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MY BEST MATHEMATICS TEACHER – PERCEPTIONS OF SINGAPORE AND BRUNEI PUPILS

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Abstract: A study on Primary School Pupils' Perception on Studying Mathematics was conducted jointly by researchers from the National Institute of Education (NIE) in Singapore and the Sultan Hassanal Bolkiah Institute of Education (SHBIE) in Brunei Darussalam. Altogether 543 twelve year olds from Singapore and Brunei participated in the study. As part of the study pupils were asked to respond to the question "Describe the qualities of the best mathematics teacher you have ever had?" Pupils were also asked to "Draw a picture of your best mathematics teacher teaching in class." This paper reports the perceptions of the pupils and discusses them in relation to the teaching / learning activities in mathematics classrooms in Singapore and Brunei.

Introduction

This study is a result of IDEA 98 (Inter-institute Dialogue on Educational Advances) between the Sultan Hassanal Bolkiah Institute of Education (SHBIE) of Brunei and the National Institute of Education (NIE) held in May 1998 at the NIE in Singapore. In some ways this study is also an extension of an earlier research by Kaur and Yap (1997a). The IDEA agenda is a novel project that aims to stimulate exchange of ideas and experiences on teacher education between academicians of the two institutes. In several areas collaborative research projects have been implemented, and this "My best mathematics teacher" project is one of them.

The Study

Sample

209 pupils of whom 98 were girls and 111 were boys from Brunei and 334 pupils of whom 171 were girls and 163 were boys from Singapore participated in the study. The pupils were 12 years of age and in their final year of primary school. In Singapore the pupils were from 4 urban schools, while in Brunei, the pupils were from 3 urban schools and one rural school.

Instrument & Method

The instrument used in the study was a 26 item questionnaire adapted from the Pupil Questionnaire used in the KASSEL Project (Kaur & Yap; 1997b). The questionnaire sought data on:

- Enjoyment* - mathematics at both the lower and upper primary levels mathematical topics, other school subjects and mathematical games
- Aspiration* - grade at Primary School Leaving Examination (PSLE, for Singapore) or Primary Certificate of Education (PCE, for Brunei)
- Competency* - self in Mathematics and English Language, self in mathematical tables, family members in mathematics

<i>Use</i> -	in other subjects, everyday tasks
<i>Help</i> -	tuition (outside school hours), person who helped most over the past year
<i>Homework</i> -	frequency and when it is done
<i>Computer</i> -	available at home or not, what is it used for computer work during mathematics lessons in school
<i>Calculator</i> -	used for trivial tasks or not
<i>Learning</i> -	teaching methods that enable pupil to understand new concepts well, revision techniques for mathematics tests and examination, preference for assessment modes
<i>Teacher</i> -	qualities of best mathematics teacher, drawing of best mathematics teacher teaching in class

In Brunei the pupils were administered the questionnaire in Bahasa Melayu (their national language) towards the end of their school year *before* their Primary Certificate in Education (PCE) examination in 1998. In Singapore the pupils were administered the questionnaire in English towards the end of their school year *after* their Primary School Leaving Examination (PSLE) in 1998. The difference in administration *before* and *after* the public examinations may be relevant in interpreting differences in pupils' responses reported below.

In addition to the written responses, pupils were asked to draw their "best" mathematics teacher. Though not very widely used, children's drawings have been found to provide vivid images about scientists (Chambers, 1983; Kahle, 1989), mathematicians (Wong, 1995), and classrooms (Burgess, 1994; McDonough & Pavlou, 1994; Wong, 1996). This technique has several advantages: it is easy and fun to use; it gives vivid snapshots of perceptions that have emotional content; it is not restricted by pre-coded responses; even young children who have problems reading questionnaire items can respond by drawing. The items in children drawings are often coded into well-defined categories. This coding is subjective but it seems to work well. For instance, Kahle (1989) cited inter-rater reliabilities of 0.86 to 0.97 about coding drawings of scientists and commented on the close agreement between visual images and verbal images deduced from interviews. We believe that this technique is worth further exploration.

Data and Results

In this paper only the analysis of the responses to the question "Describe the qualities of the best mathematics teacher you have ever had" and drawings of their best mathematics teacher teaching in class will be presented and discussed. A fuller report will be prepared once all the data have been analysed.

Describe the qualities of the best mathematics teacher you have ever had

A preliminary analysis of the responses led to classification of qualities under four broad areas of concern, namely: Personal qualities, Relationship/rapport, Instruction/pedagogy, and Homework policies/expectations. The qualities under the respective areas of concern are shown in Table 1. The pupils' responses were coded manually and frequency tables obtained with the help of a spreadsheet or SPSS.

The responses were organised by country as shown in Table 2. *Lower* ranks indicate *higher* frequencies. The pupils in both countries reported similar qualities about their best mathematics teachers. In particular, the ability to explain things clearly features prominently in these responses.

