Teaching Mathematics and Science in English in Malaysian classrooms: Teacher beliefs, classroom practices and student learning

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In 2003, after more than thirty years of using Bahasa Malaysia as the medium of instruction for all subjects, the Malaysian educational system started implementing a policy that made English the medium of instruction for Mathematics and the Sciences in primary and secondary schools. In order to ease transition problems, high-stakes exit exams are conducted at present using bilingual exam papers, with the final objective of eventually having English only exams. This paper examines the perceptions and beliefs of Math and Science teachers (MST) who teach Secondary Four and Five students. These students are the first and second cohort to undergo the learning of these subjects in English under this new policy. Using survey data, teacher interviews and classroom observations, it looks at how MST perceptions and beliefs influence classroom practices. It discusses how these practices can potentially influence the learning and exam performance of their students.

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INTRO

In 2003, after more than thirty years of using Bahasa Malaysia as the medium of instruction for all subjects, the Malaysian educational system started implementing a policy that made English the medium of instruction for Mathematics and the Sciences. This policy is commonly known by its Malay acronym, PPSMI (Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris). In English, it stands for "English as the Language of Instruction for Mathematics and Sciences". The main objective of this policy is two pronged: it aims to produce a new generation of students who are scientifically and technologically knowledgeable *and* fluent in English. In so doing, these youth will be able to continue accessing knowledge, especially in the sectors of science and technology, even after leaving school. They therefore become valuable human capital, a workforce capable of continued learning, which contributes to the economic growth and development of the country.

PPSMI had simultaneous entry points at three levels in the school system: Standard One, Form One and Lower Form Six. Mathematics and Science teachers (hereafter referred to as MST), therefore, became change agents responsible for ensuring that their students would be competent enough to function in these subject domains in English. Unwittingly, MST are now expected to play the role of *teachers of English for Academic Purposes (EAP)* in mathematics and science classrooms. This poses quite a challenge in the Malaysian context since the teachers themselves, as well as their students, are English Language Learners (ELL), i.e., English is not their first language. Moreover, in terms of teacher education, MST are trained first and foremost to be subject specialists, not language teachers.

The educational system in Malaysia is very exam oriented and the Malaysian Ministry of Education has harnessed the intense pressure that major public exams can exert to promote change in teaching practices in the classroom. As part of this policy, the Form Five (Grade Eleven) high-stakes exit exams, called the SPM exams, for all Mathematics (Mathematics and Additional Mathematics) and Science subjects (Biology, Chemistry, Physics, Science) have been in bilingual format since 2003. However, the Form Five students sitting for these exams at that time were still being taught in Bahasa Malaysia.

This paper examines the classroooms of MST who are teaching Mathematics and Science in English at the Form Five level for the first time to find out how MST view these exams and

1) How do MST perceive English as compared to BM as the language of instruction? Are there differences between urban and non-urban MST?
2) How do MST perceive the bilingual Mathematics and Science exams, i.e., the BM version as compared to the English version? Are there differences between urban and non-urban MST?
3) How do their perceptions affect their classroom practices, and consequently, student learning? Are there differences between urban and non-urban MST?

Methodology

A mixed methods approach was used both for data collection and for data analysis (Tashakkori & Teddlie, 2003). It was felt that this methodology would be best suited for capturing the multiple facets of washback that occur at the systemic level as well as school and classroom contexts.

The study used a complex research design both for the quantitative and qualitative data. This means the data collection process tried to ensure that there could be comparisons made between and within all designated levels and categories across data collection periods and also across the different kinds of data whenever possible.

Duration of the study

The research took place over the course of one school year from the months of January to November. Three periods of data collection were designated. The first period, T1, is at the beginning of the school year. The second period, T2, is in the middle of the school year. The third and final period of data collection, T3, is at the end of the school year, when the SPM exams are just about to take place.

Participants

Quantitative Data (Survey)

The participants who filled out the survey were Form Four and Five MST in 41 secondary schools from 3 states on the West Coast of Peninsular Malaysia. These MST came from two groups of schools within each state. The first group refers to urban area schools, meaning that they are situated in towns or cities with a high population density, a good system of infrastructure and public services. The second group consists of out-of-town (OOT) schools in areas with low population density. These schools are located in areas where infrastructure and public services, while they exist, may be less extensive or of a relatively lower quality.

The table below shows the number of urban and out-of-town schools from each state:

Table 1: Number of schools per state

STATE	URBAN SCHOOLS	OUT-OF-TOWN (OOT) SCHOOLS
PENANG	9++	6
PERAK	6	6
JOHOR	7*	8
TOTAL	22	20

Qualitative Data (Case Study)

MST were observed and videotaped while doing classroom teaching. An observation grid was filled in as teaching occurred. Audiotaped, semi-structured interviews were conducted with participating Form Four and Five MST. The semi – structured interview explores MST's academic and teaching background, their students' backgrounds, school environment and how these influence their perception of the PPSMI policy and SPM exam. Field notes were additional sources of information. Sometimes, informal chats with teachers in the staffroom and school corridors were also helpful in providing insight into certain aspects of the policy, teacher opinions and teaching practices. Permission was obtained from the teachers concerned to use this data. Group interviews and informal conversations with students are sources of qualitative data as well.

Data collection procedure

Batches of 6 – 30 questionnaires were hand delivered to each school between mid-January and early March, 2007 during the first period of data collection. The questionnaires were either left with the principal, senior assistant or Head of the Math and Science panel in every school. Therefore, the choice of language for the questionnaires was usually made by these individuals and not the teachers themselves. These questionnaires were either collected in person or returned by mail. The same procedure was repeated for the same schools between mid-October and early November, 2007 for the third period of data collection.

