

Capturing Changes and Differences in Teacher Reflection through Lesson Study: A Comparison of Two Culturally Diverse Malaysian Primary Schools



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Abstract This chapter discusses the changes and differences in the levels of teacher reflection as they engaged in the lesson study (LS) process. Two culturally diverse primary schools were selected to form a LS group each. These schools were culturally different in terms of medium of instruction and ethnicity. Six mathematics teachers from School A and three mathematics teachers from School B participated in this study. Both groups conducted five LS cycles. The research lesson taught in each cycle varies in topic and grade level. Data were collected through video recording of lesson observation, reflection sessions, and interviews with the teachers and selected pupils. In this study, Hatton and Smith's four-level reflection framework (descriptive story, descriptive reflection, dialogic reflection, and critical reflection) was used as a basic structure to capture the changes in teacher reflection across the five LS cycles. Using the same framework, the differences in reflection between the two LS groups were also compared. Analysis of the data revealed that there were some slight and gradual changes in the levels of teacher reflection as they progressed

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from the first to the fifth reflection session. At the earlier LS cycles, teacher reflection was mainly at descriptive story level. However, their reflection gradually advanced to a higher level, the dialogic reflection at the later cycles. Although both groups were culturally different, there were not much observable differences in their levels of reflection after completing five LS cycles. This study suggests that LS as a teacher professional development program is able to nurture and foster the quality of teacher reflection.

Keywords Levels of reflection · Primary mathematics teachers · Lesson study · Cultural diversity

1 Introduction

Lesson study (LS) is a form of teacher professional development originated in Japan. It comprises four sequential steps: study, plan, do research lesson, and reflect. Teachers actively carry out LS to enrich instructional practice and to enhance students' learning. Tapping into its potential, researchers worldwide continually explore and expedite LS to achieve greater pedagogical goals. For instance, they have widened the scope of their studies to include both teacher learning (Meyer and Wilkerson 2011; Suh and Seshaiyer 2014) and student learning (Lasut 2013; Mak 2016). Other researchers engaged LS to promote teachers' questioning skills (Ong 2010), explore learners' observation skills (Myers 2012b), and for teacher reflection (Suratno and Iskandar 2010).

Since 2011, LS has attracted the attention of the Ministry of Education (MOE) of Malaysia. The Teacher Education Division was entrusted to promote professional development communities using LS as the core approach to improve teaching and learning. Consequently, the number of participating schools nationwide has multiplied considerably from the original 289 to more than 600 schools to date. In addition, review on these LS projects gave encouraging feedback. Among few, LS helps teachers in advancing their content knowledge and pedagogical content knowledge (Chiew and Jong 2009; Goh et al. 2007), enhances their teaching practices (Chia 2014; Ong 2010), strengthens teacher collaboration (Goh et al. 2007; Lim 2006), secured teachers' attention on student learning (Chiew and Jong 2009; Lim et al. 2005), improves student performance (e.g., Mak 2016), and promotes teacher reflection (Chiew 2009). However, study on Malaysian teachers' reflection is still scarce, and past studies did not examine details of reflection in-depth.

In LS, reflection occurs at the planning, teaching/observing, and reflecting stages (Suratno 2012; Suratno and Iskandar 2010). This study focused solely on teachers' reflection at the reflecting stage. It explored and studied the depth of teachers' reflection attained at four different levels. In the process, changes in reflection across five LS cycles from two LS groups based in two culturally diverse primary schools were documented. Results were compared and contrasted to screen for observable changes at different levels.

2 Literature and Theoretical Framework

This section delineates definition of reflection, types of reflection, and theories underlying the reflection in the LS.

2.1 Definition of Reflection

The notion of reflection was initiated by John Dewey (1859–1952). In his 1933 work, Dewey defined reflection as the “active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends” (1933, p. 9). Likewise, many other definitions were used by present-day researchers to describe reflection. Closely related to the aim of this study is Barnett and O’Mahony’s (2006) definition that reflection is “a learning process examining current or past practices, behaviors, or thoughts in order to make conscious choices about future actions” (p. 501). In essence it suggests that reflection is a learning process which includes hindsight, insight, and foresight. In this study, we adopted Barnett and O’Mahony’s (2006) definition of reflection, and we viewed reflection as “an intellectual activity carried out by a group of participants. They look back at the pupils’ learning during the research lesson. Thereafter, they identify the reasons for the occurring incidents and explore alternatives to improve pupils’ learning.” This view was informed by Hatton and Smith’s (1995) three natures of reflection (Descriptive, Dialogic, and Critical) for reflection on action (see Sect. 2.2.1 for more details).

