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Examining Classroom Interactions in Secondary Mathematics Classrooms in Brunei Darussalam

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Abstract

This study examined the classroom interactions in three secondary mathematics classrooms in Brunei Darussalam. Investigations were conducted on whether the types of classroom interactions (be it public or private) may have any direct effects on Year 10 students' learning of mathematics. The participants involved in this study were three mathematics teachers and 78 Year 10 students. Data were collected by video-recording a sequence of three lessons for each of the three classes, the use of lesson feedback forms (which included a questionnaire on code-switching) distributed to the students and student interviews. The results of the study revealed that majority of the lesson time for all three classes were spent on public interaction (78.9%) rather than private interaction (10.4%). Moreover, it was found that the types of interaction have no direct effect on the students' learning; rather it is how the teacher carried out these interaction types that can affect the students' learning. From the results of the questionnaires on code-switching, there was an almost evenly divided preference for code-switching (Malay and English) and using 'English only' as the medium of instruction among the student participants. It seems that code-switching is only useful in helping the students to understand the lesson better; however it does not necessarily mean that the secondary students learned better when the teacher code-switched during the lesson.

Keywords: code-switching, public and private interactions, types of classroom interactions, secondary mathematics, Brunei Darussalam

1. Introduction

1.1 Introduce the Problem

For many students and teachers, the classroom is where they constantly meet and attend to build knowledge, exchange ideas, exchange questions, assess and be assessed, and most of all, interact with one another. The mathematics classroom in particular, is no different. Secondary students in Brunei Darussalam, in general, spend at least two hours a week in schools learning mathematics and up to approximately 560 hours of learning mathematics in a school year (assuming that there are 200 school days in a year). The majority of this time would be devoted to teachers transmitting their mathematical knowledge content to students, students completing mathematical tasks given by the teachers and revisions for any major mathematics exams (for example, Mid-year exams, public exams and so on). In those two hours within a week, how much time do teachers spend interacting privately with their students on the content of their lessons or students interacting publicly on their mathematical ideas? For a long time, classroom interaction in Bruneian mathematics classrooms has always been dominated by public presentation by the teachers and students working individually on their mathematical tasks (Abd Salam, 2011; Clements, 2002; Lim, 2000, Matzin et al., 2013; Sakdiah, 2005; Shahrill, 2009; Shahrill & Clarke, 2014; Shahrill et al., 2013).

The implementation of SPN21 (*Sistem Pendidikan Negara Abad ke-21* or the 21st Century National Education System) by the Ministry of Education in Brunei Darussalam in 2008 brought with it a mission to transform our educational system to be more holistic and well suited for the 21st century. The mission for all Bruneian

educators now is to '*Provide Holistic Education to Achieve Fullest Potential for All*' and hence aim to make their lessons more student-centered rather than the traditional teacher-centered (chalk and talk based) lessons. In the new mathematics curriculum (under SPN21), a conceptual framework was illustrated to show how communication is supposed to interweave with the teaching of mathematical content (Curriculum Development Department, 2006). To see whether lessons are student centered or teacher centered, the authors argue that this could be deduced from the level of classroom interactions or, more accurately, the communication level between students and teacher during lessons.

Research on classroom interaction has focused on the aspects of the language used and communication amongst the participants in the classroom. Earlier studies on classroom behavior were found to be more prominent during the 1950's (Hoetker & Ahlbran Jr., 1969). A decade later, efforts have shifted to developing systems of observation for studying the classroom teaching activities. Flanders (1970) then developed a system for observing verbal classroom interaction and found that two thirds of classroom talk were controlled by teachers, two thirds of this discourse is in the form of questions and further studies have shown that two thirds of those questions were closed questions (Flander's Two-Thirds Rule).

Bellack and colleagues (1966) have observed that there was a similar pattern in the teaching sessions of fifteen eleventh grade social studies classes in New York. They characterized this behavior of the teacher-student interaction in the classrooms as the 'Classroom Language Game' where the sequence 'teacher questions, student response and teachers' reaction to students' response' was highly frequent.

In a research study by Khalid and Tengah (2007) on communication in the Bruneian mathematics (primary) classroom, they emphasised the importance of communication in the mathematics classroom where children are expected to discuss mathematics with their peers and teachers. Furthermore, teachers should encourage the students to make conjectures, to generate generalizations, or to compare alternative solutions. If such level of communication were already to be expected in primary mathematics classes, then one would certainly expect that secondary mathematics classes should involve more active student participation and (higher order level) discourses.

