

"A Microscope Under Any Other Name" - Code Switching in the English - Medium Science Classroom: An Investigation of Two Schools in Sri Lanka.

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ABSTRACT

In 2002, under the New Educational Reforms, one of the more controversial initiatives was the re-introduction of English medium instruction at junior secondary level in selected State schools in Sri Lanka. One of the key concerns articulated at the time was the already low language proficiency in English of both students and teachers and the possibility of disparities between English proficient and less proficient students widening. Using the neo-Vygotskian framework of socio-cultural theory, particularly scaffolding, (Wells, 1996; Wood, Bruner and Ross, 1976), this paper analyses the code-switching behaviour of secondary school English medium science teachers in two major urban state schools in Sri Lanka, one in the capital, Colombo, and the other in the Kurunegala district. Canagarajah (2005) and Lin (2006) are among prominent Asian scholars who view CS and the use of mother tongue in English medium classrooms in a favourable light, albeit for different reasons. Several studies however have reported that teachers who do resort to code-switching are apprehensive and defensive about such practice (e.g. Probyn, 2005, 2006, 2009), while the use of the first language in the English as a second language classroom has been denounced (e.g. Karunaratna, 2009). Using a qualitative case study approach, this study set out to investigate, by means of micro-analysis of science classroom discourse audio-taped over a school term, how first language and target language are used in this context. The study investigated two schools with an aim to finding out if code-switching and/or use of the students' and teachers' mother tongue serves as a scaffolding mechanism, if there is a justification for its pervasiveness, and if there is any difference related to the implementation of policy across the two schools. Results show that particular ways of using of mother tongue and code-switching can serve to provide Limited English Proficiency students access to science discourse as well as encourage participation by students in the EMI science classroom.

Key Words: Code - Switching, English Medium Instruction, Secondary School Students

1. INTRODUCTION

Learning science is challenging even when the medium of instruction (MOI) is the mother tongue or first language of the students studying it. Roth (2005) goes so far as to evoke Derrida's (1998:7) pair of contradictory statements on language; "we only ever speak one language" and "we never speak only one language" to signify the difficulty inherent in learning science. He argues that learning science thus involves learning to use language that is "both the same as and very different from" the language we use in activities unrelated to science (2005:viii). Learning science in a language which is a second or even foreign language then, must be a task of Herculean proportions, especially if the proficiency of both teachers and students in the MOI is significantly limited. In many post colonial Asian contexts, renewed forces of economic globalisation have driven state governments to reverse their former mother tongue education policy to English medium education policy especially for science and math subjects. (Lin, 2006: 293). Often, this is in response to the perceived or articulated needs of limited English proficiency students who (or whose parents) desire an English (L2) medium education especially in science and math subjects for its socioeconomic and instrumental value. Therefore, exploring bilingual teaching is imperative in such contexts as Malaysia and Sri Lanka, where there is renewed interest and policy focused on teaching in the English medium.

It is in such a context that this paper sets out to investigate the role and function of mother tongue and code-switching in two of Sri Lanka's English medium science classrooms. In the next section of the paper the background to the English medium instruction (EMI) policy currently in place in several Sri Lankan State schools, and some relevant, highly debated issues surrounding it will be outlined. A review of relevant literature which discusses the use of mother tongue in EMI classrooms in Section 3 is followed by a description of the theoretical framework used for the study in Section 4. Section 5 explains the design of the study and analysis of data; section 6 discusses the findings. Section 7 concludes the paper with the discussion and implications of the research.

2. BACKGROUND TO CURRENT EMI POLICY

The issue of language in education, particularly in relation to English, and the medium of instruction (MOI) has been a long debated one in both colonial and post colonial Sri Lanka, as it has been for a number of other countries which were once colonized by Britain. All three languages (English, Sinhalese and Tamil) have figured in tensions between the two major communities in the island, as well as within communities, in relation to socioeconomic disparity. Official language policies, education policies as well as language-in-education policies have been implicated in creating and exacerbating these conflicts during colonial times. While in the early stages of decolonization, the concerns were

largely related to matters of identity and nationhood, in light of the more recent phenomenon of globalization, the concerns about English and language-in-education policies have largely revolved around issues of employability, access and equity, the disparities between disadvantaged and privileged schools and between policy and practice. After independence, successive governments have attempted to address the issue of language and its divisive role in post colonial Sri Lanka, in order to rectify inequality and provide a more democratic social system, with little success. The context of this study is the most recent of such attempts to address the issue of language and equality with regard to educational opportunity; the New Educational Reforms and New Initiatives in Education - proposed and begun to be implemented in several stages, beginning in 1997. The study deals with the re-introduction of EMI in selected state owned schools at junior secondary level (Grade 6) in 2002, for selected subjects, including Science, Social Studies and Mathematics, in the present climate of an overwhelming desire and demand for English by parents to provide their children with English education.