2.2 Types and Levels of Teacher Reflection

In order to assess teachers’ reflection, researchers have developed several models to classify the different types or levels or dimensions of reflection. The earliest attempt to categorize the level of reflection was through Van Manen (1977) who staged a three-level reflection, namely, technical rationality, practical action, and critical reflection. Hatton and Smith (1995) expanded Van Manen’s three categories to form a four-category analytical framework consisting of descriptive writing, descriptive reflection, dialogic reflection, and critical reflection. Valli (1997) examined “what” and “how” do teachers think about in her literature review along with several teacher education programs and concluded that there are five types of reflection: technical reflection, reflection-in- and reflection-on-action, deliberative reflection, personalistic reflection, and critical reflection. Jay and Johnson (2002) proposed a typology showcasing three dimensions of reflection, namely, descriptive reflection, comparative reflection, and critical reflection. Ward and McCotter (2004) analyzed the reflective texts written by 13 pre-service teachers through grounded theory

approach. They developed a rubric consisting of four levels of reflection, namely, routine, technical, dialogic, and transformative. Each level was described from the dimensions of focus, inquiry, and change. Moreover, an in-depth analysis of the levels of reflection shows that teachers who reflect at higher level tend to look at the incidents from a number of perspectives prior to making judgment and decision for further action (Hatton and Smith 1995; Jay and Johnson 2002). Consequently, they gain insight and change or even improve their practice (Lee 2005; Ward and McCotter 2004).

Table 1 displays a summary of the types of reflection advocated by the researchers mentioned above and the respective year of their publication. Although the list is by no means exhaustive, it is sufficient to support the research framework of this study.

Of the many frameworks developed, Hatton and Smith's (1995) model was found helpful in identifying the levels of reflection and is popular in studies conducted in secondary schools and institutions of higher learning. Among a few studies that engage this model is, for instance, Myers (2012a) who examined 20 participating pre-service American teachers enrolled in a mathematics method course. Analysis of individual reflections and group reports revealed that the pre-service teachers' reflections were at the lowest levels: descriptive writing and descriptive reflection without any critical reflection reported. Most recently, Nurfaidah et al. (2017) investigated the development of levels of reflection encapsulated in reflective teaching practice of four Indonesian EFL pre-service teachers. They found that the

Table 1 Types of teacher reflection

Researcher (year of publication)	Types of reflection
Van Manen (1977)	Technical rationality
	Practical action
	Critical reflection
Hatton and Smith (1995)	Descriptive writing
	Descriptive reflection
	Dialogic reflection
	Critical reflection
Valli (1997)	Technical reflection
	Reflection-in and on-action
	Deliberative reflection
	Personalistic reflection
	Critical reflection
Jay and Johnson (2002)	Descriptive reflection
	Comparative reflection
	Critical reflection
Ward and McCotter (2004)	Routine
	Technical
	Dialogic
	Transformative

teachers' level of reflectivity resided at dialogic reflection and dialogic reflection. Similar to Myers' (2012a), no one attained the quality of critical reflection. Likewise, Iksan and Rahim's (2017) study on 17 Malaysian secondary teachers' reflection on teaching and learning mathematics through lesson study and video critique found that a majority of these teachers reflected at dialogue reflective stage. Some of these teachers reached descriptive reflective stage, and only few teachers advanced to critical reflective level.

In this study, we investigated teacher reflection using Hatton and Smith's (1995) four-category analytical framework consisting of descriptive writing, descriptive reflection, dialogic reflection, and critical reflection.

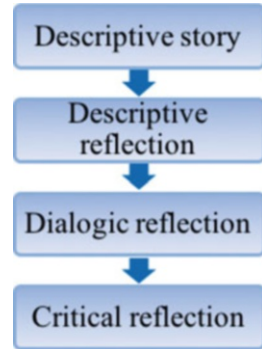
2.2.1 Hatton and Smith's Four-Level Reflection

Hatton and Smith's (1995) work in categorizing the levels of reflection was an extended development of Van Manen's three categories of reflection. In their study conducted at the University of Sydney focusing on reflective teaching, they investigated the types of reflection in 60 pre-service teachers' writing. Based on the analysis of the reports written by these teachers, Hatton and Smith categorized four types of writing: descriptive writing, descriptive reflection, dialogic reflection, and critical reflection. They elaborated that critical reflection is at the highest level in which practitioners become increasingly aware of the problematic nature of their actions and begin to search and examine why things occur the way they do. It is subjected to the historical and sociopolitical context of an event or action and is more demanding as it requires knowledge and experience to develop. In descriptive reflection, teachers attempt to provide the reason and justification besides reporting the incidents. Dialogic reflection is analytical in nature. It requires the use of judgments and other possible alternatives of explaining and hypothesizing to explore the experience, events, and actions. Lastly the descriptive writing is nonreflective as it merely describes events without supporting reasons and justification.

Descriptive reflection, dialogic reflection, and critical reflection are all reflective. The highest level is the critical reflection. The lowest level is the nonreflective descriptive story. Figure 1 shows the four levels arranged according to developmental sequence.

In this study, we stress on the word "level" to underline the hierarchical nature of the four types of reflection. We replaced the original term "descriptive writing" to "descriptive story" which we adopted from Suratno and Iskandar (2010). Suratno and Iskandar used the term "story" to evaluate teachers' written reflection and oral reflection which is similar to the forms of data collected in this study. For this study, we drew on Hatton and Smith's (1995) four-level reflection as the research framework and the analytical tool.

Fig. 1 The hierarchical four-level reflection model



2.2.2 The Language Factor

It should be noted that there are also contextual aspects that need to be considered when conducting reflection sessions. For example, the issue of language and communication skills may actually hamper some participants from engaging in a thorough discussion. Posthuma (2012) asserts that language is a contextual factor that possibly influences participants' reflective practice. In her study she found that the participating teachers struggled to express themselves when they were asked to reflect in English, which was not their home language. In this respect, we sought to minimize the effect of language incompetency in teachers' reflection in this study by allowing the participating teachers to use their mother tongue when they were reflecting.

