Different Versions of the Same Lesson Plan: Implications on the Lesson Design

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The World Bank 2007 TIMSS Video Study provided a distinctive insight into the practices of the Indonesian classroom and identified key strengths and weaknesses of current teaching. This investigation considered this evidence in the development of a structured lesson design that specifically addressed the instructional practices of the teaching and the actions of the participants. Watson's (2008) framework was used to analyse two teachers implementation of the lesson. Findings revealed that the teacher's initial content-based decisions on how to frame the lesson were most influential in how the lesson was shaped and impacted greatly on the level of student involvement.

The Indonesia Ministry of Education and Culture has undertaken substantial changes to its education system that have resulted in increased student access and participation rates. These initiatives have included a major teacher reform effort in 2005, requiring a four-year degree and certification by 2015 (Fahmi, Maulana, & Yusuf, 2011). This new reform recognised as the "Teacher Law", has seen an increase in the design and use of lesson plans in the classroom (World Bank, 2010). Running in parallel to the new certification process was the "Better Education through Reformed Management and Universal Teacher Upgrading (BERMUTU) project. This project was used to support the Government's endeavour to improve teaching quality by providing continuous professional development through enhanced teacher cluster groups. These initiatives alone came at great expense to the government and indicate the country's dedication and high regards to the education of its young people and quality of teachers (World Bank, 2010).

Indonesia has also been a committed participant in the Trends in International Mathematics and Science Study (TIMSS) and was ranked 36th out of 48 participating countries in 2007. Although these results have been useful in identifying Indonesia's standing in student achievement and progress over time, it failed to provide insight into understanding the factors that may be impacting on student performance including any benefits of recent government initiatives. It was for this reason that following the 2007 TIMSS, the World Bank conducted a video study examining over a 100 classes across Indonesia.

Context: The Indonesian Video Study

The World Bank study followed the same methodology used by the 1999 TIMSS video study of seven countries, including Australia, the Czech Republic, Hong Kong, Japan, the Netherlands, Switzerland and the United States (Hiebert et al., 2003). This not only provided a proven coding scheme but also the context for a comparison of Indonesia's results with that of other countries. Subsequently, the use of video as a means of evaluating classroom practices provided a comprehensive insight into what was happening in

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Indonesia's classrooms and led to the identification of relationships between teaching practices and student achievement.

The Indonesian video study focused on five key dimensions that framed mathematics classroom practices in the country: (1) structure of lessons; (2) content of lessons; (3) instructional practices; (4) actions of participants; and (5) classroom climate and resources (World Bank, 2010). These Indonesian practices were then examined in light of the seven other countries from the 1999 TIMSS video study to highlight any similarities and key differences.

1. Structure of lessons: The World Bank (2010) reported that Indonesia's mathematics classes were significantly longer than in comparator countries, with lessons lasting 70 minutes compared to an average of only 41 to 51 minutes in other countries. In fact, over 40% of the Indonesian classes went beyond one hour and 15 minutes, with eight classes extending beyond 90 minutes. Yet this does not translate to more mathematics time per week.

2. Content of lessons: The World Bank (2010) reported that only 3% of problems presented in Indonesian classrooms could be recorded as high complexity compared to from 6-39% in other countries. It was also found that Indonesian teachers used relatively fewer problems involving applications and more problems involving mathematical proofs (World Bank, 2010). This resulted in fewer opportunities for students to examine different ways of solving problems and exploring alternate solutions.

3. Instructional practices: Compared to other countries, Indonesia had relatively more lessons that included goal statements and lesson summaries. This practice is well aligned to Indonesia's teacher training guideline and is evidence that the training has filtered into the classroom setting. Also of note, was the high incidence of exposition (teacher explaining while students listen and answer closed questions) as the most commonly used teaching strategy.

4. Actions of participants: One of the most prominent results recorded by the World Bank (2010) was the small number of words spoken by both Indonesian teachers and students compared to the other countries. Indonesian teachers spoke fewer than half the number of words as in other countries, with only 2633 words in an average lesson compared to 5198-5902. Similarly students only spoke 194 words compared to 640-1108 in other countries. However a further striking outcome was the teacher-to-student ratio for words spoken was much higher in Indonesia with teachers speaking 28 words for every word spoke by students, compared to 8-16 elsewhere. This indicates that students in Indonesia tend to participate less verbally and possibly could signal less active and engaged participation.

5. Classroom climate and resources: As anticipated due to social and economic diversity, the quality of the classrooms varied depending on the region of Indonesia although most classrooms were found to be well-lit and adequately resourced (World Bank, 2010). There was a high incidence of the use of textbooks in 93% of classes and also real world objects (28%) compared to other countries.

