

KEYNOTE ADDRESS

TEACHING SCIENCE AND MATHEMATICS IN ENGLISH: THE WAY FORWARD

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1. Firstly, allow me to bid each and everyone present here today, a very warm welcome and Selamat Datang. I would like to congratulate the English Language Teaching Centre (ELTC) and the Teacher Education Division (TED) for organizing this conference and to thank them for inviting me to present this keynote address.

Implementation Of ETeMS

2. It has been one and a half years since the Cabinet announced the use of English for the Teaching of Science and Mathematics (EteMS). It is now one year since this curricular innovation has been implemented in our schools. As we stand poised to enter into the second year of implementation of this innovation, this conference is to me both timely as well as apt.

Public Interest On Implementation Of ETeMS

3. No other policy change in recent years has attracted as much media attention, and invited as much public and political debate. Some of the comments and opinions have been unexpected what to others can perhaps be ascribed to apprehension and anxiety. However, many of these comments and opinions do reflect legitimate concerns. It seems to me that the concern for the decline of English, the concern for mother tongue instruction and culture and awareness and concern for the 'critical' subject status of English, science and mathematics, have all contributed to this public and political debate.

Implementation Difficulty

4. Though there has been dialogue over some of these issues, misconceptions persist about EteMS. In this multicultural country of ours, there is always a tendency to be suspicious of any policy change that impinges on education and language. These suspicions however grow out of a healthy awareness that education is the driver of economic growth and socio-economic change. Therefore, any potential change to the existing framework of education provision will invite criticism and resistance. Additionally, there is always the fear of change itself and how it will impact on existing structures and beliefs. Researches support the theory that implementation of an innovation is difficult caused partly by the threat to the comfort practice and environment of implementors.

Change Versus Growth & Development

5. However, it is from change that we get growth and development. We cannot get trees if seeds do not undergo transformation. As a nation, we have great hopes and a magnificent vision. We want to be on par with the developed world and we want to be a world-class center of education excellence. However, aspirations cannot be realized if there is no proper and effective action.

Change Versus Vision

6. A great vision demands great change. And great change demands great flexibility. We must develop the capacity to adapt quickly and continually in order to acquire and master new knowledge and skills. We need to actively engage our people in change so that they may own that change. As we work together towards realizing our vision, we require a shift in our mindset. In the words of Peter Senge in his 'Fifth Discipline', we need a

“...shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality, from reacting to the present to creating the future.”

Change Unavoidable

7. We need to recast our Future in a new mold that we are still in the process of shaping and defining that future. We have to be willing and able to go beyond the mere rhetoric of change.

Increased Rate of Change

8. Change and chaos are part of the natural order. Paradoxically, it is from change and chaos that we create a sense of permanence and order. It remains a fact that the pace of change in the 21st century will far exceed that which humankind experienced during the agricultural and industrial revolutions. While the agricultural revolution evolved over a period of thousands of years, the industrial revolution took only three hundred years. The technological revolution will take mere decades.

Globalisation Threat – Agenda for Action

9. Malaysia today is a mature developing country but still an infant in the developed world. The impact of globalization, both positive as well as negative, is everywhere in our nation – the rapid growth of technology and service-based industries, the appearance of foot-loose industries that are only too quick to move on to cheaper, more economical pastures, the ubiquitous computer in every home; the people who are deskilled and rendered unemployed by computerization and technological change, etc., etc. If we want to realize our vision, we can neither wait for things to happen nor can we merely react to things as they happen. We have to seize the initiative and strike out on our own, and we must start with the education of our people.

Agenda for Action – Human Resource Development

10. In this new global economy, intellectual capital has supplanted physical capital as the source of present and future wealth. The ultimate resource of any country is therefore its human resource. To assure our Future, we need a skilful, creative, flexible and knowledgeable workforce. To compete and secure our place among the nations of the world, our people must be well trained and highly skilled. To participate meaningfully in the global village, our people must have multiple literacies – linguistic, scientific, mathematical and technological. To succeed, our people must not only be highly trained and highly skilled but also develop emotional competencies that are imbued with logic and rationality. The issue here then is, can traditional or conventional approaches to education fulfill our needs?

