

English for the Teaching of Mathematics and Science (ETeMS): From concept to implementation
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Background

Bahasa Malaysia, the national language has been the medium of instruction for about 20 years. During this time, English was relegated to second language status though in some remote parts of the country and in monolingual environments, it has become more or less a foreign language. Declining performance in English over the years has prompted the English Language Committee at the National Level to propose the teaching of non-examination subjects in English, among many other strategies. The proposal was never accepted for various reasons. However, the year 2002 represents a significant milestone in the history of education development in the country. "Science and Mathematics will be taught in English in 2003", the media screams. For those in ELT it is a long overdue decision. But for those in who had been wasting taxpayers' money not learning the language after 11 years of education, it seemed to be the beginning of a nightmare. And for some others, it is the fare for political mileage.

Why then the sudden focus on English? This question should really be addressed by looking at the bigger picture. On the global front, developments and advances in scientific and technological advances began to make its impact as more and more of our graduates found it difficult to get the job they wanted simply because they were not proficient in English. It was also becoming increasingly challenging to translate the latest technological developments into Bahasa Malaysia. For example, in Chemistry, since the beginning of the 1990s, more than 1 million articles have appeared in specialized journals every 2 years. In Biology, in 1977 scientists can determine was the method designed to determine 500 base sequence of the letters that codify the information in DNA but today, they can decipher the 3 billion bases of the human genome in a few years. In Mathematics: 100,000 new theorems are created per year. Accelerated change with enhanced technologies has given us no choice if we want to be global players.

The Policy

The change in policy is basically an emergent response to current needs. The language can just about be any language but it just so happened that English has become an international language being widely spoken around the world and that much of the world's knowledge is locked within this language. Teaching the subjects in the science disciplines in English would expedite acquisition of scientific knowledge in order to develop a scientifically literate nation by the year 2020. Thus projecting manpower needs in terms of qualifications and skills, the Cabinet made a decision to teach Science and Mathematics in English.

The use of English for teaching the two critical subjects will of course, in the long run, help to enhance the learning of English through mutual reinforcement in all three subjects. This mutuality could well lead to a blurring of boundaries between subjects and at the same time contribute to the growth of Bahasa Malaysia as learners become more aware of the actual meanings in English. Learning through translated texts is learning through the schema of the disciple rather than directly through the guru.

The implementation strategy used is a staggered model involving classes in Year 1, Form 1 and Lower Six classes in the first year of implementation. This was followed by classes in Year 2, Form 2 and Upper Six in the second year, i.e. 2004. The training will continue in this incremental manner until full implementation covering all levels of schooling in the year 2008. This staggered model was an outcome of negotiations between the wider public and NGOs with the Ministry of Education.

The response

At the early stage of implementation, questions were raised on the credibility of English language trainers and the linguistic paucity of Science and Mathematics teachers. These appeared every other day in the media and in public forums. However, a few months into the implementation, the Ministry decided to give teachers a financial incentive to motivate teachers. This noble intention raised yet another challenge. Everyone tries to create a connection with the teaching of science and mathematics from administrators right down to teachers in the classroom. Teachers who were resistant to the idea initially were 'rushing' to be trained in order to qualify for the incentive. Many of these were senior teachers who were skeptical of the

change. They felt that the idea had little chance of success. They were also suspicious of the involvement of English language teachers as trainers in their subject area. They did not want to be involved in the training course whether as participants or as trainers because they felt they are proficient and that they have no business getting involved with other teachers who are weak in the language. They felt that their job was to teach students not their colleagues. The 'forced' attendance did not make them good participants at the language course. They were critical of their trainers and of the contents of the course. Letters to the media as in Appendix A expressed all these sentiments.

For those genuinely in need of the language, they were appreciative of the support and training given based on feedback from recent monitoring reports. Some were so committed to the improvement of their own language that they signed up privately for language courses. Weaker teachers tend to be self-conscious and relied heavily on the teaching courseware. But all the teachers tried to use English in the delivery of the lesson content. Initial observations seemed to indicate additional challenges, that these teachers not only have problem with the language but also with the content and pedagogy.

