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Bilingual education: cognitive benefits and policy into practice

Cambridge Horizons seminar series:
Exploring educational issues affecting Asia Pacific region

Bilingual education: cognitive benefits and policy into practice

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(*Left to right*): Ben Schmidt, Regional Director, Asia Pacific, Cambridge International Examinations, Presenters Dr Peeter Mehisto and Professor Amy Tsui, Audience discussion

Foreword

Ben Schmidt
Regional Director, Asia Pacific
Cambridge International Examinations

Bilingual education is a priority for Cambridge

Cambridge Horizons is a series of live and online discussions, bringing together education experts and stakeholders to explore and debate educational issues affecting the Asia Pacific region. For the inaugural Cambridge Horizons, we have chosen "bilingual education" as our theme – a topic that often comes up in our conversations with policy makers, curriculum developers and educators in Asia Pacific. We are exploring ways we can develop our support in this area. The discussions we had at this first seminar have given us new insights and perspectives.

Cambridge learners are often bi- or multi-lingual, studying some or all of their subjects in English. This means Cambridge learners have complex needs, and so we build plenty of flexibility into our programmes to help schools make them regionally relevant. Cambridge also works in partnership with ministries of education to ensure that Cambridge programmes fit in with national requirements.

Cambridge programmes and qualifications are taught in a wide variety of schools in Asia Pacific – state, private and international – and often in multi-lingual settings, with schools choosing many different models of adoption. For example:

- A small Cambridge school in Bali runs a dual-language model of Indonesian and English in its primary and secondary school, using the Cambridge international programmes and qualifications alongside the National Curriculum of Indonesia. Already in the Early Childhood Centre, all students are introduced to both English and Bahasa Indonesia.

- In Hanoi and Ho Chi Minh City, one of our Cambridge Associates has secured endorsements from the Departments of Education and Training to offer the Cambridge international programmes and qualifications in English to students in state schools. They participate on a voluntary basis, while also following the Vietnamese national curriculum taught in Vietnamese.

- In Shanghai, one of our Cambridge schools seeks to ensure that students benefit from the essence of both Eastern and Western teaching methods and styles. They have recruited two sets of teachers: foreign English-speaking teachers and Chinese bilingual teachers working together within each subject area.

We have set up a Cambridge bilingual research programme to develop our expertise in bilingual education and give more support to Cambridge schools on language issues. This support will not only benefit bilingual schools where teaching takes place through both English and another language, it will also benefit English-medium schools with multicultural student populations. In both types of schools, English may be the second language of the teacher, too.

Our research includes examining the impact of bilingual education on the teaching and learning process, and the role of assessment within it. We are also reviewing the vast amount of literature that exists on bilingual education.

Our research into bilingual education has highlighted specific needs:

- Schools need more support in setting up and managing bilingual programmes

- Teachers need more support in developing greater language awareness, which will in turn benefit their students' learning

The recent Cambridge Horizons seminar on 'the cognitive benefits of bilingual education' is a sign of our commitment to supporting multilingual education in Asia Pacific.

Chair's overview

Isabel Nisbet
Senior Education Adviser, Asia Pacific
Cambridge International Examinations

Bilingual education: cognitive benefits and policy into practice

Language education and the educational implications of learning in more than one language was an obvious theme for our first Cambridge Horizons seminar.

At a policy level, language education has been seen by governments across the world – and notably in Asia Pacific – as having instrumental importance in many respects. Language can be an instrument of foreign and strategic policy and a support for global competitiveness. The recent Australian White Paper on the significance of Asia for Australia is an example of such thinking. Domestically, many Asian countries see education in more than one language as an instrument of social policy (promoting social cohesion and racial harmony) and as a vehicle for developing characteristics such as respect and empathy that we want to see in our young people. Education in a national language or a "heritage" language linking to the nation's cultural inheritance can be part of a strategy to teach national values and encourage students to be rooted in their culture. And language education, including the study of a second or third language, can be encouraged as a means of improving educational outcomes in all subjects.

All these are instrumental benefits of bilingual – or multilingual – education and of fluency in more than one language. In addition to this instrumental view, many of us were struck by Professor Amy Tsui's quotation from Professor Marcelo Suarez-Orozco: "Learning a foreign language is about a way of being in the world, not about getting the next deal done".

Dr Peeter Mehisto explored with us some of the complexities of bilingual education. He identified a wide range of "driving forces", "mechanisms" and "counterweights", with the "counterweights" including the need to balance short-term student achievement against longer-term student achievement and good pedagogy.

The second part of Dr Mehisto's presentation brought together research findings on the cognitive benefits of bilingualism and multilingualism. He reminded us that learning is a physical as well as a social process, and he described links between bilingual education and better executive functioning of the brain, which is essential for all cognitive life, and particularly relevant to critical thinking and other higher order abilities sometimes labelled as "21st century skills. He spoke of the development of the "metalinguistic mind", the capacity for contextual sensitivity and better intercultural communication. He also referred to evidence of health benefits, including delaying the onset of mental decline on ageing.

In the discussion session a question was raised about how proficient bilingual learners need to be to reap these benefits. Dr Mehisto said that much of the research on cognitive benefits in young learners was carried out in "immersion" programmes, but said that the conclusions were more widely applicable, beyond a threshold level of linguistic attainment. There was also discussion about the age at which children should start to learn a second language, and Dr Mehisto referred to one research finding that starting at the secondary level with no prior engagement with the second language could be particularly challenging.

Professor Tsui addressed the second part of the seminar title – policy into practice. Drawing from evidence across the world, she described different approaches to bilingual education: the Canadian/French immersion approach, two-way immersion (Spanish/English) in the USA, "late immersion" in Hong Kong and "Content and Language Integrated Learning" (CLIL) in Europe, with many variants of each practised.