Students who interact frequently and have good relationships with their teachers will achieve at higher levels than those who does otherwise (Rimm-Kaufman, 2011). Undoubtedly, technology has also played a prominent role in enhancing classroom interaction as well.

2. Review of the Literature

2.1 The TIMSS-99 Video Study Results on Classroom Interactions

Classroom interaction, in its most basic definition, is the interaction between the participants of a classroom, be it between the teacher and the students or among the students themselves. For the purpose of this study, we have used the definitions of the different types of classroom interactions which were identified by the 1998-2000 Third International Mathematics and Science Study (hereafter, TIMSS 1999 Video Study) of eight-grade mathematics classrooms in seven countries (Hiebert et al., 2003). Based on the findings from the TIMSS 1999 video studies, five types of classroom interaction were defined, however, we will only focus on two types of classroom interaction for this research namely *Public interaction* and *Private interaction*. According to Hiebert et al. (2003), these are defined as "Public interaction: Public presentation by the teacher or one or more students intended for all students; Private interaction: All students work at their seats, either individually, in pairs, or in small groups, while the teacher often circulates around the room and interacts privately with individual students" (p. 53).

The results from the 1999 TIMSS Video Study have found that the country with the highest percentage of time spent on public interaction was Hong Kong SAR with 75% and the lowest percentage of time spent was in the Netherlands classrooms with 44% (Hiebert et al., 2003). On the other hand, Hong Kong classrooms have spent the lowest percentage of time in private interaction (20%) and the Netherlands otherwise (55%). They also reported that "working individually is a more common activity for students in all the seven countries than working together during private time" (Hiebert et al., 2003, p. 56).

Shahrill (2009) conducted a smaller scale research of the TIMSS 1999 Video Study within the Brunei context, also found similar results when she compared the results of the seven countries in the TIMSS 1999 video study to the research of four mathematics classroom practices in Brunei. However, in Shahrill's study, the data collection method followed that of the Learner's Perspective Study approach. It involved videotaping, for each participating teacher, a considerable number of consecutive lessons rather than just single lessons. The participating teachers were regarded as 'competent' teachers by their 'local' mathematics education community

such as the Principals or Heads of Departments of the school (Clarke, 2004, 2006a, 2006b; Clarke, Emanuelsson et al., 2006; Clarke, Keitel & Shimizu, 2006; Clarke, Mesiti et al., 2006; Clarke et al., 2007; Clarke & Xu, 2007, 2008; Koizumi, 2013; Omar et al., 2014; Shahrill, 2009; Shahrill & Clarke, 2014; Shahrill & Mundia, 2014). Furthermore, Shahrill stated that for the Brunei data and Australia, "there was no detectable difference between the percentage of lesson time spent in public and private interaction" (p. 130). During private interaction work time, students worked at their seats while the teacher often circulated around the room and interacted privately with individual students. It was also found that "regardless whether they were seated in groups, majority of the Brunei students (87%) preferred to work on their tasks individually during the private work time" (Shahrill, 2009, p. 131).

2.2 The Use of Bilingualism and Code-Switching in Mathematics and Science Classrooms

The official language in Brunei Darussalam is *Bahasa Melayu* (or the Malay Language), but English is also widely used socially and as the medium of instruction for most subjects in schools and higher institutions. Thus, mathematics is taught in English in primary and secondary schools (Mundia, 2010; Shahrill, 2009; Shahrill et al., 2014). The use of bilingualism and code-switching is a common phenomenon in mathematics classrooms in Brunei Darussalam. Bruneian mathematics classrooms for one still practice the use of code-switching in classrooms when teaching and learning science and mathematics (Salleh et al., 2007; Leong, 2009). Similar practices can be found in Malaysia (Lim & Presmeg, 2011; Then & Ting, 2009) and Kuwait (Abdullah, 2010).

Earlier research findings indicated that bilingualism in early childhood can accelerate the development of both verbal and non-verbal abilities (Cummins, 1976). Studies on the effect of using bilingualism in Bruneian primary mathematics and science classrooms have shown that bilingualism can have a negative impact on students' ability to solve mathematics word problems (Leong et al., 2003) and also understanding certain concepts in science (Salleh et al., 2007). Though these may be the case in primary classrooms, it is still unsure whether a similar scenario is happening in the secondary classrooms as well, hence the rationale for carrying carry out this present study.

