

## **Assessment in Primary Mathematics Classrooms in Malaysia**

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### **Abstract**

*The aim of this paper is to present a theoretical framework for assessment in the primary mathematics classroom, principally to be used by teachers and researchers conducting Lesson Study as an approach to improve the teaching and learning of mathematics. In the Malaysian context, assessment is viewed as an integral part together with other teaching and learning activities in the classroom. It begins with planning rich mathematical tasks that would enable students to actively construct mathematical ideas. In the classroom the teacher assesses students' learning in order to further facilitate the construction of mathematical ideas. The actual implementation of this model of classroom didactics however would entail the further development the teachers' facilitating skills which are essential to assist students learn mathematics meaningfully. This teacher development program could perhaps be best realised through a collaborative school-based teacher development program such as the Lesson Study.*

### **Introduction**

The purpose of this discussion about assessment is to present a theoretical framework for the reference of teachers and researchers in conducting Lesson Study particularly in the Malaysian primary school context. Its aim is therefore to look at assessment and see how best Lesson Study Groups can examine classroom assessment in order to help improve the teaching and learning of mathematics. To begin, it is perhaps pertinent to discuss some of the key ideas and issues related to the implementation of the Malaysian Primary School Mathematics Curriculum.

As Malaysia practices a central system of education with a national curriculum, all public schools in the country are required to follow a common curriculum recommended by the Ministry of Education. The Curriculum therefore serves as the main reference and guide for teachers to plan and implement their lessons.

#### *The Primary School Mathematics Curriculum.*

As with the mathematics curriculum of many countries, the Malaysian Primary Mathematics Curriculum has moved away from a focus on skills-and-computation towards more emphasis on the understanding and applications of the basic skills of mathematics (Curriculum Development Centre, 2003). Since 2003, the mathematics curriculum has been seen to be more skewed towards creating thinking students with more attention being given to mathematical processes. The Curriculum now places more emphasis on problem solving, communications, mathematical reasoning, and mathematical connections and representations.

#### *Assessment in the Primary Classroom*

The Mathematics Curriculum emphasises that assessment should be a part and parcel of the learning process.

Assessment is an integral part of the teaching and learning process. It has to be well-structured and carried out continuously as part of the classroom activities. By focusing on a broad range of mathematical tasks, the strengths and weaknesses of pupils can be assessed. Different methods of assessment can be conducted using multiple assessment techniques, including written and oral work as well as demonstration. These may be in the form of interviews, open-ended questions, observations and assignments. Based on the results, the teachers can rectify the pupils' misconceptions and weaknesses and at the same time improve their teaching skills. As such, teachers can take subsequent effective measures in conducting remedial and enrichment activities to upgrade pupils' performance. (Curriculum Development Centre, 2003; p. xx)

Malaysian teachers are thus encouraged to practice formative assessment in the classroom which refers to assessment carried out during learning as opposed to summative assessment that is carried out after learning (Popham, 1988). The ultimate purpose of classroom assessment is thus to facilitate and promote learning in the classroom. Through authentic assessment, teachers will then be able to plan their lessons so as to help form students' learning. However, in practice the observance of formative assessment seems to have been side-tracked by external influences which have not been specifically recommended in the curriculum. Generally, these influences seem to be the reasons for many teachers in schools to adopt an examination-focused disposition towards assessment.

#### *The Influence of the Malaysian Public Examinations System*

In the Malaysian school system, primary schooling cover a period of six years, while secondary schooling is over five years. There are three main public examinations that are compulsory for the students: The Ujian Penilaian Sekolah Rendah/Primary School Assessment Test (UPSR) which is administered at the end of primary school; the Penilaian Menengah Rendah/Lower Secondary Assessment (PMR) after three years of lower secondary education and the Sijil Pelajaran Malaysia/Malaysian Certificate of Examination (SPM) at the end of five years of secondary education. As much as the Ministry of Education tries to deemphasise the focus on examinations, the orientation by the general public towards examinations over the years does not seem to have decreased. One reason for this phenomenon is that selection of students for entry into selected residential schools and the award of scholarships is often based on the results of the public examinations. Moreover, these awards are highly valued as they provide the paths to higher social mobility. Thus the public examinations have become increasingly high-stakes in the eyes of the students and of the public. There is also a perception that public examination results reflect the performance of schools. Good schools are often labelled as those which are able to produce good results in the public examinations. Subsequently many schools plan programmes in order to prepare students to sit for the public examinations. Most schools conduct trial examinations before the actual public examinations. Not unexpectedly, very often the questions in the trial examinations mirror those of the public examinations. Further, it is not uncommon to see internal school examination systems that are based the public examinations format. In many schools there are the end-of-the-year examinations with two end-of-term examinations. There are also monthly tests that students sit. Thus summative assessment is often perceived to be more important than formative assessment. Frequently these tests and examinations are considered as formative assessment by the teachers while in fact they resemble what Cooper and Bronwen (2009) would rather consider as continuous summative assessment. Thus for many teachers, formative assessment in the classroom have come to be of secondary importance.

