

Assessing for Improvement of Teaching and Learning through Lesson Study Collaboration

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Abstract

Teaching and assessing are closely inter-related. Assessing is an on-going process that aims to understand and improve students' learning. Hence, all teachers need to equip with assessing skills that will not only inform them of their students' understanding of the subject matter but also help to improve their instruction strategies to enhance learning. One way to enhance assessing is through reflection, and reflection is one of the prominent features in lesson study. This paper aims to discuss how teachers' reflection in two cases of lesson study collaboration has helped to change teachers' instructions to assess students' learning. In sum, changing instructions to assess students' learning and using students' assessment to inform teaching can lead to key improvement of teaching.

Introduction

Teachers teach so that students learn, this is the primary aim of any classroom teaching. To see if this happens, the teacher assesses his/her pupils all the time. As defined by Angelo (1995), assessment refers to "an ongoing process" which "aimed at understanding and improving student learning" (p.7). Likewise, White (2007) proposed that assessment should be "seen as a process for gathering evidence and making judgement about students' needs, strengths, abilities and achievements" (p.44). Hence, when we talk about assessing, we should be talking more about the process, rather than the product.

However, depending on the aims and objectives of assessment, there are three major types of assessment:

- a) **Assessment of learning** which often refers to summative assessment that provides a grading or comparing a student's achievement with a standard. The emphasis is on what the student has achieved as compared to what has been intended or to a predetermined standard.
- b) **Assessment as learning** involves the students actively in setting the goals of instruction and criteria for performance, and the assessing occurs throughout the learning process. The aim is making assessment part of a learning process.
- c) **Assessment for learning** was defined by Black et al., (2004) as "any assessment for which the first priority in its design and practice is to serve the purpose of promoting students' learning".(p.10)

Indeed, all the three types of assessment differ in its design and serve its own purposes. While assessment of learning serves the purpose of providing accountability, ranking or certifying competency; assessment for learning is more making use of “assessment activity to provide information that teachers and their students can use as a feedback in assessing themselves and one another and in modifying the teaching and learning activities in which they are engaged” (Black et al., 2004, p.10). This view is also quoted in the document of Assessment Standards for School Mathematics by the National Council of Teachers of Mathematics (NCTM, 1995) that, “although assessment is done for a variety of reasons, its main goal is to advance students’ learning and inform teachers as they make instructional decisions” (p.13).

Stiggins (2002) argued that both assessment of learning and assessment for learning are essential, but the former is currently much more emphasised while the latter was still absent in many American classrooms. In our opinion, assessment for learning is also lacking in Malaysian school context as Malaysian school culture is also very much examination oriented which tended to focus on students’ summative achievement and ranking in public examinations. Even assessment in school mathematics is also gearing towards modelling questions in public examinations.

In view of the positive impacts of assessing for learning, which emphasizing on gaining feedback from assessing students to improve on teaching, we have set up to explore how to help teachers in this direction. To support mathematics teachers in the assessing strategies, we propose to use teacher professional development programme such as Lesson Study to help teachers to cope and get ready for the change.

Why Lesson Study?

Lesson study is a Japanese model of professional development that focuses on a group of teachers collaboratively plan, teach and reflect on live classroom lessons. Review of past literatures indicates that Lesson Study was already well established in Japan since the 1960s (Fernandez & Yoshida, 2004) but claims were also made that Lesson Study had actually started in the 1880s under the Meiji government (Isoda, 2007). However, the rapid spread of lesson study began in the United States, particularly in the mathematics education communities, with the publication of the book, titled “The Teaching Gap: Best Ideas from the world’s teachers for improving education in the classroom” written by Stigler and Hiebert (1999). Since then, the lesson study movement has further spread to many more Asian countries, such as Thailand, Singapore, Indonesia, Malaysia and some African countries (through joint projects sponsored by JICA and their respective governments) and more recently the Asian Pacific Economic Cooperation (APEC) – Tsukuba Lesson Study project headed by Isoda and Inprasitha.

However, to date, lesson study is yet a model of teacher professional development in Malaysia. Most lesson study groups were set up and piloted as research projects (Lim & Kor, 2010) or master (Goh, 2007) or PhD thesis (Chiew, 2009; Ong, 2010). Despite this, the policy makers had begun to show attention as in recent years, more and more introductory seminars and workshops of lesson study were being conducted in Malaysia.

