CODE SWITCHING IN

PRIMARY MATHEMATICS CLASSROOMS

by

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ABSTRAK

Bahasa pengantar bagi subjek Matematik dan Sains di Malaysia ialah bahasa Inggeris. Sungguhpun guru matematik mematuhi polisi bahasa rasmi untuk dua subjek ini, namun kajian empiris telah menunjukkan bahawa bahasa pertama pelajar (Melayu, Cina, Tamil) turut digunakan. Maka fenomena peralihan kod di bilik darjah matematik berlaku. Walau bagaimanapun, maklumat berkenaan fenomena tersebut masih kurang. Kajian ini menyelidik isu berkenaan apa, bila dan mengapa peralihan kod berlaku dalam bilik darjah matematik di Sekolah Kebangsaan (SK) dan Sekolah Jenis Kebangsaan Cina (SJKC) di Kelantan. Enambelas pengajaran kelas dari SK dan SJKC telah dicerap dan dirakamkan dengan perakam video. Antara 16 pengajaran tersebut, lapan daripadanya dari SK dan yang baki dari SJKC. Antara empat pengajaran di setiap sekolah itu pula, dua daripadanya ialah Darjah 2 dan dua yang lain ialah Darjah 5. Bahasa pengantar rasmi untuk kelas matematik di semua kelas adalah bahasa Inggeris. Masa pencerapan untuk setiap pengajaran berbeza dalam lingkungan masa setengah jam hingga satu jam. Sesi temubual dengan guru dan enam orang pelajar (Darjah 5 sahaja) dari setiap peserta kelas dalam kajian turut dijalankan sebaik sahaja sesi pencerapan pengajaran tamat. Penemubualan untuk dua kumpulan orang ini dijalankan berasingan masa. Bahasa yang digunakan dalam temubual ialah bahasa Melayu untuk peserta kajian SK dan bahasa Cina untuk peserta kajian SJKC. Proses temubual dirakamkan dengan alat perakam suara. Data yang dipungut daripada rakaman video dan audio ditranskripsi verbatim. Data kajian menunjukkan bahawa kebanyakan guru matematik sekolah rendah menggunakan peralihaan kod dalam pengajaran. Terdapat 42.46% penggunaan perkataan Melayu dalam perbualan bilik darjah di SK, manakala di SJKC pula, penggunaan perkataan Cina dalam

perbualan bilik darjah ialah 40.43%. Peralihan bahasa merupakan strategi, alat dan sumber komunikasi yang berkesan. Pertimbangan pedagogi sebegini menyebabkan timbulnya penggunaan peralihan kod secara dalam ayat dan di antara ayat di kalangan guru matematik sekolah rendah. Dalam kajian ini, penggunaan pendekatan peralihan kod berlaku dari permulaan kelas sampai penamatan kelas. Sembilan fungsi komunikasi penggunaan bahasa dalam kelas matematik dwibahasa yang dikemukakan oleh Clark (1974) serta skala pemberian nilai fungsi komunikasi yang dibangunkan oleh pengkaji yang digunakan dalam kajian ini telah terbukti berguna dan sesuai untuk menentukan corak dan tujuan peralihan kod. Selain mencapai fungsi-fungsi komunikasi tersebut untuk memenuhi keperluan perkembangan kognitif di kalangan pelajar, guru-guru kerap juga menukar kod kepada bahasa ibunda pelajar untuk mencapai tujuan-tujuan lain dari segi pengungkapan, pertuturan, afektif, sosial dan pengurusan, antaranya, termasuk mengambil hati pelajar yang fasih dan yang kurang fasih dalam bahasa Inggeris; menarik perhatian; menegaskan sesuatu isi penting dan lain-lain lagi. Data rakaman bilik darjah juga menunjukkan bahawa beberapa kelas menjadi kurang aktif apabila guru secara bandingan menggunakan lebih bahasa Inggeris dalam pengajaran mereka. Fenomena ini juga sebaliknya membayangkan bahawa penggunaan peralihan kod para guru merupakan strategi yang penting apabila menghadapi pelajar yang kurang fasih bahasa Inggeris. Implikasi daripada dapatan kajian ini ialah guru-guru harus digalakkan menggunakan bahasa pertama pelajar juga selain daripada menggunakan bahasa pengantar rasmi. Pendekatan ini membolehkan guru menyampaikan pengajaran dengan lebih berkesan serta perbualan bilik darjah juga akan lebih relevan dengan keperluan pelajar, khususnya ia dapat menggalakan penglibatan aktif pelajar dalam pembelajaran matematik.

ABSTRACT

The medium of instruction for mathematics and science in Malaysia is English. Available empirical research findings have shown that although Malaysian teachers comply with the official language policy for the teaching of these two subjects, the students' first languages (Malay, Chinese and Tamil) are still used, leading to the phenomenon of code-switching in the classrooms. However, information about the nature of the phenomenon of code-switching remains scarce. This study examined the issues of what types, when, and why code-switching occurred in national and Chinese primary mathematics classrooms in Kelantan. The teaching of mathematics in 16 classes from two types of school was observed and video-recorded. Of the 16 classrooms, eight were from two national schools (SK) and the other eight were from two Chinese primary schools (SJKC). Within the four classrooms of each school, two were Standard 2 and the other two were Standard 5. The duration of each observed class varied from half an hour to an hour. Interviews with teachers and six students in Standard 5 from each of the participating classes were conducted immediately after each classroom observation but separately and consecutively. The language used in the interviews at the SK schools was Malay, whereas at the SJKC schools, interviews were conducted in Mandarin. Each interview was audio-recorded. All video-recorded and audio-recorded data were transcribed verbatim. The research data showed that most primary mathematics teachers resorted to code-switching in teaching, from the beginning to the end of the lessons. It was found that in mathematics classroom discourse, mathematics teachers at SK resorted to code-switching to the students' first language (42.46%) more often than SJKC teachers did (40.43%). Alternation of languages served as a useful communicative resource, tool