Lesson Plan Design

Within this evidence-based context, our investigation determined the extent to which lesson design would influence teaching practices. Thus, the study sought to:

1. Design a lesson plan that would address some of the issues identified in the World Bank findings.

2. Examine the differences in the way two teachers present the same lesson in their classrooms.

Since the introduction of the teacher law in 2005, Indonesia has also implemented a new mathematics curriculum. Both of these reforms emphasised the designing and developing of lesson plans that subsequently have become a high priority for teachers. It was for this reason that the current study chose to use lesson plans as a means of professional development in addressing some of the concerns outlined in the World Bank study. The lesson plan aimed to scaffold teachers to plan, evaluate and analyse the way mathematics content was presented in the classroom.

The lesson plan used in the study was designed using the content of 2D and 3D shapes for a Year 8 classroom. The intention of this lesson was for students to be able to use the correct terminology and language associated with 2D and 3D shapes, to recognise the relationship between 2D and 3D shapes, to recognise and articulate the differences and similarities between prisms and pyramids and to identify and describe the properties of prisms and pyramids. It was anticipated that this content matter would be relatively familiar for the teachers, consequently allowing them more opportunity to focus on their pedagogical practices. The content was closely aligned to the curriculum and included relevant Indonesian syllabus outcomes. The outline of the lesson was modelled on and adapted from proformas offered by the Indonesian Ministry of Education. The aim was to try and replicate an Indonesian lesson plan for familiarity and to model an example for the teachers. The lesson was written in English and translated into Indonesian.

The lesson plan design aimed to address two issues outlined from the World Bank findings; namely, *the instructional practices* and *the actions of the participants*. For this reason, a detailed script was included in the lesson plan. First, this involved examples of questions for teachers to use to scaffold students during the group work such as "How many sides? What about the length of sides? How about the position of the sides? Are the sides parallel? How many angles? What types of angles? Are there relationships between angles of the shape?" Second, possible explanations of mathematical content were identified such as "At the conclusion of the explanation, students need to see that there are three different types of quadrilateral based on parallel lines: one pair of parallel sides (Trapezoid); two pairs of parallel sides (parallelogram); no parallel sides (e.g. kite).' Third, we also indicated the need to build a classroom norm to avoid students from chorusing "Teacher directed questions. Students put up their hand to answer." Fourth, notes for a class discussion were explained such as "Teacher led discussion questions for mind map presentation: Is there anything missing from the mind map? What can we add into the mind map?" Finally, we provided a sample mindmap of 2D shapes and their relationships within the lesson plan.

The tasks were designed to actively engage students in talking with one another as well as with the teacher and class as a whole. Because of this, more opportunities were provided for students to develop their own conclusions when less direct instruction from the teacher. Furthermore, we hoped our design would focus on the nature of students' mathematical engagement.

Method

Following the completion of the lesson design, three schools were selected from the area of Sulawesi in Indonesia. These schools were familiar to the research team and were eager to embrace the opportunity for professional development. Within the schools, five

Year 8 mathematics teachers volunteered to be a part of the project. For this paper, the analysis will involve two of the teachers from the same school. Both of these teachers were very experienced and highly qualified.

A representative of the research team met with the teachers several days before the lesson was to be implemented for professional development. This provided the opportunity to talk through the intent of the lesson as well as the tasks involved. Particular emphasis was placed on the use of correct mathematical terminology and the engagement of the students. At this stage, the teachers were given the opportunity to raise questions and concerns regarding the lesson plan design which the research team aimed to address.

The lessons were videotaped, with two cameras positioned in the front and back of the classroom as well as an audio recorder. This footage provided the evidence for further analysis. Student's work samples were collected as well as student's comments on how they perceived the lesson. This included questions such as what they enjoyed, what they had learnt and suggestions about things that needed to be improved. The respective classes comprised of 29 and 38 students.

Data were analysed using Watson's (2008) framework. This qualitative comparison of the 'same' task looked at the amount of variation offered in the task, the questions and prompts used by the teachers, class formation for activities and opportunities for thinking and reasoning. More specifically;

> These foci for analysis were selected on an underlying theory that students can only respond to what is made available to them in words, actions and artefacts of the lesson. In other words, the meditational devices and instructions used by the teacher and other students, whether intentional or not, shape the learners' experience of the lesson (Watson, 2008, p. 4).

Therefore our analysis involved isolating episodes within the two lessons and considering: "What is the class supposed to be doing right now? What are they supposed to be thinking about? What is being said and done, and by whom, that is shaping and is shaped by the activity?" (Watson, 2008, p. 3). More specifically, what is actually done, talked about, learnt, and how this takes place. To do this, the transcripts of the lessons were placed side by side and aligned to the same activity or task. It was noted how the activity was implemented, the teacher and students' roles and the nature of engagement. This analysis informed how the teacher's different perspectives shaped the two lessons in similar and different ways. For the purposes of this paper, the first 40 minutes of the lesson plan was analysed with two specific episodes identified.