Research concerns lesson study has indicated encouraging and positive results towards teachers’ teaching. Lewis (2005) outlined seven “*key pathways*” of lesson study process that would result in improvement of teachers’ instructions. They are: (i) increased knowledge of subject matter, (ii) increased knowledge of instruction, (iii) increased ability to improve students, (iv) stronger collegial networks, (v) stronger connection of daily practice to long-term goals, (vi) stronger motivation and sense of efficacy, and (v) improved quality of available lesson plans (p.78). These key pathways were argued to emerge from lesson study

processes which include planning and discussing of lesson plan, teaching and reflecting of a lesson.

In fact, teachers continue to learn and improve their teaching in a variety of ways. They learn from their own teaching practices (Ball & Cohen, 1999) and reflecting on their teaching practices (Schon, 1987). However, if teachers are engaged in lesson study processes, the learning is enhanced as proposed by Vygotsky (1987). Lesson study provides a contextual learning environment for teachers to enhance their knowledge of instruction such as subject matter, pedagogical, questioning and assessing skills.

How Lesson Study can help in assessing for improvement of teaching?

In this paper, we will focus our discussion on two cases of lesson study to illustrate how teachers' assessing and teaching strategies were changed through the lesson study collaboration.

Case A: A primary school

The lesson study group in case A comprised of four mathematics teachers in a primary school. The lesson study cycle consisted of two discussion meetings before the first teaching, one reflection immediately after the first teaching, one discussion meeting to revise the lesson and one reflection meeting after the re-teaching. All the activities were video and audio-recorded for analysis purposes. The group have planned a 60-minute lesson to teach on the topic *Two Dimensional (2-D) Shapes* in a Primary Year 3 mathematics class. The lesson consisted of the following four main activities:

- (i) Activity 1: Creating a picture using 2-D shapes on a manila card
- (ii) Activity 2: Identifying 2-D shapes and their properties
- (iii) Activity 3: Identifying real objects that have the 2-D shapes
- (iv) Activity 4: Singing the song 'We are the 2-D shapes'

This lesson study cycle was unique in the way that both lessons were shared and taught by all the participating teachers. The first lesson was taught by four teachers with each one in charge of one activity. However, during the second lesson teaching, one of the teachers was ill and hence the lesson was taught by only three teachers.

An analysis of the first and second video-recorded lessons shows that, the teachers have managed to upgrade the level of geometrical understanding of the pupils by changing the questions asked. The following descriptions illustrate the changes:

First activity in the first teaching

In the first activity of the first teaching, the first teacher asked the pupils to create a picture using the 2-D shapes (circles, triangles, squares, and rectangles) that were given to them in an envelope. The teacher began the lesson by asking the pupils to identify a few 2-D shapes that were shown to them one by one as follows:

(Explanatory notes are in round brackets. T1 represents Teacher 1 and Ps represents Pupils.)

- T1: What is this? (Showing a square cardboard to the whole class) What shape is this?
Ps : Square.
T1: Square. What shape is this? (Showing a triangle cardboard to the whole class).
Ps : Rectangle.
T1: Eh?
Ps : Triangle.

T1: Triangle. What is this? (Showing a rectangle cardboard to the whole class).
 Ps : Rectangle.
 T1: Rectangle. What is this? (Showing a circle cardboard to the whole class).
 Ps : Circle.

The above excerpt shows that the pupils were able to identify the 2-D shapes except for the triangle initially. But after the teacher's interjection, they quickly shouted "triangle!"

First activity in the second teaching

In the second teaching which was carried out in a different Primary Year 3 class, the same teacher also began the lesson by asking the pupils to identify several 2-D shapes that were shown to them one by one.

T1: What shape is this? (Showing a rectangle cardboard to the whole class).
 Ps : Rectangle.
 T1: Rectangle. What is this? (Showing a circle cardboard to the whole class).
 Ps : Circle.
 T1: Circle. So, circle has [straight] side or not?
 Ps : No.
 T1: What is this? (Showing a triangle cardboard to the whole class).
 Ps : Triangle.
 T1: Triangle. Triangle has how many [straight] sides?
 Ps : Three.
 T1: Three sides. What is this? (Showing a square cardboard to the whole class).
 Ps : Square.
 T1: Ok. Square has how many [straight] sides? (Showing a cardboard square to the whole class).
 Ps : Four.