2.3 The Theoretical Framework

Figure 2 shows the theoretical framework of this study. Situated learning theory (Lave and Wenger 1991) theorizes that there are novice and expert in a community of practice. The community of practice in this study refers to the lesson study groups set up by the teachers and researchers (who played the role of knowledgeable others). The novices were teachers who were new to the lesson study and reflection in lesson study. Meanwhile, the experts were teachers or knowledgeable others who were familiar with lesson study or were able to reflect at higher level.

In Fig. 2, lesson study cycle is the practice of the community. There are four sequential steps in a lesson study cycle (Lewis 2009), namely, (1) Study, (2) Plan, (3) Do, and (4) Reflect. Suratno and Iskandar (2010) claim that reflection is the heart of lesson study as it is found not only in the Step 4 but in all the steps. They believe that every lesson study group applies different kinds of analysis in reflection. As Fig. 2 shows, prospective analysis is used when doing a study and planning. Situated analysis is applied during the research lesson in Step 3. Finally, retrospective analysis is applied when teachers are reflecting in Step 4.

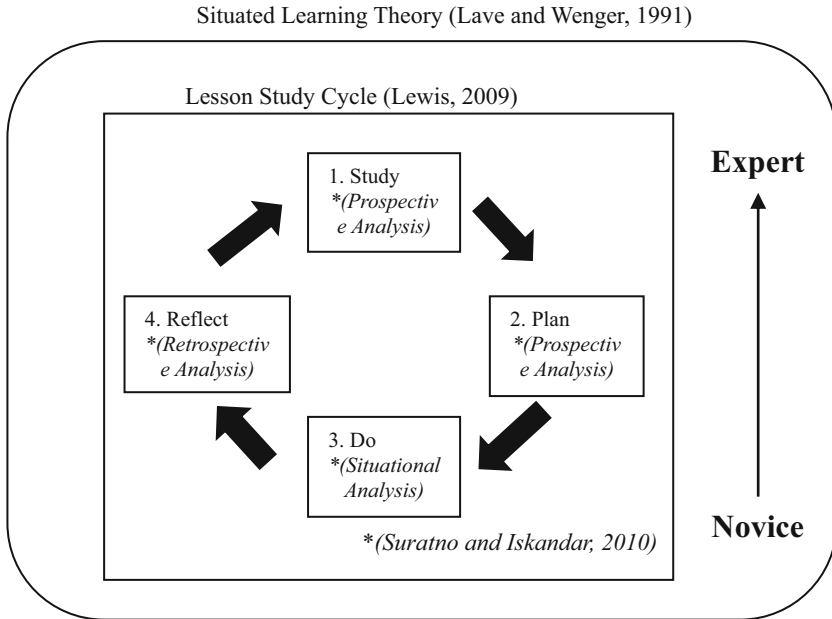


Fig. 2 The theoretical framework

This study examined and discussed reflection at Step 4 only as it was at this instance the participating teachers and researchers came together to contemplate retrospective practice or working through reflection-on-action (Hatton and Smith 1995; Schön 1983). As the teachers participated in the lesson study cycles, they collaborate and interact with other novices and experts in the community of practices. The novice teachers internalize the culture and belief of the community of practice and eventually mold to become experts.

3 Methods

In this section, we describe the background of the participants of the study. Besides, we also discuss the process of lesson study conducted by the two lesson study groups. Lastly, methods of data collection and data analysis are presented.

3.1 *The Setting: The Participating School, the Lesson Study Groups, and the Teacher Participants*

There are three mainstream primary schools in Malaysia. They are the national school, the national type Chinese school, and the national type Tamil school.

Although these three types of school adhere to the same curriculum, they are different in the medium of instruction and the ethnicity of the pupils. In national school, most of the pupils and teachers are Malay. The medium of instruction is the Malay language. Meanwhile, the majority of the pupils and teachers in national type Chinese school are Chinese. They use Mandarin as their medium of instruction. Likewise, in the national type Tamil school, most of the pupils and teachers are Indian, and they use Tamil as their instructional medium.

This chapter discusses LS conducted in national school and national type Chinese school. LS in Tamil school was not discussed because more time is needed to decipher the Tamil language.

3.1.1 Lesson Study Group A

Lesson Study Group A was set up in a national type Chinese school. This school was a small school located in a rural area. It has a headmaster, 10 teachers, and 138 pupils in the school. There was only one class in each grade. The school daily session started at 7:40 am and ended at 1:10 pm, operating from Monday to Friday. The school had just moved into its new building when the study was initiated. The new building was well equipped with computer laboratory, science laboratory, mathematics laboratory, library, music room, and audiovisual room. Interactive whiteboards were installed in some of the classrooms.

Lesson Study Group A was initiated to all four mathematics teachers in the school, known as TA1, TA2, TA3, and TA4. Table 2 displays the background information of the participating teachers. In this chapter, all the participating teachers were given codes starting from “T,” whereas the researchers or knowledgeable others were given codes starting from “R.” “TA” refers to teachers from Lesson Study Group A, while “TB” indicates teachers from Lesson Study Group B.