Preliminary discussions and subsequent interviews conducted with high-level policy makers revealed that the purpose of re-introducing EMI was to improve students' language proficiency and provide exposure and the opportunities to learn English - that children from affluent backgrounds gain from going to 'international schools'- to children from less privileged socio-economic backgrounds. A further aim was to give children confidence in using the language, and to expose them to authentic opportunities to practice the language. The knowledge of English is synonymous in this country with "self confidence" and therefore, it was envisioned that studying in the EMI would also add to children's self confidence.

Thus, a publication by the National Education Commission, (NEC) a governmental authority set up in 1991 and vested with the responsibility of formulating national policy on education reported in 2003:

"A Bilingual policy should be introduced in junior secondary classes to provide an enabling environment to ensure that all students, irrespective of socio-economic and/or regional disparities, have the opportunity to acquire a level of English proficiency adequate for higher education and career advancement. The teaching of Science, Mathematics, IT, Health and Physical Education, Environmental studies and Social Studies has been introduced already in Grades 6 and 7 in schools...Some subjects should continue to be taught in Sinhala/Tamil" (NEC, 2003:xviii)

This is despite the fact that the majority of learners do not have necessary English proficiency to successfully engage with the curriculum - for example 75% of GCE

(Ordinary level) candidates failed their English examination after 10 or more years of English lessons (Melvin, 2005) - and an acute shortage of teachers adequately trained or proficient enough in English to teach subject content in the English medium. Although EMI has not been introduced as compulsory, but as an 'option' that students can select, English being the 'cultural capital' (Bourdieu, 1991) it is in Sri Lanka today, the notion of "choice" is questionable. This phenomenon has been aptly called "the necessity of limited options" (Probyn, 2005:164).

Anecdotal evidence and small scale studies have shown that this EMI is beset by problems ranging from a lack of teachers, decreasing student numbers and the need for EMI students to attend private 'tuition' classes for those subjects in their mother tongue, after school hours. In one among a series of reports commissioned by the NEC to look into and report on the effectiveness of the implementation of Educational reform at secondary level, Gunawardena and Lekamge (2003) found, in an evaluative survey done in two districts, that it was the opinion of principals, that a lack of competent teachers to teach in English was the main reason for ineffective implementation of EMI. It is therefore a valid concern, and a possibility, that EMI in Sri Lanka, given the current inadequacy of resources, may only benefit students who are already competent in both languages but will not have the desired effect on students who do not already have access to the linguistic capital that English has become.

Other studies in conducted in similar contexts, e.g. Probyn (2005, 2006), Martin (2005), Lin (1999) and Valdes (1998) show the tension that exists between medium of instruction policy and practice. Reporting the findings of her South African study, Probyn (2006) points out that there is "a gap between learner's English proficiency and the linguistic demands of learning through the medium of English and likewise there is a gap between the intended and enacted language policies, with a range of bilingual practices evident." (2006:393). In preliminary classroom observations this researcher carried out in EMI science classrooms in two schools in Colombo, a range of practices including the use of mother tongue (L1) was evident. Given the fact that in most part, Sri Lankan state schools deal with students whose proficiency in English is limited (hereafter, Limited English Proficiency (LEP) students), and that the use of mother tongue is prevalent even in the English classroom (e.g. Karunarathna, 2003), this study is aimed at investigating the functions of switching between L1 and English in the science classroom and to ascertain whether they can be justified as a pedagogical scaffolding device - specially for LEP students.

3. LINGUA FRANCA VS. MOTHER TONGUE

In many of the studies conducted of EMI classrooms where the MOI is a second or foreign language for both teacher and students, researchers have found that the use of English is largely confined to a recitation script (Tharp and Gallimore, 1998) and is used only for choral repetition / choral response routines and Rote Learning (e.g. Chick, 1996; Bunyi, 2005; Martin, 2005). Chick (1996) famously coined the phrase Safe Talk to describe this type of classroom discourse. Safe-talk is primarily the language used by teachers in the classroom when they do not want to take any risks but instead choose to follow prescribed ('safe') routines and patterns (Weber, 2008: 155). Chick (1996) and Hornberger and Chick (2001) are two significant studies which explore the concept of safe talk in investigations of classroom discourse where the MOI is a former colonial language. The 2001 study presents an ethnographic study of language practices in two classrooms, one in South Africa and the other in Peru, where English and Spanish were the respective MOIs. In both cases, the language of instruction was inadequately understood by many students and even by some of the teachers.