Professor Tsui spoke of the links between bilingual education policy and issues and emotions around national heritage and identity. This meant that discussion of, and the practice of, bilingual education, could be highly sensitive both emotionally and politically. She illustrated this by describing some of the debates in Hong Kong and their high emotional temperature.

Next, Professor Tsui summarised some of the research on the effects of bilingual education, including the effects on content knowledge of the subjects taught in the second language. We learned from her that the findings are conflicting, and she spent some time rehearsing the findings of March, Hau and Kong (2000) on the Hong Kong experience. She considered with us why the evidence on implementation was mixed, and suggested some underlying conclusions, including the need to allow flexibility to address "mediating factors" when rolling out bilingual programmes and the benefits of immersion approaches.

Professor Tsui gave an example showing the need to unpack content-specific academic/technical language, particularly if it is a second language. Her example was of asking a science class about "neutralisation" and she illustrated how this could be done in a way that enabled the students to understand why the words were used, rather than just memorising them.

In conclusion, I offer five observations which I have drawn from the presentations and the discussion. First, we need to be clear about the *goals* of language education, whether for first, second or "foreign" languages, and about whether they refer to outcomes for a selected group of students or for all students, regardless of ability or motivation. Professor Tsui distinguished between "basic interpersonal cognitive skills" and "cognitive academic language proficiency" and while she emphasised the latter, she agreed that there were contexts in which developing basic communication skills in the second language was important, and could not be taken for granted.

Second, we need clarity about the *processes* involved in bilingual education – who is to be involved and what they are to do – and those need to be clearly communicated to all concerned. Dr Mehisto illustrated the importance of this.

Third, we need to be aware of the *political and emotional baggage* around the words used to describe language education. The word "bilingual" itself may be seen as implying equality of sovereignty and importance between the two languages involved, and this can cause concern or controversy. There are also sensitivities around the phrase "mother tongue", which can refer to an allocated national or racial "heritage" language, rather than to the language actually spoken by the parents or grandparents of students.

Fourth, both speakers emphasised the importance of *stakeholders* in bilingual education – not just teachers, but also parents and the wider community.

Lastly, in my view learning a second language and learning *in* a second language should *not be seen as a threat to instilling national culture* in young people and developing their love for their motherland. Many countries are themselves multi-racial and multi-lingual and ability to negotiate that diversity can surely support national cohesion. But more generally, students who develop some of the abilities and character-traits which Dr Mehisto described – including cross-cultural awareness and empathy – will be the best possible ambassadors for their country.

Dr Peeter Mehisto[1]
Author of *Excellence in Bilingual Education*

The Cognitive Benefits of Bilingualism

Introduction

Although the terms bilingual and bilingualism can be used to describe or refer to people, groups, regions or countries that use two or more languages in a wide range of contexts, most research reported on in this article focuses on the use of just two languages. It is believed by many researchers that bilingualism in any language improves cognitive functioning. In particular, it is believed that it increases the cognitive load that the bilingual individual can handle at one time, that it improves episodic and semantic memory, increases metalinguistic awareness, and encourages the development of higher-order problem-solving skills. This article addresses those claims by drawing on research, above all, from the neurosciences, but also from psychology, education and linguistics. All of these fields explore language and learning.

Cognitive benefits

Language is not only socially constructed, but it has a biocognitive and neurocognitive basis (Ullman, 2006: 235). Dweck (2006) and Doidge (2007: 43) have likened the brain to a muscle that develops as it is exercised. Research shows that this is clearly more than just a metaphor as part of the corpus callosum in the brain of bilingual individuals is larger in area than is the case for monolinguals. Coggins *et al.* (2004: 72–73) found that 'bilingual learning and use can have a profound effect on brain structures in general and the corpus callosum in particular.'

Further, despite the fact that young minds are particularly adept in learning, learning and changes in the brain resulting from learning occur throughout a person's life. The professional discussion in the neurosciences is showing signs of an increased shift from speaking about 'critical periods' when a child can learn a new skill or develop a new ability, to a discussion of a 'sensitive period', and the ability of people to learn throughout their lives (Howard-Jones, 2007: 8; OECD, 2007: 166). This is in line with earlier work in second language acquisition. Although Hakuta *et al.* (2003: 37) point out that 'second-language proficiency does in fact decline with increasing age of initial exposure', they believe language learning is not restricted to a critical period. Furthermore, although most of the studies reported on below focus on people with a relatively high degree of fluency in at least two languages, it is becoming apparent that even in the initial stage of L2 learning changes occur in the brain:

> Preliminary results from three studies indicate that classroom-based L2 instruction can result in changes in the brain's electrical activity, in the location of this activity within the brain, and in the structure of the learners' brains. These changes can occur during the earliest stages of L2 acquisition (Osterhout *et al.*, 2008: 510).

What is less certain is what these changes mean, and if these changes have a different significance depending on when L2 learning begins. However, a considerable body of evidence is pointing to a distinct bilingual advantage or premium. It has long been felt that bilingual individuals can look at the world from more than one cultural perspective. This likely helps them to better understand different perspectives. As Singleton and Aronin (2007: 83) state:

> We note that multilinguals have a more extensive range of affordances available to them than other language users and we argue that their experience as multilinguals provides them with especially favourable conditions to develop awareness of the social and cognitive possibilities which their situations afford them.