and strategy. Pedagogical considerations gave rise to the use of intrasentential and intersentensial code-switching among the teachers observed. The nine communicative functions of language use proposed by Clark (1974) and the tentative guiding scale developed by the researcher for assigning the Clark's communicative functional values were found to be feasible and useful in examining the patterns and purposes of code-switching. Besides achieving the nine communicative functions for fulfilling the needs of students' cognitive development, teachers occasionally code-switched to students L1 to achieve textual, conversational, affective, social and managerial purposes, such as appealing to the literate and the illiterate (L1 & L2), capturing attention, emphasizing a point and other ends. Besides, classroom video recorded data also showed that classes became less active when teacher used English to teach mathematics. This finding suggests that teachers' code-switching is an important teaching strategy when dealing with Limited English Proficient learners. Among the most important implications is that mathematics teachers should be encouraged to use the students' L1, in addition to the official language, as use of the students' L1 can make teaching more effective, and classroom discourse more relevant to students' needs, specifically through encouraging active involvement in the learning of mathematics.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Malaysia is a multi-ethnic and multi-cultural society. Malays, Chinese and Indians are the three main ethnic groups. Among these three ethnic groups, the Malays constitute more than half of the total population. Due to its status as a British colonial state, English was the dominant administrative and educational language at all levels during the British regime. With this socio-cultural and historical background, most Malaysians practically are bilingual or multilingual. Most literate Malaysians are able to speak Malay, the national language, and English, a language prevalent in the Malaysian business sector and at the global level. However, the proficiency of the language competencies of Malaysians in these two languages may range from not so fluent to very fluent. In social communication, the participants who are able to speak English and Malay may differ in their proficiencies of these two languages and frequently resort to code-switching to help them in their communication (Dayang Fatimah, 2007; Farid, 1987; Jacobson, 1993; Jamaliah Mohd. Ali, 1995; Le Vasan, 1996; Morais, 1991; Wong, 1974). Code-switching other than English to Malay and vice versa (English to Malay) has also been found to be a very common phenomenon in discourse among Malaysians, who tend to code-switch from one language to other languages such as Tamil/English/Malay (David & Hashim, 2001); English/Hokkien/Mandarin (Kuang, 2002); Malay/Hokkien (Chng-Lee, 1995); Malay/English/Hokkien (Pakir, 1989); English/Mandarin/Cantonese/

Malay (Kow, 2003); Malay/English/Seban/Kelabit (Martin, 2005); Arab/English/Malay (Mohammad, 2006) and Kelantanese Malay/Standard Malay (Zuraidah, 2003).

1.2 Statement of the Problem

Code-switching refers to the use of more than one language within a turn or utterance in interaction among bi/multilinguals, both in in-group and out-group encounters (David, 2003a). As has been depicted in empirical research, it is the norm in discourse in Malaysian multilingual society, and is very commonly found in the educational context (Atan, 1998; Lim, 2003; Norizah Mohd Said, 2004; Ong, 1989; Paramasivam Muthusamy, 2006; Sumathi Krishnan Kutty, 2005; Tan, 1992; Zaiton Ismail, 2004). In the "Preface" to a Special Issue of Multilingua (*Journal of Cross-Cultural and Interlanguage Communication*) on "Code-switching in Malaysia", David (2003a) reported that code-switching is used by Malaysians as a resource, a tool and a strategy of communication:

> "[I]n Malaysia, while David shows that Malay/English code-switching is seen as a **resource** to influence and coerce speech participants in the courtroom and to exert power, Jariah Mohd. Jan also sees code-switching as a **strategic tool** used to wield power in official government meeting... Zuraidah, discussing Malay language/dialect code-switching, argues that it is a **tool** used between members of community, i.e. the Malay Kelantanese community, to signal rapport and intimacy and regional identity... Kow ... provides a range of examples of how ... code-switching must be viewed as an innovative **strategy** to communicate and construct meaning in what children consider efficient and effective ways, especially when children need to compensate for a limited vocabulary" (p.3-4, emphasis added by the researcher)

David (2003a) concludes in the Preface by saying that the functions of code-switching reported in that issue are to soften a directive; to emphasise a point; to help communication, to indicate regional allegiance, to show power and status, to construct meaning when one needs to compensate for a limited vocabulary.

In Malaysia, with the implementation of Teaching and Learning of Science and Mathematics in English or PPSMI (*Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris*), the medium of instruction of mathematics and science in National primary schools and Tamil primary schools is English, a language which is not the mother tongue of the majority of the students in the respective schools. In Chinese primary schools, mathematics and science are taught in two languages, i.e. Mandarin and English, by following the "2-4-3 formula" and "6-2, 3-2 formula". The "2-4-3 formula" represents the time for teaching English as a language and English in the content areas of mathematics and science. At the lower primary level (level I) which comprises Standard One, Two and Three, besides two periods of English language, there are four periods of mathematics and three periods of science taught in English, complementing another six periods of mathematics and three periods of science which are taught in Mandarin. At the upper primary level (level II) which comprises Standard Four, Five and Six, the "6-2, 3-2 formula" means the time allocation for the subjects of mathematics and science in the two languages. That is, besides five periods of English language, there are six periods of mathematics and three periods of science taught in Mandarin, and only two periods of mathematics and two periods of science are taught in English (Ong, 2005).