As a result, as Weber (2008) points out, "interaction in these classrooms was limited to mere repetition, cued responses and chorus-like answers" (2008: 56). Hornberger and Chick (2001) call this type of interaction safe-talk, which they define as talk that allows a minimal form of participation. Weber points out that it takes place "without loss of face for the students and (especially) the teacher" (Weber, *ibid.*). According to Chick (1996) Hornberger and Chick (2001), such practices do not play any role in student empowerment or equity. Martin (2005) who studied two rural classrooms in Malaysia discusses the discrepancies between "what is officially planned by the ruling elite and ...the voices of the local classroom participants" (2005:75). He notes that pupil responses in English were largely confined to single word labels and the repetition of key lexical items. He describes the dominant discourse of the so called English Medium classroom in Malaysia as 'safe' after Hornberger and Chick (2001) but with the added slant to refer to practices that allow the students and teacher to be seen to accomplish lessons. Studies such as those done by Brock- Utne (2005) in Tanzania and South Africa, and Williams (2006) on Malawi and Zambia confirm Hornberger and Chick's observations of the effects of using the former colonial language as medium of instruction.

In another study which, although not set in a post-colonial context, investigates a classroom of unequal distribution of linguistic capital, Tuveng and Wold (2005) suggested that there was collusion between students and teachers in keeping up the pretense that learning is taking place. They investigated comprehension problems faced by minority students learning mathematics in Norwegian. Using frameworks of institutional discourse and a dialogical and social-cognitive perspective on language and communication, Tuveng and Wold (*ibid.*)

analysed classroom discourse and found that the teacher, by her modeling, and the children, by their behaviour [of choral repetition without real comprehension], co-create a situation in which difficulties in comprehending the language of instruction are masked.

Similar research has found that when L1 was used in class, it was only to gloss terms and not as 'exploratory talk' (Mercer, 2000). For example, Martin (2005) expresses dissatisfaction over the manner in which classroom participants in two Malaysian English as a second language (ESL) classroom use Malay only to annotate lessons and with little "exploratory use of language" (Martin, 2005: 87). Overall then, the consensus is that there is significant tension between policy and practice not only in EMI content classrooms but also ESL classrooms (e.g. Karunaratna, 2003; Bunyi, 2005) in several post colonial countries where new MOI policies are in place; and where the language of the former colonizer is chosen to replace national languages as the MOI, the L1 of the students is used only to gloss but never to explore meanings of concepts or to generate meaningful student participation.

4. RE-VISITING ESSENTIALIST POSITIONS

In the context of such discrepancies between policy and practice, the focus on tension between mother tongue and target language are evident in the studies cited above. However, some scholars (e.g. Canagarajah, 2005; Lin, 2006) are increasingly taking a different view of the tensions and reappraising the uses of mother tongue in the EMI content classroom. For example Canagarajah (1995) suggests that by mixing Tamil and English, Sri Lankans are able to pretend that they are still using Tamil (for nationalist solidarity purposes) while claiming the symbolic rewards associated with English. The flexible use of Tamil bridges the gulf between the home and school, or cultural knowledge and academic knowledge. Lin (2006) demonstrates how classroom code switching (CS) between English and Cantonese in a Hong Kong English medium science classroom helps to socialise students into sociolinguistically appropriate bilingual practices in the larger society. She found the following pedagogical functions achieved by the teacher through the use of the students' L1, after analyzing an audio taped science lesson:

- (1) Embedding the presentation of key L2 terms and concepts in a rich L1 semantic context.
- (2) Socialising students into the Observe-Wonder-Explain practice and attitude of scientific inquiry characteristic of scientists.
- (3) Illustrating abstract scientific concepts with concrete L1 everyday life experiences and examples.
- (4) Summarising what is taught in L2: Spelling out the core L2 scientific terms / drawing students' attention to the L2 science discourse in the L2 sciencecoursebook and worksheets (Lin, 2006: 296).

This position is influenced by the perspective of Hornberger's (2003, 2004) continua of

biliteracy model which argues against the binary essentialisation of linguistic discourse along the lines of literate/oral, vernacular/lingua franca, narrative/academic, contextualized/decontextualised and micro/macro contexts. This model rejects the notion of choice between these extremes as well as the notion that they are mutually exclusive. Hornberger points out that instead, each community must negotiate and develop a mix of languages, literacies, discourses which best suit their own interests , based on history and the relationship between languages in their environment and along a continuum of the dichotomous communicative constructs mentioned above (See figure 1):

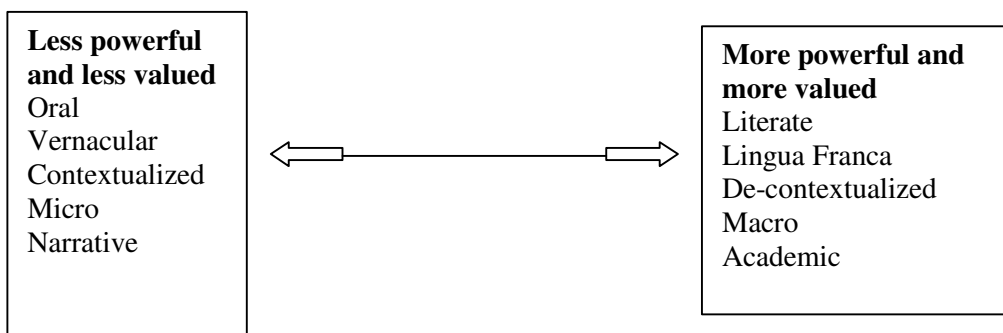


Figure 1: Continuum between dichotomous divisions (based on Hornberger, 2003).