Table 1: Classification of Teacher Qualities

<i>Personal Qualities</i>	<i>Instruction/Pedagogy</i>
101 – patient	301 – explains clearly
102 – helpful	302 – simple and easy exposition
103 – hardworking	303 – good in maths/clever
104 – responsible	304 – teach slowly/show more examples
105 – punctual	305 – correct pacing
106 – humorous	306 – show working step by step
107 – confident	307 – systematic planning/well prepared
108 – calm/good tempered	308 – not boring/interesting
109 – courteous/pleasant/nice	309 – ensures pupils understand
110 – neat	310 – provides individual help
111 – cheerful	311 – good notes/worksheets
112 – enthusiastic	312 – make maths meaningful/different approaches
113 – humble	313 – group work/discussion/pupil participation
114 – serious/dedicated	314 – stimulate thinking
115 – considerate	315 – experienced
116 – appearance (pretty/handsome)	316 – open minded
<i>Relationship/Rapport</i>	<i>Homework Policies /Expectations</i>
201 – strict/firm	401 – demanding/a lot of homework
202 – not fierce/approachable/encouraging/motivating/friendly	402 – moderate homework
203 – lenient	403 – not too much work
204 – supportive	404 – do work in class
205 – fair	405 – constant review/reinforcement
206 – ensures class is attentive	406 – serious with pupils' work
207 – authoritative	407 – checks homework/goes through homework
208 – caring/kind	408 – give difficult problems
209 – understanding	409 – regular tests/assessment
210 – listens to pupils	410 – encourage pupils to do more sums
211 – answers questions	
212 – never gives up hope on pupils	

Table 2: Rankings of Teacher Qualities by Country**Singapore**

Rank no	Personal Qualities	Instruction/Pedagogy
1	Patient	Explain clearly
2	Humorous	Ensures pupil understand
3	Helpful	Good in maths/clever
4	Serious/dedicated	Provides individual help
5	Courteous/pleasant/nice	not boring/interesting/funny
Rank no	Relationship/Rapport	Homework policies/Expectations
1	Caring/kind	Demanding/ a lot of homework
2	Understanding	Check / goes through homework
3	Not fierce/approachable/encouraging/motivating/friendly	Constant review/reinforcement
4	Strict/firm	Give difficult problems
5	Answer questions	Moderate homework

Brunei		
Rank no	Personal Qualities	Instruction/Pedagogy
1	Calm/Good temper	Explains clearly
2	Helpful	Ensures pupils understand
3	Courteous/Pleasant/Nice	Group work/Discussion/Pupils' Participation
4	Responsible	Simple/Easy exposition
5	Neat	Provides individual help
Rank no	Relationship/Rapport	Homework policies/Expectations
1	Answers questions	Do work in class
2	Not fierce/ Approachable/ encouraging/motivating/friendly	Demanding/ A lot of homework
3	Strict/Firm	Encourage pupils to do more sums
4	Supportive	Constant review/Reinforcement
5	Ensures class is attentive	Check homework/Goes through homework

To illustrate the above results, a few responses are given below. They highlight that the desirable qualities are integrated, suggesting that an effective teacher should use a repertoire of techniques as well as develop several positive characteristics.

Examples of responses from Singapore

Pupil 2071: Patient, hardworking, caring, understanding, able to solve challenging problem sums.

Pupil 2075: Able to explain clearly; caring, patient and kind; encourages pupils to ask questions; does not give too much homework; makes the lessons interesting (games/quizzes)

Pupil 2081: Patient and explains till we understand; experienced and knows which method is the best; strict – makes sure we learn and do our homework.