A more extensive range of affordances or interpretations leads to a greater number of options from which to choose. This leads to a view of the bilingual as having increased competence or multicompetence. 'Multicompetence' was coined as a term to describe the added capacity resulting from bilingualism (Cook, 1991: 112). 'These subtle differences consistently suggest that people with multicompetence are not simply equivalent to two monolinguals but are a unique combination […] so the multicompetence state (L1 + L2) yields more

than the sum of its parts, L1 and L2' (Cook, 1992: 557). Thus, a bilingual individual that is seeking to solve a problem in one language is thought to be able to draw on the other language and related frames of mind to bring extra cognitive capacity to bear in solving a problem. 'The learner's playful use of multiple linguistic codes may index resourceful, creative and pleasurable displays of multicompetence' (Belz, 2002: 59). In a world that is thought to be more and more complex and placing greater and greater demands on the individual, strengthened multicompetence could bring extra resources to bear in meeting the challenges faced by individuals and societies.

In order to determine the degree of cognitive flexibility, that is to say the ability to notice and work with additional information at one time, some researchers ask their subjects (bilingual and monolingual subjects) to describe what they see in pictures that contain more than one embedded image. In two studies, Bialystok and Shapero (2005: 595) found that 'bilingual children were more successful than monolinguals in seeing the other meaning in the images'. It is also notable that 'bilingual children show an earlier understanding that other people can have false beliefs than monolingual children' (Goetz, 2003: 1). Thus, a bilingual has earlier access to a wider range of interpretations of information than a monolingual, and this holds the potential of greater cognitive flexibility.

In addition, bilinguals are thought to have greater control over their cognitive processes than monolinguals. The capacity to control or manage one's cognitive processes is referred to in the literature as executive function. Improved executive function is thought to help bilinguals to better focus their attention and improve problem-solving skills, and this from an earlier age through to a later age. In particular, this not only gives the early bilingual person a head start on monolinguals, but the brain may develop more sophisticated and durable wiring due to the 'massed practice' (Doidge, 2007: 156) over extended time that bilingualism provides. Bialystok (2007: 210) argues that:

> The executive functions are basic to all cognitive life. They control attention, determine planning and organization, and inhibit inappropriate responding […] Speculatively, these executive functions are recruited by bilinguals to control attention to the two language systems in order to maintain fluent performance in one of them. The massive practice that is involved in that application leads to the hypothesis that these processes are bolstered for bilinguals, creating systems that are more durable, more efficient and more resilient. Thus, for bilinguals, control over the executive functions develops earlier in childhood and declines later in older adulthood.

Bialystok *et al.* (2005: 40) attribute the improved executive function to the extra cognitive demand of managing two active language systems. An essential aspect in executive control is being able to determine which information is worthy of attention and which is not. In order to effectively solve a problem one needs to use relevant information and ignore the irrelevant. It is important not to allow irrelevant information to inhibit thinking. Thus, inhibitory control, the ability of the individual to ignore irrelevant stimuli, contributes toward effective thinking and decision-making. For example, McLeay (2003: 435) found that when monolingual and bilingual subjects were presented with more complex tasks, bilinguals had an advantage: 'The distracting influences [...] confuse the monolinguals, whereas the bilinguals are more able to resist the distractions of the irrelevant information in determining topological 'sameness' and are better able to encode the 'deep structure' of the images.' Similarly, Colzato *et al.* (2008: 302) concluded that bilingual individuals 'have acquired a better ability to maintain action goals and to use them to bias goal-related information. Under some circumstances, this ability may indirectly lead to more pronounced reactive inhibition of irrelevant information.' This ability may be of particular value in an information age where people in the developed world are presented with ever-increasing amounts of information.

It is not simply problem-solving that is improved through bilingualism, but learning in general. To learn one needs to focus one's attention. Moreover, it is thought that not only can bilinguals better avoid irrelevant information, they can also handle a greater amount of information and solve some types of cognitively demanding problems with greater ease than monolinguals. In studies involving multimedia gaming bilinguals performed better than monolinguals once the cognitive load was increased. As Bialystok (2006: 76) observes: 'because all the participants were highly practiced and efficient at performing this task, group differences emerged only when processing demands increased, setting limits on the performance of the monolinguals but not the bilinguals.'

This does not necessarily indicate that bilinguals are cognitively more capable than monolinguals, but that they may be better at processing a larger number of cognitive demands in a shorter timeframe. They may be able to handle more tasks at once. Learners in bilingual programmes in Belgium, Germany, Italy, Spain, and Switzerland are found to achieve better results in learning the target language and the content in other subjects than is the case with students in standard first language programmes (Gajo and Serra, 2002; Braun, 2007; Lamsfuss-Schenk, 2008; Sierra, 2008; Zydatis, 2009). Even very limited forms of bilingual education restricted to 10% of the curriculum over four years appear to have a positive effect on learning in general. Van de Craen *et al.* (2007: 193) found that 'CLIL pupils outperform non-CLIL pupils' on standardised mathematics tests even when these students do not study mathematics through CLIL. Van de Craen *et al.* (*ibid.*) conclude that 'an enriched language environment seems to have a positive effect on learners' cognitive abilities'.

In addition to a growing body of research that suggests bilinguals have greater executive control, increased multicompetence, enhanced problem-solving skills and increased learning capacity, researchers are identifying other cognitive gains which are likely to add to a possible bilingual advantage. These include improved memory in bilinguals over monolinguals and greater metalinguistic awareness. Metalinguistic awareness is 'the knowledge we have about the structural properties of language, including the sounds, words and grammar of language' (Cloud *et al.*, 2000: 3). Heightened metalinguistic awareness allows bilinguals to compare their languages. This can lead to greater precision in the use of language. It can also serve as a tool in language learning as it can, for example, help a bilingual student decode words in a text by drawing on knowledge from both of their languages. What is less discussed is that metalinguistic awareness can foster problem-solving. Bialystok (1986: 499) points out that by intentionally controlling linguistic processing a child can 'consider the aspects of language relevant to the solution of a problem.' Similarly, Clarkson (2007: 191) who studied bilingual students found that those who are successful in mathematics 'seem to have better metalinguistics skills that allow them to self-correct when solving problems, and are perhaps more confident in their approach to solving difficult problems.'

