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ABSTRACT

This study aims to characterise the pedagogical practices of 45 observed primary mathematics lessons taught by 24 mathematics teachers in six national primary schools (SK) and six Chinese vernacular primary schools (SJKC). The data were collected using two video cameras, one focused on the teacher while the other camera focused on the pupils' activities. The qualitative data were analysed based on two main activities in the classroom, which are teacher's activities and pupils' activities. The findings show that mathematics lessons conducted by SK teachers tended to engage the pupils in individual seatwork so as to assess pupils' understanding. Conversely, SJKC teachers were focused more on explaining mathematical concepts to help the pupils build up their conceptual understanding. By characterising the pedagogical practices of mathematics lessons in various schools, the researcher hopes that the findings of this study will contribute to better understanding of the teaching and learning process in SK and SJKC mathematics classrooms. The results serve as a documentation of pedagogical practices in Malaysia to enable implementation of suitable programmes to help in improving teachers' pedagogical practices from different types of primary schools. While the results are interesting and provide some directions, a much larger study would be needed to determine if the results are due to the teachers' enthusiasm, geographical differences, cultural or social differences, or what is known as the Hawthorne Effect.

Keywords: Pedagogical practices, mathematics lesson, characterising

INTRODUCTION

Pedagogical practices refer to processes of how lessons are being carried out in the classroom. Thompson (2005) defined pedagogy as the art of teaching, and the principles and methods of instruction. A lesson in a mathematics classroom involves different methods of instruction and a variety of classroom activities and practices. Schmidt, Jorde, Cogan, Barrier, Gonzalo, Moser, Shimizu, Sawada, Valverde, Mcknight, Prawat, Wiley, Raizen, Britton and Wolfe. (2002) stated that classroom activities are dynamic interactions between subject matter content, teachers, and pupils. Clarke (2001) stated that a pedagogical practice is a form of communal collaborative activity constituted as it is constructed through the participation of both teachers and learners. All these activities and interactions formed the characteristics of the pedagogical practices of a particular mathematics lesson. Thus, different mathematics lessons might show similar or different characteristics.

A comparative study related to pedagogical practices of mathematics classroom in different countries was started by Stigler and Hiebert (1999) through the TIMSS 1995 Videotape Classroom Study. Subsequently, a few more international comparative studies on mathematics classroom were conducted such as the Survey of Mathematics and Science Opportunities (Schmidt et al., 2002), the Third in Mathematics and Science Study (TIMSS 1999) video study (Hiebert et al., 2003), and the Learner Perspective Study (Clarke, Keitel & Shimizu, 2006). Researchers believed that such investigation and comparison could provide information on how a lesson was conducted and the mathematical content presented during the lesson (Stigler, Gonzales, Kawanaka, Knoll & Serrano, 1999). In Malaysia, there were a few research studies about pedagogical practices in expert teachers' mathematics classrooms (Lim & Kor, 2012; Ruzlan, 2007; Tan, 2012) and mathematics research lessons of Lesson Study (Chia & Lim, 2014; Lim, Kor & Chia, 2014). Yet, there is still limited literature related to normal daily teaching practices and comparison of pedagogical practices of the mathematics classroom (see Tan, 1995; Chia & Lim, 2015) in the context of Malaysia. While research in the expert teacher's classroom is to find out the characteristics of exemplary pedagogical practices, research in normal daily classroom is to identify the characteristics of ordinary teacher's pedagogical practices. The findings can enable researchers to compare the difference between the expert teacher's pedagogical practices and the ordinary teacher's pedagogical practices in mathematics lessons.

There are three types of primary schools in Malaysia based on the main language used in schools due to multi-ethnic characteristics of Malaysia (Ministry of Education, 2013). These are: (a) national primary schools (SK); (b) Chinese vernacular primary schools (SJKC); and (c) Tamil vernacular primary schools (SJKT). Are there any similarities or differences of pedagogical practices in those types of primary schools? Malaysia is part of the Asia region and so to what extent the difference in term of characteristics of pedagogical practices in Malaysian mathematics classroom as compare to other Asia countries? To enable such comparisons to be made, firstly we need to find out the common characteristics of pedagogical practices in Malaysia mathematics classroom.

In this study, the researcher will only look into the Malay-medium national (SK) and Chinese vernacular primary schools (SJKC) in Penang and Kelantan. Penang is an urban state located in the northwest of Peninsular Malaysia and its population is highly diverse in ethnicity and culture. However, Kelantan is a rural state located in the northeast of Peninsular Malaysia and its population mainly is Malay. Due to its location, Kelantanese Malay culture is differ from Malay culture in the other states of Malaysia. Such selection is made to find out whether

culture and geographical factors can influence the differences in pedagogical practices within the same education system. By characterising the pedagogical practices of mathematics lessons in SK and SJKC schools in two different states, the researcher hopes that the findings of this study will contribute to teachers' and educators' better understanding of the teaching and learning process in SK and SJKC mathematics classrooms. Furthermore, this could help to find ways to improve the teaching and learning process in mathematics classrooms in future.