### *The Purpose of Classroom Assessment*

What then is the main purpose of the assessment to be conducted in the classrooms? Undoubtedly, summative assessment is still of importance since grading and reporting form an important part of the functions of the school. The standardised school tests play an important role in the administration of the school as they are often used as 1) progress reports for parents, 2) a basis for selection and grading of students for placement purposes within the school, and 3) preparation of students for national standardised examinations. However, these summative examinations ought not to be the sole mode of assessment especially in the context of the classroom. As Stiggins (2005, 2007) observed, summative assessment often discriminates against the lower ability learners. On the contrary, in this age when education has been democratised, education should aim to assist all students to do well in school. With the ever increasing demand for a skilled and technical-minded pool of human resource, the aim for assessment should thus be to provide feedback and evidence towards quality education for students of all abilities. Towards this end, formative assessment can and should play a major role in assisting students form and construct mathematical ideas and knowledge in the classroom.

### *The Culture of the Malaysian Primary Classroom*

*The current practice.* A typical primary mathematics lesson in Malaysia consists of 4 phases: 1) The *consolidation* phase which deals mainly with the introduction to the lesson, 2) the *core-content* phase where the teacher would introduce the content, 3) the *rehearsing* phase where pupils would practice solving problems which were similar to those given in the core-content phase either in the form of board work or seatwork, and 4) The *lesson closure* phase refers to the activities that bring the lesson to a close (Ruzlan, 2007). Ruzlan (2007) further found that questions framed by teachers were typically close ended. Open-ended questions were not often used. Typical of some of the close-ended questions were closed procedural questions (“*Alright, what is one times five?*”), close-routine questions (“*Do you understand?*”), closed complete-the-statement questions (“*Fractions have a numerator and denomina...?*” students complete the statement with “*...tor*”), closed verification questions (“*Is the answer right?*”) and closed terminology questions (“*What do we call this fraction?*”). Current practice thus shows that assessment in a typical Malaysian mathematics classroom is centred on assessing whether students are able to do mathematics problems that are similar to what has been taught by the teacher previously. Discourse is also teacher-focused with students attempting to get the right answers from the teacher’s perspective. Students play the role of receivers rather than constructors of knowledge. Clearly this is contrary to the vision of the Malaysian curriculum to assist the students build mathematical ideas and subsequently apply them into daily use.

This typical classroom scenario is further enforced by teachers’ beliefs that it is more efficient to give clear explanations as opposed to allowing students to work on tasks and construct their own mathematical ideas, and that hard-work and “practice-makes-perfect” are the key ingredients for success in learning mathematics (Lim, 2006).

### **A Model for Didactics in the Malaysian Primary Mathematics Classroom**

In the late 1990s, a model framework to incorporate mathematical processes into the mathematics classroom was conceptualised by the Teacher Training Division, Ministry of Education, Malaysia. The model highlighted four important aspects of a mathematics lesson: rich mathematical tasks which enable the students to engage in mathematical thinking, constant assessment of the lesson by the teacher both during and after the lesson and the

creation of a conducive environment that allows mathematical discourse to take place (National Council of Teachers of Mathematics, 1991; Bahagian Pendidikan Guru, 1998, Cheah, 2007)). While the model has been in existence since 1998, actual classrooms have not been able to realise the suggestions as recommended in the model. The observations of live lessons and the video recordings of Japanese elementary mathematics classroom during the APEC-Tsukuba Lesson Study Conferences<sup>1</sup> have however shown that this model can be actualised in practice. Further the Japanese lessons show the possibility of bringing mathematical discourse and rigour in the primary school to a greater depth than otherwise would have thought possible. The live demonstration lessons at the APEC Tsukuba Conferences also highlight the importance of the role of the teachers in executing the lessons. Possibly, the key of these exemplary lessons lies in the skills and knowledge of the teachers that have been developed and nurtured through years of refinement using the Lesson Study approach.