Mathematical language is very specific and consists of a lot of symbols and several forms of representation (Pimm, 1987). Students might be less familiar with mathematical language as compared to the everyday language (Shuard & Rothery, 1984). Morgan (2006) points out that the responsibility of a mathematics teacher includes teaching students the 'mathematics content', the mathematical language, and the language of instruction. As a mathematics teacher, (s)he might like to use the students'

mother tongue to enhance students' acquisition of mathematical knowledge as well as the language of instruction, i.e., English, and the language of mathematics. Therefore, it is important to examine how mathematics teachers make use of one aspect of the students' valuable experience encompassing, the mother tongue of the students and the rich culture embedded in it, and incorporate it with students' present competency in English, to help the students negotiate the meaning of mathematics. In other words, it is vital to examine what functions of code-switching can serve in mathematical teaching and learning.

Teachers who are equipped with bilingual/ multilingual capability and have a sufficient understanding of various educational theories and motivation skills may be aware of the difficulties caused by the language medium in learning mathematics. In the learning of mathematics, the process by which a student arrives at the answer to a problem is even more important than the answer itself. Hence, teachers need to make the students talk mathematics and participate in classroom activities to explore and construct mathematical ideas. In short, teachers must help students make their thinking visible to others by encouraging them to talk and write about the process they use to solve problems (Bushman, 1995; Lim, 2006). With this in mind, teachers may seek resources or tools such as the students' first language, to draw upon their great reservoir of linguistic and cultural experiences loaded in the mother tongue, in order to help the students in their mathematical conceptual and procedural understanding, and at the same time, develop students' interest in participating in classroom activities. Prodromou (1992) argues that there are times when the use of mother tongue in the second language (L2) classrooms can be justified. According to him, the use of mother tongue could be seen (a)

as a means of providing support and security for the less confident learners or (b) as a launching pad for other activities (Prodromou, 1992, p. 63).

Recent available research in Malaysia concerning classroom practices in relation to the implementation of PPSMI has found that code-switching is a common feature in most classrooms (Harshita Aini Haroon, 2005; Lim & Wun, 2003; Sidhu, 2005). In the classroom context, school teachers and pupils are used to the switching between students' mother tongue and the language of instruction for a range of managerial, affective and cognitive development purposes (Atkinson, 1987; Cook, 2001; Harbord, 1992).

So far, research examining the practice of code-switching in primary mathematics classrooms remains limited. Thus, it is crucial to understand how bilingual teachers and students utilize their facility with two languages to communicate mathematically within the primary classrooms. Research makes it possible to better understand the cognitive and social functions of code-switching in classroom discourse. This knowledge will enable educators to gain insights into the uses of the mother tongue to fulfill the cognitive and affective needs in a bilingual context. These constitute two important aspects of the whole process of bilingual or multilingual development.

1.3 Objectives of the Study

This study has three main objectives. The first one is to identify when teachers and students code-switch in mathematics classroom discourse; the second one is to examine the patterns of code-switching, and the third one is to explore the reasons for or purposes of code-switching in the natural setting of the mathematics classroom. The

major concern regarding the purposes of code-switching is on how relevant or significant the effects of a particular switch are for the learner and the teacher.

1.4 Research Questions

To achieve the objectives stated in the above section, the following research questions were formulated to guide the study:

1. What languages are used in primary mathematics classrooms and to what extent do teachers and students resort to code-switching in teaching and learning mathematics?
2. When does code-switching occur in mathematics classroom discourse?
3. Why do mathematics teachers code-switch at that particular point of communication during the progress of a mathematics lesson?

1.5 Theoretical Framework

Code-switching is a norm and naturally occurs in many multilingual and bilingual communities (Swigart, 1992; Goyvaerts & Zembele, 1992). This variation of language is used by bilinguals in negotiation of meanings and accomplishment of certain conversational goals (Auer, 1998; Heller, 1988; Jacobson, 1998; Li, 2000a; Milroy & Muysken, 1995a). Bilinguals usually have a conscious strategic consideration while resorting to code-switching as a tool or resource to establish, maintain or alter power relations in a discourse (Gumperz, 1982; Mayers-Scotton, 1983; Tay, 1989; David, 2003a). Fishman (1965) argues that the form of code-switching produced in the discourse is not randomly constructed, but rather is a rule-governed phenomenon. This viewpoint

has been confirmed by research (Poplack, 2004). Contextual factors come in to play their roles in conditioning and constraining bilinguals' choice of meanings and forms of realization in words while code-switching (Auer, 1998; Blom & Gumperz, 1972; Gumperz, 1982; Heller, 1988; Jacobson, 1998; Li, 2000b; Milroy & Musken, 1995b; Myers-sotton, 1993). Such factors are participants' demographic background like class, gender, age, ethnic identity, educational level, occupation and religious beliefs (Grosjean, 1982, p. 136, see Table 1.1). Others include preference of audiences, local culture, social regulations, context of discourse, and speaker's experience and competence in that language.