In each of the case study schools, Form Four and Five MST were observed and interviewed once over the three periods of data collection (T1, T2, T3): at the beginning of the school year from March to April, in the middle of the school year in July and at the end of the school year in November. Interviews usually took place during MST's free periods in the school staffroom or any other available room. Observations of classroom teaching were generally conducted before the interviews, but due to the teachers' time constraints, this order could not always be respected. The classroom observations were videotaped. An observation grid was also completed by the researcher as the lesson progressed. In addition to interviewing and observing the teachers in class, the researcher also spent one to two weeks in each school, getting to know more about the school [its history and ethos, and also the physical surroundings], its staff [teaching and support staff as well] and students. Interviews with students took place during the second and third period of data collection. During the first period, they had come to know the researcher better and had become less shy.

RESULTS

For the questionnaires, the response from Form Four and Five MST during both periods when they were administered was good and the rates of return are fairly high. Below, in table format, are the figures for the questionnaires during the first and third periods of data collection.

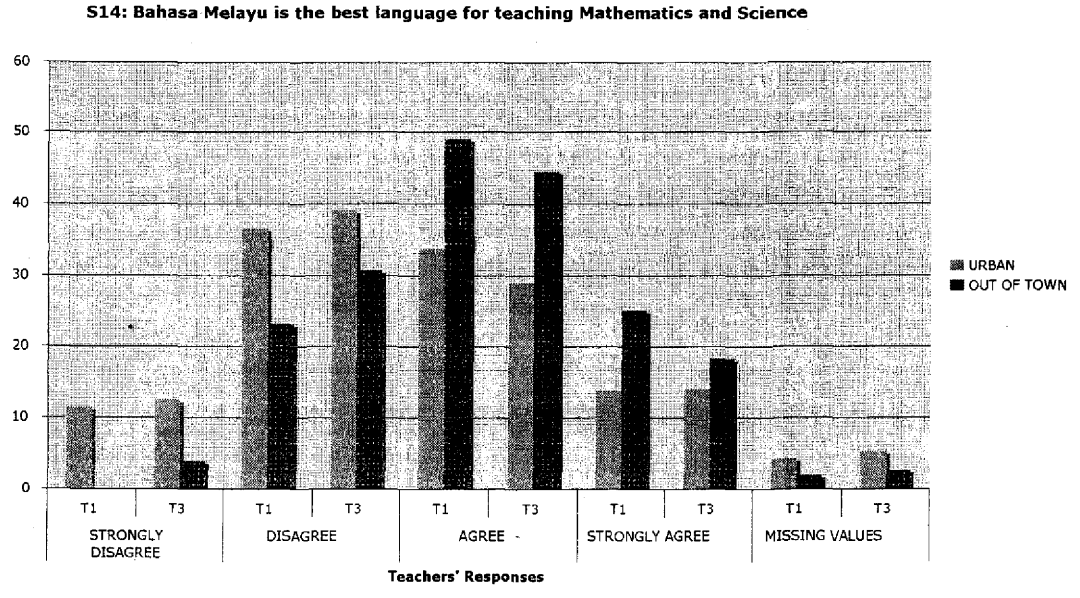
Data collection period	Number of copies distributed				Rate of return
	English	Bahasa Malaysia	Total	Returned	
T1	275	172	447	366	81.8%
T3	252	198	450	367	81.5%

Table 2: Figures for survey during T1 and T3

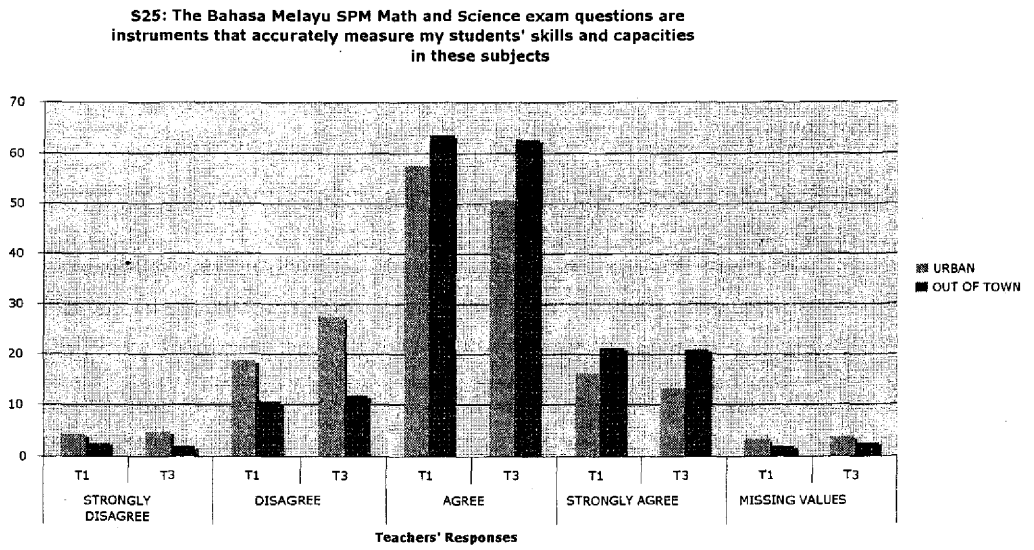
For S14: **Bahasa Malaysia** is the best language for teaching Mathematics and Science, the responses in raw numbers are as follows:

S14	Strongly disagree		Disagree		Agree		Strongly agree		Missing values	
area	T1	T3	T1	T3	T1	T3	T1	T3	T1	T3
Urban	24	26	77	81	71	60	29	29	9	11
O.O.T	1	6	35	47	74	68	38	28	3	4

They appear in Chart 2 below in the form of percentages:



Looking at the responses to S14, we can see that it is almost the mirror image of S13 responses. In this case, it is the urban MST who are divided about the role of Bahasa Malaysia. During T1, approximately 48 percent of them disagree or strongly disagree with this statement, while 52 percent disagree or strongly disagree. These figures remains practically the same for T3. Out of town MST, on the other hand, are supportive of this statement: a little more than 74 percent of them either agree or strongly agree that this is the best language for teaching Mathematics and Science during T1. However, this support drops to approximately 63 percent during T3.



By looking at the chart for S25, we can see that for this statement, both urban and out of town MST consider the Bahasa Malaysia version of the SPM exams will be able to accurately measure their students' abilities. During T1, the combined percentage of out of town MST who agree or strongly agree with S25 is very high, almost 85 percent. So is that for urban MST, approximately 74 percent. These same percentages drop slightly during T3 to about 84 percent for out of town MST. However, there is a bigger drop for urban MST; the figure goes down to 64 percent.

MST comments concerning the impact of bilingual SPM exams on students performance varied. An urban MST commented in the T3 survey that it might not make much difference for her students:

> U T3 JOH 248: Although BM is my students' mother tongue I strongly believe that writing down answers for M & S in Malay especially my subject would be a problem to my students as they have learned the subject in Eng for the past 2 years.

Another urban MST puts it even more strongly: U T3 PEN 9 writes, "Students will confuse and waste time if the exam questions were prepared in BI & BM. Some of the terms they couldn't understand in BM."

This contrasts with a comment from urban MST, also during the T3 survey. For this MST, the bilingual version could aid the students. This MST, who is from an out-of-town school suggests - R T3 PER 123:...baik dapat diteruskan dalam dwibahasa kerana dapat membantu pelajar menjawab soalan dalam peperiksaan awam. Another o.o.t. MST agrees: R T3 JOH 308: I'm teaching at rural area where students can't understand English very well. So, answering in (M)alay can sho(w) student skills & capacities.

about language. It is about numbers. He thinks that PPSMI would have a bigger impact on the Science subjects:

> "Matematiks tak da sangatlah PPSMI ni... Matematiks tu banyak number... sebab dia tak perlu, write a sentence dalam Matematik. Sebab, write sentence tu, buat apa – only numbers."
> [Translation: *Mathematics doesn't have that much (to do with) PPSMI... Mathematics uses lots of numbers... because they don't need, to write a sentence in Mathematics. Because, what's the point of writing a sentence – only numbers*]

In any case, even during T1, he states his teaching objective baldly:

> "Saya ajar Maths, dan kebanyakannya Add Maths. Saya lebih bertumpu kepada untuk menjawab peperiksaan. Itu saja. Untuk menjawab peperiksaan."
> [*I teach Maths, and mainly, Add Maths. I focus more on answering the exam. That's all. To answer the exam.*]

Encik Hamdan was observed teaching 5 Science 1 (5S1), the best class for all three periods of data collection. He was also observed in 5 Humanities 2 (5H2), one of the weakest classes in the form, during T1 and T3. When observed in class, Encik Hamdan teaches much of the time in English in 5S1 lessons, about 80% of the time. However, his use of Bahasa Malaysia increases noticeably when he is in 5H2. Although he will sometimes switch to Bahasa Malaysia while teaching in 5S1, he does so more often when students pose a question in Malay during whole class instruction or when they approach him individually. Typically when teaching in BM, he retains the English mathematical terms. Occasionally, he provides the BM equivalent of the term. The excerpt below, where he is teaching 5H2 about the elements of a matrix, is an example of this pattern.

En Hamdan: Elements in matrix. Every number dia, every number dia (he points to the numbers he has written for the 2x2 matrix on the board) ini elemen, in that, in that particular matrix. Elemen dalam Bahasa Melayu tu, apa?
Student: Unsur

[Translation: *En Hamdan: Elements in matrix. Every number it, every number it (he points to the numbers he has written for the 2x2 matrix on the board) [is] this element, in that, in that particular matrix. What is element in BM?*
Student: Unsur (Element in BM)]

When teaching in 5H2, this switch happens more frequently, without prompting by students. His students in both classes preferred to address him in BM when they spoke to him. During T3 for both 5S1 and 5H2, the entire lesson was centred on exam revision, i.e. doing past year exam questions. Either Encik Hamdan or his students would read out the question in English and proceed to work out the solution.

For the SPM exam, his views are that the bilingual format is helpful for the present cohort of students: "It will help them because they can, uh, answer it in Malay... And, and read the question in Malay if they cannot understand the, the English." However, he feel that it will no longer be necessary with the students who started learning their Maths and Sciences in English from Standard 1 onwards. They will not need bilingual translation anymore because they wouldn't know the Malay terms anyway, unlike the students in F5 at present.

anxiety is due to fears that his student will be penalised for mixing both languages in their response to any given question.