Results

The transcripts of the first 40 minutes of each teacher's lesson on 2D revision are outlined in Table 1. Both lessons were completed in approximately similar time periods however a variance was noted in student presentations between Teacher 1 (T1) and Teacher 2 (T2). Two episodes were identified that demonstrated significant differences in the way the activity was implemented and subsequently the level of engagement of the students and the role of the teacher. These episodes are outlined in the Table 1.

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Table 1
A summary Table for 2D Revision

'What is the class supposed to be doing right now? What are they supposed to be thinking about?	What is actually done, talked about, learnt, and how this takes place	
	Teacher 1	Teacher 2
In groups of 3 or 4 students are supplied one large piece of paper.	The class were divided into 7 groups of 4 or 5 students. Each group was supplied an A4 paper & a marker.	The class were divided into 8 groups of 4 or 5 students. Each group was supplied an A4 paper & a marker.
Episode 1 - Each group is given a cut out of a 2D shape either: rectangle, square, triangle, rhombus or parallelogram. Explain the task and prompt questions such as related to the sides and angles.	Each group was given one of a cut out of seven 2D models (rectangle, square, triangle, rhombus or parallelogram, kite, trapezium), explained the task, sketched a mind map with an empty space in the centre and located arrows around the space, asked for a volunteer to re-explain the task, added a minor correction at the end of the student's explanation.	Each group was given one of three 2D models (rectangle, square, equilateral triangle), explained the task (explicit hint) & modelled the mind map explicitly referring to the example in the lesson plan and stated the art thing, used the questions provided in the lesson plan to closely guide the students.
Episode 2 - Students create a mind map and brainstorm as much information as they can about their allocated shape. Students present their mind maps to the class for discussion and the teacher led discussion questions	Students created a mind map and brainstormed as much information as they could. The teacher's role: encouraged students' contribution, prompted students' thinking, answered students' questions. A student read while others listened, clarified and discussed it when needed.	Students created a mind map and brainstormed as much information as they could. The teacher's role: encouraged the students to quickly finish the mindmap, guided on how to do the task, led the students' activity through leading questions, concerned about time and display (art), a student read, the teacher revoiced, QA style, explained (Chorusing + quite noisy).
Teacher explains the following mind map of quadrilateral.	Teacher summarised the properties of the 7 2D models using a diagram of 2D shapes, enriched by the students' contributions.	Teacher summarised about the three models without using a diagram

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T1's Instructional Practices and Student Participation

Throughout the two episodes T1 intentionally selected instructional practices that would encourage greater student participation and involvement. By taking on the role of facilitator, the teacher guided students' questions and understandings in making links between the shapes. T1 provided opportunities for students to articulate the properties based on their own observations and to develop a deeper understanding of mathematics terminology.

In Episode 1, the provision of a larger number of 2D shapes encouraged student contribution and prompted students' thinking. For example, when the students described the properties of a parallelogram as "two parallel lines" T1 challenged this description and allowed the students the opportunity to articulate appropriately on their own that it is in fact "two pairs of parallel lines". This required the students to visualise a parallelogram and question what the terminology indicated and whether it was being used appropriately. In this instance, by challenging students' understanding the teacher guided the discussion but it was a joint collaboration by the teacher and the students in reaching their conclusions together.

In Episode 2 students were encouraged to contribute and listen carefully, particularly as T1 required them to raise their hands to respond to questions. This was different to current Indonesian practices that often involved chorusing answers with the teacher (World Bank, 2007). By scaffolding, questioning, eliciting ideas and encouraging discussions T1 demonstrated the instructional practices intended in the lesson plan.

Consequently, a major result of this was an increase in student participation. An example of this can be seen in the student presentations of their mind maps in Episode 2. Some of the students commented on how the properties of a rhombus could be equated to that of a square. In a discussion, a group of students correctly described some properties of a rhombus including: "it has four sides that are all the same length, the opposite sides are parallel and they have equal length, the opposite angles are equal and it has two symmetry lines." Another group of students stated that those are the properties of a square. The teacher challenged students to prove it using the cut out models. After the teacher demonstrated the two lines of symmetry by following students' suggestions to fold the square model horizontally and vertically, the teacher continued leading the discussion:

T : Can you show the other line of symmetry?
Ss : Yes.
S1 : Fold the corner
T : Please raise your hand up if you would like to show it.
S2 : [she demonstrated by folding diagonally right top corner to left bottom corner]
T : Now we have three lines of symmetry. What else?
S2 : [she demonstrated by folding diagonally left top corner to right bottom corner]
T : Okay. There are four lines of symmetry. How about that rhombus? {pointed to the model that was held by another student]. Does a rhombus have four lines of symmetry?
S3 : [Folded while counting and show her working to the class]. One, two.
T : Can you show another line of symmetry?
S3 : No
T : Can you show how it can't.
S : [folded in other ways but the foldings are different]
T : Therefore, a square has four lines of symmetry and a rhombus has only two lines of symmetry.