THEORETICAL FRAMEWORK

The teaching and learning process is a social-cultural activity (Vygotsky, 1978). There are interactions between the teacher and pupils and interactions between pupils and pupils. A classroom will have their shared system of value and belief. The teacher might select certain teaching instructional strategies, but the instructional strategies might be influenced by the pupils' response, classroom situation, available facilities and resources. Review of the related research show that there was no specific theory that explains about how a teacher chooses his/her pedagogical practices. The reasons for the choice are always complicated and depend on various factors such as the pupils' ability, classroom resources, the teachers' philosophy and beliefs about teaching and learning, subject content as well as the teachers' content knowledge.

In this study, the researcher observed the pedagogical practices that were enacted in the mathematics classroom, tried to search for the pedagogical characteristics and the teacher-pupils and pupils–pupils interactions throughout the whole lessons. The focus of this study was to narrow down and to categorise only the teacher's instruction during the lesson and the pupils' involvement in the classroom to identify the characteristics of the mathematics lesson. The researcher did not take into account other factors (such as classroom situation, available facilities and resources) that might influence the teacher's instruction and pupils' involvement (Kaur, Low & Benedict, 2007). The researcher hopes to look for a better understanding for the complexity in the mathematics classroom. The complexity could be due to the factors that affect the pedagogical practices like the curriculum, the school, the teacher, and the pupils. Taking the teacher factor as example, the complexity could be the aspects of the teacher's beliefs, pedagogical content knowledge, pedagogical knowledge and cultural background (Schmidt et al., 2002).

LITERATURE REVIEW

The focus of recent studies is more on classroom practices to understand better the teaching and learning process (Schmidt et al. 2002; Stigler et al.1999; Stigler & Hiebert 1999; Hiebert et al. 2003; and Clarke et al. 2006). Classroom practice is characterised as active learning (Ellerton, 2003) when pupils doing to understand mathematics during the lessons, passive learning when pupils receiving the information from the teacher solely during the lesson (Givvin, Jacobs, Hollingsworth, & Hiebert, 2009), procedural teaching (Lim, 2007) when the teaching is emphasis on the procedures or methods of solving a problem or conceptual teaching which focus on conceptual understanding (Hiebert & Grouws, 2007). Besides, the teaching approach can also be characterised as teacher-centred (Lin & Li, 2009; Zhang & Li, 2003) whereby mainly the teacher delivers the lesson's content or student-centred while students take part as the source of information.

In the TIMSS Videotape Classroom Study 1999, the following sequence of five activities had been described as the flow of the Japanese classroom: reviewing the previous lesson; presenting the problems for the day; students working individually or in groups; discussing solution methods; and, highlighting and summarising the main point. (Stigler & Hiebert, 1999, pp.79-80) The study has shown that, to a significant extent, Japanese lessons can be characterised as structured problem solving. The teacher intended to have the students work on a problem and then discuss the solution procedures, sharing important ideas found in the problem solving processes and the discussion.

After analysing a total of 30 lessons taught by three teachers with each teacher teaching ten consecutive lessons respectively in Korea, Park and Leung, (2006) pointed out that behind the seemingly procedural teaching and passive learning, the Korean students were actually heavily involved in exploration when following the prescribed classroom activities designed by the teachers. They concluded that:

> …the seemingly traditional teaching in the teacher dominated Korean classroom may still have contributed to their students' superior performance in international mof mathematics achievement. A focus on mathematics content in the teaching is not in itself good or bad for learning. It depends on how well the content is organized. (p. 258)

Study carry out by Kaur, Low and Benedict (2007) in Singapore, participated by three locally defined as "teaching competence" teachers showed that one significant observation was that, despite the apparently teacher-centred approach that characterised both teachers' instructional approaches, the review segments indicated that the students' thinking was always taken into

account during lessons and fore grounded in the discourse, albeit through the teacher. Thus, besides considering what the teachers are doing during the lesson, the content of the teachers' talk shall also taking into account., researcher shall taking into account what the pupils been doing in the lesson as well. Hogan (2008) provided results drawn from 76 observed mathematics lessons at Secondary 3 level in Singapore, to show that the pedagogical practices were: answer checking IRE (initiate, response, evaluate) sequence (42%), individual seatwork (26.2%), whole class lecture (12.9%), small group work (8.5%) and others (10.4%). In Malaysia, Tan (1995) compared 18 lower primary mathematics lessons from national school (SK) and Chinese primary school (SJKC) concluded that SK teachers mainly assigned individual seatwork during the lessons. However, SJKC teachers preferred whole class teaching and assigned individual seatwork. Similarly, lesson observation conducted by Ruzlan (2007) on two fifth-grade mathematics lessons taught by two teachers found that the lessons mainly consisted of teacher presentation of the concept and pupils participated in boardwork or seatwork. Furthermore, more recently a few studies had conducted on expert teacher classroom (see Chia & Lim, 2014; Lim & Kor, 2012; Tan, 2012). Research done by Lim and Kor (2012), observed six expert teachers' mathematics classrooms for a total of 12 mathematics lessons found that four out of six teachers focused on pupil's cognitive development and pupils' active participations. For example, one of the teachers, Teacher K would ask his pupils to demonstrate their solutions to a problem in front of the class to enable whole class review the solution, comparison of students' answer with the teacher's prepared answer and abbbcorrection could be done immediately. Besides, the teachers provided systematic explanation(from simple concept like to state the number of sides of a 2D shape to difficult concept like to list out the characteristics of a 2D shape) and pupils were involved in presentation of answer, question and answer sessions and group works.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

a) to characterise the Mathematics lesson pedagogical practices among Malay-medium national schools (SK) and Non-Malay-Medium National-type schools (SJKC) in Penang and Kelantan;
b) to compare the difference in mathematics lessons' pedagogical practices between Malay-medium national schools (SK) and Non-Malay-Medium National-type schools (SJKC) in Penang and Kelantan;

c) to identify if there is any difference in mathematics lessons' pedagogical practices between Malay-medium national schools (SK) and Non-Malay-Medium National-type schools (SJKC) in Penang and Kelantan