As shown in the second excerpt the pupils were not only asked to identify the 2-D shapes, but also the number of straight sides except for the rectangle which the teacher did not ask them to do so. By comparing the first and second excerpts it appeared that the teachers had developed a set induction which could promote higher level of mathematical thinking among the pupils. More specifically according to the van Hiele theory of geometric thinking (van Hiele, 1986), the set induction in the second teaching enabled the pupils to reach a higher level of geometric thinking (Level 2) as compared to the activity in the first teaching which only enabled the pupils to reach a lower level of geometric thinking (Level 1). That is, according to the van Hiele theory, pupils at Level 1 can only recognize and name geometric figures by their global appearance whereas pupils at Level 2 can identify properties of geometric figures. This means that in the second teaching the pupils were not only able to recognize and name rectangle, circle, triangle, and square but also they were able to correctly identify their property such as the number of sides. Thus, by changing the way of questioning, the revised lesson seemed able to promote higher level of geometric thinking among the pupils.

However, during reflection, the external adviser pointed out that, can we say: "the circle has no side or edge?" This question has stirred up some discussion among the participating teachers. They argued that it was written in the textbook that circle has no side or edge. After much debate, the teachers agreed that the question should be phrased as "How many straight sides does a circle have?"

Besides that, the participating teachers were found to be uncertain about the conceptual difference between "edge" and "side"; between "corner", "angle" and "vertices" in

geometrical shapes. This was reflected in their discussion after the lesson. Much debate was carried out to help and check each others' understanding such as through Google-search and through reference books. This clearly shows that lesson study collaboration helps teacher to assess their own understanding about the subject content, not only the pupils' understanding.

Case B: A Secondary School

The lesson study group in Case B comprised of four mathematics teachers serving in a secondary school. This group planned to use Geometer's Sketchpad (GSP) as a tool to enhance the students' geometrical and spatial thinking. They chose the Secondary Grade 8 topic Loci in Two Dimensions as their topic for research lesson, but the classes to be taught were Grade 9 students. Even though these were concepts that the students have learnt in their previous year (Grade 8), the teachers shared the opinion that most of their students could not master this topic as students found the concept of Loci abstract and difficult to visualise. Thus, all teachers agreed to integrate the dynamic nature of GSP to see if it could enhance the students' understanding of the concepts on Loci. The lesson study cycle consisted of three lesson study discussions which were carried out prior to the teachings; as well as reflections after the first and second teaching of the lesson. Briefly, the lesson contains three main activities. The first activity required the teacher to revise some related concepts such as definition of loci, and loci of various conditions such as equidistance from one fixed point and equidistance from two fixed points. These concepts were illustrated with examples (such as a swing, windmill and cycling) using GSP. During the second activity, the students were provided with GSP templates which contain the questions and answers (see Figure 1). Students worked in pairs. Students then worked in pairs to explore the eight questions given using the GSP templates.

2. Diagram 2 in the answer space shows a square PQRS drawn on the grid of equal squares with sides of 1 unit. M, X and Y are three moving points in the diagram.

(a) M is the point which moves such that its distance from point Q and point S are the same. By using the letters in the diagram, state the locus of M.

(b) On the diagram, draw
 (i) the locus of the point X that is constantly 5 units from the line QR,
 (ii) the locus of the point Y that is constantly 7 units from the point R.

(c) Hence, mark with the symbol \otimes the intersection of the locus X and the locus of Y.

Answer:

(a)

(b) (i),

(ii)

(c)

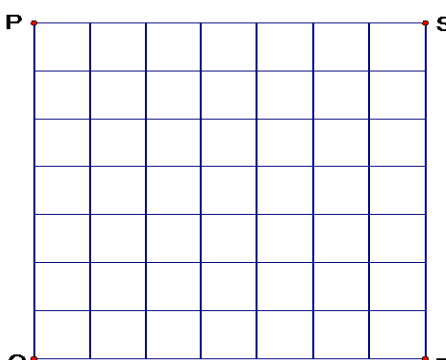


Diagram 2

Figure 1: An example of GSP templates given to students in Activity 2

In the third activity, the students work in small groups solving questions on the given worksheet. Activity 3 aimed to assess if the students have understood the concept and they were able to make use of their knowledge and skills in solving problems related to Loci in 2 Dimensions.