Table 1.1: List of Factors Influencing Language Choice

Factors Influencing Language Choice	
Participants	*Situation*
Language proficiency	Location
Language preference	Presence of monolinguals
Socioeconomic status	Degree of formality
Age	Degree of intimacy
Sex	
Occupation	*Content of Discourse*
Education	
Ethnic Background	Topic
History of speakers' linguistic interaction	Type of vocabulary
Kinship relation	
Intimacy	*Function of interaction*
Power relation	
Attitude toward languages	To raise status
Outside pressure	To create social distance
	To exclude someone
	To request or command

[Source: Grosjean, 1982, p.136]

The types of code-switching can be categorized into different ways from various perspectives. From the syntactic perspective, Poplack (1980) proposed three-way

divisions named as tag code-switching, intra-sentential code-switching and intersentential code-switching. Muysken (1995) analysed the mixture of words at the word, phrase, clause and sentence levels and produced a three-way division named as alternation, insertion and congruent lexicalization. Based on the contributing factors, Blom and Gumperz (1972) categorized code-switching into two main types: situational code-switching and metaphorical code-switching. By looking into the metaphorical meanings concerning the attribute of 'in-group' and 'out-group' in code-switches, Gumperz (1982) advanced two more categories of code-switching called 'we-code' and 'they-code'. Auer (1990, cited in Auer, 1998) proposed two types of code-switching: discourse-related switching and participant-related code-switching. These two types are differentiated by the influence of two major factors in the context of conversation: participants and topic of discourse. Clyne (1972) also attempted to categorize types of code-switching according to the triggered factors by referring to them as internal or external factors. His model is internally conditioned code-switching versus externally conditioned code-switching. The idea subsequently proposed by Valdes-Fallis (1978) is also similar to Clyne's (1972) model but comes with a brief explanation of the constitution factors where Valdes-Fallis categorized patterns of code-switching into two main groups, which she referred to as switching patterns that occur in response to external or internal factors.

Similar to the above practice, functions of language in code-switching have been categorized by different linguists or researchers in different ways. They are proposed according to the key determinants of language choice in the use of code-switching. Among them, a functional model which originates from the field of grammar and which was proposed by Halliday (1994) has gained popularity recently in text analysis and

discourse analysis, and other models are, in fact, derived directly from the studies on code-switching.

Halliday (1973, 1975, 1985, 1994, 2004), the key founder of the Systemic Functional Grammar theory, proposed three highly generalized adult language functions, named as ideational function, interpersonal function, and textual function. These metafunctions are developed from the maturity of children's micro-functions of language, namely, instrumental, regulatory, interactional, personal, heuristic, imaginative, and informative. The key determinant in Halliday's model is the functional selection of the process and product of meaning potential (networking of semantic system) getting done by language in a discourse context comprised of the interaction of field, tenor and mode. Ferguson, one of the pioneer scholars in the study of code-switching, proposed a Diglossia model. His model is determined by choice of formality in language use where the language contact is clearly defined as family or societal formal affairs. A common example is the official language used for formal political speeches and the mother tongue used for informal conversations with friends (Ferguson, 1959). Fishman (1956), another important figure in leading the early research into code-switching, by considering the influence of contextual factors, proposed the Domain Theory. The question "who speaks what language to whom and when?" determines how code-switching handles the shift of topic, participants and setting. Blom and Gumperz, proposed a Signalling and Interpretive Model, to correlate code-switching with situational parameters and stylistic communicative moves informed by socialization process among bilinguals. For instance, a shift of language may signal to exclude someone from participating in the discussion or may be interpreted as exerting power. Social meaning and situational norms are the two

key determinants in Blom & Gumperz's model (Blom & Gumperz, 1972). Giles and his colleagues (1973) who studied the convergent and divergent forces in speech, proposed the Speech Accommodation Theory. This theory considers the creation of social distance or intimacy in shaping the choice of code-switching. Myers-Scotton (1983) looking into speaker's right and obligation sets, proposed a Markedness Model in explaining the function of code-switching related to speaker's intention to maintain or alter his/her right and obligation sets by resorting to 'deeper meaning' of 'marked' terms.

Besides the above functional models, there are three more 'Six-function models'. Gumperz (1982) drawing on a powerful idea of contextualization cues and research data gathered from three language sites, proposed a widely used Six-function model in the study of code-switching. The six-functions of Gumperz's are: Quotation, Addressee specification, Interjection, Reiteration, Message qualification, and Personalization versus objectivization. Marasigan (1983) studied the subtle illocutionary intention of speaker in the code-switching data collected in Philippines, and proposed another Six-function model which is mainly founded on Searle's (1976) Speech Act Model. The six functions of Marasigan are Representative, Directive, Commissive, Expressive, Declarative, and Conditional. The last Six-function model was proposed by Appel and Muysken (1987). They are the specialization functions of language use. This model was founded on Jakobson's (1960) and Halliday's (1964) work. The six functions are determined by communicative events. They are Referential, Directive, Expressive, Phatic, Metalinguistic, and Peotic.

Furthermore, some studies which focused on functions of code-switching in classrooms during the 1990's have produced the following findings. Meritt et al (1992)

claim code-switching is used in the reformulation across codes; bringing new information to the content of the activity; translation or word substitution within one sentence; and classroom management routines. Canagarajah (1995) reported on functions of code-switching in three areas: classroom management, content transmission, and reflection of social and communicative life outside school. Eldridge (1996) described and analysed the code-switching of young learners and found seven functions he labeled as equivalence, floor-holding, metalanguage, reiteration, group membership, conflict control, and alignment and disalignment.