PARTICIPANTS

The participants of this study were 24 teachers from 12 primary schools. Half of the primary schools were national primary schools (SK) and half were Chinese vernacular primary schools (SJKC). The schools were selected based on their location and the willingness of the schools to be in the project. These schools were located in two different states, namely Penang and Kelantan. The distribution of the school and teachers involved is as displayed in Table 1. The participating teachers were expected to deliver two lessons each for the observation, however, there were three teachers who conducting only one lesson due to time constraints. The participating teachers were decided by the school, as this project wanted to capture the pedagogical practices of a range of school teachers. The lessons were random normal daily set by them. The Grade of the mathematics classrooms involved range from Grade 2 to 6 and comprised several topics such as measurement, time and money as shown in Table 2. A total of 45 lessons were observed and recorded.

Table 1
Distribution of the school and teachers involved from Penang and Kelantan

School	Penang	No. of Teacher	Kelantan	No. of Teacher	Years of teaching experience
National primary schools (SK)	2	4	4	8	3 - 20
Chinese vernacular primary schools (SJKC)	2	4	4	8	3 -20

Table 2
Summary of the Grade of the classes and topics taught during the observation

State	School	Grade	Topics
Penang	National primary schools (SK)	2 -5	Time, Money
	Chinese vernacular primary schools (SJKC)	2-5	Time, Operation involving numbers, Measurement involving length, Measurement involving mass
Kelantan	National primary schools (SK)	4-6	Operation involving numbers, Time, Counting number, Volume, Money

	Chinese vernacular primary schools (SJKC)	4-5	Measurement involving length, Conversion of units, Volume, Time

METHOD OF DATA COLLECTION

In this study, two video cameras were used to capture the implementation of lessons in the mathematics classrooms. One camera (the teacher camera) captured the teachers' actions and their interaction with the pupils during the lessons. The other camera (the pupil camera) focused on the pupils and captured their actions and interactions with their teachers and their peers during the lessons. The pupil camera was focused on the pupils who were asking questions, doing presentation in front of the class, random selection of working group session and other pupils' activities. During the group work session, due to only one camera, the focus working group was selected randomly to record pupils' interaction optimally.

DATA ANALYSIS

This study aims to characterise the different categories of classroom activities and practices involved, thus the researcher adapted the analysis method used by Kaur, Low and Benedict (2007). They characterised the classroom pedagogical practices into six categories: whole-class demonstration, seatwork, whole class review of pupil work, group quiz, test, miscellaneous (p.4-5). Based on Kaur, et al., (2007) analysis model, the data collected were analysed qualitatively follow the qualitative data analysis (Creswell, 2009) procedures. The data analysis was done by using the NVivo software to code each characteristic of the pedagogical practices of lesson in the classroom.

The video recordings of lessons were reviewed a few times to identify preliminary features of the lesson. For example, the teacher explained a mathematical concept, such as the concept of length, the teacher posed questions to the whole class or the teacher assigned certain task to the class. Based on the literature review and theoretical framework the coding was done mainly according to the teacher's instruction by the researcher. After that, the features identified were divided into two main coding categories: teacher's activities (consisted of codes for teachers' activities during the lessson) and pupils' activities (consisted of codes for pupils' activities during the lessson) which made up the characteristics of the pedagogical practices of the lessons. Table 3 displays the codes of the teacher's activities while Table 4 shows the codes of the pupils' activities identified through the video recordings of the lesson observations.

Table 3

Coding categories in the teacher's activities

Categories	**Explanation**
Induction set	Activity done by teacher to attract the pupils' attention before the lesson begins or the teacher introduces the topic or the teacher revises prior knowledge of the pupils. Example: At the beginning of the lesson, the teacher posed questions related to the topic of the day, length. Teacher: If, Mrs Lim, she wants to sew a dress, so what must she buy? What must... *Pupils: Measuring tape.* Teacher: She buys?? What the must… she needs to do... First thing, what must she need to do? *Pupils: Measuring tape.* Teacher: No, no. If she wants to make erm… sew a dress, so what must she do? *Pupils: Cloth.* Teacher: She has to… buy [a] cloth. Ok. *Pupils: …buy [a] cloth.* Teacher: She have….has to go to the textile shop to buy cloth. So, before that, what must she do? *Pupils: Measure…* *Pupils: Measure her body.* Teacher: Ahh...she must measure the size, the body arr… (Transcript: SJKCKS-4A: Measurement)
Class management	The teacher does class management, including: the teacher gives instruction to pupils or the teacher set up the lesson or the pupils greet the teacher. Example: Teacher: Just leave your things on your table, ok. Are you ready? *Pupils: Yes.* Teacher: Ok, sit down. (Transcript: SJKCKS-4A: Measurement)
Revision	The teacher revises previous lesson with the pupils or the teacher re-explains the concept. Example: The teacher requested the pupils to recite the name of the months in a year after question and answer sessions about the name of the months in a year as revision. Teacher: Now, can you tell me the [name of the] months of a year, [starts] from January? *Pupils: January, February, March, April, May, June, July, August, September, October, November, December…* (Transcript: SJKCKM-4K: Time)
Teaching and explaining	The teacher teaches and explains mathematical concept to the pupils and gives examples. Example: Teacher: ... Now, here, we have this, our ruler, I draw it, then enlarge it, ok. [So,] you can see it clearer. This one, 1 cm with 10 divisions, the small, small line, 10 lines. Ok, so, this one [the