Current Requirement for Human Resource - Knowledge

11. One of the greatest impacts of globalization is the heightened pace of knowledge through enhanced technologies. In the 1970s we were able to survive with the use of translated texts. However, in the 1990s, the profusion and proliferation of knowledge proved to be a daunting challenge to our translation industry. Allow me to illustrate this with a few facts and figures:

- In Chemistry, since the beginning of the 1990s, more than 1 million articles have appeared in specialized journals every 2 years (Clark, 1998). Between 1978 and 1988, the number of known chemical substances increased from 360,000 to 720,000, reaching 1.7 million in 1998 (Salmi, 2000)
- In Biology, only in 1977 was the method designed to determine the base sequence of the letters that codify the information in DNA; initially, it was possible to determine the sequence of 500 bases per week. This same method, today perfected and automated, can decipher the 3 billion bases of the human genome in a few years. Presently, a genome center can determine a million bases per day (Brunner, 2001)
- In Mathematics: 100,000 new theorems created every year (Madison, 1992)
- In the discipline of History: In two decades, – that is, between 1960 and 1980 – more publications were produced than in the entire previous period since classical Greece (van Kijk, 1992)
- Finally, in recent years five new Management books are published every day (Clark, 1998)

12. Considered together, it is estimated that knowledge, defined as the disciplinary base published and recorded, took 1,750 years to double in the period between 1 A.D. and the year 1750 A.D. It then doubled in volume, successively, in 150 years, 50 years, and now, every 5 years. It is estimated that by the year 2020, this knowledge base will double in 73 days.

13. Under these conditions, according to Gardner (1999:53),
 ... the individual (or “intelligent agent”) who can examine these bodies of knowledge and determine what is worth knowing will be at a tremendous premium. Even more esteemable will be the person (or browser) who (or that) can synthesize the

exponentially expanding domains of knowledge so that vital information can be made available in useful form to the average citizen and the average policymaker.

14. All of this presents serious challenges to the education systems in general and to schools in particular. Who will be the synthesizers of knowledge of tomorrow? What other areas will be added to the concept of “basic skills” (computers, net surfing, use of multi-media), when, and in what modalities? In terms of curriculum, how can we organize global knowledge that is constantly changing and growing? How do we cope with the fact that a growing proportion of relevant knowledge is trans-disciplinary? How much emphasis should be placed in education on the disciplines

Strategy to Achieve Goal – Facilitate Learning

15. The exponential growth of knowledge that I have described renders translation an untenable option for us. If our national education system is to prepare our people to function in the information-rich world of the 21st century, then we must adopt better ways to facilitate learning at the various levels of our education system. We must consider novel and innovative ways to educate our people even as we develop new ways to live among the very determined and compete among the very strong in the global world. It is only if we do this that we will succeed in developing world-class citizens who are able to compete amongst the best in the developed countries of the world. In order to address this challenge, the government planned and implemented, among others, the Teaching of Science & Maths in English or ETeMS.

ETeMS – Facilitating Science & Mathematics Learning and Raising English Standards

16. The implementation of ETeMS has raised several issues. One of these is the persistent debate over whether ETeMS is intended to raise English language proficiency or facilitate the acquisition of scientific and mathematical knowledge. In fact, the introduction has both the aims. As I have mentioned earlier, there is an urgent need for us to recast our worldview. As we take our first steps into the 21st century, I would argue that education may soon not be as compartmentalized and structured as it is now, that the borders between subjects will blur as new knowledge frontiers are opened up for investigation.

17. The debate over whether the Ministry of Education is attempting to upgrade English proficiency or facilitate the learning of mathematics and science indicates that we remain focused on the conventional notion of subjects. I would argue that it is more pertinent and more important that we ponder on the value of what we are teaching at school. We need to realize that in the real world of work, it was not the knowledge of subject disciplines alone that determine success.

18. So what does it mean to be literate in the 21st century? What should we teach at school? Should we continue to focus on subject content or should we infuse content into an instructional programme that fosters the skills needed for growth and creativity amongst the young?

Modern Literacy – Standards for Individuals

19. Let us consider what it means to be 'literate' in the 21st century. Traditionally, a literate person is defined as an educated person, one having certain knowledge and competencies primarily related to the linguistic domain. But today, we need to recast this definition of literacy. The ability to read and write has long since been replaced by the more demanding requirements of our fast changing world.