The above theories and models suggest that language functions are stirred by speaker's intention (purpose) of communication in negotiating meanings. Some related words are 'meaning potential', 'to whom and when', 'signaling and interpreting', 'convergent force', 'divergent force', 'deeper meanings', 'contextualization cues', 'creation of social distance and intimacy', and 'specialization' in a shift of conversational events. In those models, code-switching is viewed as a language tool, resource or strategy that is consciously used by bilinguals to realize their intentions of speech to accommodate various speech needs. These speech acts are determined by contextual factors like: 'formality', 'shift of topic, participants and setting in discourse', 'social norms', 'ideational, interpersonal, and textual consideration', 'situational parameters', 'socialization process', 'speaker's right and obligation sets', 'communicative moves in different language sites', and 'types of language use'. It can therefore be concluded that the general model is: *'functions of code-switching' are stirred by the 'intentions of code-switching' where code-switching is used as a strategic verbal device to achieve some purposes of a conversation, and the intentions are further determined by the interplay of*

various 'contextual factors'. Table 1.2 below sums up the functional perspective of three major components of a discourse in code-switching. The ingredients listed in each of the components have been proposed by the researchers as discussed above.

Table 1.2: Three major components of code-switching in discourse from the functional perspective

Functions of Code-switching	**Intention of code-switching**	**Contextual factors**
• Quotation • Addressee specification • Interjection • Reiteration • Message qualification • Personalization versus objectivization • Representative/ referential • Directive • Expressive • Phatic • Metalingistic • Poetic • Declaration • Conditional • Instrumental • Regulatory • Interactional • Personal • Heuristic • Imaginative • Informative • Translation	• Meaning potential • To whom & when • Signaling & interpreting • Convergent force • Divergent force • Contextualization cues • Deeper meaning • Creation of social distance and intimacy • Illocutionary intention • Specialization • Situational code-switching • Metaphorical code-switching • We-code • They-code • Classroom management • Transmission of school content • Reflection of social life	• Ideational, interpersonal and textual consideration of meanings & words • Interaction of field, tenor and mode of a discourse • Formality • Shift of topic, participants and setting in discourse • Social norms • Situational parameters • Socialization process • Speaker's right and obligation sets • Stylistic communicative moves • Language contact • Types of language use • Language Policy & Language Plan in School • Grosjean's (1982) list of factors (see Figure 1)

Code-switching only happens in bi/ multilingual language sites. Specifically, each of the bi/ multilingual language sites is a typical type of itself. For instance, practices of code-switching in Vietnam and Malaysia can differ greatly where the language type in use and language contact in each site are generally not the same, although both nations are from the same Asean region. In the past, Vietnam was a colonial state of France whereas Malaysia was that of the British. Thus, Malaysians are not likely to resort to French in code-switching as the Vietnamese do in a bilingual

conversation. The linguistic practices in the above two language sites have been shaped by the historical and cultural events that occurred at the sites. Inversely, Halliday (2002, p. 5) pointed out: "Human history is the interplay of material and linguistic forces". Thus, code-switching is conditioning, and behaviour that is being constrained by linguistic practices that have their roots in the history and culture of a bi/multilingual language site. Furthermore, there are many ways in constructing and interpreting meanings in a discourse when the interlocutors exchange their meanings in the process of communication, and code-switching just serves as one of many strategic ways to achieve certain communicative needs. Besides, it is because of people's experience in a bi/multilingual language site that certain conversational intentions can best be achieved by using code-switching, and this has informed people who resort to code-switching for certain conversational goals. Figure 1.1 below shows a more general theoretical framework of the functions of code-switching in a bi/multilingual language site based on the above elaboration on practice of code-switching.

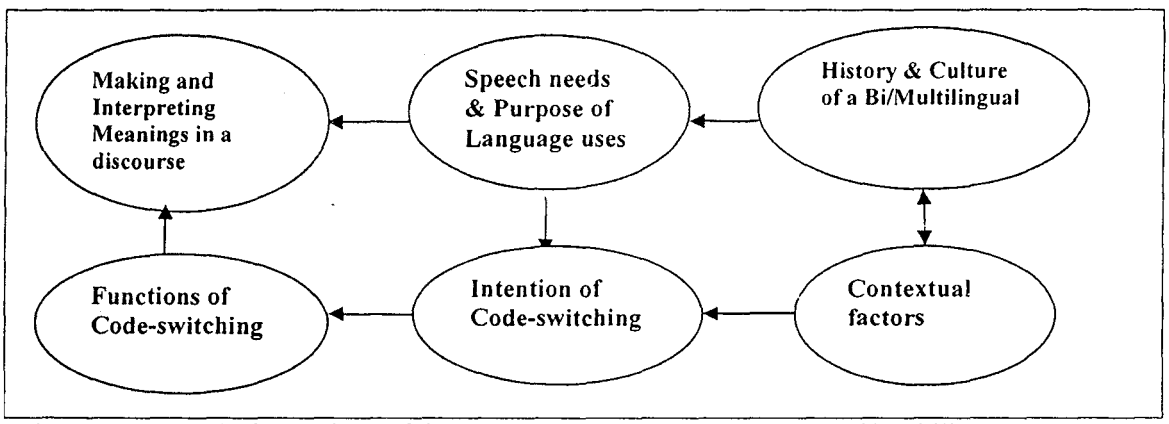

Figure 1.1: Model of Functions of Code-switching in a Discourse on a Bi/Multilingual Language Site

In Figure 1.1, the three ovals with the respective labels in the lower part represent the three major components of a discourse in code-switching, whereas the three ovals

with the respective labels in the upper part represent the three major components of a more general model of language uses which involves speech needs, its effects and it is being constrained by historical and cultural factors of a language site. The arrow lines show code-switching is one of the common linguistic practices of language uses on a bi/multilingual language site. The double-headed arrow linking the two ovals in the right-hand side represents the reality that all possible ingredients in the contextual factors of a discourse are the product of history and culture of a bi/multilingual language site, and their interplay inversely contributes to the formation of history and culture of that bi/multilingual language site. The final goal of any discourse is making and interpreting meanings, and the functions of code-switching are basically towards this end.