A bilingual mind draws on its metalinguistic awareness to understand that words can have more than one meaning or vary in their scope of meaning from language to language. Bilinguals are more likely to identify ambiguity in communication as they seek precision in the meaning of not just words, but of underlying concepts. This can help them to solve word problems in mathematics or contribute to greater sensitivity in interpersonal communication. More specifically, Moore (2006: 135) found:

> […] that bi/plurilingual children, in favourable contexts, do not hesitate to use all language resources at their disposal, individually and collectively. They are more open to variation and they show greater flexibility in adapting to new linguistic systems. Such orientations seem to relate to greater awareness of language patterns, and a more efficient (strategic) use of the resources at hand […].

It can also be surmised that metalinguistic awareness is a sign of greater flexibility. Flexibility is considered an important skill in ensuring personal happiness (Csíkszentmihályi, 1990; Seligman *et al.*, 2007) and an important characteristic sought after by employers. Flexibility opens up more conceptual and pragmatic options for an individual. Kharkhurin (2007: 182) believes that 'bi- and multilinguals are 'cognitively more flexible' and this is facilitated by their increased metalinguistic awareness.' Moore (2006: 125) explains that 'competence in two languages, and specifically heightened language awareness, serve as resources to build knowledge in context.' As language learning requires considerable time, it is heartening that research seems to indicate that even low levels of L2 learning can positively impact on the brain leading to increased metalinguistic awareness. Eviatar and Ibrahim (2000: 462) found that 'even low levels of ability in the second language are related to metalinguistic advantages.' This has positive implications for bilingual education.

In addition to metalinguistic awareness and increased flexibility, some researchers believe that bilinguals have improved memory. For new learning to occur, it has to somehow or other link to current understandings and memories. The linkage of current understandings and new input, and the resulting interaction between new and old can lead to different, new and or enhanced understandings. Thus learning is tied to memory. Episodic and semantic memory are two functions within long-term memory. Research by Kormi-Nuori *et al.*

(2008) suggests that the bilingual mind has superior episodic and semantic memory when compared to monolinguals. Episodic memory, as its name suggests, is about episodes or events and includes information about such elements as time, place, feelings and activities. Semantic memory includes general knowledge about, for example, ideas, facts and problem-solving. Kormi-Nuori *et al.* (2008: 93), who conducted four experiments on memory, concluded that:

> […] a positive effect of bilingualism was found on episodic and semantic memory tasks; the effect was more pronounced for older than younger children. The bilingual advantage was not affected by changing cognitive demands or by using first/second language in memory tasks. The present findings support the cross-language interactivity hypothesis of bilingual advantage.

This view is reinforced by Lewis (2012:10 referring to Thierry 2007) who argues that 'semantic relatedness is greater for objects learnt' through cross-language 'encoding-retrieval than in monolingual encoding-retrieval' leading to more effective learning. Increased long-term memory should allow learners to work with greater amounts of information while expanding their understandings and knowledge base. This suggests that being bilingual can help foster learning in all school subjects. It also implies that policy makers consider ways of fostering early bilingualism, by supporting home language development for those who are already bilingual, and by offering more early provision of bilingual education.

Health implications of cognitive benefits

Research points to the possibility that knowledge of more than one language slows down mental decline as a person ages. This may be due to the more complex neural circuitry of bilingual individuals. Not unlike the workings of a national electric power grid, the more complex the grid, the more options are available to bypass a failing part of the circuitry and maintain power to the system as a whole. Marder *et al.* (2008: 1) state that '[a]s scientists unlock more of the neurological secrets of the bilingual brain, they're learning that speaking more than one language may have cognitive benefits that extend from childhood into old age.'

These cognitive benefits appear to have health implications. If age-related decline can be slowed or diminished through bilingualism, this could have considerable consequences for individuals, their families and friends, and for society. Bialystok *et al.* (2007), who studied bilinguals who spoke a variety of 25 languages, report that the onset of dementia was delayed in bilingual individuals by 3.9 years even when controlling for factors, such as education, employment and gender. As Bialystok *et al.* (2007: 460, 463) explain below, it is not that the bilingual brain can better avoid pathology or disease, but that it is more adept at compensating for pathology or disease.

> Cognitive reserve is considered to provide a general protective function, possibly due to enhanced neural plasticity, compensatory use of alternative brain regions, or enriched brain vasculature. […] The speculative conclusion […] is that bilingualism does not affect the accumulation of pathological factors associated with dementia, but rather enables the brain to better tolerate the accumulated pathologies (*ibid.*).

Thus, the long-term financial benefits to society of a policy that fosters bilingualism could be considerable. If bilingual individuals can stave off the negative effects of dementia for several years, this should lead to substantial savings in health care for individuals, families and states. Bialystok *et al.* (2007: 459 referring to Brookmeyer *et al.,* 1998) emphasise that 'a 2-year delay in onset of Alzheimer's disease […] would reduce the prevalence in the United States by 1.94 million after 50 years, and delays as short as 6 months could have substantial public health implications.' Alzheimer's Disease International (2010: 2) in its *World Alzheimer Report 2010* estimates that dementia cost the world economy in 2010 USD 604 billion. Despite the fact that several scholars consider the majority of the world's population to be bilingual there are still substantial numbers of monolinguals who are missing the advantages of bilingualism. The potential additional health care costs associated with this monolingualism have yet to be quantified.