She argues that these features are (or can be) negotiated by a community to define its needs and aspirations. Ramanathan (2005) discusses ways in which students, teachers and institutions interpret and engage with particular language policies to "build bridges across perceived chasms while respecting tensions in contact zones" (p viii). Evoking Hornberger's continua, she points out that in postcolonial contexts where appropriation and nativization are the default mode, occupying different points on several co-existing biliteracy continua is not only beneficial but "makes room for both gradual development and occasional back tracking" (2005:viii).

In attempting to ascertain the functions and roles of code-switching from and into mother tongue, this study uses the Neo-Vygotskian approaches of sociocultural theories of language learning and specifically the concept of scaffolding (Bruner 1983; Wells, 1996; Wood, 1988). Scaffolding grants a view of learning as contingent and afforded by teacher response to learner needs. Neo-Vygotskians such as Rogoff (1990) and Wertsch, (1985), have built on Vygotsky's (1962) argument that children develop higher-order cognitive functions including linguistic skills, through social interaction with adults or more knowledgeable peers, eventually internalizing these skills and functioning independently. The most important interactions take place within a child's Zone of Proximal Development (ZPD) that is, slightly ahead of the learner's independent learning ability. Scaffolding

practices have been described as manifested in the following actions by the teacher (Wood et. al, 1976):

- Recruitment (R)
- Direction Maintenance (DM)
- Reduction in degrees of freedom (RF)
- Marking critical features (MCF)
- Frustration control (FC)
- Demonstration (D)

Thus, three main research questions are posed in the study:

1. When and Why do classroom participants switch to mother tongue while teaching in proficiency in English?
2. To what extent can CS act as a scaffolding device and expedite participation and interaction which is essential in learning science?
3. What differences are there in the use of L1 / CS practice between a better resourced national school in the metropolis and a provincial school where teacher and students have less exposure to English

5. DESIGN OF STUDY

5.1 *Data Collection strategies*

A qualitative and interpretive approach was used to gather data for the study, which focuses on the process of learning, and not the quality of the end product. In keeping with a holistic approach associated with classroom and other ethnography, a multi method strategy was used for data collection in order to create "a whole picture of the particular cultural event under study - a picture that leaves nothing unaccounted for and that reveals the interconnectedness of the component parts" (Hornberger, 1994: 688). The main methods of data collection were:

- Observation and field notes
- Audio-taped transcripts of classroom lessons
- Semi-structured interviews with teachers

In keeping with the ethnographic case study approach, the proceedings of the two schools were observed over a period of one school term.

5.2 *Participants.*

The participants were the teachers of two schools, both classified as type 1AB¹. School X was chosen on account of it being a prestigious school in the country's capital, Colombo and one which is considered one of the best girls' schools in the country. School Y is also an urban school in the Kurunegala district, approximately 96 kilometers northeast of the capital. Although it is also a Type 1AB school and shares similarities with School X in terms of qualified teachers, its geographical location signifies the fact that it draws students from rural areas as well as from a wider range of socioeconomic backgrounds. Further, there is less exposure to English outside the capital city and the Colombo district.

Table 1: Type of school, district and teacher experience

School	Province/District	Teacher Experience	Class Size
School X	Western / Colombo	31/2 years	40
School Y	North Western / Kurunegala	None (novice)	24

5.3 *Ethical Issues*

In collecting data, strict anonymity of participants was adhered to, with Schools being named only as School X and School Y. The teachers who participated in the interview too, are assigned pseudonyms. As far as possible, the research was conducted in the most non-interventionist way possible, with minimal disruption to ongoing classroom activities, using a very small digital audio recording device, with the informed consent of the school authorities as well as the classroom teacher whose classroom was recorded. The purpose of the research was explained clearly to the participants before the researcher obtained permission to enter the classroom.

6. FINDINGS

Perhaps the most significant but least surprising finding was that CS was a pervasive occurrence in both classrooms. This confirms what earlier studies done in the context of ESL classrooms in Sri Lanka have shown (Perera, 2002; Karunaratna, 2003). The study also confirms the reasons for CS found in earlier studies, (e.g. Johnson, 1983. 1985): for classroom management, marking the transition points of a lesson structure, encouragement, summary/review.