Puan Sarjit – Puan Sarjit is a Biology and Science teacher who has almost twenty years of teaching experience. She received her primary and secondary schooling in English but went to university in BM. She had always taught in Malay since starting her career until PPSMI came along. Puan Sarjit taught in urban areas before being posted to SMK Kayu Manis, where she has been teaching for fourteen years. She mentions that she enjoys teaching in English. She is a Critical Friend in the Buddy System. She was observed teaching 5 Vocational and Technology 2 (5VT2), classified as average to weak in this school. Puan Sarjit is very fluent in English. In contrast, her students are not. She feels part of the problem may be that the class she is teaching is not very academically motivated either: "...basically I feel the problems that I'm facing now I also faced when I was teaching Math and Science, when I was teaching Science in Malay... So, it's basically just getting the content across. Whether it's in English or whether it's in Malay, as I mentioned earlier, the students are not focused on the actual, yeah, learning process."

When she was observed teaching during T1 and T2 however, she spent almost equal amounts of time teaching in English and BM. Puan Sarjit often explains a point in English and then translates the same idea into BM. We can see this in the example below, when she explains Bernoulli's Principle to her students: "As the water flows in the horizontal tube, the velocity increases. Semakin jauh air itu bergerak, halajunya semakin meningkat."

She tells her students during T1:

> "If I ask you a question English, try and answer in English. If you can't, tak apa. Jawab dalam Bahasa Melayu. Sekurang – kurangnya saya tahu kamu faham apa yang saya kata."
> [Translation: *If I ask you a question in English, try and answer in English. If you can't, that's alright. Answer in BM. At least I know you understand what I am saying.*]

However, during T3, about two weeks before students sit for the SPM, her attitude is completely different:

Sekarang saya tak kisah kalau kamu nak pilih untuk baca dalam Bahasa Inggeris atau Bahasa Melayu, tak apa. Saya nak jawapan yang betul.
[Translation: *Right now, I don't care if you choose to read in English or BM, it doesn't matter. I want the correct answer.*]

She explains to me in her T3 interview: "And at the end of the year, the students actually approached me to teach them in Malay. Although they had been exposed to all the terminology and all that in English, they were like, desperate, you know." Like Mr. Ang above, Puan Sarjit is trying to ensure that students do not give up hope simply because they do not pass or do well in their English-only exams in school. Like Encik Hamdan above, she also keeps the English terms when translating into BM, but more often than not, she explains to the students entirely in BM.

Like the other MST interviewed, Puan Sarjit is of the opinion that having bilingual SPM exams are a positive thing since it encourages students to at least attempt an answer. She says in her T3 interview: "You see, students who have a problem with the language, when it's unilingual, they don't understand the question and they don't answer... Simple as that."

Like her colleague Mr. Ang, Puan Sarjit is somewhat apprehensive about how her students will perform in the SPM even with bilingual support:

Furthermore, although the aim of the MST in carrying out bilingual classes is student comprehension, this approach also comes at a cost: it can take twice as long to teach the same amount of content. In a system where the SPM exit exams include all topics taught over the upper secondary cycle of Form Four and Form Five, this practice may limit the number of topics that teachers are able to complete. In fact, Encik Hamdan mentions that MST have the option of teaching their students the Minimum Adequate Syllabus (MAS), which means teaching them the topics from the syllabus which are absolutely necessary for passing. Once again, this practice is only current with weaker classes, not the stronger ones. In consequence, this of course impacts the level of achievement of these students on the SPM exams.

As for the English or Bahasa Malaysia version of exam questions as instruments for measuring their students' abilities, MST from both urban and out of town areas, in general, tend to see both versions in a positive light. In fact, for many teachers, they are practically the same. An urban MST comments: "Questions are the same – Bahasa Malaysia version is translated into Bahasa Inggeris (English). Both exactly the same and student can answer in either language." It should be noted however, that the positive perception of out of town MST concerning the English version is marginal during T1, only fifty-four percent, and actually drops to forty-seven percent during T3.

> ...ramai pelajar tidak dapat menjawab soalan yang diberikan kerana tidak memahami soalan yang diberikan. **Mereka mungkin berupaya menterjemah perkataan yang tidak diketahui dengan bantuan kamus tetapi kerapkali pelajar gagal untuk menginterpretasikan soalan tersebut.**
>
> *...many students cannot answer the questions given because they don't understand the questions.* ***They may be able to translate the words they don't know with the help of a dictionary but often, the students fail to interprete (the meaning of) the question.***

The observations of Mr Ang and Puan Sarjit show that this drop in the approval of the English version can be due to the out of town MST's realisation that students are still struggling to answer in English two months away from the SPM. It may also be influenced by the MOE decision to postpone unilingual Science and Math exams to 2012 instead of implementing them that year. It should also be kept in mind that this first cohort of Secondary Four and Five students began their Math and Science learning process in primary (elementary) school using Bahasa Malaysia. Apart from the Maths and Sciences, their other subjects are also taught in BM. That is why MST such as Encik Hamdan and Puan Sarjit, who teach average to weak students, resort to translating their teaching to BM. By doing so, they hope to increase their students' comprehension of the content taught and consequently, help them perform better on their exams. The MST interviewed all expressed the view that bilingual SPM papers are a good option for students who did not start learning Sciences and Mathematics in English in elementary school. For them, if students do not understand a question in English, they can refer to the BM version, and then proceed to answer in either one of the languages.

These classroom practices may be problematic because they rest on two possibly implicit and erroneous assumptions. The first is that since students are able to understand better in BM, they will be able to express their understanding in this language when placed in exams situations. The second is that students do not need much preparation for answering questions in BM – they can do it on their own because it was their first language of instruction and it is the first language for many students. Student views on this matter contradict these beliefs. For them it is not always possible to make that lingusitic shift. Even though in their T3 interview, 5ST1 students in SMK Kayu Manis (out of town school) said they would refer to the BM version if necessary, one of

comments from MST responding to the survey indicate that teachers are conscious of this shortcoming too.