Conclusion

The cognitive benefits of bilingualism are far from fully understood or researched. Nonetheless, many researchers have found evidence that bilingualism improves cognitive functioning, and that this is independent of which languages are involved. In particular, it is believed that bilingualism increases the cognitive load that the individual can handle at one time, that it improves episodic and semantic memory, increases metalinguistic

awareness, and encourages the development of higher-order problem-solving skills. These skills hold the potential of contributing to the economic, social, cultural and political well-being of bilingual communities. In addition, the health implications of bilingualism are likely to be considerable both for individuals and societies. Education systems can play an important role by fostering the development of languages people already speak and by helping people to learn new languages through effective bilingual education programmes. Due to a dearth of research on trilingualism, this discussion was limited to individuals who possess two languages to a greater or lesser extent. In the European context where the European Commission (2003: 7) has set the ambitious goal of all citizens becoming trilingual (mother tongue plus two languages), there is a need to learn more about trilingualism.

[1] I gratefully acknowledge the work done with colleagues in conducting the following literature review: Marsh, D., Beardsmore, H.B., de Bot, K., Mehisto. P., Wolff, D., 2009, *Study on the Contribution of Multilingualism to Creativity Compendium Part One Multilingualism and Creativity: Towards an Evidence-base*. European Commission, Brussels.

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Bilingual Education: Policy into Practice

1. Introduction

"English is Global. So Why Learn Arabic?" This is the title of an article which appeared in the *New York Times* in early 2012. It introduced a recent essay in *The Times* by Lawrence Summers, former President of Harvard University, in which he wrote about preparing American students for the future. He argued that English is a global language and so investment in learning a foreign language is not essential. His essay attracted several hundred critical responses from people in academia, business, and all walks of life. The following is an excerpt from the *New York Times* from a professor of globalization and education at New York University.

What Would Aristotle Think

Marcelo M. Suárez-Orozco is the Ross university professor of globalization and education at New York University and the former Victor S. Thomas professor of education at Harvard.

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Welcome to a laboratory for 21st century higher education: Russian and Chinese students are taking chemistry with a world-renowned Israeli professor; across the hall, Hungarian and Argentine undergraduates take mathematics with a professor from France; while American and Qatari students study anthropology with a Latino professor.

The campus is in Abu Dhabi. The students are switching effortlessly from Mandarin to Arabic, Spanish to Russian and Hungarian to English. They embody what will matter most in education moving forward: cognitive flexibility and the ability to communicate clearly in a setting where cultural diversity rules.

Lawrence Summers would tell these students to get over it: a command of English and translation machines the size of an iPhone is all they need to succeed. … Aristotle is turning in his grave!

Professor Marcelo M. Suárez-Orozco ends his response to Lawrence Summers with the following insightful remark:

Learning a foreign language is about a way of being in the world, not about getting the next deal done. It telecasts respect for one's interlocutor and cognitive curiosity even as it nourishes the brain's jewel in the crown, its executive function. Indeed, neuroscience is beginning to show that the brains of bilinguals may have advantages in what will matter most in the global era: managing complexity, rational planning and meta-cognition.

www.nytimes.com/roomfordebate/2012/01/29/is-learning-a-language-other-than-english-worthwhile

Indeed, the need to develop bilingual and even multilingual competence of every citizen is on the agenda on all policy makers. Bilingual or multilingual education ranks top in all education agendas. Various models of bilingual education have been trialed and implemented in many countries, with enormous resource commitment from governments worldwide. However, research evidence has not always supported the efficacy of bilingual education. Research findings are often inconclusive, and sometimes even conflicting. Why? This paper attempts to answer this question. It starts a review of the most common models of bilingual education and some of the studies conducted on these

models. I shall explore why the research findings have been inconclusive, and identify the mediating factors that policy makers need to take into consideration as they deliberate on the model(s) of bilingual education that would best suit the needs of their communities.

2. Models of Bilingual Education

The most often quoted models are the Canadian French Immersion Programs because they were the earliest models, introduced in the 1960s, and the early total immersion has been considered most effective in the development of additive bilingual competence, that is, the development of L2 is achieved not at the expense of L1 development. Since then, a number of countries have adopted variations of the Canadian in relation to different goals, different student populations and different concerns. Globalization has also led to multiple language immersion, especially in continental Europe. Immersion programs motivated by revitalization of indigenous languages and cultures also adopted immersion in indigenous languages.

3. The Canadian French Immersion Programs

The Canadian immersion programs vary according to two dimensions, the stage of learning, that is, early or late, and the proportion of the curriculum taught through L2, that is, total or partial, as presented in Figures 1–4 on my powerpoint slides (see Cummins and Swain, 1986).

Variations of these programs have been adopted in many different parts of the world. The major characteristics of immersion programmes have been defined by Johnson and Swain (1997) as consisting of the following elements: (a) the aim is additive bilingualism; (b) L2 is the medium of instruction; (b) at least 50% of curriculum is taught through the target language in the early stages; (c) the immersion curriculum parallels the L1 curriculum; (d) exposure to L2 is largely in the classroom; (e) students are at similar and limited levels of L2 proficiency; (f) explicit support for L1, (g) L1 is the majority-language, and (h) teachers are bilingual. The findings of the immersion programs consistently showed that the most effective model is early total immersion. Students in early total immersion developed a high level of proficiency in French and were able to catch up in their English proficiency soon after the introduction of English language arts for a year. However, it was also found that while students were able to develop near native proficiency in receptive skills, they lagged behind in productive skills, particularly in grammatical accuracy (Harley, Allen, Cummins, & Swain, 1991). For a review of the Canadian immersion programs and their implications, see Cummins (1998).