Code-switching is also often practiced in mathematics and science classrooms in Malaysia. Code-switching helps teachers achieve their teaching goals when teaching content based lessons that involve students who lack proficiency in English (Then & Ting, 2009). Students tend to perform best when being taught *Bahasa Melayu* though a study has shown that students from urban schools faced fewer problems when taught in English (Ngee et al., 2005). In a study by Abdullah (2010) on students' language attitude towards code-switching in the college of health sciences, it was found that the students strongly prefer the use of code-switching (between Arabic and English languages) as the medium of instruction and that they find it beneficial for them as it helps make the course content easier to understand. However, his research was only conducted in a single class of second year students which therefore limits his study to be generalised to the target population. In studying the effect of teachers' code-switching on the students' learning, we used and adapted the questionnaire in Abdullah's (2010) study for this research.

3. Methodology

3.1 Purpose of Study

The purpose of this study was to explore and investigate the patterns of classroom interaction, the language used by the teacher in communicating and delivering the lesson content, and to study the effects of the teachers' use of language on students' learning in the mathematics classrooms. The three research questions investigated in this study were how much of the lesson time is devoted to public interaction and private interaction? What are the effects of the type of classroom interaction on students' learning? And what are the effects of the teacher's code-switching on students' learning?

3.2 Participants

The participants for this study comprised of 78 Year 10 students (34 male and 44 female students), and three mathematics teachers from a secondary government school in Brunei Darussalam. The average number of teaching years' experience for the three teachers was approximately 9 years. In addition, all were trained qualified teachers in science and mathematics.

3.3 Instruments

3.3.1 Video-recording of Lessons

Data was collected by video-recording three consecutive lessons of each of the three classes. Two cameras were used for this study; one stationary camera was positioned near the front of the classroom capturing the

behaviours of most of the students during the lessons, while the other camera monitored the behaviours and actions of the teacher from the back of the classroom. A recordable clip-on microphone was used by the teacher to record most if not all of his/her discourse during each lesson. Video-recording the lessons enabled us to capture the rich details of the classroom dynamics that was happening in the three classrooms. Video-based studies are expected to have the greatest potential to inform classroom practice because of its ability to sustain and its capacity to capture the complexities of a classroom (Clarke, 2003; Fitzgerald et al., 2013; Shahrill, 2009; Shahrill & Mundia, 2014).

3.3.2 Distribution of Lesson Feedback Forms

At the end of the second lesson, for all the classes, the students were given feedback forms that asked about what they have learnt from the said lesson. Hughes (1997) mentioned that spending the last couple of minutes reflecting on what has been learnt will offer the teacher a somewhat instant indication of what is being, and has been, learnt during a lesson. The feedback forms were only distributed at the end of the second lesson because it was sufficient to give us an idea what the students have learnt from the current and previous lessons. The feedbacks that the students had given were used to determine which of them will be interviewed for further analysis of this research.

A questionnaire on the teacher's use of code-switching in the classroom was also included in the feedback forms. The questionnaire contained fifteen items and was adapted from Abdullah's (2010) questionnaire in his study on students' attitudes towards code-switching. It consisted of:

1) A structured question on students' preference of the language of instruction.
2) An open-ended question which demonstrated students' preferences for the language of instruction.
3) Structured questions on students' views about the teaching language (13 items). Here, a 4-Likert scale was used where students were requested to give their views. The scale was compromised as follows: Strongly Agree, Agree, Disagree and Strongly Disagree.

3.3.3 Student Interviews

The student interviews were carried out after all the video-recording sessions were completed. These students were selected based on the feedbacks that they had given in the lesson feedback forms and also the students' interactional behaviour which can be observed during the video-recording sessions. The types of feedback that was chosen depended on the length of the feedback and also those that included mathematical terms which were highlighted by the teacher during the lesson. These interviews were carried out during lesson times (about two weeks after the video-recording sessions) where they were asked to watch the final video-recording session that was taken and comment on the lesson shown in the video. The interview was done both written and orally; the written interview gave students more time, comfort and ideas on what they would like to say for the interview; the oral interview was conducted to further consider the students' choice of responses given in the written interview.