	smaller division] we call millimetre. (Transcript: SJKCKS-4A: Measurement)
Desk instruction	The teacher walks around to check pupils' work during individual seatwork or group discussion
Checking for individual understanding	Whole class review of the pupil's work or the pupil answers the teacher question verbally. Example: Teacher: Arr…give me the answer. Can use mental calculation. Divide by 1000, move the decimal point to right, or multiply move to the right or move to the left. Ok, Judy. *Judy: B.* (Transcript: SJKCKM-5B: Length)
Checking for whole class understanding	The teacher asks whether the pupils understand or not/ The teacher asks pupils got any question or not. The teacher reviews group work's answer. Example: Teacher: So, class understand or not? *Pupils: Yes.…* (Transcript: SJKCKS-5K: Measurement)
Whole class question and answer	Whole class questions and answers session where the teacher asks questions to the class and the pupils answer. The teacher asks question verbally or ask the pupils to answer questions from worksheet/ textbook. In question and answer session also included the teacher states the answer for the question. Example: Teacher: Round off the… cm, cm, what is cm? *Pupils: Centimetre.* (Transcript: SJKCKS-4A: Measurement)

Table 4
Coding categories in the pupils' activities

Categories	**Explanation**
Individual seatwork	The pupils work out the exercise individually in the classroom. Example: Teacher: Ok, class you all erm…try to do exercise at the page 167. (Transcript: SJKCKS-5K: Measurement)
Group work	The pupils work in pairs or in group to obtain the answer. Example: Teacher: …I want you to group into five groups and then you go back to your place and then I will give you some of objects to measure. (Transcript: SJKCKS-4A: Measurement)
Presentation	The pupils come out and present their answer after group discussion or individual seatwork.
Spell the word	The pupil(s) being asked to spell the word or term related or non-related to lesson. Example: Teacher: Ok, precious. Spell precious. *Pupils: P-r-e-c-i-o-u-s, precious.* (Transcript: SJKCKM-5M: Volume)

Reading the question or answer	The pupil(s) being asked to read the question or answer from worksheet/ textbook. Example: Teacher: Ok, children read question, Example 1. Read out the question. *Pupils: 3 litres of water, 2.15 litres of syrup and 0.63 litres of lime juice are mix in a container to make lemonade. What is the total volume of the liquids?* (Transcript: SJKCKM-5M: Volume)

This NVivo analytic software enabled researcher to code the video recording data directly at different time frame according to the descriptions of the coding categories identified in both Table 3 and Table 4. After the coding process, we analysed the characteristics based on the percentage of coverage of each the activities obtained from the NVivo software. The percentage of coverage was the percentage of time spent in an activity in the particular lesson. At the moment the teacher started an activity such as individual seatwork, the researcher then coded it as individual seatwork until the activity ended. The NVivo analytic software could give the percentage of coverage for the particular activity as compare to the total time taken for the particular lesson. Thus, the length of the lesson will not affect the outcome of the analysis.

Type	Name	In Folder	References	Coverage
Video	SJKCKS_4A	Internals	16	18.61%
Video	SJKCKS_5K	Internals	17	12.31%
Video	SJKCKS_5A	Internals	14	13.41%
Video	SJKCKS_4K	Internals	9	18.72%

Figure 1. Summary of the data analysis for the characteristic "checking for individual understanding" of the school SJKCKS extracted from the NVivo analytic software.

However, the software had limitation whereby it could provide only the percentage of coverage of a particular characteristic for a particular lesson not the average percentage of coverage of a characteristic for all the 45 lessons. For example, as shown in Figure 1, the analytic software provided the summary of the type of data (type), the name of the school named by the researcher and the classroom involved (name), the number of coding on the time frame (references) and the percentage of coverage (coverage) for the code "classroom management" of the school SJKCKS. The average percentage of coverage was calculated by summing up the percentage of coverage for all the lessons and divided by the number of lessons involved with the help of Microsoft Excel or manually. For example, to calculate the average percentage of coverage for the coding category classroom management for all the

lessons conducted in SJKC schools in Penang (see Figure 2) by using the following general formula and taking the example of "classroom management":

$$\text{Average percentage of coverage for a coding category} = \frac{\text{Total percentage of a coding category}}{\text{Number of lessons}}$$

$$= \frac{145.65}{8}$$

$$= 18.21\%$$

Lessons	Class management
SJKCKS_4A	18.61%
SJKCKS_5K	12.31%
SJKCKS_5A	13.41%
SJKCKS_4K	18.72%
SJKCKM_4H	25.39%
SJKCKM_4K	27.50%
SJKCKM_5M	7.77%
SJKCKM_5B	21.94%
Total	145.65%
Average	18.21%

Figure 2. Data extracted from Microsoft Excel for coding category "classroom management" for all the lessons conducted in SJKC schools in Penang.