Since then, variations of the Canadian model have been introduced in many different parts of the world, some of which retained only part of the characteristics of outlined above. With the increasing demand for mastery of more than two languages, particularly in countries in continental Europe, double immersion programmes have been introduced, involving a third language, though they are still relatively few (see Fig. 5). In the USA, the concern that submerging minority students in mainstream English education has resulted in the loss of their mother tongues has led to the setting up of Two-Way Immersion (TWI) programs.

4. Variations of Canadian Immersion Programs and Research Findings

4.1 The U.S. Experience: Two-Way Immersion Programs

Two-way Immersion programs in the US are typically Spanish-English, bringing together students who are native speakers of English and native speakers of Spanish for learning academic subjects in the same classroom. The goals of these TWIs are bilingual and biliterate competence, academic achievement and cross-cultural competence. Typically, instruction is done through both languages, with the target language used solely for a substantial portion (50% to 90%) of lesson time. A more or less equal number of students are involved and they are integrated most or all of the instruction time. Most research on Spanish-English TWI programs showed that they were successful in achieving these goals (Lindholm-Leary and Howard 2008). With the rise of Asia, there has been an increasing number of TWI in languages other than Spanish, especially in Chinese (Mandarin).

Lindholm-Leary (2011) reported on a study of a TWI (Chinese-English) program in two schools in California. Students in one school (Program 1) were from average to low income families, (25% from low SES families), and only half of their parents had college degrees whereas students in the other school (Program 2) were mostly from middle class high income families and most of their parents had college degrees.

The results of language proficiency showed that similar to the Spanish-English TWI, students in both TWI programs were able attain intermediate to high levels of proficiency in both languages and could use the four language skills in a variety of contexts. The results of academic achievement also showed that similar to other TWI programs (Spanish and Korean) (e.g. Bae, 2007; Genesee et al., 2006; Lindholm-Leary & Howard, 2008), students in the Chinese TWI programs consistently achieved either at same level of their non-TWI peers in the same school, or well above the state grade level of their non-TWI counterparts in reading and math.

The results allay the fear of native English speaking parents that their child's English language development and academic achievement will be hampered because Chinese is a difficult language to learn. In fact, the TWI English speaking students often outperform their non-TWI English speaking counterparts (in mainstream English programs). The fact that, similar to Spanish TWI programs (see Genesee *et al.*, 2006), students in Program 1 did as well as or above their peers in non-TWI programs shows that the program works for students from different SES backgrounds.

4.2 The Hong Kong Experience: Late Total Immersion

Marsh, Hau and Kong (2000) conducted a large scale study of the effect of late total English immersion in Hong Kong over a period of three years, from Grade 7 to 9, on students' academic achievement in English and Chinese, and four content subjects: math, science, history and geography. Fifty-six secondary schools and 12,784 students at secondary one (Grade 7), constituting a representative sample of schools in Hong Kong, were selected through the Education Department of the HK Government for the study. These schools used English, Chinese, or a mix of English and Chinese as the medium of instruction. The study used standardized achievement tests scores prior to entry to secondary schooling, and standardized achievement tests administered to students at the end of each of the three grades in these six subjects.

The study yielded the following results: (a) there was positive effect of English immersion on students' achievement in Chinese and English, particularly the latter; (b) the effect on mathematics achievement was slightly negative, but very negative for geography, history, and science; (c) the effect was equally negative irrespective of whether the students were initially more able or less able academically; d) students who had higher English proficiency were less disadvantaged in geography, history and science; e) a strong emphasis on English in English classes had a positive effect on achievements in all six subjects, including Chinese, in English immersion classes; (f) the negative impact did not decrease over time, although the negative effect somewhat decreased for history, and less so for science.

4.3 The China Experience: CCUEI Project (China-Canadian-USA English Immersion)

In late 1990s, Canadian French immersion model was first introduced in a number of kindergartens in Xi'an by a group of local teacher educators and supported by scholars from Canada and USA, which later was adopted by primary and middle schools. Now most major cities including Beijing, Shanghai, Guangzhou and Xi'an have English Immersion schools. There are now approximately 50 K–12 schools with more than 30,000 students enrolled in such programmes (Cheng *et al.*, 2010).

Cheng *et al.* (2010) conducted a study on three schools in China which have adopted immersion program in which 30–40% of the curriculum was conducted in English. The immersion subjects included English language arts, science and social studies. Mathematics was taught in Chinese. The use of English as a medium of teaching in physical education, art and music varied.

The study involved 998 students from Grades 2 (385), 4 (430), and 6 (183), of which 618 were English immersions students and 380 were non-immersion students. School designed achievement tests in L1 (Chinese) and math were used. The contents of the tests were similar but the tests were different. All three schools used the Cambridge Young Learners English Tests.

The results showed the following: (a) For English, English immersion students did better than non-immersion students for all three grade levels; (b) for Chinese and math, immersion students did better than non-immersion students only in Grade 6; (c) in Grade 4, however, non-immersion students did better than immersion students; (d) measures of all three subjects were correlated with each other for Grades 2 and 4 for immersion and non-immersion students, and for Grade 6 for non-immersion students. For Grade 6 immersion students, Chinese was not significantly correlated with English or math, but the latter two was significantly correlated.

4.4 The European Experience: Content-and-Language-Integrated Learning (CLIL)

CLIL is a model of bilingual education widely adopted in Europe to address the need for every European to develop plurilingual competence, that is, the ability of an individual to speak at least two other languages in addition to his or her mother tongue, as promoted by the European Commission. CLIL also aims to nurture intercultural understanding and intercultural communication. CLIL emerged in the 1990s and has become a priority concern in European education in the last 10 years. CLIL has now been widely adopted throughout Europe. Currently, about 30%–40% of primary and secondary students are receiving tuition in CLIL. In many European countries, both foreign languages and minority languages are used in CLIL, for example, France, Spain, Italy, and Germany. Teachers of CLIL are specialists in subject disciplines rather than language teachers, although in many institutions language teachers work in collaboration with subject teachers to offer the program.

