student speaks the language of test in home, the more likely he or she will do well in science.

The results also show that much of the variation at the student level in Malaysia and Singapore can be explained by socio-economic status and attitude towards mathematics or science learning.

References

Aiken, L. R. (1972). Language factors in learning mathematics. *Review of Educational Research*, 42, 359 – 385.

Coleman, P., Campbell, E., Hobson, C., McPartland, J., Mood, A. Weinfeld, F. & York, R. (1966). Equality of educational opportunity: Washington DC. National Centre for Educational Statistics.

Creemers, B. P. M. (1996). The school effectiveness knowledge. In Reynolds D. et al (eds). *Making good schools: linking school effectiveness and school improvement*. London: Routledge.

Cuevas, G. J. (1984). Mathematics learning in English as a second language. *Journal of Research in Mathematics Education*, 15(2), 134 – 144.

David, M. K. & Govindasamy, S. (2007). The construction of national identity and globalization in multilingual Malaysia. In A. B. M. Tsui & J. W. Tollefson (eds.), *Language policy, culture, and identity in Asian contexts*, 55 – 72. Mahwah, NJ: Lawrence Erlbaum Associates.

Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, 66(3), 361 – 396.

Howie, S. J. & Plomp, T. (2001). English proficiency and other factors influencing mathematics achievement at junior secondary level in South Africa. Paper presented at the Annual Meeting of the American Educational Research Association. Seattle, WA.

Howie, S. (2005). System-level evaluation: Language and other background factors affecting mathematics achievement. *Prospects*, XXXV(2), 175 – 186.

Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., & Chrostowski, S.J. (2004). TIMSS 2003 International Science Report: *Findings From IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Martin, M.O., Mullis, I.V.S., & Foy, P. (with Olson, J.F., Erberber, E., Preuschoff, C., & Galia, J.). (2008). *TIMSS 2007 International Mathematics Report: Findings from IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Chrostowski, S.J. (2004). TIMSS 2003 International Mathematics Report: *Findings From IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., & Foy, P. (with Olson, J.F., Preuschoff, C., Erberber, E., Arora, A., & Galia, J.). (2008). *TIMSS 2007 International Science Report: Findings from IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Nagarathinam, R. (2008). *Current policies, developments and challenges in mother tongue education amongst public schools in Malaysia.* A paper presented at the Regional, Consultative Workshop on 'Using the Mother Tongue as Bridge Language of Instruction in Southeast Asian Countries: Policy, Strategies and Advocacy', Bangkok, Thailand, 19 – 21 February 2008.

Reynolds, D. & Cuttance, P. (1992*). School effectiveness: research, policy and practice*. London. Cassell.

Riddell, A. (1997). Assessing designs for school effectiveness research and school improvement in development countries. *Comparative Education Review*, 41(2), 178 – 204.

SEAMEO (2009). *Mother tongue as bridge language of instruction: policies and experiences in Southeast Asia.* The Southeast Asian Ministers of Education Organization (SEAMEO) Secretariat: Bangkok, Thailand. http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099079993288/Language_of_Instruction_SAR1.pdf, accessed on 15 April 2011.

World Bank (1995). Prorities and strategies for education: A World Bank Review. Washington, D. C.: The World Bank.

Yahaya, M. F., Mohd Noor, M. A., Mokhtar, A. A., Mohd Rawian, R., Othman, M. & Jusoff, K. (2009). *Teaching of mathematics and science in English: The teachers' voices*. English Language Teaching, 2(2), 141 – 147.