An additional challenge came from the administration. It is now a year and a half since the implementation of the policy. Some school heads did not allow teachers to leave for training or to train other teachers for fear of a decline in student performance in the two subjects. It is perhaps time to review the source or cause of this objection to teachers leaving the classroom. This brings us back to the scenario in June 2002.

The story behind the concept

The initial model proposed by the Teacher Education Division focused on the development of content knowledge in English. It was proposed that the training program use a cascade strategy to train all science and mathematics teachers by teachers from the same disciplines. However, a change in the medium of instruction necessitates more than a mere induction into the content in the language. It requires a more fundamental understanding of both language and content issues.

This point of view is based on the need for an effective conveyer of information that is, the language. If the language is lacking, it is unlikely that students will be able to move beyond anything more than nature study or simple arithmetic. And for teachers, it would not be possible for them to develop conceptual understanding if they cannot express themselves well in the medium of instruction. Clearly then the training of teachers has to focus on the development of language skills, both the productive and receptive skills.

Given the urgency of policy implementation, the constraints of time, the costs involved, the critical subject status of the two subjects and the logistics of training 25,000 teachers in the first year of implementation, I proposed a 5-prong strategy to upgrade the language proficiency of Science and Mathematics teachers comprising

1. Two interactive phases (weekend training and full immersion)
2. Self-instructional study pack (with self-monitoring and differentiation in levels of access)
3. Dictionaries with CD-Roms and grammar books (as reference points for meaning and pronunciation)
4. Internet based learning through freeware (for pedagogical approach and activities) and
5. The Buddy System (for teacher in-situ support)

The aim was to:

- Minimize teacher movement out of schools for training
- Optimize training cost
- Promote reflective practice to enhance learning and teaching
- Encourage teachers to self-direct their own professional development
- Develop a collaborative and cooperative culture in schools through the buddy system
- Forge local networks

All the training modules were written by ELTC based on a needs analysis conducted in a sample of semi-urban and urban primary and secondary schools.

Minimizing time away from the classroom

The critical subject status of both science and mathematics was a major consideration when debating on the mode of in-service training. In Malaysia, the most convenient and most

frequent mode of short in-service training has always been a centralized training workshop normally conducted in a hotel far away from the place of work followed by a one or two-day briefing to other staff members at the participants' place of work on completion of the training. Research has indicated that in-service education of this nature is of little value in terms of any impact. Taking teachers out for long periods away from the classroom was never the option. But getting teachers to improve their language proficiency requires at least some reasonable hands-on learning. The need for face-to-face interaction and some time for socialization and learning for an extended period during 'immersion' is critical for language learning to be of any impact especially for this target group of teachers who share the same subject knowledge.

The interactive component was carried out in two phases. The two-day training is actually a weekend training model aimed at minimizing time lost in the classroom. Teachers will only lose the time on Fridays that normally average out to about 3 - 4 periods or 15 – 20 periods over five alternate weeks. With the addition of one week of immersion, the total teaching period lost is 45 periods only. However, if teachers were to be called out for three week-long courses, this will amount to losing 25 or more periods of classroom time for each week away from the school, i.e. in total 75 periods. So the mixed model actually minimizes time out for the teacher.

However, in actual implementation, State Education Departments found the logistics of arranging for two-day training daunting. They felt that identifying training sites is a challenge. So the end result was the five-day training package for a number of states. The administrative and management convenience supersedes the theoretical benefits.

Optimizing training cost

The economics of teacher education must be seen not only in terms of actual costs but also opportunity costs. In terms of actual costs, a mixed model will only come to about RM 790 per head while a full three-week residential course at a hotel (low priced) will come to RM 2,040 per head for each phase of the training. In addition, the fact that training in the mixed model is to be carried out in locations near to the teachers' workplace also minimizes transport costs and time taken up for traveling.