Modern Individuals – Scientifically & Technologically Literate

20. As we move into the 21st century, literacy has come to include knowledge and competencies associated with science, mathematics and technology and their impact on our everyday lives. A scientifically and technologically literate person is one who is aware that science, mathematics, and technology are diverse but interdependent human enterprises. He must understand key concepts and principles of science and mathematics in the natural world; and, applies scientific and mathematical knowledge and ways of thinking for individual and social purposes. Central to these literacies is the ability to understand and explain clearly and correctly scientific, mathematical and technological concepts. Knowing how to read and write is a necessary but not sufficient criterion for literacy in the 21st century. The literate individual must have the awareness and the ability to reflect on our understanding of the world around us, to make informed decisions, and to think clearly and objectively in relation to the impact of scientific advancements on our lives.

Global Citizens

21. An active and critical engagement with science and technology is a fundamental element of scientific literacy. The awareness and understanding that comes from being literate has important implications for our role as global citizens. Responsible citizenship is a global concern because our future citizens must understand the need and the ways to protect this fragile planet. An understanding of science and technology as mere subjects is of little use if there is no connection with real life.

22. The development of scientific literacy, other than an enhancement of subject knowledge is fundamental to good citizenship. The ability to analyze and to criticise the applications of science and technology therefore has to be an important part of education. The new generations of Malaysians therefore must have the 'knowledge-how' rather than the mere knowledge about the subjects. Good scientists, technologists or mathematicians too must be as literate. This is consistent with our National Philosophy of Education which aims to prepare citizens who are "knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving a high level of personal well-being as well as being able to contribute to the betterment of the family, society and the nation at large".

23. The change in policy is therefore not just about preparing citizens to be knowledgeable about English, Science, Mathematics and Technology as subjects per se. The focus is more on the development of individuals who will be articulate and responsible citizens of the future. This has important implications for curriculum design, evaluation, teacher education and resource development.

Choice of English over Other Languages

24. The use of English in the Teaching of Science and Mathematics is not a policy reversal as many people think it to be. It is, actually, a way forward and a response to the emergent needs of the country. We have successfully negotiated the nation-building phase of our national development. Today, the next phase of our development is to prepare the nation to face the challenges posed by rapid regional and global developments. However, this does not mean we will do away or play down the role of our national language or of any of our vernacular languages.

25. We have worked hard to develop our national language and we have spared neither money nor energy to ensure its development. Today, Bahasa Malaysia has evolved into a robust language that will continue to grow and develop. Bahasa Malaysia is already an international regional language in South-east Asia. In years to come it may yet become an important international language if we ensure its wider use perhaps through forging new links and networking with English-speaking countries. We must not be myopic in our vision and accept the status quo. We must view every partner as a potential Bahasa Malaysia speaker. Languages grow and develop through borrowing from other languages. A number of the words that we consider to be English words are, in fact, borrowed from Latin, French, Spanish, Chinese, Bahasa Malaysia, and so on. No language is 'pure' in the strict sense of the word. There is every possibility that Bahasa Malaysia will not only contribute words to other languages but be an important international language in its own right.

26. But as we strive to advance into the future, we need a language that will facilitate our communication with the wider world - a language that will enable us to retrieve and to process information in this globalized world. English should be seen as a national asset, which we can use to further our own agenda. The issue of being less nationalistic does not arise. Our fears only serve to reflect our insecurity and lack of trust in our own development over the past 30 years. The challenge is for us to maintain the momentum of our development while we seek ways to promote and document the growth of Bahasa Malaysia as a regional and international language. We should consider the implementation of ETeMS as an opportunity to develop links with the rest of the world who may want to learn Bahasa Malaysia.

Use of English in Vernacular Schools

27. Yet another issue that has attracted a lot of controversy is the use of English at the primary level in vernacular schools. Research findings on this issue are not totally conclusive. We have conflicting findings depending on the context in which the data was collected. I would suggest that

while we need to listen to the experts in the field, we must also not forget the Malaysian multicultural and political context.

Acquiring English in Pre Schools

28. Bilingualism and multilingualism are a fact of life in Malaysia. From an early age, our children are already aware of their multicultural and multilingual backgrounds. By the time they start their schooling, most of our children are able to speak at least two languages. I believe that pre-schools can assist our children in acquiring English. A large proportion of our children already go to pre-school. This trend will continue to grow judging by the large number of agencies applying to set up pre-schools.

Ladies and Gentlemen.

29. The Ministry has formalized the pre-school curriculum focusing on literacy development. We know that literacy development during the early elementary school years has an ever-widening impact on later academic achievement. It is important that we address this need for pre-school education in order to ensure that every child starts on an equal footing. Pre-school provision will continue to be one of the focal points of the Ministry to ensure equity and education for all.