The creation of a mathematically rich environment kept the students actively engaged in the lesson.

T2's Instructional Practices and Student Participation

Perhaps the most obvious difference between the two teachers when comparing the lessons was the *way* they utilised the lesson plan. For T1, the lesson provided the scaffolding needed to create a supportive classroom environment through the provision of student-centred activities and questions that provoked thinking and reasoning. However T2 utilised the lesson plan in a different way. An example of this can be seen in Episode 1, when T2 only provided 3 examples of common 2D shapes. These were shapes that have been known to the students since primary school and offered little opportunity to challenge their thinking further. Even though the lesson plan outlined a variety of shapes that could be used, the teacher seemed reluctant to use all the provided shapes as it may have required greater investigation and explanation. This choice of instructional practice resulted in limited use of mathematical terminology, as there was minimal mathematical thinking required.

Similarly in Episode 2, the teacher was particularly concerned with the time and encouraged the students to finish their mind maps promptly. The questions outlined in the lesson plan were utilised but resulted in an exposition scenario. The discussion was teacher guided with little opportunity for students to apply any form of higher order thinking. The students were not encouraged to raise their hands, despite it being mentioned in the lesson plan, and students resorted to traditional practices of chanting prompted answers back at the teacher.

The provision of the questions and answers in the lesson plan also resulted in ineffective group discussion. This was demonstrated when T2 was talking to a group of students about the properties of a rectangle. For example:

T : What is this? Why is it a cuboid [rectangular prism]?
Ss : A rectangle.
T : This is a 2D shape. We haven't learnt 3D shapes. How many sides are there?
Ss : Four.
T : How many vertices?
Ss : Four.
T : How about the opposite sides?
Ss : The same.
T : Look at it carefully. This and this [points to top and bottom side].
Ss : The same length.
T : This and this (points to left and right side).
Ss : The same.
T : Well it's also the same length. Write all of that down. Write it down. What did we say before? The one that we talked about before.

It appeared that T2 followed the lesson plan very closely in regards to use of the questions provided. However rather than allowing students the opportunity to brainstorm their own properties, the teacher used the questions to lead students to the desired answer. This ineffective use of the questions resulted in limited mathematical engagement

Concluding Comments

The lesson plan was developed in an attempt to improve instructional practices and student participation within an Indonesian classroom. These practice challenges had been

identified within the World Bank video study as concerning trends within Indonesia. In an attempt to alter instructional practices, the lesson plan was designed using activities that encouraged investigation and mathematical reasoning. This included a detailed script of questions/answers, explanations and correct mathematical terminology. Yet despite the provision of a detailed lesson, Watson's (2008) framework demonstrated that the tasks were presented in remarkably different ways and offered different mathematics learning experiences. Although this research design allowed for the role the teacher to the interrogated within a restricted boundary, we acknowledge that the dynamics of different classroom contexts and student cohorts provide established situations where classroom interactions will invariably be different. Nevertheless, the surrounding practices would also be different if T1 and T2 had taught the *same* class. Watson's (2008) framework provided the opportunity to examine the differences in the way two teachers presented the same lesson in their *own* classrooms. What appeared to be minor changes in lesson interpretation, the implemented lesson dramatically affected student engagement, especially the level of student-student engagement and knowledge application. Noteworthy, these episode shifts stemmed from the initial selection of resources (T1 used seven 2D models while T2 used only three 2D models) and the respective teacher's willingness to allow discourse to be problematic and non-linear in nature. T1 aligned the discussion to the diagram that had been created to ensure the students developed a mental model of the quadrilateral family. By contrast, T2's discussion was formulaic in approach.

It would be somewhat speculative to suggest that these differences existed because the teachers possessed different levels of pedagogical effectiveness. Nevertheless, their pedagogical practices impacted on what students gained from the lesson. T1 was able to provide students with scaffolded support throughout the lesson—connecting the experience-based concrete engagement with a diagrammatical model that provided both tacit and pictorial representations of the properties of the respective shapes within the quadrilateral family. T2 did not evoke deep thinking, nor links between and within concepts and definition. It was apparent that T1 had a better understanding of important mathematics content and concepts that needed to be introduced and reinforced throughout the lesson, with student engagement considerably different as a result.

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