1.6 Conceptual Framework

Function refers to the potential and competence of a particular thing or action in performing certain **tasks** in achieving a purpose, or purposes, if there are more than one. Code-switching refers to the practice of using more than one language in the course of a single communicative episode (Zentella, 1997). As Zentella's episode refers to a discourse sequence around one topic that is distinctive and separate of a larger series of communication, therefore, the definition of functions of code-switching adopted in this study can simply mean as *the communicative effects to be achieved by the bilingual speakers through the alternation of languages in a turn of discourse*. Here, the word effect means the behavioural or substantial outcomes that achieve a desired goal. Before a more comprehensive definition is given to the function of code-switching in mathematics classroom discourse, we need to conceptualize four underlying concepts, i.e.,

what is 'discourse', 'language', 'functions of language', and 'language uses in classroom discourse'.

According to Gee (1999), "discourse" using a lowercase "d" refers to how language is used "on site" to enact activities and identities. However, "Discourse" using an uppercase "D" involves much more than words. A Discourse is a socially accepted association among ways of using language, other symbolic expressions, and 'artifacts', of thinking, feeling, believing, valuing and acting that can be used to identify oneself as a member of a socially meaningful group or 'social network', or to signal (that one is playing) a socially meaningful 'role' (Gee, 1999, p. 131). In this study, the lower case discourse is employed to refer to how language (inclusive of body language) is used on site which reflects a speaker's way of being (roles, beliefs, attitudes, thinking, feelings) in a particular context, i.e. the mathematics classroom.

Language is a social semiotic system with rich lexico-grammar and meaning potentials (Halliday, 1973, 1978, 1985, 1994). It is the medium to transmit and reflect reality and thinking, and by itself is a social action and cultural carrier. From this view point, as a product, language is a social phenomenon of making sense and meanings evolve and comply with the grammatical regulations and social conventions; and as a process, language can serve as a tool, a resource, and a strategy in constructing and mediating meaning as well as thinking in various styles and forms.

Function of language is the core issue of pragmatics (Verschueren, 1999). It usually concerns two questions: a) what tasks get done by language? b) In what ways can language work for those tasks? The first question usually concerns the basic function of 'what language does', i.e., what communicative meanings can be generated from the

effect of interaction among the factors of topics, participants and circumstances in a communicative context; whereas the second question concerns 'how language does what language does', i.e., the potential of language in realization of meanings corresponding to the moment (when), the purpose (why), the participants (to whom), the medium and channel (what), and the language competence of participants (to what extent), of a dynamic construction of text in a communicative activity.

Language use in classroom discourse can be categorized according to its tasks as 'language for classroom management routine', 'language for transmission of curriculum content', and 'language for establishment and maintenance of social relationships among classroom participants', including the expression of speaker's identity and attitudes (Cazden, 2001). These tasks achieve a range of managerial, cognitive, affective purposes in the classroom. Other ways of categorization include the dichotomous grouping of 'safe' versus 'forbidden' (Martin, 2005), and 'academic' versus 'social' (Adendorff, 1996).

Based on the above discussion, the 'function of code-switching' for this study refers to *the interlocutors' use of their language repertoire and competence to strategically select an alternative language and mix or embed it into the base language at the word, phrase, clause and sentence levels, to try one's best to comply to the grammatical systems or subsystems of both languages, to accomplish certain purpose(s) (explicit and implicit meanings) of discourse that are manifested by specific cultural and conversational work done in a bilingual/ multilingual context.*

Figure 1.2 below shows the conceptual framework for the functions of code-switching as discussed above.

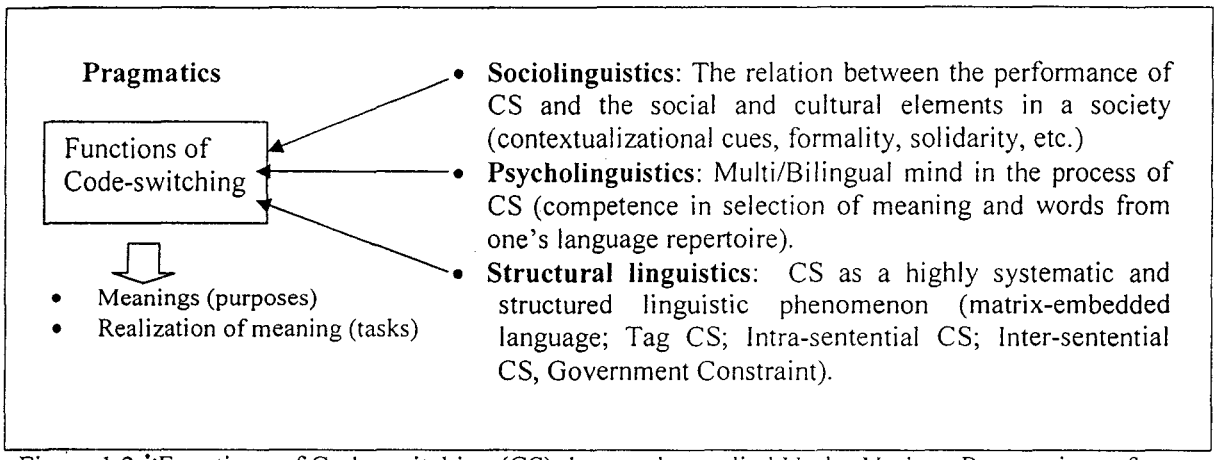

Figure 1.2: Functions of Code-switching (CS) that can be studied Under Various Perspectives of Linguistics