The issue of which subjects are well-suited and which are less well-suited to be taught through the target language is a key concern at the outset of the implementation of CLIL. In general, content subjects have been classified into three groups: humanities and social science (social studies, history, geography), natural science (mathematics, physics, biology) and creative subjects (art, sports, music). In primary education, no distinction has been made, with a few exceptions. The choice of subject group(s) for CLIL is largely up to schools in many countries. For countries which do stipulate the subject groups, the general tendency is to adopt CLIL for natural and social sciences (Marsh, 2002) Exposure time varies according to regions. In some countries, the exposure time could be as high as half to two-thirds the teaching time.

While small scale studies, often at class level, have been conducted on the implementation of CLIL, to the best of my knowledge, there has been no large scale study of the impact of CLIL on L1 and L2 development, efficacy of content subject learning, or intercultural understanding and intercultural communication. This could be because CLIL has a history of only about 15 years, and there has been considerable variation in the way CLIL is interpreted and implemented in European countries. Most of the findings of the research studies published so far converge with the findings of immersion programs: that there was largely a positive impact of CLIL on L2 development with no detriment to L1 development. More research has yet to be done on its impact on the learning of content subjects.

5. Conflicting Research Findings: Possible Reasons and Implications

Despite the conflicting and inconclusive findings of studies on immersion programs, one common positive outcome is that students in immersion programs have been able to achieve a higher level of proficiency in both L2 and L1 compared to their counterparts in non-immersion programs. This suggests that, as pointed out by a number of scholars on immersion education, the bilingual child has developed greater sensitivity to language and hence may have a more flexible mind compared to a monolingual child in the process of learning more than one language. It also supports the Common Underlying Proficiency hypothesis which states that linguistic and cognitive proficiency underlying L1 and L2 are common (Cummins and Swain, 1986). However, what has not been consistently demonstrated is that students' bilingual competence was achieved not at the expense of their achievement in other content subjects. This raises the question of whether this linguistic advantage indeed transfers to other cognitive skills. Cummins (1998), in reviewing 30 years of L2 immersion research drew the following conclusion,

> The development of additive bilingual and biliteracy skills entails no negative consequences for children's academic, linguistic, or intellectual development. On the contrary, although not conclusive, the evidence points in the direction of subtle metalinguistic, academic and intellectual benefits for bilingual children. (www.carla.umn.edu/cobaltt/modules/strategies/immersion2000.htm)

However, the findings of the large-scale implementation of L2 immersion in Hong Kong suggest that this sweeping conclusion needs to be taken with caution. This is because the implementation of language policy is a highly complex process in which a number of factors interact, and is political and emotionally charged (see the studies on medium of instruction in Tollefson and Tsui, 2004; see also Tsui, 2004). It is not always easy to tease out the interaction between these mediating factors and to establish a cause-effect relationship amongst

them. I shall nevertheless try to outline some of the identifiable ones and discuss what implications they have for implementation.

5.1 Age for L2 Immersion

Research on the Canadian Immersion programs showed that the most effective model was early total immersion. As a number of researchers have pointed out, it may be easier for K–2 immersion students to master content subjects at an early age because of the concrete nature of the curriculum (see for example Duff (1997), Met and Lorenz (1997)). Younger learners are capable of acquiring native-like competence if they also have ample exposure outside of the classroom, in naturalistic settings, because of the use of language in a highly contextualized and concrete manner.

As students move to higher levels of education, the content becomes more abstract. Older students are often more effective L2 learners because they have well developed L1 literacy skills, and they are more capable of coping with abstract and context-reduced learning in schools. However, they will need a higher level of L2 proficiency to master the content, or the L2 instruction will need to be supplemented by L1. The fact that students with higher English proficiency were able to benefit more from English immersion in the study on Hong Kong schools supports this claim. As Swain and Johnson (1997) observe, for late immersion, it is increasingly important to consider L1 literacy, general academic achievement, L2 proficiency and motivation.

5.2 L2 Immersion Language Teachers and Content Teachers' Language Awareness

One crucial factor which has not been taken into account in studies conducted on immersion programs so far is the quality of teaching in immersion classrooms. This includes the L2 proficiency and language awareness of both the language teachers and the content teachers. Not only is it necessary for immersions teachers to have a high level of proficiency, it is also important for them to be aware of the linguistic demands made on immersion students and how the latter might be adequately supported.

The findings of the Canadian immersion program that show immersion students' weaker performance in productive skills is a case in point. Swain and Lapkin (1995) called for explicit teaching of language to complement content-based language learning and for attention to the quality of students' output (Output Hypothesis) (see also Swain, 2005; Genesee, 2008). The findings of the Hong Kong study support this claim: a stronger emphasis on English in English instruction had a more positive effect on the learning of content subjects.

An aspect of teaching competence which has not been given enough attention the teachers' awareness of the difference between everyday language and language for academic study and the subject-specific linguistic features that they should help students to master in order to facilitate their content learning. Although the study of discipline-specific genre has been going on for some time (notably the illustrious work of Michael Halliday), the application of these studies to immersion teaching is much more recent. Hoare (2004) examined of the teaching of science by science teachers who were more language aware and those who were not, and found that there were qualitative differences in the way they supported (or did not support) the construction of scientific knowledge through L2 (see also Hoare, Bell, and Kong, 2008). A good example is the use of nominalization in scientific writing, referred to by Halliday as "grammatical metaphor", which is defined as the "substitution of one grammatical class or one grammatical structure, by another" (Halliday, 1993, p.79). Halliday points out that a scientific process in everyday English is expressed by a clause whereas in scientific English it is typically expressed by a noun phrase: the process is nominalized. Therefore, noun phrases in scientific writing should not be seen as terminology, or technical vocabulary, to be memorized. But rather they should be understood as a way of seeing the world. In other words, instead of seeing the world as "the world of happening", nominalization sees the world as "a world made of things" (Halliday, 1993, p.82). Therefore teaching students scientific language is an integral part of helping them to see the world in alternative ways. In doing so, teachers induct students into the discourse of scientists.