FINDINGS AND DISCUSSION

After the coding process and the calculation of the average percentage of coverage for all the characteristics identified from all the 45 lessons, the result is shown in Table 5 below.

Table 5
Average percentage of coverage for each category of activity per lesson

	%		%		%
Checking for individual understanding	21.87	Whole class Question and Answer (Q and A)	17.73	Reading Question (Reading Q)	6.82
Individual seat work	20.70	Class management	17.10	Spell the word	4.70
Teaching and explaining	19.16	Group work	9.30	Checking for whole class understanding	4.07
Desk instruction	17.92	Revision	7.48	Induction set	4.04
				Presentation	4.10

From the data we obtained, generally the teachers spent most of the time in checking individual understanding (21.87%), individual seatwork (20.70%), teaching and explaining (19.16%), follow by desk instruction (17.92%), whole class question and answer (17.73%), and class management (17.10%). From the lesson we observed, the teachers only assigned 9.30% of time for group work and 4.10% of time for the pupils' presentation.

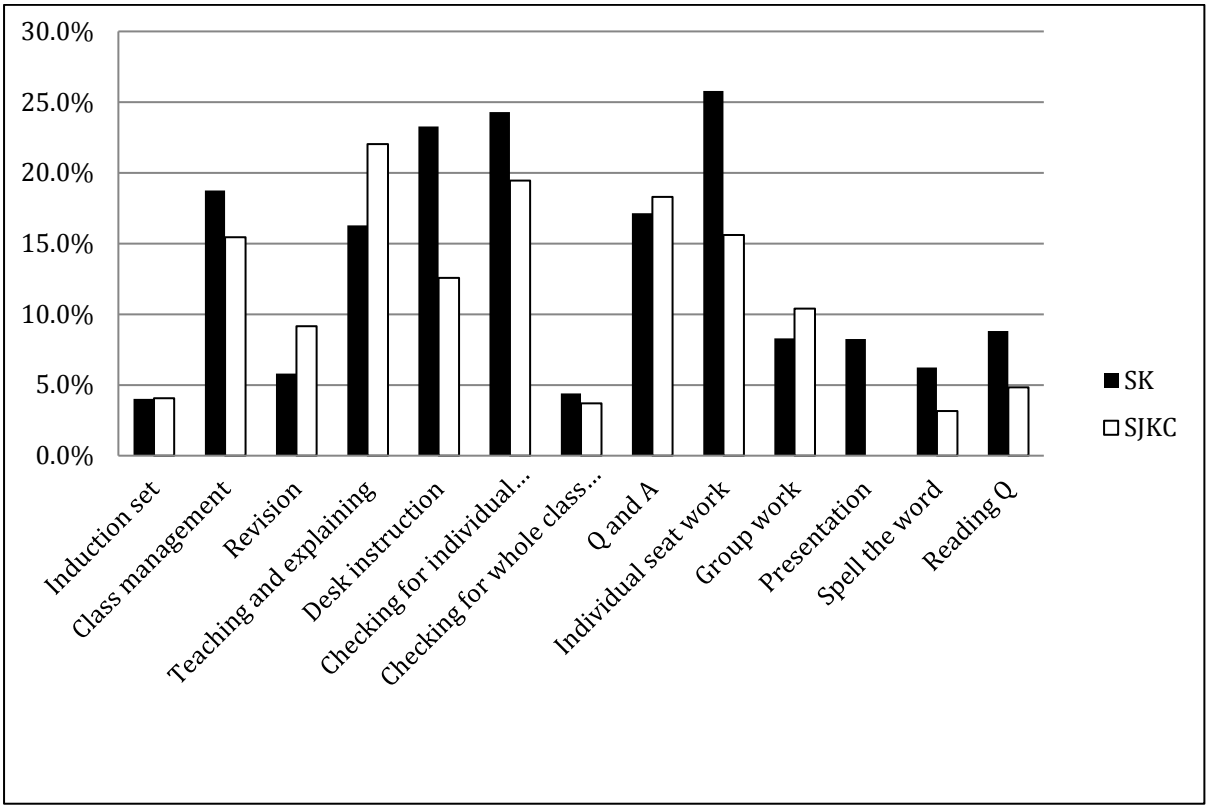

Figure 3. Comparison of characteristics of pedagogical practices between SK and SJKC

Figure 3 showed that the most significant difference between SK and SJKC was that the teachers of SK spent most of their time assigning individual seatwork (25.80%) and carrying out desk instruction (23.27%), while the teacher of SJKC spent most of their time in teaching and explaining the concept (22.04%). For example, in one of the SJKC schools, the teacher had spent time to explain how to measure length and the concept of length. This is similar with the result obtained by Tan (1995) whereby SK teacher assigned more individual seatwork and SJKC teacher tended to give more explanation.