Lesson Study Group A conducted five LS cycles. However, only TA1, TA2, and TA4 participated in all the five LS cycles. TA3 joined the first three LS cycles, and he was transferred to other schools after the third LS cycle. TA5 and TA6 were new mathematics teachers who joined the school after TA3 left the school. Both of them were invited to be part of the LS group. So, both of them only conducted the fourth and fifth LS cycles. Table 3 displays the overall participation of the six participating teachers in the five LS cycles.

Table 2 Background information of the participating teachers in LS Group A

Participant	Gender	Teaching experience (year)	Mathematics teaching (level)
TA1	Male	1	Year 4
TA2	Female	5	Year 5
TA3	Male	4	(Year 1–6) tutoring classes
TA4	Female	7	Year 1 and 6
TA5	Female	10	Year 2
TA6	Female	6	Year 3

Table 3 Attendance of participants in Lesson Study Group A

Participant	LS1				LS2		LS3		LS4		LS5	
	Setting goal 2 February 2012	Refining lesson plan 15 June 2012	Research lesson and reflection 29 June 2012	Refining lesson plan 22 October 2012	Research lesson and reflection 29 October 2012	Refining lesson plan 9 May 2013	Research lesson and reflection 11 June 2013	Refining lesson plan 15 January 2014	Research lesson and reflection 22 January 2014	Refining lesson plan 25 February 2014	Research lesson and reflection 20 March 2014	
TA1	✓	✓	✓*	✓	✓	✓	✓	✓	✓	✓	✓	
TA2	✓	✓	✓	✓	✓*		✓*	✓	✓	✓	✓	
TA3	✓	✓	✓	✓		✓	✓					
TA4	✓	✓	✓	✓	✓	✓	✓	✓	✓*	✓	✓	
TA5								✓	✓	✓	✓	
TA6								✓	✓	✓	✓*	
RL	✓	✓	✓	✓	✓		✓					
RO					✓		✓					
RF					✓	✓	✓	✓	✓	✓	✓	
Key												
✓	Teacher who attended the session											
✓*	Teacher who taught the research lesson											

All the six teachers were mathematics teachers in the school. They were teaching mathematics at different grades of the school. Their teaching experience ranged from 1 year to 10 years. Other than these six teachers, there were three knowledgeable others involved in the LS process, who were RL, RO, and RF.

RL and RO were lecturers from a local higher institution. Both of them had 30 over years of teaching mathematics experience. RF was a postgraduate student who had about 2 years of teaching experience.

LS cycles were conducted based on the teachers' availability, and convenience were put on hold when the teachers were busy with school events, like school opening, examination, and sport's day. Lesson Study Group A spent about 2 years to complete five lesson study cycles. They started in February 2012 and ended in March 2014. They conducted two cycles in the year 2012, one cycle in the year 2013, and two cycles in the year 2014. The teachers started with the preparation of lesson plan. The researchers joined in thereafter to refine the lesson plan during their visit to school. The teachers then conducted the research lesson and held reflection session immediately after the lesson. The duration of the sessions between refining lesson plan and research lesson and reflection throughout the LS cycles lasted from a week to a month (see Table 3).

3.1.2 Lesson Study Group B

Lesson Study Group B was set up in a national school. This school was a small school located in the rural area. It has a headmaster, 18 teachers, and 172 pupils. The school's daily session started at 7:45 am and ended at 2:15 pm. There was only one class in each grade.

Lesson Study Group B consisted of three teachers. Table 4 presents the background information of these three participating teachers. They were the mathematics teachers in their school, teaching mathematics at different grades. Three of them conducted five lesson study cycles together as exhibited in Table 5.

There were six knowledgeable others who participated in Lesson Study Group B, who were RL, RC, RS, RK, RF, and RM, as listed in Table 5. RL, RC, RS, and RK were lecturers from higher institution who had about 30 years of teaching mathematics experience, while RF and RM were postgraduate students. RM had about 5 years of teaching mathematics experience, and RF had 2 years of teaching mathematics experience when they participated in the study.

As shown in Table 5, Lesson Study Group B conducted five lesson study cycles in about two and a half years. They conducted the research lesson 1 or 2 weeks after the refining lesson plan session. Like Lesson Study Group A, they carried out the reflection session immediately after each research lesson.

Lesson Study Group B was participated by six knowledgeable others, while Lesson Study Group A had only three. Since not all the six took part in observing the lesson study cycles at the same time, there is no obvious impact in the level of reflection from the participating teachers.

Table 4 Background information of the participating teachers in Lesson Study Group B

Participants	Gender	Teaching experience (year)	Mathematics teaching (level)
TB1	Male	14	Year 2, 4, and 6
TB2	Female	23	Year 5
TB3	Male	6	Year 1

3.2 *The Process of Conducting the Lesson Study*

As mentioned in the previous section, both Lesson Study Groups A and B carried out five LS cycles. The LS cycles were adapted from Chiew (2009) who followed the sequential procedure: (1) identify and formulate goals; (2) plan lesson plan collaboratively; (3) teach/observe research lesson; and (4) reflect and refine lesson plan.