Examples of responses from Brunei

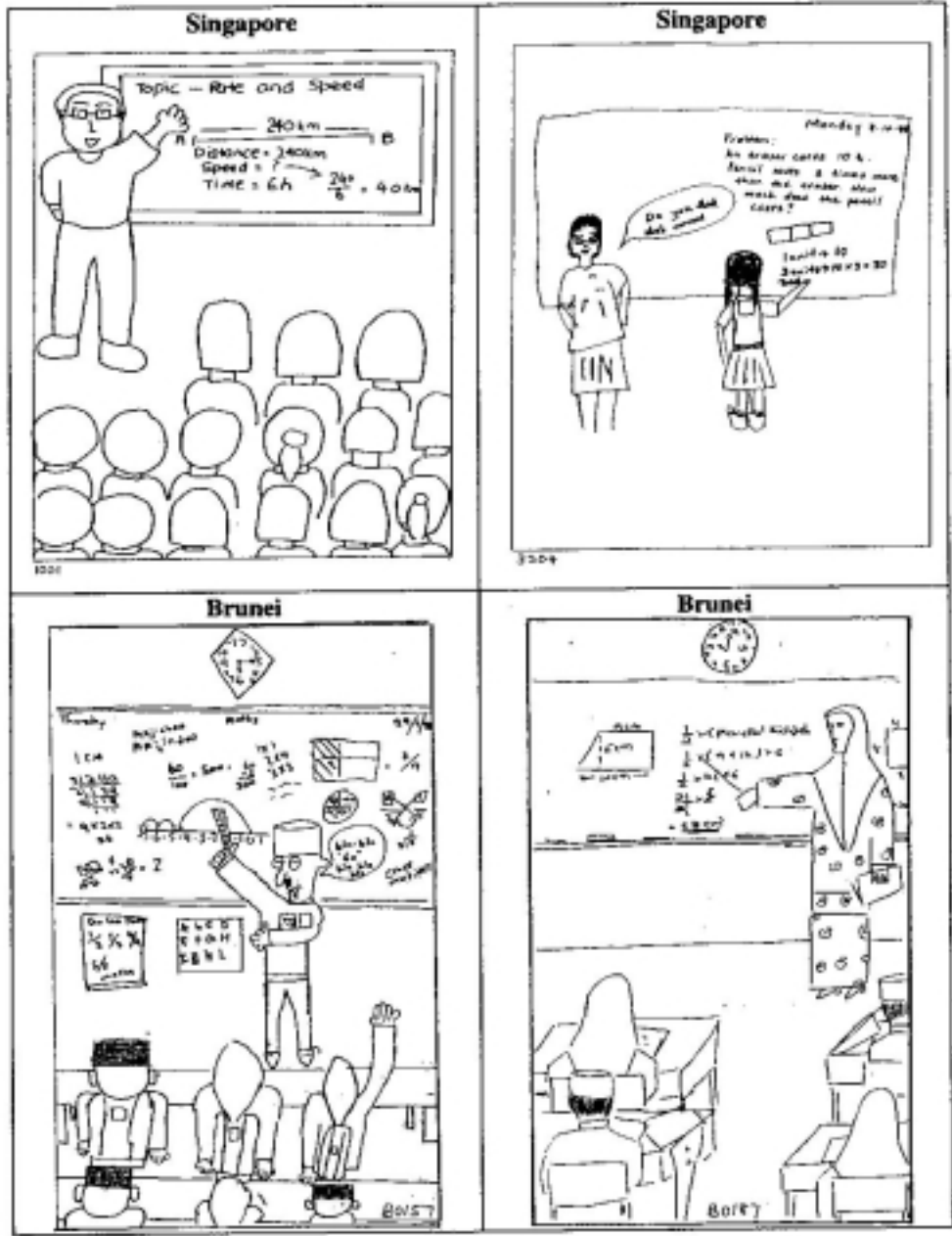
Pupil 196: Teaches us well, encourages us to learn, explains step by step so that we will understand what is being taught.

Pupil 088: She is a nice person, who explains clearly, gives written and oral tests and is able to solve any mathematical problems.

Pupil 100: At first the teacher explains. Then she asks us to open our books and re-explains. Finally she asks us whether we understand or not.

Draw a picture of your best mathematics teacher teaching in class

Below are 4 drawings of two each from Singapore and Brunei of their best mathematics teacher teaching in class. The clothing of the teachers and pupils looked different reflecting the predominant culture of the two countries. However, the similarities in the learning environment are striking indeed. The drawings showed the whole-class situation with pupils seated in rows and the teachers up front explaining something. The board was packed with mathematical symbols, diagrams, and solutions. Interestingly the Bruneian pupils were more attentive to the time of the lessons!



We conducted a qualitative analysis by counting the number of items given in the drawings. These items are grouped under three main categories: Teacher; Student & Learning; and Environment. The details are shown in Table 3.

Table 3: Categories of Pupils' Drawings

The Teacher	Student & Learning	Environment
<i>Sex</i>	<u>Number of students:</u>	Board
0 – No teacher	<i>Sex</i>	0 – No white/blackboard
1 – Male	1 – More male	1 – Empty board
2 – Female	2 – More female	2 – With work/formula, etc.
3 – Cannot tell	3 – Equal	3 – Messy
<i>Dress</i>	4 – Cannot tell	4 – Homework instructions
1 – Neat	<i>Seating</i>	5 – Value statement
2 – Messy	0 – Not applicable	<i>Mathematical work on board</i>
3 – Cannot tell	1 – In neat rows	0 – None
<i>Style of Teaching</i>	2 – In groups/pairs	1 – Maths shown (correct)
0 – No sign of teacher	3 – Individual	9 – Maths shown (incorrect)
1 – Just standing in front of class	4 – Standing	<i>Classroom</i>
2 – In front of class, clearly explaining	<i>Learning Condition</i>	0 – Messy, untidy
3 – In front of class, asking questions	0 – Not applicable	1 – Neat & orderly
4 – Working with groups	1 – Appear attentive	2 – Cannot tell (e.g. in portraits, no drawing of Ss desks)
5 – Working with individual pupil	2 – Moving around	<i>Technology</i>
6 – In front of class, giving instructions/ assigning homework)	3 – Pupil at work at chalkboard	0 – None
7 – Portrait only	4 – Pupil explaining in front of class	1 – Computers
8 – Standing in front of class giving instruction/direction not related to any obvious maths concepts or skills	5 – Pupil asking questions	2 – OHP
	6 – No indication of involvement (passive)	<i>Manipulatives / teaching aids</i>
		1 – None
		2 – Some
		# teaching aids here exclude chalks, markers or pointers