The survey and case studies also indicate that five years after the start of policy implementation there is a still a gap in terms of the linguistic learning of urban versus non-urban students. Even teachers who are highly proficient in English are still not able to teach fully in English in these classes.

What the results of this study have shown may indicate the need to re-consider certain measures related to the implementation of PPSMI. When this study was conducted, only Science students were required to take an additional English course – English for Science and Technology. As mentioned above, Science students are already in input rich learning contexts as far as English is concerned. A modified version of this course may prove helpful for non-Science students as far as mathematics and science learning in English is concerned. Consideration also needs to be given to how MST, who are only trained in subject teaching, may also be prepared to help their students in ways other than the direct translation method that is commonly used at present. Also, because of the varied linguistic practices of MST and the difference between language of testing in school and languages of testing in the SPM exams, there may be some questions as to the validity of what the bilingual exams are measuring exactly. Therefore, there needs to be a reconsideration of how MST linguistic practices in class, in-school testing practices and the SPM exams can be aligned to provide optimal support for those students who are less proficient in English so that the bilingual SPM exams can actually claim to be mainly testing students' content knowledge.

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Teaching Mathematics and Science in English in Malaysian classrooms: Teacher beliefs, classroom practices and student learning

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PPSMI

- Malay acronym for English as the language of instruction for Mathematics and Sciences (M&S)
- Implemented in 2003
- Switched medium of instruction for M&S subjects from Bahasa Malaysia (BM) to English

PPSMI

- 3 simultaneous entry points
- Math and Science teachers (MST) became *teachers of English for Academic Purposes* in their classrooms

PPSMI implementation

- Malaysian education system - highly exam oriented
- High-stakes exams: F5 (SPM) & Upper 6 (STPM)
- Malaysian Ministry of Education (MMOE) - harnessing exam pressure to aid implementation

PPSMI implementation

- Bilingual format of standardised exams in 2003
- ***Before*** students taking those exams were even being taught in English

The Paper

- Study of PPSMI implementation at upper secondary level
- Examines beliefs of MST

1. concerning language of instruction (BM and English)
2. concerning bilingual format of SPM exam papers

Teacher beliefs & classroom practices

- Teacher beliefs matter in classroom practices (Shulman, 1986; Tsui, 2003; Sato & Takahashi, 2004)
- Influences what & how to teach, when to teach it, & how to deal with student misunderstandings

EAP in ELLs M&S classrooms

- Students in Malaysia are English Language Learners
- Mathematical and scientific discourses are specific registers (Halliday and Martin,1993; Pimms, 1987)
- To be successful M&S learners, students must first master the language of science (Lemke,1990)

EAP in ELLs M&S classrooms

- Difficulties arise because words and language are applied to unfamiliar concepts (Brown & Kelly, 2007)
- Role of teacher in students' mastery of discourse is then crucial (Lee,2004)

Research questions

- How do MST perceive English as compared to BM as language of instruction?
- How do MST perceive the bilingual Mathematics and Science exams?
- How do their perceptions affect their classroom practices and consequently, student learning?

Methodology

- Mixed methods - qualitative and quantitative data
- *Duration of study: 1 school year*
  - T1 - end of Jan to early Apr
  - T2 - late June to early August
  - T3 - early October to mid-November

Participants

- *Participants*
  - *Quantitative - survey of Form 4 and Form 5 MST in 41 secondary schools from 3 states (urban & o.o.t)*
  - *Qualitative - case studies: 2 secondary schools, SMK Gaharu (urban) and SMK Kayu Manis (out-of-town)*

Instruments: *quantitative*

- *Two-part questionnaire (T1 & T3)*
  - Part 1 - MST's academic background, teaching experience and school linguistic environment
  - Part 2 - 31 statements with 4-point Likert scale

13) **English** is the best language for teaching Mathematics and Science

① Strongly disagree ② Disagree ③ Agree ④ Strongly agree

Comments:_____

Questionnaire statements

- S13: **English** is the best language for teaching Mathematics and Science.
- S14: **Bahasa Malaysia** is the best language for teaching Mathematics and Science.
- S24: The **English** SPM Mathematics or Science exam questions are instruments that accurately measure my students' skills and capacities in these subjects.
- S25: The **Bahasa Malaysia** SPM Mathematics or Science exam questions are instruments that accurately measure my students' skills and capacities in these subjects.

Instruments: qualitative

- Classroom observations with observation grid
- Semi-structured interviews with MST
- Group interviews with F4 & F5 students
- Field notes
- Informal chats

Results: S13

- o.o.t. MST divided about role of English
- More likely to think English is not the best language for M&S
- o.o.t. MST
  - T1: 52% disagree/ strongly disagree
  - T3: 54% disagree/ strongly disagree
- urban MST
  - T1: 63% agree/ strongly agree
  - T3: 67% agree/ strongly agree

Results: S14

- Mirror image of S13
- Urban MST divided over role of BM
- Urban MST
  - T1: 48% disagree/strongly disagree
  - T3: 48% disagree/strongly disagree
- o.o.t. MST
  - T1: 74% agree/strongly agree
  - T3: 63% agree/strongly agree

Results: S24

- Both o.o.t and urban MST, in general, think positively of the English version
- Urban MST
  - T1: 64% agree/strongly agree
  - T3: 69% agree/strongly agree
- o.o.t. MST
  - T1: 54% agree/strongly agree
  - T3: 47% agree/strongly agree