#### *Assessment in the Classroom*

Classroom assessment is thus to be viewed not as independent but rather as an integrated aspect of the classroom together with the mathematical task, discourse, and the environment set in place by the teacher (see Figure 1). The central focus of the lesson is the mathematical task which is relevant to the students and rich in the sense that it allows the mathematical ideas to be generated, formed and verified by the students. The teacher plays a key role in this process as he or she facilitates and helps students build these ideas through mathematical discourse. The purpose of assessment in the classroom is thus not merely to grade or determine the level of mathematical achievement, but rather to assess the students' understanding in order to engineer the students' thinking to construct and conceptualise mathematical ideas so that they are able to apply these ideas in a variety of situations. NurulHidayah and Ong (2009) found that through the use of rich tasks, they were able to assess four mathematical processes namely, conceptual understanding, mathematical representation, computational skills and mathematical explanation. Assessment of student's understanding can also be carried out using various assessment tools such as problem-solving, discussions, assignments projects, scrap-books, folios, investigations, exercises and tests. Assessment of various types of achievement targets such knowledge mastery, reasoning proficiency, skills and the ability to create products can be meaningfully planned and evidence gathered through personal communication, problem solving, thinking aloud, observing students perform various mathematics skills and exercises (Kwek, Hoo & Tan, 2007).

#### *Selection of Tasks*

Often teachers view assessment as the pencil and paper tests, or quizzes conducted as an activity after the main teaching and learning task and is viewed as separate from assessment. On the contrary, the learning task is integral to good classroom assessment. The selection of a rich mathematical task is thus the beginning of assessment for learning (Kwek, Hoo & Tan, 2007; Bryant & Driscoll, 1998). Selecting meaningful tasks that fulfils the desired learning outcomes is often difficult especially for the novice teacher but can be facilitated through group discussion as is often done in Lesson Study Groups. The following example, taken from an episode of Lesson Study carried out in a primary school in Malaysia, exemplifies the benefits of collaborative Lesson Study in creating mathematical tasks.

<sup>1</sup> <http://www.criced.tsukuba.ac.jp/math/apec/> and [http://hrd.apec.org/index.php/Classroom\\_Innovations\\_through\\_Lesson\\_Study](http://hrd.apec.org/index.php/Classroom_Innovations_through_Lesson_Study)