3.4 Limitations

Although this study followed the design of the TIMSS 1999 Video Study, we did not have the exact instruments as was used in the TIMSS 1999 Video Study, to use and to apply the codes accurately to the collected video data. Therefore the results of this study will not be as precise as that of the TIMSS 1999 Video Study. Furthermore, it was difficult to capture private interactions between the students as the video camera that focused on the students' behaviour was immobile and there was no recordable microphone available to record the students' interactions. The data generated for this investigation were from three mathematics classrooms in one secondary school only. Hence, it will not be possible to generalise the findings to the classroom practices in other secondary schools in the nation.

4. Results and Discussion

4.1 Lesson Time Devoted to Public and Private Interactions

Table 1 below shows the average percentage of lesson time devoted to public interaction and private interaction. For all the three classes, majority of the lesson time (more than half the average percentage of time) was devoted to public interaction than private interaction. Majority of the lesson times for all three classes were spent on public interaction (an average percentage of 78.9%) than private interaction (an average percentage of 10.4%); the remaining percentage of lesson times involved no interactions between the teacher and students.

Table 1. Average percentage of lesson time devoted to public interaction and private interaction, by class

Class	Public interaction	Private interaction	No interaction
	Percentage (%)		
Year 10X	71.4	12.8	15.8
Year 10Y	87.8	8.3	3.9
Year 10Z	78.0	9.9	12.1

The high proportion of public interaction during lesson times was profoundly dominated by the teachers reciting facts and questions to the students as compared to students presenting information publicly. In comparison, the class with the highest proportion of lesson time devoted to public interaction (87.8%) was found to be the Year 10Y class where the teacher had spent a greater part of the lesson times reciting and explaining the corrections of the qualifying exams to the students. On the other hand, the class with the highest average percentage of private interaction (12.8%) was found to be the Year 10X class where the teacher usually spends half of the lesson time publicly presenting information to the student while the other half of the lesson was devoted to students trying out exercise questions which were given by the teacher, thus making up the high percentage of private interactions.

4.2 The Effects of the Type of Classroom Interaction on Students' Learning

During the public interactions, teachers spent a greater part of the time reciting to the students than students presenting information to the whole class or raising public discussions. On the other hand, when comparing patterns of interactions between these three classes, students were more publicly interactive in the classes which were taught by the female teachers as compared to the male teacher, although private interaction was much higher in the male teacher's class as compared to the female teachers. In addition, students from Year 10Z were more publicly interactive than the Years 10X and Y classes.

So how do these interaction types affect students' learning? Hughes (1997) stated that "if lessons are for learning, then the statement 'pupils/students should know more at the end of the lesson than they did at the beginning' must be true" (p. 13). Thus, we will now discuss the responses given by the students in the lesson feedback forms and interviews in relation to the classroom interaction patterns seen from the videos.

In the case of Year 10X, Teacher X was mostly following the 'recitation script model' during the lesson discourse where 'teacher initiates question, students respond and teacher gives feedback' occurred frequently. The frequency of students' responses varied across the three lessons where students were more responsive during the second lesson as compared to the first and the last lesson; the students' responses were usually choral responses and the teacher's questions were almost always close-ended. During private interactions, students usually asked the teacher to check their methods and answers to the exercise questions that was given by teacher. Perhaps the lack of student participation during public interaction in the first and the last lessons (which were conducted early in the morning) was due to the fact that the students were not that particularly active in the morning lessons. The students were more active in the afternoon lessons compared to the morning lessons. Also, it was probably because the teacher gave very short wait times of less than 5 to 7 seconds for the students to respond, thus restricting students' participation during public interaction.

From the responses given in the lesson feedback forms, many students wrote "*Kinematics*" as the learning outcome of the second lesson; "*Application of integration and differentiation in kinematics*" was the second most frequent response. From the interviews, the students responded that they would learn the application of calculus in kinematics better if they have *constant practice in trying out kinematic problems* and also "*by drawing the diagrams for the kinematics problems*"; one student wrote that he would have learned better if he had mastered the basic of the topic before it was being taught by the teacher in the lesson. When they were asked verbally whether they have understood the lesson or not, they merely said "Yes".

Unfortunately we cannot determine whether the responses given by the students indicated whether the interaction types have any effect on the students' learning. Perhaps the students were not sure of what to write for their learning outcomes, therefore resulting in the ambiguous responses given in the feedback forms and the written interviews for their learning outcomes.