Results: S25

- Again both o.o.t and urban MST think the BM version measures student abilities well
- o.o.t MST
  - T1: 85% agree/strongly agree
  - T3: 84% agree/strongly agree
- Urban MST
  - T1: 74% agree/strongly agree
  - T3: 64% agree/strongly agree

Results: qualitative

- Two teacher profiles from each school
- SMK Gaharu: Mr. Wong & Encik Hamdan
- SMK Kayu Manis: Mr. Ang and Puan Sarjit

SMK Gaharu

- Mr. Wong - Physics teacher
  - Senior teacher: 30 years experience
  - Educated in English medium; tertiary education in UK
  - Very positive about PPSMI
  - First taught in English, then switched to BM before returning to English
  - Observed teaching 5S1, the best class in the whole F5

SMK Gaharu: Mr. Wong

- Observed during T1 & T2, he conducted lessons entirely in English
- Only used BM when students requested clarification

Mr. Wong:

- He mentions that, "facts and figures are important, but when, when you want to explain to them, you must say it, you need a sentence construction first."

SMK Gaharu: Encik Hamdan

- Encik Hamdan - Maths teacher
  - 15 years of teaching experience
  - Educated in BM from primary to tertiary levels
  - No problems with implementing PPSMI
  - Started teaching F4 in English a year ago
  - Observed teaching 5S1 and 5H2, one of the weakest classes in F5

Encik Hamdan:

"Matematiks tak da sangatlah PPSMI ni... Matematiks tu banyak number...sebab dia tak perlu, write a sentence dalam Matematik. Sebab, write sentence tu, buat apa – only numbers."

[Translation: *Mathematics doesn't have that much (to do with) PPSMI...Mathematics uses lots of numbers...because they don't need, to write a sentence in Mathematics. Because, what's the point of writing a sentence – only numbers*]

SMK Gaharu: Encik Hamdan

Teaching objective: "Saya lebih bertumpu untuk menjawab peperiksaan. Itu saja. Untuk menjawab peperiksaan."

"I focus more on answering the exam. That's all. To answer the exam."

SMK Kayu Manis

- Mr. Ang - Chemistry teacher
  - Senior teacher
  - Educated in English medium
  - More than 25 years experience
  - Very positive about PPSMI
  - Observed teaching 5ST1, best class in F5

SMK Kayu Manis: Mr. Ang

- "If I were to use BM to teach certain things, he'll just understand just 80%. No problem...Now, I'm using English to teach him. I believe that if I were to do, teach the same thing you know, ...he might only understand 70% or maybe 60%. Because when I use English, he might not able to understand fully. I will try to use simple English. Instead of 'effervescence', I will try to use 'bubbles', but when you try to use simple Chemistry, simple English terms, the idea is not so clear anymore sometimes...He might only be able to understand 60%."

SMK Kayu Manis: Mr. Ang

- During T1 and T2, Mr. Ang taught almost exclusively in English
- Students not comfortable with English during T1 but started using English more often during T2
- However, during T3 observation, Mr. Ang started handing out notes in BM and encouraged students to answer in BM

SMK Kayu Manis: Mr. Ang

- "...at this stage, I can't help it. I have to let them know that, er, they, not to give up but to use a bit of rojak (mixed) English. Where there are some English terms but when they start to explain, they might use the Malay [BM]."

SMK Kayu Manis: Puan Sarjit

- Puan Sarjit - Biology teacher
  - Primary and secondary education in English, tertiary education in BM
  - 20 years of experience
  - Very fluent and enjoys teaching in English
  - Observed teaching 5VT2, average to weak class in F5

SMK Kayu Manis: Puan Sarjit

- "...basically I feel the problems that I'm facing now I also faced when I was teaching Math and Science, when I was teaching Science in Malay...So, it's basically just getting the content across. Whether it's in English or whether it's in Malay, as I mentioned earlier, the students are not focused on the actual, yeah, learning process."

SMK Kayu Manis: Puan Sarjit

- During T1 and T2, spent almost equal amounts of time teaching in English and BM
- Sometimes retains English terms in BM translations, but usually gives complete explanation in BM only
- T1 teaching focused on content, T2 teaching began to pay attention to SPM questions and T3 focused entirely on exam drill

Puan Sarjit: T1

"If I ask you a question English, try and answer in English. If you can't, tak apa. Jawab dalam Bahasa Melayu. Sekurang – kurangnya saya tahu kamu faham apa yang saya kata."

[Translation: *If I ask you a question in English, try and answer in English. If you can't, that's alright. Answer in BM. At least I know you understand what I am saying.*]

Puan Sarjit: T3

- Sekarang saya tak kisah kalau kamu nak pilih untuk baca dalam Bahasa Inggeris atau Bahasa Melayu, tak apa. Saya nak jawapan yang betul
- [Translation: *Right now, I don't care if you choose to read in English or BM, it doesn't matter. I want the correct answer.*]

All teachers observed

- Stress "key words" in teaching
- Bilingual format is good for students
- Students will answer multiple choice and structure questions. Blank sheets for essay questions especially from weaker classes

Discussion: English vs BM instruction

- Urban vs o.o.t MST in terms of appropriateness of English for M&S
  - Comprehensible given sociolinguistic context
  - English as lingua franca in urban contexts among students

Discussion: English vs BM instruction

- In o.o.t or rural contexts:
- R T1 Pen 104: "Penerangan yang diberi sekiranya dalam Bahasa Inggeris kurang berkesan kerana tidak semua pelajar mahir dalam penggunaan Bahasa Inggeris dan perlu diterjemahkan di dalam Bahasa Malaysia."