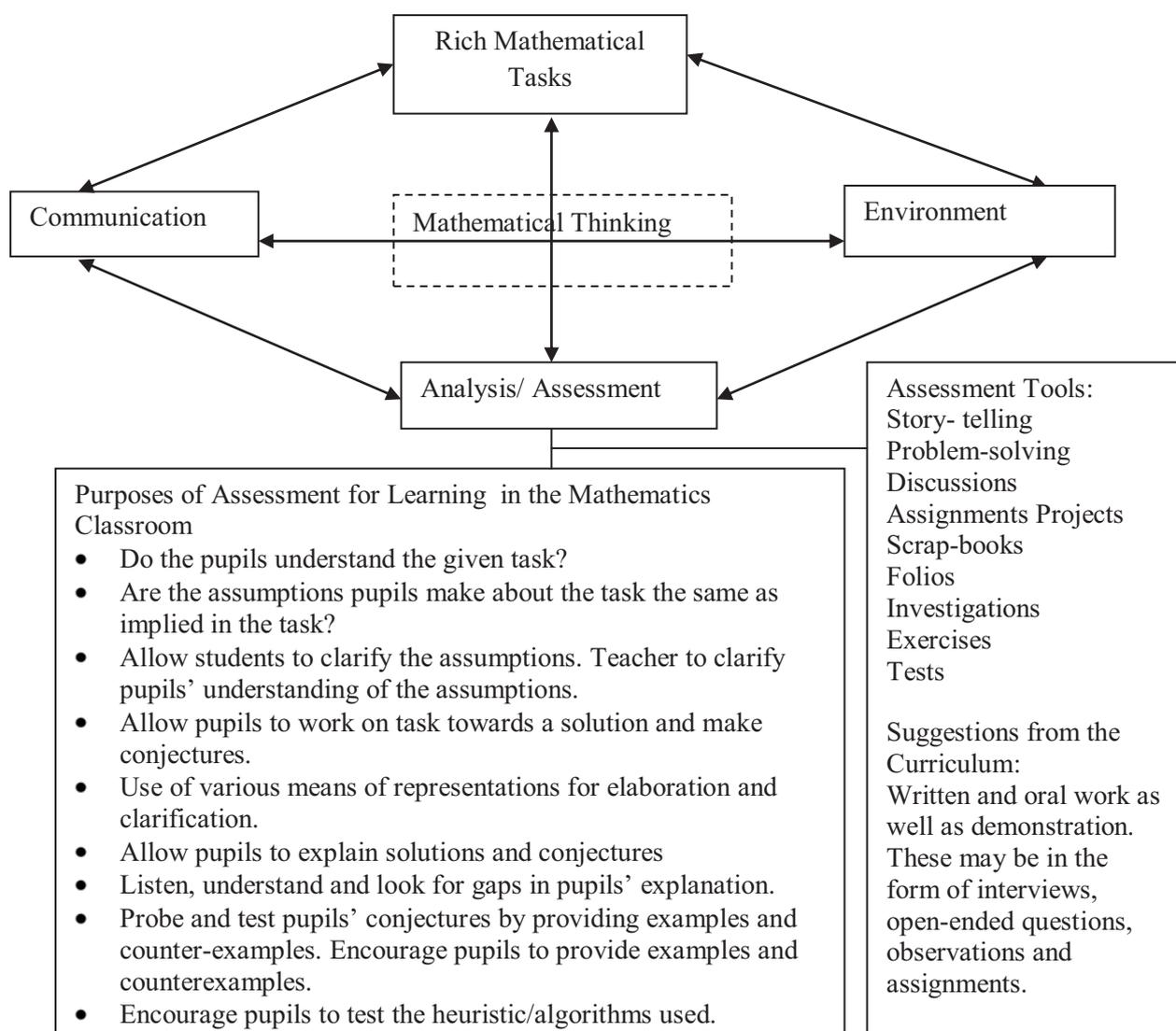


Figure 1. A framework for assessment in the Malaysian primary mathematics classroom.

*A Case from a Lesson Study Group*

The lesson was planned for a year 2 class on the topic of two-dimensional shapes. The original desired learning outcome of the lesson was to compare and sort two-dimensional shapes according to its properties. The group selected a task found in the teachers' guide book (see Figure 2). The task requires students to identify the various two dimensional shapes in the diagram. The group had initially planned this task to be the main activity of the lesson.



Figure 2. Identifying two-dimensional shapes.

However, during the group lesson planning the teachers decided that they wanted to add more rigour into the class discussion. The teachers wanted the students to be able to not only identify the shapes but also be able to recognise and state the properties of the shapes that make it different from the other shapes. In so doing, the group hoped that the students would be able to better compare the differences between the shapes in particular between squares and rectangles. The group then realised that they might not be able to achieve the lesson objectives if they used the initial activity as the main lesson task. Eventually, the group created another simple task (see Figure 3), in which the students were asked to compare squares and rectangles by using cut-outs and rotating one figure on top of the other, thus enabling the students to see the differences between squares and rectangles. The task further implicitly introduced the students to the idea of symmetry.



*Figure 3.* Comparing squares and rectangles by rotating the cut-outs.

Subsequently, the lesson assessment was then built around the task shown in Figure 3. The assessment tools were then planned and included oral questions during the task, student presentation of tasks and worksheets given at the end of the lesson.

### **Conclusion**

The Malaysian Curriculum aims at developing students who are competent in the mathematics basic skills as well as being capable of problem solving and applications, and further suggests that a process-based approach be incorporated into the primary Malaysian classroom. In addition, classroom assessment is envisaged to be formative and an integral part the teaching and learning activities. Meaningful classroom assessment can only be realised if it is useful for both teachers and students and is aimed at helping students construct, verify as well as to apply mathematical ideas. Designing good assessment therefore begins with planning mathematical tasks that allow students to generate and construct mathematical concepts. Subsequently assessment tools can then be built around the mathematical task that would enable to teacher together evidence of student learning and using such evidence to further improve the lessons. Central to this idea is the mathematical task which is designed to facilitate students constructing mathematical ideas and concepts.

There are however numerous challenges if this vision of the curriculum is to become a reality in the classroom. Undoubtedly it would require a highly competent teacher to master the complexity of the lesson where the students are continuously being actively engaged in constructing and applying the mathematical ideas and skills. One main challenge therefore is to develop teachers' skills, knowledge and attitude to implement such a curriculum. While formal training through workshops and seminars may be able to impart new knowledge to teachers, more would be required to accomplish the vision of the Malaysian curriculum, and to bridge the gap between theory and practice. Teachers need support to acquire the skills and confidence to implement the curriculum in real lessons at the classroom level. Therefore, it is recommended that a practical long-term plan of school-based teacher development be set in place to provide the necessary support for teachers. The Lesson Study approach, for example could assist teachers develop the necessary skills required to implement lessons envisioned in the Curriculum. The collaborative and practical emphases found in the Lesson Study would

further benefit the teachers as they plan, teach and analyse the lesson together. With improved collegiality and confidence, teachers would then be better equipped to move towards and make student-centred, process-focused lessons a reality.

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