¹State Schools in Sri Lanka are categorized as being Type 1AB, Type C, and Type 2. Type 1AB are considered to be the most resourced, and teach all three subject streams at the GCE A/L school leaving examinations: science, arts and commerce and mathematics. Type C schools offer GCE A/L subjects only in the arts and commerce streams, and Type 2 schools offer classes only up to the GCE (Ordinary Level) examination, i.e. Grade 10.

Episode 1¹

T: Last Friday we learnt: we cant get accurate information by observing outside no? *giya sumaney api igenagaththaney apita hariyatama thorathurak labaganna baha mokakhari sidhdhiyak bahiraya balala neda?* <**Last week we learnt, didn't we, the fact that it is impossible to obtain correct information about an event or occurrence by merely looking at it in a surface manner?**> So we ob- we use several instruments no? What are the instruments?

Ss: thermometer

T: Then?

SSS: Micro?: [scope

T: [Microscope

It also confirmed certain distinctive features of L1 and L2 use in the classroom: When speaking in English (L2) or the prescribed MOI, it was obvious that the language was text-dependent, formal, didactic and memory-based. (Johnson, 1985). In addition this study found that when speaking in English the teacher's voice was pitched louder, evoking the notion of "teacher as performer". However, in contrast when speaking in the L1 (mother tongue of the majority of students and both teachers) the discourse was text-independent, informal, explanatory and understanding-based. Additionally it appeared that in contrast to the teachers pitch for the use of English, when speaking in the mother tongue, her pitch was soft and manner conversational, evoking the notion of "teacher as facilitator/communicator"

In relation to the second part of Research Question 1, which explores the ways in which L1 (or Mother Tongue) is used by teachers to cope with limited proficiency students, it was revealed that the teacher frequently used it as it is used in the speech community of the world outside the classroom, in a situation of code switching (CS) commonly found in Sri Lankan society (Senaratna, 2009):

Episode 2:

T: List *ekak hadaganna, thavath thiyena organs gena. Colour. Paata paata thiyenewa neda: hama vitharada?*<**Make a list of other organs... Isn't colour another factor? Is it only the skin of an animal?**>

T: Brown colour *ekak thiyenawa neda, shell eka? Ow neda?* <**Isn't the shell brown? Yes, right?**>

¹See Appendix for Transcription Conventions

According to the Continua of biliteracy, what is important is the particular local needs and aspirations of the community; and the immediate community students are being socialized into is the wider Sri Lankan community, where bilingual practice is common in day to day as well as more formal discourse. The teacher's speech in the classrooms can be said to be thus, reflective of bilingual practices of wider community. Further, as exemplified in the following episode, the teacher foregrounds the target language scientific concept by means of the use of L1:

Episode 3:

T: Now tell me what are natural things. *Hamoma kiyanna, monavada natural things kiyanne?*
<Everyone tell me, what are natural things>

Another way the teacher used L1 in the EMI science classroom of limited proficiency students was to jointly construct knowledge using mother tongue as an uptake device. This enhanced student participation and served as encouragement.

Episode 4

T: Ok. Some animals have a: (0.60). ((long pause)). Some animals have clours. Can change their colours according to the: ENVIRONMENT. It's also the ADAPTATION. No? to protect from the enemies.

P1: *teacher samahara saththu summer ekata brown colour nam, winter ekata white colour. Mama tv eke dekkka.* <Teacher, I saw on tv, there are some animals who turn bron during the summer and then white during winte>

T: Yes, white colour. *Anna, e wage theiyenawa neda?* <Yes of course, things like that happen, don't they>

It was also revealed that Code Switching (CS) is used as a scaffolding device to motivate learners and draw them into participating, recruit them to the task and as a bridging between cultural/knowledge that can be drawn upon:

Episode 5

The topic was "sights, sounds and smells in the environment", and the lesson was related to teaching the concept of observation as the base of scientific endeavour.

T: What did you see hear smell today?

S1: Smell of flowers?

T: What did you feel?

Sss: ((silence))

T: What about (5) flowers?

Sss: ((silence))

T: *Ethakota monavada dekkey, denuney, ahuney?* <**Then, what did you see, feel, hear?**>
 S2: =Sound of children
 T: Taste?
 Sss: ((silence))
 T: *ada kiribath kavwada?* <**Did you have milkrice for breakfast?**>

When the students remained silent after two consecutive, authentic (as opposed to mere display) teacher questions the teacher switches to L1, with not merely a translation of the individual L2 questions but a single question which encompassed all her immediately preceding questions. This immediately draws a response from one of the students, in the form of a latched utterance³. The next question, a mere one word query also is met with silence, at which point the teacher then switches to L1 not with an attempt to translate the question, but instead with another genuine almost conversational question about what the students had had for breakfast. It was the start of a new term and the teacher is, in this instance, drawing on shared cultural knowledge of a local custom - this particular type of food is prepared to symbolize festivals or new beginnings on a fairly regular basis - to draw students into responding and to reduce their anxiety.