Both lesson study groups delivered their research lessons to different groups and levels of pupils. The topics of the research lessons were also different, as shown in Table 6. Topics chosen by the teachers were those they found difficult to teach or learned by the pupils. They did not reteach the research lesson after refining the lesson plan because there was only one class in each grade in both schools.

3.3 *Data Collection*

Qualitative data was collected through participatory observation, reflection sessions, and collection of artifacts.

(i) *Participatory observation*

The researchers played the roles as participant as well as observer in this study. They participated in the steps: (2) plan lesson plan collaboratively; (3) teach/observe research lesson; and (4) reflect and refine lesson plan. The researchers observed the teachers’ activities, behavior, commitment, as well as interaction among them. They recorded their observation by writing field note.

As the participants, the researchers assumed the roles of the knowledgeable others. They guided the teachers the process of LS, like the preparation of detailed lesson plan and the way of observing the research lessons. During the reflection sessions, the knowledgeable others gave final comments after all the teachers have given their reflections.

(ii) *Reflection sessions*

Both Lesson Study Groups A and B conducted five lesson study cycles; therefore, there were a total of five reflection sessions in both groups, respectively. All the reflection sessions began with the teacher who taught the research lesson reflected on his/her own research lesson. Then, other observing teachers took turns

Table 5 Attendance of participants in Lesson Study Group B

Participants	LS1		LS2		LS3		LS4		LS5		
	Setting goal 14 November 2011	Refining lesson plan 30 April 2012	Research lesson and reflection 10 May 2012	Refining lesson plan 26 June 2012	Research lesson and reflection 4 July 2012	Refining lesson plan 25 February 2013	Research lesson and reflection 11 March 2013	Refining lesson plan 11 July 2013	Research lesson and reflection 25 July 2013	Refining lesson plan 24 February 2014	Research lesson and reflection 3 March 2014
TB1	√	√	√*	√	√	√	√	√	√	√	√*
TB2	√	√	√	√	√*	√	√	√	√	√	√
TB3	√	√	√	√	√	√	√*	√	√*	√	√
RL	√		√		√	√	√		√		
RC	√	√	√	√	√	√	√				
RS	√		√								
RK											
RF							√			√	√
RM											√
Key											
√	Teacher who attended the session										
√*	Teacher who taught the research lesson										

Table 6 Topics and grade levels of research lessons

Lesson Study Group A		
Lesson study cycle	Topic of research lesson	Grade level
LS1	Conversion of time and calculation of interval of time	4
LS2	Calculation of the volume of cubes and cuboids	4
LS3	Calculation of volume	4
LS4	Proper fraction and equivalent fraction	3
LS5	Improper fraction and mixed number	4
Lesson Study Group B		
Lesson study cycle	Topic of research lesson	Grade level
LS1	Duration	6
LS2	Mass	5
LS3	Whole number	6
LS4	Measurement in length	4
LS5	Fraction	3

to reflect on the research lesson. Lastly the knowledgeable others gave the final comments. All the reflection sessions were video recorded with permission for data analysis purpose.

(iii) *Collection of artifacts*

The artifacts collected included the lesson plans, observation sheets, and worksheets or handouts given by the teachers. During the research lessons, all the observing teachers and knowledgeable others were given an observation sheet. The observation sheet guided the observing teachers and knowledgeable others what to observe during the research lesson. They filled in their observation in the observation sheets when they were observing the research lesson. Then, they reflected based on the observation sheets they have filled in during the reflection sessions.

3.4 *Data Analysis*

All the videos of reflection sessions were transcribed in verbatim in Chinese (for Lesson Study Group A) and Malay (for Lesson Study Group B). Analysis of the transcripts was performed based on the original language. First, the transcripts were divided into segments. A segment means a part of the transcript which was related to a topic of theme of reflection. It ended when the topic of reflection changed. The length of the segment could be as short as a sentence from a participant, for instance, “for those students who are weak [academically], we should give them more attention” (TB2, LS1). Or it could be several utterances from different participants. An utterance refers to an uninterrupted chain of spoken language. For example, when RL and TB2 discussed ways to relate the lesson with the pupils’ real life during the first reflection session:

- RL: Actually, can also conduct very simple activity, like, when [the pupils] are wearing shoes, going to wash their hands, what is the duration. . .
- TB2: Sometimes they use the concept, but they don't know.
- RL: Yes.
- TB2: They applied [in their real life] but they are not aware of.

Then, all the segments were coded to the four levels of reflection as advocated by Hatton and Smith (1995), which comprised of descriptive story, descriptive reflection, dialogic reflection, and critical reflection. Triangulation of the reflection transcripts, observation sheets, lesson plans, worksheets, and field notes was also conducted. The percentages of utterances at each level of reflection were tabulated using NVivo software.

After analyzing the levels of reflection of each reflection sessions, the levels of reflection were compared across the five reflection sessions to explore the changes of levels of reflection across the five reflection sessions. Lastly, the results from both Lesson Study Groups A and B were compared to study the similarities and differences between the two groups in terms of the levels of reflection.