Theories may have indicated that the recitation model executed by Teacher X during public interaction does not help the students learn mathematics effectively, but from what was observed from the videos, the students had

learned (actually, understood) the topic rather well as they were able to respond (albeit a few of them) to the teacher's questions during public and private interactions. It could be the case that the students learned the topic better from having to try out the exercises given by the teacher during the lessons. Perhaps a formative assessment on kinematics could help me to determine whether the students have learnt the topic effectively or not.

Public interaction was highest in the Year 10Y mathematics lessons as compared to the other two classes; Teacher Y had spent more than half of the three lessons combined going through the qualifying exam papers with her students. A subsequently small percentage of the time was spent on private interaction during the last lesson. Since Teacher Y gave continuous verbal feedbacks on the corrections made during these public interactions, the students paid close attention to the teacher's discourse during the lesson whilst learning what they have done wrong or how best to solve the math exam question at the same time; students seem to make utterances whenever the teacher gave her feedbacks. Furthermore, the students would sometimes comment on the teacher's methods or raise questions during public interaction, showing that the students were not just passive listeners during the teacher's public presentation.

In the feedback forms and interviews, most of the students reflected on how they have learned from their mistakes they made during the exams, based on the feedbacks given by the teacher. There were no comments made on the lack of private interactions between the student and teacher. Even though the high amount of teacher discourse during public interaction indicated teacher-centeredness, the constant feedbacks given by the teacher during public interaction and the students' public and private discourse with the teacher could help the students to re-learn certain topics that were both covered and uncovered in the exam papers, thus making the lessons slightly student-centered.

In the case of the Year 10Z class, the recitation model was sometimes used by the teacher to initiate students' discourse during public interactions and almost always, the students would respond to the teacher's initiations. The public interactions were conducted in the form of open discussions between the teacher and students and the students seem to enjoy contributing their ideas and questions during these discussions. When doing the exercises given by the teacher, the students tend to discuss with each other as compared to having private interactions with the teacher.

Quite a number of ambiguous responses were received from the feedback forms although there were a few students who distinctively wrote about what the teacher had actually taught them during the lesson. Presumably, students who gave the vague responses did not learn much as compared to those who wrote the more detailed responses. However, during the interview, some of the students who wrote "*Position Vectors*" in the lesson feedback forms were able to give detailed responses for their learning outcomes as compared to the Years 10X and 10Y students who gave ambiguous responses in the feedback forms. It seems that the teacher's teaching style, that is, her questioning techniques during public interaction has a positive effect on the students' learning.

Amongst the interviewees, one student said that she would rather like it if the teacher could have spent more time privately interacting with her as she feels that it is beneficial to shy students like her. Other interviewees who had had minimal private interactions with the teacher seemed to be coping well with the teacher's public presentation on vectors. Whether more private interaction is beneficial to the other student participants as well is undetermined; perhaps interviewing more students would enable me to determine the result.

It seemed that Teacher Z's questioning techniques during public interaction had an effect on the students' learning and at the same time, private interactions seemed to have its benefits for certain students' learning as well. The Year 10Z students, as compared to the students in Years 10X and 10Y classes were more verbally active during public interactions. Furthermore, the lessons were less teacher-centered as the students tried their best to discuss ideas during public interaction with the teacher. Based on the interviews and feedback forms, the Year 10Z students produced somewhat better learning outcomes than the Years 10X and 10Y students.

Based on the discussions of the findings, each of the classes has shown different results for the types of interaction on students' learning where each teacher had tried different techniques in interacting with the students. We concluded that the types of interaction seemed to have no direct effect on the students learning, but how the teachers conducted these interactions can affect the students' learning of mathematics.

4.3 The Effects of the Teacher's Code-Switching on Students' Learning

The overall language preferences for the students of all three classes are presented in Table 2 below.

Table 2. Students' preferred language for mode of instruction

Language preference	Frequency (%)
English only	31 (42.5%)
English and Malay	38 (52.1%)
Other bilingual languages	4 (5.5%)

In comparison, 34.2% (n = 25) of the sample who chose English only was from the Years 10X and 10Y classes whereas 8.2% (n = 6) were from Year 10Z. In contrast, for those who preferred English and Malay as the mode of instruction, 24.7% (n = 18) of the sample was from the Year 10Z class whereas 27.4% (n = 20) were from the Years 10X and 10Y classes. In addition, the remaining 5.5% who preferred other bilingual languages for the mode of instruction were only from Years 10X and 10Y classes.