The following episode demonstrates how the use of L1 achieves the scaffolding function of 'marking critical features' where the teacher calls attention to the definition of the term mammals by eliciting the L1 word for mammals from the students:

Episode 6

1. T: *Kavwada mammals kiyala kiyanne?* <**Who are mammals?**> Mammalia
2. Ss: *Kshreerapai* (=scientific term for mammals)
3. T: *Kheerapai: danne nathi aya innawa nam liya ganna, therumath ekka.:* (**Mammals. Those of you who don't know the term, please write it down with the meaning**)
4. She tell dog, cat, goat are in land :: ? environment. They are mammals. Not only mammals, reptilias, insectas are living:land. Reptilias and insectas: (7) are also: living in land. ((Teacher writes on board))
5. T: Ok, tell me: who are the reptilias.

The teacher, further uses the L1 to demonstrate and model the new vocabulary item by rapidly switching back and forth from L2 to L1 and then back to L2 again. She also embeds the target language term "mammals" in the L1 sentence, drawing attention to the key word. Thereafter, the teacher uses reported speech, albeit with inaccuracies in grammar, drawing the students into ownership of the knowledge shared (line 4) as well as explaining the meaning of the term 'mammals' with examples in the target language. She then attempts to decrease the students' stress by giving them a learning strategy ("write down the new term with the meaning")

³an utterance that leaves no pause between what precedes it

Therefore, in answering Research Question 2, it can be said that CS and use of mother tongue in the EMI science classroom can, and is sometimes used in several different ways to scaffold learning and bridge the gap between the learners' existing knowledge and new knowledge, as well as to embed concepts in students' local experiences. While it may not be possible to see the use of CS or the use of the students' L1 in all of Wood et al's six scaffolding features, the most prominent ways in which L1 functioned was in Recruitment, Marking critical features, Frustration control and Direction Maintenance. To a great extent, L1 serves as a way to enhance student participation in the classroom.

In seeking an answer to Research Question 3, it was revealed that significant differences existed between the large classroom of the Colombo national school (School X) and the relatively small provincial school classroom of the north western province (School Y). In the prestigious Colombo school, the teacher used CS and L1 with no clearly defined functions for L1 and L2 and was mainly concerned with covering the syllabus and rote learning. Overall, she used more L1, i.e. Sinhalese in her EMI class. Very little student participation existed except for choral repetition of answers. Further she saw her role as only that of a science teacher and her attitude towards the use of the mother tongue and/or CS as "the only option" to convey the meanings of concepts to students. Whether she was using L1 or L2, a strict adherence to a traditional IRF format, display questions and rote learning was observed.

Episode 7

1. T: Energy is another name for non material, right *non materials walata kiyana anek nama*
2. *thamie energy kiyanne. <energy is another name for non-materials>* something that
3. has no mass and that does not occupy space.
4. *neda? hari <Isn't it? OK>* err
5. SSS: ((Silence))
6. T: What is locomotion? *locomotion kiyanne? locomotion kiyala kiyanaekata, apita*
7. *kelinma avidinawa paninawa, duwanawa, peenanawa, piyabanawa ae thani vachana*
8. *kiyanna baha, podiawe vachanyak thamai kiyanna one. neda? locomotion kiyanne eka*
9. *thanaka endala thawath thanakata yanawa kiyana eka. <locomotion means what?*
10. *locomotion means, we cant just use the words walking jumping running swimming and flying, we cant just use those words alone, we need to use a common word, Don't we? >*
11. *locomotion means moving from one place to another >* moving from one place to another place,
12. *api kiyamu <let us say it together>*
13. T: moving
14. T & SSS: =Moving from one place to another place
15. T: *eka thanaka indala thawa thanakata yana ekata thamai api kiyanne locomotion kiyala,*

16. *eka ekko avidinawa venna puluwan, walking venna puluwan, ekko flying, piyabanawa venna puluwan, nathnam peenanawa venna puluwan, onama kramayak venna pulucan, locomotion kiyanne moving from one place to another place. <what we mean by locomotion is moving from one place to the other, this could mean walking, it could mean flying, or else it could mean flying, it could be any way, locomotion means moving from one place to another>*

17. T: then what is nutrition?

18. Ss: Poshanaya

In the large and prestigious national school the dominant language of the EMI science classroom was L1. However, the key words e.g. "locomotion" (line 6) and its basic definition i.e. "moving from place to place" is given to the students first in their mother tongue closely followed by the definition in English (line 11). Although the bulk of the explanation has been carried out in L1, the teacher then instructs the students to repeat after her, the definition in English (lines 12-14). The fact that students are instructed to repeat and engage in choral repetition of the definition or key words in L2 is significant in that students are being made aware that it is the L2 definition that is required of them, and which will be more symbolically valuable in the academic context. However, overall, student participation was low, and the degree of teacher-centredness very high, as demonstrated in the display questions and choral repetition of the following episode:

Episode 8

T: Now tell me what are natural things. Hamorna kiyanna, monavada natural things kiyanne?