4 Results

This section reports the levels of teachers' reflection in both Lesson Study Groups A and B, separately. Next, the levels of teachers' reflection in Lesson Study Group A will be compared with those of Lesson Study Group B to explore the similarities or differences between the two groups.

4.1 Teachers' Levels of Reflection in Lesson Study Group A

Figure 3 displays the percentage of utterances of the four levels of reflection in Lesson Study Group A across the five lesson study cycles. During the first reflection session, more than half of the utterances (54.62%) were at descriptive story level. The participants, especially the teachers, merely described the pupils' learning, teacher's time management, and teaching strategies used during the research lesson, without further analysis or intention to improve the lesson. For instance, TB3 described that "at the beginning, [the pupils] were shy, not engaged yet, [but] during the activity of creating question, [they] were more daring to talk, voice out actively, contribute [ideas to the group]" (LS1).

More a quarter of the utterances of the first reflection session (27.69%) were at dialogic reflection level. The utterances at this level were contributed by both the teachers and knowledgeable others. They did not analyze the incidents from several perspectives, but they gave suggestions to improve the lesson. For example, the

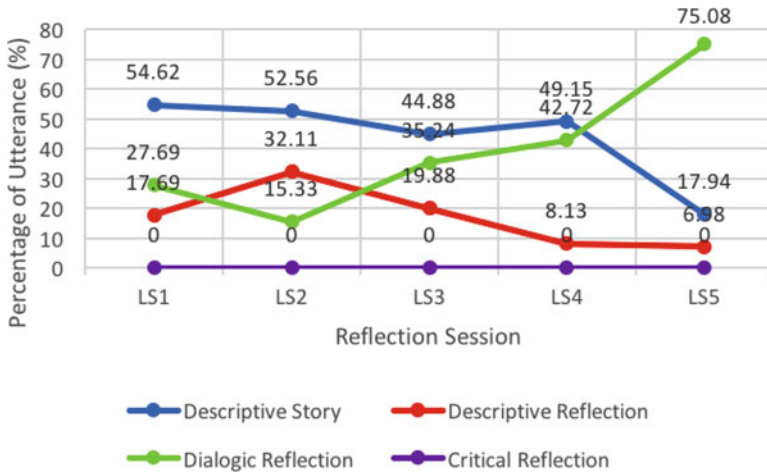


Fig. 3 The percentage of utterances of the four reflection levels across the five reflection sessions in Lesson Study Group A

teachers and knowledgeable others found that the pupils did not understand the concept of “Golden Hour” which was the concept taught in the first research lesson. Thus, they proposed some ways to refine the lesson. TB3 suggested adding a context of disaster, as he mentioned: “explain what is going to happen, [some victims] injured, buried under the soil, nothing to eat, no drink, so you think they can stay for how long?” (LS1). RL also gave similar suggestion, “add [some episodes where] some victims were injured... some people were injured and some people were buried [in the video]” (LS1).

The second level of reflection is descriptive reflection. Only 17.69% of the utterances were at this level during the first reflection session. Out of the 17.69%, 7.06% of the utterances came from TA1, the teacher who taught the first research lesson. He gave justifications when other participants commented on the research lesson. For instance, TA2 commented that the teacher should give more opportunities for the pupils to involve or express in the class. Regarding this comment, TA1 justified that he planned to get the pupils to explain their answers; however, he eliminated this section because “not enough time. [Besides], the pupils were not good in explaining. They know the way of calculating, but, they don’t know how to explain” (LS1).

As Lesson Study Group A progressed from the first to the fifth lesson study cycles, the percentages of utterances at each levels of reflection gradually changed. The percentages of utterances at the first level, descriptive story, gradually dropped to 17.94% during the last reflection session.

On the other hand, the percentage of utterances at dialogic reflection level gradually increased to 75.08% during the fifth reflection session. As displayed in Table 7, the teachers’ (TA1, TA2, and TA4, who participated in all the five reflection

Table 7 Percentage of utterances of each participant at dialogic reflection level across the five reflection sessions

Participants	Reflection Session				
	LS1	LS2	LS3	LS4	LS5
TA1	3.06	2.79	0.31	3.21	8.90
TA2	13.55	5.12	11.06	18.04	27.32
TA3	6.64	–	3.26		
TA4	0.22	1.30	4.75	5.42	7.62
TA5				4.57	3.36
TA6				5.41	21.81
RL	4.22	3.10	5.30		
RO		3.01	9.87		
RF			0.69	6.07	6.07
	27.69	15.33	35.24	42.72	75.08

sessions) utterance at dialogic level gradually increased from the first to the fifth reflection session. It was because the participating teachers analyzed or viewed the incidents from several perspectives. For examples, during the fifth reflection session, the teachers found the pupils' misconceptions in determining the denominator of the improper fraction. The pupils added up all the portions in the diagrams to get the denominator. The teachers analyzed this problem first from the perspectives of pupils' prior knowledge. TA2 suspected that "the pupils have not mastered the basic concept of the fraction" (LS5). However, her comment was rejected by TA4 and TA6. TA6 linked the pupils' misconception with the previous lesson, where the pupils learned about the basic concept of proper fraction, "could it be because the pupils were confused about the concept taught in the previous lesson? Because in that lesson, we taught them to count all the portions" (LS5). Nonetheless, the statement was rejected again by the group members. At the end of the discussion, all the teachers agreed that the misconception was caused by the instructional content delivered in that particular research lesson. TA4 concluded that "the teacher did not emphasize that there are many pieces, but you should not count all the portions, you only count the number of portions in one piece" (LS5).

