
Title	Assessment: Some insights from classroom in Singapore
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Source	<i>Association of Mathematics Educators (AME) Teachers' Conference on Assessment , Singapore, 2 June 2005</i>
Organised by	Association of Mathematics Educators (AME) and Mathematics & Mathematics Education (MME) Academic Group, National Institute of Education (Singapore)

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MATHEMATICS TEACHERS CONFERENCE

2 JUNE 2005

Keynote II

Assessment

**Some Insights from Classrooms
in Singapore**

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Jointly organized by:
Association of Mathematics Educators
Mathematics & Mathematics Education Academic Group, NIE, NTU
Supported by Ministry of Education (CPDD & Staff Training Branch)

**Assessment -
Some Insights from Classrooms in Singapore**

By

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At Association of Mathematics Educators (AME) Teachers' Conference on
Assessment

2 June 2005, Singapore

Outline

1. Introduction
2. Mathematics Assessment Project (MAP)
 - a. Research Questions and Purposes
 - b. Methodology
 - c. Preliminary Findings
3. Concluding remarks (Challenges, Difficulties, and Suggestions)

**Part I
Introduction**

A scenario of mathematics teaching in US classrooms

In any math class I've been in before, I just sat and listened to a teacher talk about what was in the book and what would be assigned for homework. When I got to college the same thing was happening except I take notes on what the professor says. I have never felt in any of those situations that I should express myself on the subject. The most any teacher has done to stimulate a discussion on the subject was to simply say "Questions." Whenever the teacher said this, though, it didn't sound like he wanted a reply.

(Weissglass, 1993)

A scenario of mathematics teaching in UK classrooms

Mathematics teaching in England, as in many other parts of the World, commonly consists of a teacher demonstrating abstract mathematical procedures at the front of the class, followed by students practising the procedures in short, textbook questions.

(Boaler, 1998)

Mathematics teaching in Singapore classrooms

1. How will you describe a typical scenario of teaching and learning in Singapore mathematics classrooms?

2. How is it associated with issues in assessment?

Concept of Assessment

1. Traditional: Test/Examination (Bayles, 1950)
2. NCTM (1995):
The process of gathering evidence about a student's knowledge of, ability to use, and disposition toward mathematics (mathematics teaching and learning) and of making inferences from the evidence for a variety of purposes.

Internal Assessment vs. External Assessment

Internal assessment basically refers to classroom assessment, which is "in the hands of the classroom teacher".

External assessment includes "all kinds of testing and assessment that is done because of external obligations from a school district, or from the state or federal government"

(Stephens, 2004)

Singapore's Assessment Guides

1. Assessment should be "an integral component of the teaching and learning process"
2. The main purpose is to "improve the teaching and learning of mathematics"

(MOE, 2004a, p.7),

Part II (c)
Some Preliminary Findings

Students' attitude towards math & math learning (I)

General view towards mathematics and mathematics learning:

- About 80% of primary students found mathematics interesting and they enjoyed learning of mathematics, while fewer secondary students claimed so (interesting: 73%; enjoy: 74%);
- More secondary students (37%) than primary students (29%) claimed mathematics hard for them;

Anxiety level in the learning of mathematics:

- About 83% of primary students were not afraid of doing mathematics, whereas 63% of secondary students thought likewise;
- Consistently, more secondary students felt nervous when they had to do mathematics (primary: 24%, secondary: 31%);

Students' attitude towards math & math learning (II)

Students' perceptions of their own performance in mathematics:

- Almost 90% of primary students believed that they can learn mathematics well, whereas only 77% of the secondary students had a similar view;
- About 80% of primary students claimed that they can get good grades in mathematics, but only 61% of the secondary students claimed so;

Students' belief about the usefulness of mathematics:

- Students at both school levels claimed that mathematics was useful (primary: 87%, secondary: 91%);
- About 64% of secondary students believed that they would use mathematics a lot as an adult, while 82% of primary students said that knowing mathematics would help them get a good job.

Primary students' math performance in 2004

Primary school level	Improved		Fluctuant		No change		Drop	
	HP	NHP	HP	NHP	HP	NHP	HP	NHP
Journal writing		2	2					
Performance task		1	1	2				
Project work			1	2			1	
Self-assessment	1		1				1	1

Note (1) HP stands for "high performing classes" and NHP stands for "non-high performing classes";
 (2) The numbers in the table stand for the number of experimental classes;
 (3) The results are based on the difference between experimental classes and their respective comparison classes on the P2 math scores, school mid-year and final-year math scores;
 (4) Taking comparison classes' math scores as benchmark, "improved" indicates the increase (decrease) in math scores for the experimental classes being greater (smaller) than that of their respective comparison classes; "drop" indicates the contrary of "improved"; "fluctuant" indicates a combination of "improved" and "drop" situations; "no change" indicates the changes in math scores for the experimental classes being similar to that of their respective comparison classes