The data from pupils' drawings are discussed below. When the percentages do not add up to 100, it shows that the items could not be coded accurately. For example, in some cases, the gender of the teacher could not be inferred from the drawings.

The Teacher

Sex	Singapore	Brunei	Dress	Singapore	Brunei
Male	41.7 %	12.4%	Neat	92.2 %	78.0 %
Female	56.5 %	68.4%	Messy	3.0 %	1.4 %

Style of Teaching	Singapore	Brunei
In front of class:		
- standing	8.4 %	27.8 %
- explaining	61.0 %	34.4 %
- asking questions	11.7 %	12.0 %
- giving instructions related to maths	3.9 %	-
- giving instructions unrelated to maths	1.5 %	-
Working with:		
- group of pupils	0%	0.5 %
- individuals	0.3%	2.9 %

In Brunei the female teachers outnumbered the male teachers in the ratio 5:1, whereas in Singapore there was more balanced distribution. In both countries, the predominant teaching style is whole-class instruction with the teacher standing and explaining in the front of the class. Group work was hardly depicted in these drawings.

Student & Learning

No of students	Singapore	Brunei	Sex	Singapore	Brunei
0	77.2 %	40.7 %	More male	6.3 %	13.9 %
1 – 9	21.0 %	34.6 %	More female	4.5 %	9.6 %
10 – 19	1.8 %	1.5 %	Equal	3.3 %	9.6 %
20 & above	-	1.5 %	Cannot tell	8.4 %	4.3 %

Seating	Singapore	Brunei
In neat rows	12.9 %	39.2 %
In groups / pairs	4.5 %	2.9 %
Individual	2.1 %	0.5 %
Standing	3.3 %	-

Learning condition	Singapore	Brunei
Appear attentive	18.0 %	32.1 %
Moving around	-	3.3 %
Pupil at work at chalkboard	0.6 %	-
Pupil explaining in front of class	0.6 %	-
Pupil asking question	1.2 %	-
No indication of involvement	0.6 %	-

A majority of the Singapore drawings did not show any student, while a greater percentage of Brunei drawings included students. Similarly, a higher percentage of Brunei drawings showed neat seating arrangement. Coding the learning conditions was a bit more problematic. The Singapore drawings included some active participation of pupils in the lessons. Since the pupils were asked to draw their teachers, the results above about pupils were not conclusive and require further exploration.

Environment

Board	Singapore	Brunei
No board	15.9 %	0.5 %
Empty board	8.1 %	12.4 %
With work/ formulae, etc	68.5 %	64.6 %
Messy	5.1 %	1.4 %
Homework instructions	1.8 %	-
Value statement	0.6 %	-

Mathematical work on board	Singapore	Brunei
No mathematics shown	8.1 %	11.0 %
Mathematics shown (correct)	65.8 %	59.3 %
Mathematics shown (incorrect)	2.7 %	10.9 %

Classroom	Singapore	Brunei	Technology	Singapore	Brunei
Messy/untidy	0.6 %	1.0 %	Computers	-	0
Neat/orderly	18.6 %	78.0 %	OHP	2.1 %	0
Cannot tell	81.4 %	-	None	97.9 %	100 %

Manipulatives/Teaching aids	Singapore	Brunei
None	96.7 %	98.1 %
Some	0.6 %	1.9 %

There were many similarities in the physical classroom environments found in both countries. In particular, the blackboard (whiteboard) invariably contained some mathematics. In the Brunei drawings, about 11% of the mathematics were found to be wrong. This provides another source of information about pupils' errors. Most of the drawings in both countries did not show any teaching aids. One might infer that most teachers who were considered "best" by their pupils did not use teaching aids or the pupils were not aware of these aids. As a step towards promoting metacognitive awareness, the teachers could explain to their pupils the purposes of the teaching aids they have used.

Conclusions

The results of this collaborative project confirm the traditional or conventional mathematics teaching found in many Asian and western countries. This method has been internalised by upper primary pupils as one shown by their "best" mathematics teachers. The technique of pupils' drawings is a promising research tool that can provide an exciting and valid snapshot of the classroom environment of "good" mathematics teachers.

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