Also, the teachers of SJKC carried out 3% more time spent on revision and nearly 2% more time spent on group work in the lesson compare to the teachers of SK whereas the teachers of SK asked the pupils to read aloud the questions more frequent than the teachers of SJKC. Besides, the teachers in SK preferred to ask their pupils to present their answers in front of the class immediately after completing their group discussion on the task given but this was not happening in SJKC. However, both SK and SJKC teachers spent almost the same percentage of time of a lesson in checking individual understanding, carry out induction set and checking whole class understanding.

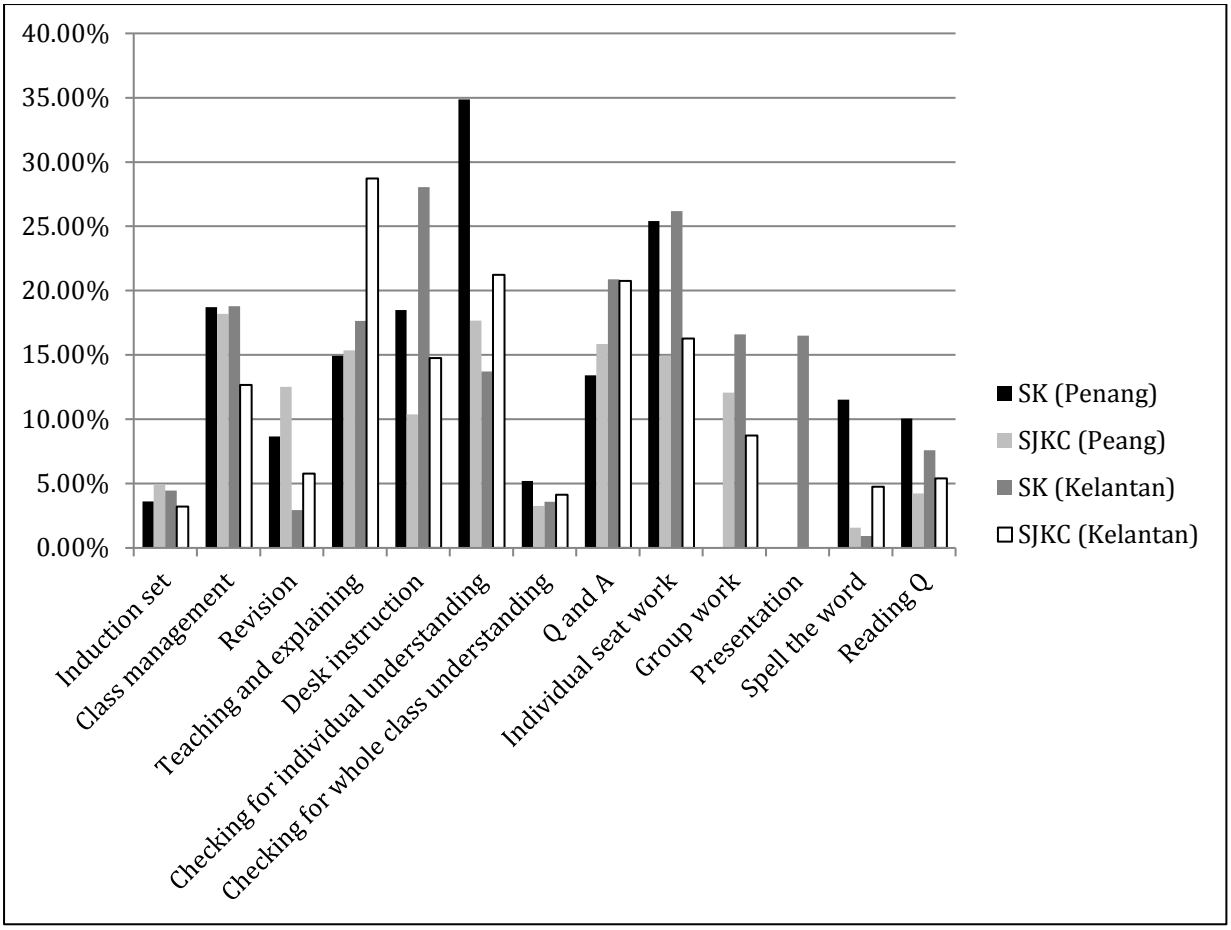

Figure 4: Comparison of pedagogical practices between SK and SJKC in Penang and Kelantan

As we take a closer look into the different types of schools in the two states as shown in Figure 4, teachers of SK in Penang appeared to spend most of their time in checking individual understanding (34.86%), followed by assigning individual seatwork (25.41%). However, teacher of SJKC in Penang spent the most time in class management (18.21%), followed by checking individual understanding (17.68%) and spent almost equal time for whole class question and answer (15.87%), teaching and explaining (15.36%) and individual seat work (14.49%). Teachers at SK in Kelantan, spent most of the time in desk instruction (28.04%), individual seatwork (26.19%), and whole class question and answer (20.88%). Furthermore, teacher at SJKC in Kelantan spent most of the time in teaching and explaining (28.73%), followed by checking individual understanding (21.23%) and whole class question and answer (20.75%). In addition, the data analysis shows that SK in Kelantan carried out group work and presentation, SJKC in Penang and Kelantan carried out group work only, while there was no group work and presentation observed in SK of Penang.