  [Translation: *Explanations given in English are less effective because not all students are fluent in the use of English. [The explanations] need to be translated into BM.*"]

Discussion: English vs BM instruction

- MST are indeed teaching in English
- Bilingual lessons: low English proficiency and academically weak students
- Comprehension...at a cost
- MST have option of teaching Minimum Adequate Syllabus (MAS)

Discussion: English vs BM version of SPM exams

- Urban and o.o.t MST see both English and BM versions in positive light
- An urban MST comments: "Questions are the same – Bahasa Malaysia version is translated into Bahasa Inggeris (English). Both exactly the same and student can answer in either language."
- However, approval of o.o.t MST for English version is marginal (T1: 54%) and drops to 47% during T3

English vs BM version

- Observations of Mr. Ang and Puan Sarjit suggest why this drop occurs: they see students struggling to answer exam questions 2 months from SPM
- MMOE postponed English only SPM format to 2012

Discussion: classroom practices vs student realities

- Classroom practices rest on two problematic assumptions:

1. Since students understand better in BM, they can perform in BM during SPM
2. Students do not need preparation to answer in BM

Student views: SMK Kayu Manis

Chong Ming: " I don't think I can understand. The chemical terms, I not sure what natrium [sodium], kalsium [potassium] is. We learn this in English."

Halimi: Saya prefer BI. Macam saya cakap, dah biasa dari Form One kan, jadi tak boleh ubah benda tu. Memang kita dah paham istilah kan, then bila transfer dari BM, apa tu memang tak paham

[Translation: *I prefer English. Like I said, we're used to it from Form One, right, so we can't change it. We already understand the term right. So when we transfer from BM, we really don't understand what it is.*]

Classroom practices vs student realities

- Emphasis on key words

1. helps students increase M & S vocabulary
2. They score more points in exams

Classroom practices vs student realities

Obscures ability of students to make meaningful connections:

Syimah: "Dia, sama ada kita faham ke tidak benda tu. Kita tak boleh ingat ah, macam terms tu dalam English tapi hakikatnya kita tak faham apa yang kita tulis tu, kan."

[Translation: *It's, whether we understand it or not. We can't memorise those terms in English ah, but in fact we don't understand what we are writing, right.*]

Conclusion

- MST have adapted teaching practices to improve student comprehension
- Leads to wider gap between strong and weak students: reduced linguistic input and academic content for latter

Conclusion

- MST practices do not consider what students need in terms of production
- MST assumptions contradict with what students themselves say they can do

Conclusion

- Gap between urban and o.o.t. areas still exists
- Need to rethink:

1. Measures related to PPSMI implementation
2. Alignment of classroom linguistic practices, in-school testing practices and SPM bilingual exams

Theoretical Explanation of Training Programs on Earnings (Comments on Ashenfelter Model)

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Abstract: *Evidence shows that the most important factor for developing training programs is by reducing unemployment. This reason has a two sided explanation. On one hand, persons involved in such programs would be occupied in a certain activity (in this case attending the program). So for the training period they will not be counted as unemployed. On the other hand the training programs aim to give people who are already unemployed some new qualification which will increase their opportunities to find a job. The second argument cannot be considered as one which will really contribute to the reduction of unemployment as a whole. This paper attempts to explain the effect of training programs, considering the theoretical background in question.*

Keywords: Training programs, earnings, Ashenfelter model.

1. Introduction

We will consider the workers and especially of their decreased earnings, which allows us to examine the effect of training programs on earnings. The study of this effect could meet several problems which would not reflect the actual effect of these programs. The main problem arises from the fact that it is too expensive to keep track on trainees over a long enough period of time to measure the full inter-temporal impact of training.

For the purpose of creating the earning function and seeing the effect of the training function has upon it. It is necessary to find data for a group of individuals which can serve as a comparison for benchmarking the earnings of the trainees so that general changes in earnings are not taken to be the effect of training. We must be cautious about the fact that it is possible the two groups not be drawn from the same population so it is necessary in this case to control statistically for differences in the two groups. This requires a specification of the earnings function that would prevail for both groups in the absence of the training program.

2. Model

A useful specification of earnings determination is used by Ashenfelter:

$$y_{it} = \alpha + \sum \beta_j' y_{i(t-i)} + \sum \beta_j' \left(A_i + t\right)^j + e_t + e_i + e_{it} \qquad (1)$$

where y_{it} is the earnings of the i^{th} individual in period t,

A_i is the age of the same individual in period $t = 0$,

α, β are parameters, and

$e_t + e_i + e_{it}$ is the disturbance term.

The disturbance term $e_t + e_i + e_{it}$ is taken to have an effect e_t specific to the time period, and a remainder e_{it} with zero expectation. Following this representation, current earnings are taken to be the sum of a polynomial in age and/or an autoregression in earnings plus the error components comprising fixed and random effects. The fixed effect e_i captures such factors as ability, motivation, or other previous investment in human capital by a specific worker, while the effect e_t captures economy-wide movements in earnings.

There are several ways to rationalize the use of the equation. For example, it can be used as a basis for predicting earnings. Taking into account any theory of determination of earnings we can see that the proposed equation exploits all necessary rudimentary notions. If we try to see whether it can characterize the known facts about the structure of earnings, we will examine how it reflects the finding that over a wide range of age distribution earnings increase with age, but at a decreasing rate. The polynomial presented in the equation can accommodate these facts, but it can be done as well by the autocorrelation. Finally, the equation can be rationalized as the end result of an optimal investment program in human capital by individual workers.