This study will only focus on the pragmatic aspect of code-switching, i.e., to gain insight into what meanings (purposes) code-switching serves that can be inferred, interpreted, and defined from the way such meanings are being realized by the language task. Hence, in the process of interpreting the research data, my arguments on how meanings are signaled through the alternation of language in response to the discourse topics, participants and situations in the mathematics classroom may inevitably be supported by the relevant theories of code-switching from the domains of sociolinguistics, psycholinguistics and structural linguistics.

1.7 Significance of the Study

In the light of this functional perspective, this study focuses on documenting the following matters: a) *types* of linguistic variations in terms of choice of language codes; b) the *meanings* negotiated through linguistic variations in terms of choice of language codes; c) language as *social action* shaped by the *social norms* (rules, interpersonal relationships between speakers and possible channel). Specifically, it will focus on

teacher-pupil *interaction* through code-switching in classroom conversation that helps to *facilitate* mathematics learning as well as pupils' *communicative competence* development. The nature of classroom setting and social activity are important in shaping the language of curriculum, language of control, and language of interpersonal identity of classroom discourse (Cazden, 2001). According to Verschuren's (1987) pragmatic viewpoint, communicative competence refers to the human capability to *adapt* to the changing conditions for social conduct. By considering questions of functions and meanings of code-switching, this functional approach helps to answer the basic questions of when, how and why code-switching occurs (Appel & Muysken, 1987). To accomplish this, a qualitative approach is most appropriate.

Code-switching is a interlinguistic phenomenon specific to bilinguals. This bilingual phenomenon is in much need of explanation and understanding for those who must deal with them in the instructional context or other contexts where this is an important matter (Duran, 1994). This study is aimed at documenting when, why, how, and what functions of code-switching practices are used in primary mathematics classrooms in Malaysia. Indeed, teachers in Malaysia are inevitably involved in bilingual/ multilingual instruction due to the Malaysian plural society background and as a post-colonial state. It is imperative for teachers to gain a better understanding of code-switching, which is an important aspect of the whole process of bilingual development. As has been mentioned by Duran (1994, p. 69), "Developmental knowledge should aid instructional knowledge, and instructional knowledge should aid development." To date, not much research has been conducted on code-switching in the subject of mathematics in Malaysia. Thus, it is hoped that the findings of this study can contribute to the

knowledge of code-switching in a particular content area in the major languages of Malaysia. The understanding of the code-switching practices and processes during mathematics instruction in the classroom will benefit linguists, bilingual specialists, teachers, curriculum developers and future students.

Hymes (1972) pointed out that an adequate theory of the functioning of language would systematically relate language and context within a single model. Therefore, any model of the functions of language use is basically contextually sensitive. The functions of language in the classroom are a special case of the general problem of the study of language in its social context (Hymes, 1972). Hence, it is important for documenting the functions of code-switching in mathematics classrooms in the Malaysian context where its language site is unique.

1.8 Operational Definitions

[The definitions of code-switching, discourse, effect and function have been given in **1.6**.]

Base language: The language which provides the morphosyntactic structure of an utterance in which code-switching and code-mixing occur (Li, 2000).

Code borrowing: Word or short expression adapted phonologically and morphologically to the language being spoken (Grosjean, 1982).

Code alternation: A general term for the communication strategy of alternate use of two languages in the same utterance or conversation (Li, 2000).

Code mixing: A communication strategy used by bilinguals in which the speaker of language X transfers elements or rules of language Y to X (the base language);

unlike borrowing, however, these elements are not usually integrated into the linguistic system of X (Li, 2000).

Code-switching: The alternating use of two languages on word, phrase, clause, or sentence level (Valdes-Fallis, 1978, p. 6). In this study, terms such as "mixing code of L1 and L2" and "alternation of code" are used interchangeably with "code-switching".

Contextualization cues: Linguistic signals help to delineate the context, thereby channeling or guiding interpretation and so giving additional meaning to what is said and done in a conversation. It can take any linguistic form-- a phonetic, lexical, or syntactic choice. It has the function of 'message of message' (meta-message) (Adendorff, 1996).

Embedded language: The language which provides lexical items which are inserted into the utterance in which code-switching and code-mixing occur (Li, 2000)

Function: Effect achieved or work done by certain action or utensil actualized by one's intention and usable resources.

Intersentential code switching: Code-switching between sentences/ utterances.

Intrasentential code switching: Code-switching within sentence/ utterance.

Language switching: An individual cognitive phenomenon where a person uses two languages during solitary and/ or mental arithmetic computation. E.g., it can refer to language used when a person is individually engaged in an arithmetic computation rather than in a conversation (Qi, 1998).