Students who preferred the mathematics subject to be taught in 'English only' wrote the following comments: It is easy to understand; I'm more familiar with the English language/ It is easy to communicate; English is the language used in the O Level exams; English is internationally recognised; It helps improve my English; It helps strengthen my English; It shows the teacher's confidence in English.

The students who preferred both English and Malay as the medium of instruction wrote the following comments for their choice of answer: It helps me understand better when Malay was used to explain things; I'm not really good in English so Malay can help me understand better; It is the language that we use every day; It helps strengthens my English and also helps me to understand when it was explained in Malay as well; It is more fun; I like the teacher to be comfortable to what he is teaching and I would feel the same too.

The minority of students who chose "Other bilingual languages" wrote the following comments: It would be easier for me to communicate with the teacher; Because I'm a mixed race and I am able to understand with mixed language; It is easier to understand; It is easier for me to learn.

Table 3 shows the students' responses for the questionnaire items on the use of teacher's code-switching in the mathematics lessons.

Table 3. Students' responses for the questionnaire items

No.	Item Description	Strongly Agree	Agree	Disagree	Strongly Disagree
		Frequency (%)			
1	Teaching the subject only in one language is beneficial to me.	15 (19.5%)	43 (55.8%)	17 (22.1%)	1 (1.3%)
2	Teaching the subject in Malay and English is desirable to me.	14 (18.2%)	47 (61%)	15 (19.5%)	1 (1.3%)
3	Teaching the subject in Malay and English makes it easy for me to understand	18 (23.4%)	46 (59.7%)	12 (15.6%)	1 (1.3%)
4	It confuses me when the subject instructor teaches in Malay and English at the same class period.	3 (3.9%)	10 (13.0%)	49 (63.6%)	15 (19.5%)
5	Mixing of Malay and English leads to the weakness of my Malay.	4 (5.2%)	8 (10.4%)	49 (63.6%)	16 (20. 8%)
6	Mixing of Malay and English leads to the weakness of my English.	3 (3.9%)	11 (14.3%)	47 (61.0%)	16 (20.8%)
7	Mixing of Malay and English strengthens my English.	4 (5.2%)	39 (50.6%)	30 (39.0%)	4 (5.2%)
8	I respect the instructor more when teaching in Malay and English	7 (9.1%)	44 (57.1%)	22 (28.6%)	4 (5.2%)

9	I respect the instructor more when teaching in Malay.	6 (7.8%)	29 (37.7%)	36 (46.8%)	6 (7.79%)
10	I respect the instructor more when teaching in English.	15 (19.5%)	35 (45.5%)	22 (28.6%)	5 (6.49%)
11	Teaching the subject in Malay increases my chances of passing the exams.	4 (5.2%)	25 (32.5%)	43 (55.8%)	4 (5.19%)
12	Teaching the subject in English increases my chances of passing the exams.	12 (15.6%)	46 (59.7%)	18 (23.4%)	1(1.3%)
13	Teaching the subject in Malay and English increases my chances of passing the exams.	12 (15.6%)	37 (48.1%)	24 (31.2%)	4 (5.19%)

Though most students preferred English and Malay as the mode of instruction, it seems that a higher percentage (75.3% in total) of the students agreed that teaching the subject in English only will increase their chances of passing their exams than when being taught in English and Malay (63.7% in total). In addition, majority of the students disagreed (83.1% in total) that teaching mathematics in Malay and English in the same class period will confuse them. Furthermore, most students agreed (83.1% in total) that teaching in Malay and English makes it easy for them to understand.

From the results of the questionnaires on code-switching, it was found that there was an almost evenly divided preference for code-switching (Malay and English) and using 'English only' as the medium of instruction among the student participants. It seems that code-switching is only useful in helping the students to understand the lesson better; it does not necessarily mean that the secondary students learned better when the teacher code-switched during the lessons. Perhaps a further study can help determine the effects of the teacher's code-switching on the secondary students' learning of mathematics.