Other than analyzing the problem from several perspectives, the high percentage of utterances at dialogic reflection level was also due to the teachers, and knowledgeable others gave more suggestions to improve the lesson. Their suggestions were more concrete, specific, and detailed.

Next, the percentages of utterances at the descriptive reflection level in all the five reflection sessions were not high. The teachers and researchers seldom justified the reasons of the incidents happened in the research lesson. Teachers who taught the research lesson would justify the reason of his/her teaching when commented by about their teaching.

Critical reflection was the highest level of reflection among the four levels. Nevertheless, none of the teachers and researchers reflected at this level across the five reflection sessions.

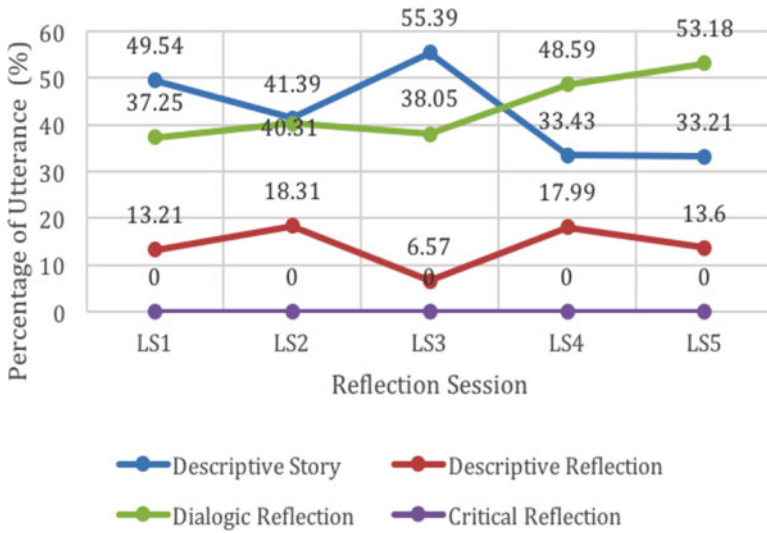


Fig. 4 The percentage of utterances of the four reflection levels across the five reflection sessions in Lesson Study Group B

4.2 Teachers’ Levels of Reflection in Lesson Study Group B

This section discusses about the reflection of teachers and knowledgeable others from Lesson Study Group B. Figure 4 displays the percentage of utterances at the four levels of reflection across the five reflection sessions.

As shown in Fig. 4, the percentage of utterances at the descriptive story was high at the early stages of lesson study, which were 49.54%, 41.39%, and 55.39% in the first, second, and third reflection sessions, respectively. The participating teachers and researchers merely described the incidents in the research lesson, like pupils’ learning, pupils’ behavior, teaching strategy, and mathematical task. For instance,

The pupils were not sure how to use the timelines of hour and minute (TB1, LS1).
 The time taken for discussing the pupils’ answers was a bit longer [than expected] (TB3, LS3).

The second level of reflection is descriptive reflection. The percentages of utterances at this level were relatively low if compared with those of descriptive story and dialogic reflection, ranging from 6.57% to 18.31%. Most of the utterances at this level were contributed by the teachers who taught the research lessons. They justified their reasons when the other participating teachers or knowledgeable others commented on their research lesson. For example, during the second reflection, RC commented that TB2 who taught the research lesson did not get

the pupils to present their answers as indicated in lesson plan, showed all the correct answers instead. Based on the comment, TB2 justified that she changed the plan because “I was lacking of time” (LS2).

The third level of reflection is dialogic reflection. As shown in the Fig. 4, the percentage of utterances at dialogic reflection was quite high across the five reflection sessions. However, most of the utterances at this level during the first three reflection sessions were contributed by the knowledgeable others. As shown in Table 8, 9.30%, 14.16%, and 3.7% out of the 37.25% of the utterance during the first reflection session were contributed by the knowledgeable others RL, RC, and RS, respectively. Similarly, during the second reflection session, RL and RC contributed 15.98% and 8.24% out of the 40.31% of utterances, which were at dialogic reflection level. It was because the knowledgeable others gave a lot of suggestions to improve the lesson during the reflection session.

As the teachers progressed to the fourth and fifth reflection sessions, they started to reflect at dialogic reflection level. The percentages of their utterances at dialogic reflection level increased. For instance, the percentage of TB1’s utterances at this level were 14.31% and 10.98%, respectively, during the fourth and fifth reflection sessions, respectively. The participating teachers gave lots of suggestions to refine the lesson, for instance, “prepare two sets of questions in the envelope, one as given, for the high performers, I should prepare another [set of] questions, maybe with diagrams only, no numbers. So, the pupils find out the equivalent fractions based on the diagram provided, for the low performers” (TB1, LS5). Their suggestions were more specific, and they elaborated the benefits or importance of the new ideas.

Lastly, critical reflection is the highest level of reflection. However, none of the participating teachers and knowledgeable others reflected at this level in the five reflection sessions.