Learning Aids – Current Environment

30. In addition, we must not forget that our younger generation learns in different ways from us. A large number of us did not have access to television when we were young. In fact, there was no television then. Nor were there computers, multimedia and all the other things that we now take for granted. Our learning resources then were static. We developed attentive listening skills and text-bound comprehension. The world of our younger generation is however bombarded with visuals, moving pictures and sound. Many of our children can perform multiple tasks – reading a text, viewing television, talking on the mobile and writing an assignment – all at the same time. If our children are capable of multi-tasking, how will they respond in a classroom dominated by the drone of a teacher's voice?

31. We have the mechanisms to address both the cultural sensitivities as well as the criticism that ETeMS has attracted. We have taken the initiative to provide various forums to offer the public the opportunity to air their views. Our approach has not been confrontational. We have responded to criticisms and negative comments with logic and rationality. We have demonstrated to our critics that our actions are based on informed decisions. We have also demonstrated that we are capable of seeing the bigger picture as we work towards securing the future of this nation. I would like to assure all of you that the Ministry of Education is indeed aware of the issues attendant to the implementation of ETeMS and that our policy and practice takes account of the views and concerns of all interested parties on the basis of our understanding of the wider context.

32. Although the implementation of ETeMS is already underway, there are however still many issues and questions that we need to continuously review and evaluate.

In Teacher Education, we need to continuously determine what changes in pre-service teacher education are required to ensure that our new graduates will be able to teach in English? How is this monitored? What changes are there in place for a trans-discipline approach to teacher education and continuing professional development? What is the research base on teacher learning and trainer development? What are the standards set for teacher education? Who or what can we benchmark?

In Assessment, the issue is how will bi-lingual rubrics affect assessment and evaluation? What provisions are there to measure multiple literacies as against subject knowledge competence? What is the progress on alternative assessment?

With regards to Materials and Technology: Do the materials reflect the trans-disciplinary nature of knowledge? How interactive are the materials and how do they allow for teacher intervention? How do they contribute to the development of literacy?

In Curriculum Design: How are linkages established between the disciplines? What provisions are there to foster student learning across the disciplines? What is done to ensure literacy is attainable by all? How loaded is the curriculum? What has been done to reduce the loading? What should be the optimal number of subjects in a school curriculum?

On School Inspection: How proficient and competent are the Inspectors? How much autonomy do teachers have in curriculum interpretation?

On Textbooks: Do we have competent local textbook writers? Will the translation of texts enable us to meet the demand of books in time? How different is the content of published books from our prescribed syllabus? How do textbooks adapt to different student needs in different parts of the country? What is the function of school textbooks in the 21st century?

On School Management: What provisions are there in terms of time and space for teacher collaboration in curriculum interpretation, materials production and teacher learning? What has been done to involve the community and industry? How are the school resources managed for accountability especially under the Smart Schools and ETeMS programs?

On Higher Education: What provisions are there by way of policy to foster multi-disciplinary learning and skills development? How close is higher education to teaching at the chalkface? How many of our academics are trained in education? How many are qualified teachers or trainers? How much does higher education interact with the workplace? Should higher education be merely reactive to the needs of the market or should it be agents of change as in the past and be proactive to affect changes?

33. Some of these questions might have already been addressed. But it does not mean having been addressed; there is no room for review and improvement. There is always the need to respond to feedback and to take account of national and global developments.

Ladies and Gentlemen.

34. Finally let me emphasise again that English is an indispensable tool that will enable us to achieve our aspirations for the 21st century. Fluency in English will enable us to prevail against many of the challenges posed by the effects of globalization. We have to accept that English is a global language. It has the second largest number of speakers in the world. In addition, most of the books and other resources are written in English. The implementation of ETeMS represents our weapon in ensuring that our people are ready to meet the challenges of the 21st century.

35. I hope this conference will provide the platform for both theorists as well as classroom practitioners to share their ideas and voice their views and concerns. We need to deliberate on further initiatives that can be undertaken to assist teachers and students to cope with this change. We need to develop ideas and forge programmes that will ensure the continued smooth implementation of this innovation. The meaningful dialogue that emerges from this conference will surely enable us to anticipate potential challenges and inform us of new practices and policies to make the second year of the implementation of this program an even more successful year.

36. I wish you a fruitful conference and dialogue. Once again, I would like to congratulate the English Language Teaching Centre and the Teacher Education Division for your commitment and with this I declare the conference open.

Thank you.