SSS: The things which are not made by man

T: The things which are not made by: [man

SSS: [man

T: then artificial things?

SSS: Things which are made by man

T: Things which are made by : [man right

SSS: [man

T: Then er what are living things?

The things?

SSS: =The things that perform vital activities

T: Then non living things?

SSS: The things which are not perform, [which are not performing vital activities

T: [which are not performing vital activities.

T: Things which are not performing [vital activities

SSS: [vital activities

In the entire collection of transcripts, only one instance of student initiation was found:

Episode 9

The teacher was attempting to explain recurring phenomena in the environment and give examples of patterns.

1. T: vaporizing *kiyanne mokakda ethakota?* <What is vapourising, then?>
2. T & SSS: *vashpa wenawa kiyana eka* <the act of vapour forming, that's what it means>
3. T: *vashpeekaranaya kiyana eka*, vaporizing of water to form clouds, form *kiyanne? hadanna*
4. *kiyana eka, jalaya vashpa vela, valakulu athiwela wessa athiwenawa.* are repeating incidents.
5. S: repeating *kiyanne?* <what does repeating mean>
6. T: *aapahu aapahu sidda wenawa kiyana eka* <it means, the act of happening again and again>

In line 5, one student asks for clarification regarding the meaning of a particular L2 word, which is interestingly, not even a particularly scientific term, and the teacher uses L1 to define it. The student who asks for clarification too, uses L1 to ask the question. This episode (like many other in both schools) highlights the importance of the shared L1 as a mediating tool in a limited English proficiency setting, and reiterates the need for non-essentialist positions regarding the use of only one language (i.e. the target language) for imparting knowledge about science.

In the provincial school, on the other hand there was more student participation and a larger number of students participated in classroom discussions and/or volunteered to answer teacher questions. A joint co-construction of knowledge advocated by socio-cultural theories of language learning was observed:

Episode 10

T: Ok. some Some animals have a: (0.60) ((long pause)) Some animals have colours. Can

change their colours according to the: ENVIRONMENT. It's also the adaptation no? to protect from the enemies.

S: *teacher, samahara saththu summer ekata brown colour nam, winter ekata white colour. mama tv eke dekka.* <teacher, some animals are brown during summer but turn white during winter. I saw it on tv>

T: Yes, white colour. *Anna, e wage thiyenawa neda?* <Yes, there are things like that, aren't there?>

Further, the students in School Y frequently initiated discourse and responded in the Mother tongue:

The teacher in School Y also used L1 and L2 frequently in the class, but in fairly equal proportions. This was borne out by what was observed in the classroom as well as stated in her response during the teacher interview. She was defensive/apologetic about using L1 but saw it as one way of getting the students to be active learners and share knowledge. This teacher occasionally used context rich L1 to explain and then summarize in English, providing access to the science discourse:

Episode 11

T: *Kannuda mammals kiyala Kiyanna? Mammalia.*

SSS: *Eksheerapai (15)*

T: *Eksheerapai: ksheerapai :Danne nathi cya innawa nam liya ganna, therumath ekka< Mammals. Mammals. If there's anyone who doesn't know this word, write it down along with the meaning ok> :: (5) she tell dog, cat, goat are in land :: environment. They are mammals. Not only mammals, reptilias, insectas are living: land. Reptilias and insectas:: (7) are also: living in land. [she writes on the board]*

T: Ok, Tell me: who are the reptilias?

7. DISCUSSION, IMPLICATIONS AND CONCLUSIONS

Though admittedly, the findings of this study are limited to the classroom discourse of two schools, it is possible to consider that they are applicable to schools in which there are contextual similarities across the country, i.e. the larger prestigious national schools more under pressure to meet examination requirements and maintain students pass rate high whereas the provincial schools have less demands and pressure put upon them by all stakeholders. This may explain the teacher in School X resorting to the use of more L1 than L2 overall, because, as she admitted in the interview, her main and only priority was to cover the syllabus and maintain a high pass rate among students. The teacher in School Y, however viewed her role as being mainly a science teacher but with some responsibility towards enhancing the students' language proficiency. Interestingly, she also considered the situation of being an EMI science teacher as a way of improving her own English. Further the classroom arrangement in School X was the traditional one of teacher at the front and all students sitting in rows neatly placed one behind the other. Although School Y started the school term with the traditional classroom arrangement, within two months the layout had changed, with the 24 students arranged in four groups of six each, providing easier access for group work and discussion.