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

Code-switching is a common phenomenon in the language contact among bilinguals (Poplack et al., 1989). It is frequent for bilingual communities to use their two languages in different domains and settings (Fishman, 1965; Valdes-Fallis, 1978). The language variation that emerges from such communication is an important field of study in psycholinguistics, sociolinguistics, structural linguistics and pragmatics (see Figure 1.2, p. 17). However, it has only begun to attract serious attention from the scholars in the last few decades (Poplack, 2001). In the majority of bilingual classrooms, where qualitative research has been carried out, code-switching has been found to be a normal and spontaneous occurrence, and to be neither random nor meaningless, nor does it reflect language deficiency (e.g. Adendorff, 1993; Camilleri, 1996; Martin, 1996, 2005; Ong, 1989; Setati, 2005; Sert, 2007; Valdes-Falis, 1978; Zabrodskaja, 2007).

Bentahila and Davies (1995) concluded a decade ago that, "studies of code-switching over the past two decades have tended to concentrate on two parameters: grammatical constraints governing switching and the rhetorical or discoursal functions individual switches may fulfill" (p. 75). Poplack (2004) points out that researchers have provided evidence that code-switching is a rule-governed phenomenon. On the structural level, several studies have shown that code-switching is known to be grammatically constrained (Bhatt, 1997; Belazi et al., 1994; di Siullo et al., 1986; Pfaff, 1979; Poplack, 1980; MacSwan, 1997; Myer-Scotton, 1993; Santorini & Mahootian, 1995). On the

functional level, code-switching is used as a discourse strategy (Gumperz, 1982; Tay, 1989) and expresses several different communicational and social functions within the conversation (Bautista, 2004; Gardner-Chloros et al., 2000; Gumperz, 1972; Heller, 1988; McClure, 1981; Nishimura, 1995; Pakir, 1989; Reyes, 2004; Yau, 1993).

The objective of this study is to examine the functions of code-switching in mathematics classrooms. This study, therefore begins with the definition of code-switching and its categorizations as discussed in the literature, and then focuses on the discussion of the functional perspective of code-switching in the classroom, as well as the purposes and reasons behind the use of mother tongue in the classroom where L2 serves as the medium of instruction.

2.2 Types of Code-switching

There is a range of terms related to the definitions regarding code-switching. Among them are code borrowing, code mixing, code change, loan words and language shifts. The following sections will deal with the definitions of code-switching and its categorization, followed by a review of some related terms.

2.2.1 Definitions of code-switching

There are many different definitions of code-switching. Some are broadly defined while others are more restricted in definition.

Robert Di Pietro (1977, p. 3) gives a broad definition of this phenomenon: "[C]ode-switching is the use of more than one language by communicants in the execution of a speech act." Valdes-Fallis (1978) has a similar definition but introduces it

in the levels of language that are involved. She says: "Code-switching can be defined as the alternating use of two languages on word, phrase, clause, or sentence level" (Valdes-Fallis, 1978, p. 6). Gumperz (1982) has a similar notion of code-switching proposed by Valdes (1978), but he uses 'grammatical systems or subsystems' of a speech rather than stating the language's morphological and synthetic features. He defines code-switching as "the juxtaposition within the same speech exchange of passages of speech belonging to two different grammatical systems or sub-systems" (Gumperz, 1982, p. 59). Those definitions stated above imply bilinguals have some degree of competence in the two languages even if bilingual fluency is not yet stable or equally developed (Duran, 1994).

Poplack (2004), however, has a more restrictive definition of code-switching. She defines code-switching as "the utterance of internal juxtaposition, in an unintegrated form, of overt linguistic elements from two or more languages, with no necessary change of interlocutor or topic"(p. 589). Here, she conditions code-switching with the notions of 'unintegrated' form; 'overt' linguistic elements which may or may not have a change in 'topic' and 'interlocutor'. She argues that there is little consensus in the literature over which aspects should be subsumed under the label of code-switching. She gives an inclusive summary from the literature review that, "code-switching is but one of a number of the linguistic manifestations of language contact and mixing, which variously includes borrowing on the lexical and syntactic levels, language transfer, linguistic convergence, interference, language attrition, language death, pidginization and creolization, among others" (Poplack, 2004, p. 589). Poplack's summary of code-switching is very broad and includes many things. However, for this study, the broad sense of code-switching is adopted but it will not discuss in detail Poplack's labels such

as 'borrowing', "language transfer', 'linguistic convergence', 'interference', 'language attrition', 'language death', 'pidgination' and 'creolization'.

2.2.2 Categorization of code-switching

In categorizing code-switching, Clyne (1987) considered psycholinguistically conditioned rather than sociolinguistically conditioned mechanism. He developed the notion of "triggering" (Clyne, 1967, 1972) to represent the psychologically- conditioned mechanism. According to Clyne (1972), code-switching triggered by external factors is called *externally conditioned code-switching*, whereas code-switching triggered by personal factors is called *internally conditioned code-switching*. Several principal switching patterns (English-Spanish) that occur in response to external and internal factors have been listed by Valdes-Fallis (1978) and are shown in Table 2.1.

From the linguistic structure, Poplack (1980) proposed a three-way division for code-switching, namely, tag-switching, intra-sentential code-switching and inter-sentential code-switching. Tag-switching refers to insertion of a tag or interjection in language A into an utterance which is otherwise entirely in language B (e.g., 'you know', 'look', 'I mean' etc.). Intra-sentential code-switching involves all kinds of switching within the clause or sentence boundary. Inter-sentential code-switching involves a switch at a clause or sentence boundary, where each clause or sentence is in one language or another. All three types of code-switching may be found within the same discourse.

Studies on how a language is used and mixed at the word, phrase, clause and sentence level on a bilingual site is seen in Muysken's (1995) research which advances another three-way division for code-switching, namely, alternation, insertion and