The first teaching was taught by Teacher Z while the second teaching by Teacher L. Analysis of the video recording of the first and second teaching shows that teacher's instruction in the second teaching was modified after the reflection of the first teaching.

Teacher Z was not satisfied with her students' performance after examining their worksheet answers. She reflected that one possible reason of their poor performance could be that some students could not understand the meaning of some key terms such as "equidistant" and "constant". In addition, teacher Z also observed that many students were too eager to try out in computer and to click the GSP template that they were not paying full attention to the teachers' instruction and explanation. This was reflected by Teacher Z during the reflection of her teaching:

The problem is they [students] just click the button like that and don't read the questions properly . . . because after I gave them the worksheet and I walked around, they cannot answer the questions because they cannot understand the sentences and words like equidistant. Most of them didn't read the question. They just like to look at the moving points. When I asked them, they said understand but when they do the worksheet, they cannot do because they cannot understand the question.

Teacher L concurred with Teacher Z after observing her teaching:

A few of them not concentrating because of the computers in front of them. This is the first time they use GSP and hands-on activity. When the teacher teaches, a small group don't care and this is normal!

In addition, the third participating teacher, teacher G also pointed out that perhaps supplying the GSP templates which contain the solution buttons might have distracted the students to click and see the animations. She suggested providing GSP templates that only contain questions without the solution buttons to the students in the second activity. This aims to encourage the students to explore by themselves before checking on the answers provided.

Consequently, the lesson plan was revised and taught in the second teaching by Teacher L. He explained the concepts of certain key terms such as equidistant and constant as a whole class activity at the beginning of the lesson. To ensure the students paying full attention to the teacher's instruction, he did not allow the students to switch on the GSP programme when he was explaining in activity 1. For activity 2, students were given a copy of the worksheet to explore in pairs, and then checking if their solutions were correct using the GSP template provided.

Reflection of Teacher L after the second teaching shows that:

...I feel satisfaction teaching them because at least they respond...Even the weak one, at least they tried and they asked questions. When the students explores the Question 1-8 [in activity 2], first they tried to read the question very fast... after I reminded them to slow down and do one by one, some stillbut the best thing is they repeat, after they have finished the questions. It is very good, ...they try to discuss, even the weaker ones are willing to try. ...once they go to Step 3 when doing the worksheet, from 3-4, may be

some of them, not listening well, they can do very well Question 3 and 4. But very good-lah, they go back to Question 1 and 2 after that.

After they have finished all the questions, they were asked to use GSP to check the answers. They were so careful and checked so carefully....

While Teacher Z also echoed that, compared to the previous class, this class has much better attitudes and they accepted the lesson differently. The students paid more attention to the teacher's instruction and hence they were able to solve better the problems in the worksheet.

In addition, as pointed out by the third participating teacher, Teacher G that, "You didn't tell them the answers. This is good. The students tried very hard. When I told them, you can check the answer later. They were so surprise." Teacher Z also agreed that, as compared to the first teaching, her students just clicked the answer on the computer, but after that, they still asked her what was the answer. This showed that they were not paying attention at all.

Compare to the first teaching, the participating teachers found some success in the second teaching when the students were assessed in the worksheet. Teacher Z expressed positively of the lesson plan and lesson study collaboration as it had engaged the students to be actively part of the learning process which differ from her usual approach of teaching in the classroom. In our view, through lesson study collaboration, teachers were naturally engaged and encouraged to reflect and to assess their own teaching. This improves teachers' teaching knowledge and skills as highlighted by Lewis (2005).

Conclusion and Implications

We acknowledge that both cases A and B were not set up with the goal to see if teacher can change their assessing strategies through lesson study collaboration. However, analysis of the teaching and the reflection showed that apparently, teachers were able to change their teaching strategies or questioning techniques via lesson study process. Particularly, they can be changed in the following manners:

- a) Questioning – by changing the content of the questions such as from what to how and why, pupils will be assessed to a higher level of thinking.
- b) Mathematical tasks – Very often, Malaysian teachers tended to assess their students' understanding of certain subject matter through written exercises based on textbook or workbook. However, by changing to using dynamic software such as GSP, pupils can be posed with more challenging questions and hence enhance their geometrical thinking level.

Nevertheless, for the above to happen, teachers need a lot of external assistance and moral support. As a result of lesson study collaboration, teachers can gain more ideas in varying their questioning techniques or mathematical tasks that promote more students' thinking and learning.

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