We will try to determine the effect of training on earnings, following the approach of Ashenfelter. It is convenient to re-write the K^{th} order difference equation as a first order difference equation using the matrix notation. If B represents a matrix of order (kxk), we may write our basic equation for the comparison group and for the trainee participant group respectively as follows:

$$z_{it}^{c} = B.z_{i(t-1)}^{c} + d_{it} + b_i + u_{it} \tag{2}$$

$$z_{it}^{p} = B.z_{i(t-1)}^{p} + d_{it} + b_i + R_i + u_{it} \tag{3}$$

R_i is the incremental effect of training on trainee earnings in i^{th} period. It will be of course zero in the periods before training. So it is impossible to determine the amount by which the earnings of a trainee in the t^{th} period are greater than they would have been in the absence of training without further manipulation because the effects R_t will accumulate through the earnings generation process. To determine the effect of training on earnings in the t^{th} period, suppose that it is known that the period prior to the advent of training is the $(t-s)^{th}$. Writing equation (3) repeatedly and in lagged form and continuously substituting we get:

$$z_{it}^{p} = B^{s} z_{i(t-1)}^{p} + d^{*}_{i(s)} + R^{*}_{s} + b^{*}_{i(s)} + u^{*}_{i(s)} \tag{4}$$

The same process applied to equation (2) gives the following result:

$$z_{it}^{c} = B^{s} z_{i(t-s)}^{c} + d^{*}_{i(s)} + b^{*}_{i(s)} + u^{*}_{i(s)} \tag{5}$$

If we compare the two last equations, it is clear that the term $R^s = \sum_{\tau=0}^{s-1} B^\tau R_{t\tau}$ is the amount by which earnings are higher for trainees in the i^{th} period than would have been the case in the absence of training.

For estimation purposes, Ashenfelter defines the variable $p_i = 1$ fior those who become trainees in the $(t-s+1)^{st}$ period and zero otherwise. He then gets the following result for the observed earnings of the i^{th} individual:

$$z_{it} = p_i z_{it}^p + (1-p) z_{it}^c = B^s z_{i(t-s)} + d^*_{is} + b^*_{is} + R^*_s p_i + u^*_{is} \tag{6}$$

It should be mentioned that the construction of the equations written above demands the usage of longitudinal data. The proposed discussion supposes the hypothesis that the earnings generating functions are of the same form for both the trainees and the comparison group members. In that sense, one of the advantages of longitudinal data is the fact that in this case we may test the veracity of this hypothesis on data for periods prior to the advent of training. If the result is that the earning functions are different for the two groups prior to training, this may serve as a signal of serious problems with the maintained hypothesis.

The analysis can continue in the context of the special case of equation (6). In particular, when $B = 0$ and $\beta_j' = 0$ for $j > 1$ so that $d_{it} = \left[\alpha + \beta_1'(A_i + t) + e_t\right]\delta$. In this case, no autoregressive component in earnings appears, and we merely observe a linear effect of age plus the fixed effects for the individual and the time period. But this approximation is not satisfactory over longer periods. In any event it allows a comparison of more sophisticated schemes against the one proposed in other studies. If we maintain the assumption that $B = 0$ but now $R^*_s = R_t$ in equation (4), a very simple estimator for R^*_s is suggested. If period *t-s* is supposed to be the period immediately preceding training, there is no reason for using it since $R = 0$ in the periods prior to training will do equally well. In case of a decline in the earnings of trainees relative to the comparison group in the period prior to training using a base period prior to the period *t-s* will underestimate the training effect. The underestimation will be exactly equal to the magnitude of the decline in the earnings of the trainees. If the decline is transitory and offset by a certain increase in earnings, the usage of a base period prior to the period *t-s* will give an unbiased estimator of the true training effects.

Ashenfelter himself considers that the specific assumptions about the value of the matrix *B* used to generate simple estimators is convenient but nevertheless unsatisfactory. He proposes that explicit attention should be paid to the presence of the individual effects of b_i in the estimation process. Actually ignoring these effects does not necessarily mean that the estimated training effects are biased, but it implies inefficiency for the estimation method. There will be bias only if these specific effects are correlated with the trainee participation after holding constant age and pre-training earnings levels. Re-writing equation (6) in the form:

$$z_{i(t-s+1)} = B z_{i(t-s)} + d_{i(t-s+1)} + b_i + R_{(t-s+1)} p_i + u_{i(t-s+1)} \tag{7}$$

And subtract it from (6) we get::

$$z_{it} - z_{i(t-s+1)} = (B^s - B)z_{i(t-s)} + (d^*_{is} - d_{i(t-s+1)}) + (b^*_i - b_i) + (R^*_s - R_{(t-s+1)})p_i + (u^*_{is} - u_{i(t-s+1)}) \tag{8}$$

In the last equation, the individual effects $(b^*_i - b_i)$ are not zero, but they should be reduced. It can be expected that the omission of the individual effects b_i will not severely affect the training effects, but due to them the lagged dependent variables will be badly biased.

3. Conclusion

One such specification is that when choosing the group of people not being involved in training as a comparison group we should be very careful. This group should not consist of people with earnings much higher than the trainees. The motivation of undertaking training must be considered when drawing the groups for comparison.

In order to find the extent to which it contributes to the increase of people's welfare. It will help as well to determine to what extent such programs need an improvement because well-organized training programs can contribute substantially in solving some of the economic problems of these countries during the period of transition.

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