Drawing on the work of Snow, Met and Genesee (1989), Hoare distinguished between content obligatory language, that, language that must be used to express content, and content complementary language, that is, language which complements the explanation of content but not essential, and found that teachers who attended to the former produced superior results in students' science learning than those who did not. (For an illustration of how a grammatical metaphor, neutralization, was unpacked by a science teacher, see slide 25).

5.3 Language Support and the L2 Curriculum

In immersion programs, students are faced with a dual challenge of learning both a new language and new content. As pointed out above, this may be easier for early immersion students as content learning is by nature more concrete. In late immersion programs, content learning is more abstract and students have to learn through a language which they are still learning to master may. Students need to be adequately supported linguistically both in the classroom and outside the classroom. In Hong Kong, schools which want to use English as a medium instruction must have in place adequate resource support for students. This often takes the form of offering additional remedial classes for weaker students, and using split classes for English lessons. However, unless this is properly done, this kind of support may not be effective.

Walker (2010) reported on a Pilot Enrichment Program funded by the HK Government to provide English support for students switching from Chinese as a medium of instruction (CMI) to English as a medium of instruction (EMI) in senior secondary schooling, i.e., from Secondary 4 (Grade 10) to Secondary 7 (Grade 13). The enrichment program took place two years prior to the switch to EMI in Secondary 4 (Grade 10) and consisted of 60 modules, taught either after school for one hour once or twice per week by English or subject teachers, or as part of the curriculum in subject lessons. Walker compared the performance of students (430) who had undergone the EP and those who had not (44) on the comprehension and production of scientific English 4 months after they had transitioned into EMI at Grade 10. Students were given two tasks, one was an aural cloze on the use of metals and the environment, and the other required students to produce a definition of an alloy, select suitable alloys for making a warship and a window frame, and provide justifications for their choices. The results showed that students in the EP group did not perform better than those in the non-EP group.

Drawing on data collected in other parts of the study, including lesson observations and interviews with teachers, Walker suggested that the lack of impact could be attributed to the lack of explicit focus on language in language teaching, the lack of awareness of the teachers of the importance of the subject-specific linguistic features, the pre-dominance of teacher talk, and the design of the materials which is either not subject-specific enough lexico-grammatically for science teachers participating in the EP or too subject-specific for participating English teachers. There was however positive effect on listening-related tasks and slightly more positive effect in word and sound perceptions, suggesting that more intensive intervention earlier on in secondary schooling and the integration of the subject specific genres into the English curriculum could be more effective. She noted that there was a gap between the language taught in the EP and the language that the students need in order to make sense of their content subject.

This raises the question of the extent to which the L2 curriculum provides language support for immersion students to study content subject through L2. Much of the L2 curriculum in Hong Kong and the L2 textbooks, focuses on L2 used for everyday knowledge and the emphasis is often on Basic Interpersonal Communication Skills (BICS), with little attention to Cognitive Academic Language Proficiency (CALP) (Cummins, 1984). There is a need to review the L2 curriculum in immersion programs as well as in programs which aim to help students to transition from L1 to L2 as a medium of learning.

5.4 Cognitive Challenge and Pedagogy

In many immersion classrooms, teaching is often teacher-centered and transmissive. Many immersion teachers attribute the adoption of didactic teaching to students' low level of L2 proficiency. This often compromises the cognitive challenge of content learning as a result simplifying the target language, and reducing the interaction between the teacher and the students to closed questions and narrow factual question which require only minimal responses from students. This is supported by a study conducted in Hong Kong on the same teachers teaching physics through L1 and L2. The study showed that in the L1 physics classroom, the teacher used a much higher number of open questions which required higher order cognitive skills, made much more frequent shifts from classroom context to real-life contexts, and provided much richer explanations. By contrast, the same teacher used far more closed "blank-filling" questions which required lower order cognitive skills, and largely confined her explanation to the classroom context (Tsui and Marton, 2004). Furthermore, in the L2 physics classroom, the cognitive demand of the questions were often reduced as the teacher changed by open-ended questions to closed questions and yes-no questions. As Cummins (1998) pointed out, the cognitive challenge of content-

based teaching can be elevated by a number of measures. This includes a more flexible use of L1 when necessary; making use of repetition, paraphrases, repetition an paralinguistic gestures to aid comprehension; using graphics as auxiliary but not replacement tools to convey abstract concepts; providing opportunities for collaborative learning and meaningful use of technology.

5. Concluding Remarks

In this presentation, I have reviewed the models of bilingual education, the research findings on the effectiveness of these models in achieving the goals of bilingual education. I have explored the mediating factors that could have contributed to the different outcomes. When an externally developed model is adopted for local use, there is often a tendency to do so without a critical review of the mediating factors that could come into play and how they might differ in the specific context of implementation. There is also a tendency to allow little flexibility for variation. The prohibition of the use of L1 in L2 immersion classrooms in a case in point – recent research on bilingualism has suggested that L1 should be drawn on, rather than to be shunned, as a resource in L2 immersion classrooms, when students have difficulty grappling with abstract concepts in content teaching. It is therefore very important that teachers are empowered to make decisions on what works best for their students.

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