In terms of opportunity costs, the space in between short interrelated and interlinked training sessions (once a fortnight) will allow time and space for teachers to try out or apply what they had learnt and to reflect on the value of that learning, the reflections of which will add on to the value of the next training session. The sharing of practical experiences within the group and the building on this experience lends authenticity to the training.

One might argue that geographical constraints may affect the viability of the mixed model. However, this could actually be a strength in the sense that small groups of teachers within a district can be gathered to learn together and making an even stronger impact in terms of learning and the development of collegiality.

Week-long training often involves a larger number of teachers and the impact might be lost in the numbers involved. The longer time spent together on one or two areas will help build the understanding of concepts.

In implementation, the training cost is much more as nearly everyone went for the package. The convenience and the attraction of a ready-made environment offered a much bigger incentive for organizing the course in centralized locations like hotels.

Promote reflective practice to enhance learning and teaching

The concept of reflective practice has been put into teacher education for nearly 30 years. However, in practice, teachers claimed that they had little time to reflect or to share their reflections. Teaching was more of an intuitive process rather than one that is well thought out. Teachers simply do not know why they did well in one lesson or less so in another even though they used the same lesson plan. Developing an informed profession requires some thinking into common and uncommon practices.

In actual implementation, there was little time for most teachers to write anything substantial. Teachers find difficulty expressing their thoughts about their own teaching. It is not the culture to write about their thoughts (Choong, 2001)

Encourage teachers to self-direct their own professional development

The provision of self-directed learning resources is aimed at promoting self-directed learning for continuous professional development. Given the short interactive phases of training, teachers should be given the opportunity to self-direct their own professional and personal development. No one can develop a teacher. For this reason, every school was provided a set of materials for staff development comprising a self-instructional package for self-improvement, a set of grammar books and dictionaries with CD-ROM. Schools were expected to draw on these exemplar materials to develop their own resources for staff development. The sharing of resources is expected to enhance relationships within the school. Ideally, teachers can be given a subsidy to buy the computer and to develop their toolkit for 21st century teaching and learning.

In actual implementation, every science and mathematics teacher was given a set of the materials and a laptop. As for the self-instructional pack, the monitoring aspect was excluded for some unknown reason. The expenditure incurred was immense if this was to continue till 2008.

An early research exercise recently revealed that teachers have not used the self-instructional pack. They claimed they have no time to check what has come into the school. Some did not know of its existence. However, these responses seemed reasonable as teachers were just too busy attending courses conducted by the different divisions of the Ministry. They have no time to actually look at what they were given. The research might be just too early.

Develop a collaborative and cooperative culture in schools through a buddy system

Teachers working alone may produce negative energy in the school. Teachers who are less confident may become defensive and may even be aggressive towards students. A school environment that encourages collaborative and cooperative behavior is more conducive to learning and sharing. Teachers who are less confident will not have to bear the burden of guilt. Sharing with a critical friend can ease much of the tension derived from 'hiding' inadequacies and may lead to the formation of strong partnerships for mutual growth. With the support given, teachers who are less confident may grow in confidence and positive energy that can be

infectious. Students under their care will have much to gain through teacher-enhanced learning.

Training modules were written by ELTC and about 176 lecturers from teacher training colleges and key teachers from schools were trained to be master trainers to train critical friends who were the experienced and proficient English, Science and Mathematics teachers.

In implementation, not many schools have started the buddy system as the critical friends, often either older or younger than the buddy. Time is needed for teachers to work together. That time must be timetabled otherwise there are always reasons for not getting together. Teacher training colleges however, have not gone fully into the training due to shortage of time and manpower.

Forge local networks

Resource centers set up in the 1980s continue to serve an important function in gathering teachers together to a local center. The sharing can lead to the development of 'indigenous pedagogy', pedagogy built on an understanding of local contexts. The interlinking of local networks will enable the development of a wider vision vital for teacher development and education development.