In general, we observed that 23 out of 24 participating teachers spent almost equal time with teaching and explaining the concept and to get a response from individual pupils during the lesson by posing questions. Besides, they also preferred to have whole class questions and answers session as well as individual seatwork to assess their pupils' thinking. Most of the teacher liked to walk from desk to desk especially when they assigned individual seatwork. Not much pupils to pupils interactions were observed in these mathematics classrooms. The results corresponded to some of the similarities as reported by Hiebert et al. (2003), Ruzlan (2007) and Tan (1995). Hiebert et al. (2003) reported that lessons across the seven countries in their study share some general characteristics, such as private individual work and teachers talked more than pupils during the lesson.

Furthermore, there were differences in mathematics lessons' pedagogical practices between SK and SJKC schools in Penang and Kelantan. Mathematics lessons in SK in Penang mainly consisted of the teachers posed questions to individual pupils. While in mathematics lessons of SJKC in Penang, the teachers spent more time on managing the classroom during the lessons observed. Teachers at SK in Kelantan had spent most of the time in desk instruction while the pupils were assigned with individual seatwork and group work sessions. Teachers at SJKC Kelantan had spent the most time in teaching and explaining in their mathematics lessons.

CONCLUSION

This study attempted to characterise the pedagogical practices of 45 mathematics lessons, delivered by 24 teachers from 12 primary schools. The researcher acknowledges this study is not able to generalise the pedagogical practices of these mathematics lessons to be the typical Malaysian mathematics lesson. There are limitations in terms of data collection where the classroom lesson was randomly selected, observed once, without specifying common topic and no fixed length of the lesson. Thus, the researcher opted to compare the percentage of coverage of the time taken for the activities involved to eliminate the effect of the duration of a lesson conducted. Besides, the researcher acknowledges that the pedagogical practices can be differ from lesson to lesson according to different phases of the topic taught, either at the beginning, middle or at the end of the topic.

The findings determine that the analytic software used in this study was able to identify the characteristic of the pedagogical practices in the mathematics classroom. This means of analysis method is still new in Malaysia and the findings show that the teaching and learning process of a lesson can be analysed through a simplified lens. Nevertheless, analysis of

pedagogical practices of mathematics lessons in Malaysia is still rare, thus this analysis provides us a chance to glimpse into what were the patterns of pedagogy carried out in some Malaysian mathematics lessons.

In addition, the findings reveal the pedagogical practices in Malaysian mathematics classroom involving mainly the teacher posing questions to the whole class or individual pupil, the teacher explaining the concept and pupils doing individual seatwork. Teachers in SK school prefer to assign individual seatwork during the lessons, while SJKC teachers spent most of their time in teaching and explaining the concept. SJKC school teachers do more lecturing during mathematics lessons that can be related to Confusion-Heritage Cultural (Biggs, 1994). In Penang, SK teachers prefer to check individual understanding and SJKC teachers do a lot of classroom management during the lessons. This could be due to the class size in SJKC Penang is relatively bigger which require more classroom management to be done. In Kelantan, SK teachers tend to assign individual seatwork and SJKC teachers conduct teaching and explaining the concept in mathematics classroom. The results serve as a documentation of pedagogical practices in Malaysia. It shows that different types of primary schools portray different pedagogical practices which reflect also different professional development programmes are needed to cater for different types of primary school.

In future, the research could include Tamil vernacular schools for comparisons of pedagogical practices between three types of primary schools in Malaysia. This kind of comparison requires a systematic description of the pedagogical practices involved in the classroom. Besides, more detailed and in-depth analysis of the activities identified during the lessons could be conducted. Further analysis of the lessons could be done to identify the kind of mathematical content involved, the way of teaching and explanation is done, the thinking level of questions being posed and the type of mathematical task that pupils participated during the lessons. While the results are interesting and provide some directions, a much larger study would be needed to determine if the results are due to the teachers' enthusiasm, geographical differences, cultural or social differences, or what is known as the Hawthorne Effect.

REFERENCES

Biggs, J. B. (1994). Asian learners through Western eyes: An astigmatic paradox. *Australian and New Zealand Journal of Vocational Educational Research, 2* (2), 40-63.

Chia, H. M. & Lim, C. S. (2014). Characterising the pedagogical flow of mathematics lessons of an expert teacher in Malaysian Chinese vernacular primary school. In A. L. White,

Suhaidah Tahir & U. H. Cheah (Eds), *Empowering the future generation through mathematics education* (pp. 385-395). SEAMEO RECSAM, Malaysia.

Chia, H. M. & Lim, C. S. (2015). *Comparing the pedagogical flow of two primary mathematics research lessons on the same topic of time*. Paper presented at International Conference on Science and Mathematics Education (CoSMED) 2015, 16-19 November, RECSAM, Malaysia.

Clarke, D.J. (2001) *Perspectives on Practice and Meaning in Mathematics and Science Classrooms.* Dordrecht: The Netherlands, Kluwer Academic Publishers.

Clarke, D., Keitel, C. & Shimizu, Y. (2006). The Learner's Perspective Study. *In D. Clarke, C. Keitel & Y. Shimizu (Eds.), Mathematics Classrooms in Twelve Countries: The Insider's Perspective.* Rotterdam/Taipei : Sense Publishers.

Creswell, J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches. (3rd ed.). California: Sage Publications, Inc.

Ellerton, Nerida, F. (2003). Summary of the best practices and innovations in the teaching and learning of mathematics in the represented APEC economies. In *Seminar Proceedings on Best Practices and Innovations in the Teaching and Learning of Science and Mathematics at the Primary School Level*, organized by the Educational Planning and Research Division, Ministry of Education, Malaysia. pp.208-223.