Secondary students' math performance in 2004

Secondary school level	Improved		Fluctuant		No change		Drop	
	S/E	NA	S/E	NA	S/E	NA	S/E	NA
Journal writing		1	2	1				
Performance task	1	1	1		1			
Project work	1			1				
Self-assessment	2	2						

Note (1) S/E stands for "Special/Express classes" and NA stands for "Normal Academic classes";
 (2) The numbers in the table stand for the number of experimental classes;
 (3) The results are based on the difference between experimental classes and their respective comparison classes on the PSLE math scores, school mid-year and final-year math scores;
 (4) Taking comparison classes' math scores as benchmark, "improved" indicates the increase (decrease) in math scores for the experimental classes being greater (smaller) than that of their respective comparison classes; "drop" indicates the contrary of "improved"; "fluctuant" indicates a combination of "improved" and "drop" situations; "no change" indicates the changes in math scores for the experimental classes being similar to that of their respective comparison classes

Secondary Students' Mathematics Performance (2005 Mid-Year Results)

			M	S.D	N	t	p
School 1 (NHP)	Exp	Expt	70.58	11.37	22	0.904	0.369
		Ctrl	68.00	13.65	17		
	NA	Exp	57.30	15.52	34	6.982	0.000*
		Ctrl	33.51	15.29	9		
School 2 (HP)	Exp	Expt	79.39	12.05	27	3.275	0.002*
		Ctrl	68.72	16.39	17		
	NA	Expt	59.98	18.89	23	0.594	0.554
		Ctrl	57.72	16.63			

Alternative assessment methods and different purposes of assessment	
Alternative method	What can be better assessed
Performance-based assessment	Cognitive domain, particularly students' higher-order thinking process and problem solving ability.
Authentic assessment	Cognitive domain, particularly real-life problem solving ability.
Portfolio assessment	Both cognitive and affective domains, particularly the development of students' learning over a period of time or represented in a few aspects.
Journal writing	Both cognitive and affective domains, particularly students' deep thinking and written communication skills, and their disposition concerning learning of mathematics.
Project assessment	Cognitive domain, particularly students' problem solving ability and creative thinking skills.
Oral presentation	Cognitive domain, particularly students' organizational and oral communication skills.
Student interview	Both cognitive and affective domains, particularly for getting information from a few particular students.
Classroom observation	Affective domain, particularly students' learning behaviors in classroom.
Student self-assessment	Both cognitive and affective domains, particularly students' disposition toward learning of mathematics, and their involvement in learning process, e.g., doing group activity.
Student-constructed assessment	Cognitive domain, particularly at the evaluation level in Bloom's taxonomy of educational objectives in cognitive domain.

Part III
Concluding remarks
(Challenges, Difficulties, and Suggestions)

Challenges and difficulties for teachers

- New to the alternative assessment strategies
 - designing of tasks;
 - integrating the tasks into daily math teaching;
 - using rubrics to evaluate students' work on the tasks;
 - using information from students' work on the tasks to improve teaching;
- Juggling between school curriculum & existing workload and learning how to apply the new assessment strategies in teaching;
- Supporting students in both affective and cognitive domains.

Challenges and difficulties for students

- New to the alternative assessment strategies
 - getting started;
 - meeting with tasks' expectation;
 - learning new skills (communication, data collection, high-order thinking, organization, self-reflection, etc.);
- Juggling between conventional learning and working on the new types of tasks;
- Applying learned knowledge to new and unfamiliar situations.

Suggestions for implementations (I)

- Start small
- Develop clear rubrics
- Expect to use more time at first
- Adapt existing curriculum
- Have a partner
- Make a collection
- Assign a high value (grade) to the assessment
- Expect to learn by trial and error
- Try peer assessment activities
- Don't give up

(Hange & Rolfe, 1994)

Suggestions for implementations (II)

- Set a reasonable and manageable target at the beginning stage
- Expect to start slow and small
- Explain the rationale to students
- Be encouraging to students
- Use it to supplement and complement, but not replace or displace, the traditional assessment
- Try to integrate into Singapore curriculum (not an add-on)
- Make reference to Mathematics Assessment Guides by MOE
- Have a team or a colleague work together
- Learn from experience and professional activities
- Seek external help when necessary (e.g., from NIE Lecturers, Researchers and AME)

Acknowledgement

The MAP project team wish to express heartfelt thanks to all the teachers, administrators (HOD/Level Head/Subj. Head/P/VP), and students in the participating schools for their collaboration, support, and help for the project.

Thanks

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