Table 8 Percentage of utterances of each participant at dialogic reflection level across the five reflection sessions

Participants	Reflection session				
	LS1	LS2	LS3	LS4	LS5
TB1	4.94	10.07	7.39	14.31	10.98
TB2	3.88	4.12	5.27	8.19	14.56
TB3	1.27	1.90	0.99	5.84	11.78
RL	9.30	15.98	14.42	16.62	
RC	14.16	8.24	2.62		
RS	3.70				
RK			7.35		
RF				3.64	13.75
RM					2.12
	37.25	40.31	38.05	48.59	53.18

4.3 Comparison Between the Levels of Reflection of Participants from Lesson Study Groups A and B

In both lesson study groups, the percentages of utterances at descriptive story levels were high at the beginning stages. It was because most of the participants, especially the participating teachers, merely described the incidents which happened during the research lessons. However, the percentages utterances at this level decreased as the participants progressed to the later stages of lesson study.

The percentages of utterances at dialogic reflection level were the second highest. This trend was shown in both Lesson Study Groups A and B. In Lesson Study Group B, at the beginning stages, most of utterances at this level were contributed by the knowledgeable others. It was because the teachers did not articulate much during the reflection sessions. Although the participating teachers also gave comments in improving the lesson, their suggestions were short, simple, and general. On the other hand, even though percentages of utterance at this level in Lesson Study Group A were low at the beginning stages, those utterances were contributed by both the participating teachers and researchers.

Although the trends of percentage of utterance at dialogic reflection level were a bit different between the two LS groups, both groups showed an increase in the percentage of utterances at the later stages of lesson study. The participating teachers started to analyze the lesson from several perspectives. Besides giving more suggestions to improve the lesson, their suggestions were more specific and elaborated.

Descriptive reflection is the second level of reflection. The percentages of utterances at this level were relatively low if compared with those of descriptive story and dialogic reflection, in both lesson study groups. It was because most of the utterances at this level were contributed by the teachers who taught the research lessons. They justified their reasons when other teachers or knowledgeable others commented on their lessons.

In both cases, none of the participating teachers and knowledgeable others reflect at the highest level, critical reflection level.

5 Discussions and Conclusion

This chapter discusses the changes and differences in the levels of teacher reflection as they engaged in the LS process. Two culturally diverse primary schools were selected to form a LS group each. Although we compared two lesson study groups which were set up at two schools which were culturally different, we found not much observable differences in the levels of reflection after completing five LS cycles. In both lesson study groups, most of the recorded utterances of teacher reflection at the beginning were mainly at descriptive story level. This finding is consistent with Myers' (2012a) finding. In her study, the teachers conducted one lesson study cycle,

and their reflection was found predominantly at the descriptive story level. So, the high percentage of utterances at descriptive story level at the beginning stages in the present study could be attributed to teachers unfamiliar with LS and had yet to acquire the reflective skills.

As the teachers progressed to the later stages of LS, their reflection was noted to shift to a higher level, the dialogic reflection. This finding aligns with the situated learning theory developed by Lave and Wenger (1991). The theory posits that learning is embedded within activity, context, and culture. Applying the theory, we explain that as the participating teachers reflected together with their peers and knowledgeable others in the LS group, they observed and learned the tactic of dialogic reflection. At the end they emulated successfully the dialogic reflection after taking part in several reflection sessions.

However, an important point to note in this study is none of the teachers and knowledgeable others in both LS groups reflected at critical reflection level, which is the highest level of reflection. In the future, researchers may consider introducing workshop on reflection in order to foster reflective skills. Teachers and knowledgeable others can be trained to reflect at critical reflection level.

Results of comparison in levels of reflection between the two LS groups in two cultural diverse primary schools showed that neither culture nor ethnicity of the participants has affected their reflection. Instead, it was the knowledgeable others and the interaction within the group that augmented the quality of reflection. In both cases, the knowledgeable others in the Lesson Study Group B were capable in reflecting at the dialogic reflection level even at the early stages of LS. Modeling the knowledgeable group, the rest of the participating teachers in the same group were able to gradually reflect at dialogic reflection level as they progressed to the fourth and fifth reflection sessions.

The findings of this study also showed that after five reflection sessions, there were some noticeable positive changes in the content as well as the level of teacher reflection. These observed changes included (i) improvement in the depth of reflection when reflecting on pupils' learning, (ii) development of the awareness about all possible misconceptions and confusions underlying pupils' learning, (iii) reflection with critical lenses, and (iv) improvement in teachers' reflection at the descriptive story level at the beginning stages to the dialogic reflection level at the later stages of the lesson study. These findings are in agreement to Suratno and Iskandar (2010) and Chiew (2009) that to some extent lesson study is feasible in promoting the reflection among teachers.

Research literature suggests that knowledgeable others play crucial roles in facilitating discussion (Huang and Shimizu 2016; Takahashi 2014). As such, we recommend highly that future study may continue to examine the nature and pattern of reflection from two groups: teacher vs. knowledgeable other. Nonetheless, we uphold Takahashi's view that more reflection sessions in lesson study are needed to observe more visible changes in teacher reflection. We conclude that LS as a teacher professional development program is able to nurture and foster the quality of teacher reflection.

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