Givvin, K. B., Jacobs, J., Hollingsworth, H., & Hiebert, J. (2009). What is effective mathematics teaching? International educators' judgments of mathematics lessons from the TIMSS 1999 Video Study. In J. Cai, G. Kaiser, B. Perry & N.-Y. Wong (Eds.), *Effective mathematics teaching from teachers' perspectives: National and cross-national studies* (pp. 37-69). Rotterdam: Sense Publishers.

Kaur, B., Low, H.K. & Benedict. T.M. (2007). Some aspects of the pedagogical flow in three mathematics classrooms in Singapore. Paper presented at Redesigning Pedagogy: Culture, Knowledge and Understanding, Singapore.

Lim, C. S. (2006). In search of good practice and innovation in mathematics teaching and learning: A Malaysian perspective. *Tsukuba Journal of Educational Study in Mathematics, 25*, 205-220.

Lim, C. S. (2007). Characteristics of mathematics teaching in Shanghai, China: through the lens of a Malaysian. Mathematics Education Research Journal, 19(1), 77-89.

Lim, C. S., & Kor, L. K. (2012). 'Excellent' primary mathematics teacher's espoused and enacted values of effective lessons. *ZDM - The International Journal on Mathematics Education, 44*, 59-69.

Lim, C. S., Kor, L. K. & Chia, H. M. (2014). One mathematics teachers' evolving pedagogical practice through Lesson Study. In A. L. White, Suhaidah Tahir & U. H. Cheah (Eds), *Empowering the future generation through mathematics education* (pp. 64-76). SEAMEO RECSAM, Malaysia.

Lin, P.-J. & Li, Y. (2009). Searching for good mathematics instruction at primary school level valued in Taiwan. *ZDM—The International Journal on Mathematics Education, 41*, 363–378.

Ministry of Education. (2013). *Malaysia Education Blueprint 2013-2025 (Preschool to Post-Secondary Education)*. [online] Available at: https://www.moe.gov.my/images/dasar-kpm/articlefile_file_003108.pdf

Hiebert, J., Gallimore, R., Garnier, H., Bogard Givvin, K, Hollingworth, H., Jacobs, ... Stigler, J. (2003). *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Study*. Washington, DC: NCES.

Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students‘ learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Charlotte, NC: Information Age Publishers.

Hogan, D. (2008). Pedagogical practice and pedagogical research in South East Asia: The case of Singapore. Paper presented in the International Symposium: Teaching, Learning and Assessment, Hong Kong.

Park, K. & Leung, F.K.S. (2006). Mathematics Lesson in Korea: Teaching with Systematic Variation. In D. Clarke, C. Keitel & Y. Shimizu (Eds.), *Mathematics Classrooms in Twelve Countries: The Insider's Perspective* (pp 247 – 261). Rotterdam/Taipei : Sense Publishers.

Ruzlan Md. Ali (2007). Teacher talk in mathematics classrooms: Questioning to establish procedural competence. In U.H. Cheah, Y. Wahyudi, R.P.Devadason, K.T. Ng, J. A. Chavez & D.D. Mangao (Eds.), *Proceedings of the Second International Conference on Science and Mathematics Education (pp. 342-352).* Penang, Malaysia: SEAMEO Regional Centre for Education in Science and Mathematics.

Schmidt, W. H., Jorde, D., Cogan, L. S., Barrier, E., Gonzalo, I., Moser, U., Shimizu, K., Sawada, T., Valverde, G. A., Macknight, C., Wiley, D. E., Raizen, S. A., Britton, E. D. & Wolfe, R. G. (2002). *Characterizing pedagogical flow: An investigation of mathematics teaching in six countries*. Dordrecht: Kluwer.

Stigler, J. W., Gonzales, P., Kawanaka, T., Knoll, S., & Serrano, A. (1999). *The TIMSS Videotape Classroom Study: Methods and Findings from an Exploratory Research Project on Eighth-Grade Mathematics Instruction in Germany, Japan, and the United States.* Washington, DC: U.S. Government Printing Office.

Stigler, J.W. & Hiebert, J. (1999) *The Teaching Gap*. New York: NY, Free Press.

Tan, C. T. (1995). Pengajaran Matematik KBSR: Perbandingan dua buah sekolah rendah di Daerah Petaling, Selangor *[KBSR Mathematics teaching: A comparison of two primary schools in Petaling District of Selangor]* Unpublished M.Ed. Thesis, University of Malaya, Kuala Lumpur, Malaysia.

Tan, S. F. (2012) Characteristics of mathematics lesson valued as effective by excellent teachers and their pupils. Unpublished M.Ed. Thesis, Universiti Sains Malaysia, Pulau Pinang, Malaysia.

Thompson, C. S. (2005). Powerful pedagogy: Learning from and about teaching in an elementary literacy course. *Teaching and Teacher Education, 22*, 194–204.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Massachusetts: Harvard University Press.

Wragg, E.C. (1994). An Introduction to Classroom Observation. London: Routledge.

Zhang, D., Li, S. & Li, J. (2003). *数学教育学导论* [An introduction to mathematics education]. Beijing: Higher Education Press.