At the moment, some State Education Departments are still in the process of setting up a web page. However, the network is not primarily for English Language teachers or for science and mathematics teachers.

The Financial Incentive

A financial incentive was given to teachers to motivate them to teach the three critical subjects. This changed the environment for the introduction of ETeMS.

Implications of ETeMS training

What is in place at State, Division, District and in some cases, school level is a core of teachers who have been trained and who have developed professionally and are now an invaluable resource waiting to be tapped as trainers for in-situ or coordinated training programmes.

Each school should also by now have amongst its staff, a Critical Friend who is in effect a reference point not just for those who need professional support but for the school as a whole. These critical friends too should be acknowledged and accorded the recognition they deserve.

The laptops and LCD projectors that were supplied under the TESME initiative have increased the assets of schools and opened up new pedagogical, teaching – learning opportunities possibilities for ALL teachers. Sound management and equitable opportunities for the use of these resources should lead to enriching learning experiences for students

The self-instructional packages given to the Maths and Science teachers should serve as a catalyst and rekindle their interest in improving their English language proficiency and prod them to be more confident in their ability to teach themselves.

Concluding remarks

In the final analysis, and in spite of the teething problems in the formative stage of the implementation of the Teaching of mathematics and Science in English program, the anticipated negativity and cynicism of some segments of the profession and fraternity, initial findings indicate the mood for optimism amongst those who matter most – the teacher at the chalkface.

At ELTC as the people who gave birth to the ETeMS training concept, we believe that we can be more involved at the management level as we can give advice based on our network with teachers and trainers as well as research. It is highly unfortunate we are excluded and are not able to get the feedback from the weekly meetings at the Ministry to enable us to provide the necessary advice before decisions are made at the ministry level. We are at the moment adjusting and orientating our training in response to decisions made so as to make ETeMS more workable. But we are extremely happy to be able to contribute to this policy change and to be able to work across disciplines.

** Details on the gap between concept and implementation available only for academic research only from the writer.

Appendix A

English course a waste of time for the veteran

Aug 6:

AM in total agreement with LESOCH of Ipoh (NST, Aug 1) on the on-going course for teachers of Mathematics and Science in English. I am one of those who had to attend the first phase of the course in April and May this year and I will be attending the second phase in September and October.

I am teaching PMR classes and these two months are very crucial for the students.

I not only learnt Science and Mathematics in English, but started my career in 1972, teaching Mathematics in English. I even taught SPM students English for a few years when there was a shortage of English teachers.

Now that I have about three years left before retirement I am forced to attend this course.

Can you imagine a person of my age and experience being taught to make simple sentences and to speak in front of the class (stand and deliver)? To add insult to injury, most of the Jurulatih Utama were not even born when I started teaching.

Some of them can't even get their tenses correct and feel bad seeing me sitting there in front of them. This must probably be my worst humiliation.

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Teachers must follow ministry's directives

Aug 4:

WHILE the nation appreciates the Government, in particular the Ministry of Education, for enforcing changes and reforms in the educational system, it is alarming to read in newspapers that there are teachers who feel otherwise.

Seven months since the announcement to implement the teaching of Mathematics and Science in English, there are teachers who are not willing to toe the line. The option to sit Maths and Science examination papers either in Bahasa Malaysia or English provides them with an opportunity to transgress the policy.

Their indifference may delay the nation's endeavour to build a generation of young people proficient in the English language.

What are the reasons for their reluctance? Perhaps these teachers are not competent enough to speak and write the language, or are afraid to make mistakes while teaching and to be corrected by students.

The answer is for them to return to classrooms and learn, just like their students. Education is a life-long process, anyway.

Their act also amounts to sabotaging the nation's attempt to build a better tomorrow. It is imperative then, that these teachers be stopped from carrying out their purpose. The spread of this "gangrene" must be halted before another generation is affected.

Teachers unwilling to adhere to directives and policies should be told to leave. We do not need teachers who are lazy, indifferent, ignorant, uncommitted and cannot learn.

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