In the interviews as well as in classroom observations it was found that the two teachers demonstrated different attitudes and beliefs about their own ability and role as EMI science teachers. While the teacher in School X revealed that her role was merely that of a science teacher and her proficiency was adequate to teach in the English medium, the teacher in School B admitted that her proficiency and training to teach in the EM class was inadequate and that she considered herself a novice. Her perception was that by teaching in the EM, her own proficiency in the language would be enhanced. Therefore further studies are needed to investigate the relationship between teacher beliefs of their own roles as EMI instructors and the impact of these on the way policy is implemented.

The findings of this study support the claim that it is futile to consider the use of mother tongue and target language as an "either / or" phenomenon. Instead, points along a continuum which suits each context is necessary to provide a framework for EMI classroom talk. The findings also support Lin's (2006) claim that it is unrealistic to have interactional communicative proficiency as the goal for EMI content classrooms in contexts where the majority of students and teachers' proficiency in the language is limited. Instead, a more realistic goal of assisting LEP students to be exposed to academic language related to the subject matter, including terminology and granting them access to scientific discourse is proposed. This study therefore takes the position that in LEP contexts such as Sri Lanka, essentialist paradigms such as mother tongue vs. lingua franca are not only unfeasible but unnatural and not reflective of communication norms in wider society, where code switching is a widely practiced linguistic behaviour (Senaratna, 2009).

As Lin (2006) points out, although the students might not have exposure to English for giving lively explanations and examples, they are at least helped to access and acquire the English science discourse through the help of the bilingual teaching approach. When language-in-education policy makers consider their options, it has to be made clear that with the majority of limited-English-proficiency students in ESL/ EFL contexts in many Asian societies, realistic educational goals have to be set up. If the purpose of teaching science and maths school subjects in English (e.g. the recent policy implemented in Malaysia) is mainly that of enabling students to be able to access the global English discourses of science and technology, then it is not realistic to also expect students emerging from these science and maths lessons to speak fluent everyday English. (Lin, 2006:301)

If communicative proficiency or an outcome similar to what Cummins (2008) called Basic Interpersonal Communication Skills (BICS) is envisaged by implementing an EMI policy, several factors need to be in place to make this a reality:

- 1) EMI teachers' proficiency in English should be improved, both at their initial teacher training stage as well as a continuous process by means of in service workshops etc.

- 2) Teacher training should include awareness of the benefits of using mother tongue in the EMI classroom and the supportive manner in which CS can be used to benefit EMI learning and teaching
- 3) The goals and outcomes expected from EMI science teachers should be clearly spelt out
- 4) Transition from teacher-centred transmission model to learner centred/democratic learning processes

Since this and other studies have over and over again revealed that CS and use of L1 prevails in the EMI classroom, it is possible to train teachers to do so not in a haphazard and/or instinctual manner but with knowledge of how and where it can be used to the greatest effect. Instead of the present unsystematic use of L1 teachers can be made aware of conscious and deliberate CS practices which can help limited proficiency students gain the rewards of an EMI education more effectively. Therefore, in keeping with Hornberger's perspective of a continuum discussed above, this paper argues that a mix of mother tongue and English may well serve the needs of LEP students, and considers the role that Sinhala (the mother tongue of the students who constitute the participants in this study) might play in the science classroom to be a significant one. The researcher argues, with Lin (2006) that we should move away from purist and essentialist paradigms of mother tongue/second language, oral/literate, traditional / non-traditional and agrees with Luke (2005) who speaks of the need for edgy hybrids of policy and practice, and of allowing students access to the dominant discourses of science by drawing on their linguistic and cultural resources.

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APPENDIX*Transcription conventions*

1. Participants: T=teacher; S= students; Ss = two students, SSS= many students.
2. Left Bracket [: indicates the beginning of overlapping speech shown for both speakers, second speaker's bracket occurs at the beginning of the line of the next turn rather than in alignment with previous speaker's bracket.
3. Equal Sign=: indicates speech which comes immediately after another person's; shown for both speakers (i.e., latched utterances).
4. (#): Marks the length of a pause in seconds,
5. (Words): The words in parenthesis () were not clearly heard; (x) = unclear word; (xx) = two unclear words; (xxx) = three or more unclear words,
6. Underlined words: Words spoken with emphasis,
7. CAPITAL LETTERS: Loud speech
8. ((double parenthesis)): comments by the researcher including relevant details pertaining to interaction
9. Colon: Sound or syllable is unusually lengthened (e..g., rea::lly lo::ng)
10. ↓ Terminal falling intonation
11. ↑ Rising continuing intonation,
12. Question Mark: High rising intonation, not necessarily at the end of a sentence.
13. Dash - a short untimed pause
14. Long dash __ self correction
15. italics: L1 utterances;
16. <bold italic>: English translation of L1 utterances