5. Conclusions

Observations of the three mathematics classroom practices revealed that classroom interaction was overly dominated by the teacher's discourse rather than the students'. Perhaps it was because the lesson times were quite short. Teachers felt that they have to rush through the one hour lesson to teach the students what they have prepared in their lesson plans, therefore resulting in the teachers to recite to the students instead in order to save time (as well as to complete the syllabus on time).The results achieved in this study contrasted to those which were found in Shahrill's (2009) study where it was found that on average, 51% of the time was spent on public interaction and 47% of the time on private interaction in four Bruneian mathematics classrooms. It would appear that the teachers in this study focused more on presenting publicly to the students than letting them try out exercises during the lessons. Again, this could be due to the fact that the public O Level examinations were approaching, some teachers felt that they should get on with finishing the syllabus on time and start preparing the students with revisions, thus cutting lessons short by just reciting to the students during public interactions.

There is no doubt that the teachers in the sample were trying to finish the syllabus on time as lessons seemed to be rushed and fast-paced. It should be noted that all the Year 10 students in this study sat for their O Level exams in November that year (at the time of study). It may be typical to most Bruneian teachers for wanting to finish the syllabus on time as at the end of the year, students had to sit for a compulsory assessment covering most if not all of the topic in the syllabus.

The findings that revealed most students' preferences for code-switching and teaching in English only implied that many of the students have actually realised the importance of learning mathematics in English (since their exams will be in English). Furthermore, students and teachers should realise that the students will not be equipped with dictionaries during the exams or the teachers assisting them in code-switching certain terms in the exam papers for them. This also implied that teachers should make an effort to try to code-switch less often, so that it can help the students to familiarise themselves with the appropriate English terms when learning mathematics. However, it should be reminded that these results are only applicable to the participants of this study. It cannot be generalised to the other secondary mathematics classroom practices in the whole of Brunei Darussalam.

6. Implications and Recommendations

From the findings of this research, there are a few factors that may affect classroom interactions in the mathematics classrooms that may also be useful for mathematics teachers to consider. Firstly, the teacher's questioning techniques may have an impact on students' participation in classroom interaction. Teachers may be suggested to prompt their students to respond to the teacher's questions in such a way that it engages the students to thinking for themselves. In addition, teachers should also allow a wait time of about 5 to 7 seconds after posing questions to students; this will enable the student to respond, reflect or even pose their own question (Ellis, 1993; Rose & Litcher, 1998; Rowe, 1978, 1986; Shahrill, 2013; Shahrill & Clarke, 2014; Shahrill & Mundia, 2014). We should also remind ourselves that the purpose of questioning is to generate interest, to engage and to challenge the students, and not to intimidate students with short responses.

The teacher's behaviour may also affect the level of students' participation during classrooms interactions. In comparison, the female teachers who depicted more friendly behaviours received more student participation during public interactions as compared to their male counterpart, who seemed to portray a strict behavior when teaching. This somehow intimidated the students to respond to his initiating questions. In his study on teacher behaviours in the science classrooms, Dhindsa (2006) stated that teachers should improve their communication behaviours which could help in making science lessons more enjoyable and attract more students to the subject. A similar concept can be applied in the mathematics classrooms as well.

In addition, perhaps by incorporating the teaching of mathematics with the use of technology in the Bruneian classrooms may help enhance classroom interaction as well as improve the students' learning. Studies have shown that the use of computers in classrooms can help increase factual information exchanges and task conceptualization interactions between teachers and students (Karasavvidis et al., 2003). Similarly, Beuckman et al., (2006) stated that technology-enhanced classroom interaction can also improve students' learning as well.

For further research on classroom interactions in the mathematics classrooms, we recommend that more interviews should be conducted with the students, be it written or oral. The interviews may be more useful than using the lesson feedback forms in trying to find out the learning outcomes of the students as one can prompt the students to elaborate more on their responses. In addition, perhaps an interview with the teachers could also help in gathering more results in studying the effects of the types of classroom interaction on the students' learning.

In addition, a comparative study involving more than one school may produce more distinctive results than comparing the classroom interactions of one school only. Furthermore, the instruments used in this study might require proper modifications for future uses. The items used in the feedback forms and interviews should be further modified in order to determine the students' learning outcomes and also the students' attitudes towards the teacher's code-switching in the lessons.

From this study, although teachers practiced code-switching during lessons to enhance understanding however, there were students who still preferred to be taught in English only. This indicated that code-switching does not play a very significant role in teaching and learning, as what some previous studies have shown (refer also to Pungut & Shahrill, 2014). Having conducted the research (albeit using a small sample group), this study has its merit for further research in the future. It is hoped that the findings of this study can generate seminars and workshops on enhancing classroom interactions for teachers in general, particularly mathematics teachers in Brunei Darussalam.

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