

Is there a Chinese Pedagogy of Mathematics Teaching?

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As reported in previous issues of CERCUlar, researchers at the University of Hong Kong have had a long tradition of involvement with projects conducted under the umbrella of the International Association for the Evaluation of Educational Achievement (IEA). One of these projects is the Third International Mathematics and Science Study (TIMSS), which has attracted considerable attention worldwide.

Francis Lopez-Real and Ida Ah Chee Mok are specialists in mathematics education, who are following up some dimensions of the TIMSS project. They are doing this in a project supported by the Research Grants Council (RGC) of Hong Kong in which Frederick Leung is the Principal Investigator and Ference Marton is a co-investigator. Here they explain the basis of their project and the ways in which it will contribute to wider understanding of the processes of teaching and learning.

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Francis Lopez-Real and Ida Ah Chee Mok

TIMSS was the largest comparative study of student achievement in mathematics ever undertaken, and involved 41 countries. Unlike many previous studies, TIMSS collected data on a large number of factors that might influence achievement. These included curricula, textbooks, resources, the environment, and attitudes of teachers and pupils.

Many researchers felt that teaching must be one of the most significant factors influencing achievement. As Stigler & Hiebert (1999, p.2) put it: “Standards set the course and assessments provide the benchmarks, but it is teaching that must be improved to push us along the path to success”. The TIMSS steering group therefore decided to conduct a video study in parallel with the main study, to record and analyse a large number of lessons from different countries.

The steering group realised that for economic and logistical reasons the sample for the video study could not be as large as for the main study. In the event three countries were chosen for comparison: Germany, the USA, and Japan. The original intention was to tape 100 Grade 8 lessons in each country, but for various reasons the final study comprised 100 lessons in Germany, 81 in the USA, and 50 in Japan. Even with a smaller scale than initially envisaged, this was also the largest study of such qualitative data ever undertaken in mathematics education.

One of the main purposes of the video study was to determine whether clearly-distinguishable characteristics of teaching styles and methodology could be identified across cultures. If so, this might help

to explain the different achievement levels of students. The data were collected through random sampling of teachers and Grade 8 classes from within the larger TIMSS sample.

One major problem was to ensure that the lessons taped would be typical of normal teaching rather than special, stand-alone events. This issue was explained to all teachers, who were asked to provide details of what had occurred in the previous lessons and their plans for the next lessons. The researchers were aware that some aspects, such as student behaviour and discipline, were unlikely to be typical due to the presence of the video camera. Nevertheless they believed that many teacher behaviours, such as routine classroom discourse, are so highly socialised and automatic that they are difficult to change.

The researchers' analysis of the results of the TIMSS Videotape Classroom Study are reported in the book *The Teaching Gap* (Stigler & Hiebert 1999). The book claims that the tapes did indeed illustrate quite different pedagogies *across* the three countries, and that these teaching methods were highly consistent *within* countries. "To put it simply, we were amazed at how much teaching varied across cultures and how little it varied within cultures" (p.11). The 'teaching gap' of the title refers to these cross-cultural differences.

Two chapters in this book describe these images of teaching, and analyse three lessons to illustrate the case. The authors propose three 'mottos' for describing the main characteristics of a lesson in each country. For a German lesson, the motto is "developing advanced procedures"; for a Japanese lesson it is "structured problem solving"; and for a US lesson it is "learning terms and practising procedures". Adding flesh to these descriptions, the main aim of Japanese mathematics lessons appears to be conceptual understanding through problem solving with the students having much of the 'control'. Conceptual understanding is also a major aim for German lessons, but the 'control' remains very much with the teacher. In contrast, the major aim in the US lessons appears to be acquiring techniques and algorithms. The lesson illustrations given in the book strongly substantiate these characterisations, and the authors claim that they are highly typical. Indeed, the authors describe the mental picture of the teaching pattern within each culture as a kind of 'teaching script'.

This is a powerful image; but does a national teaching script really exist? In recent years the phenomenon referred to as 'the Asian learner paradox' has been discussed by a number of authors (e.g. Watkins & Biggs, 1996, 2001). Stated briefly, this is the apparent contradiction between the teaching methods/environment in Asian schools (i.e. large classes, whole class teaching, examination-driven teaching, oriented to content rather than process, emphasis on memorisation, etc.), and the fact that Asian students have regularly performed better than their Western counterparts in comparative studies. The paradox lies in the fact that the above characterisation of Asian teaching describes features that, according to much research, is not conducive to effective mathematics learning.

The Japanese lessons described in the video study certainly do not 'fit' the Asian stereotype. So, is Japan an exception within Asian cultures? In fact, as Stigler & Hiebert observe (1999, p.106), "one might even argue that Japanese lessons better exemplify current U.S. reform ideas than do U.S. lessons". Or, is the stereotype image of most Asian mathematics teaching quite wrong anyway?

Our own experience of teachers in Hong Kong and elsewhere in Asia suggests that the Japanese image portrayed in *The Teaching Gap* is not typical. We also note that Leung's (1995) comparative study of

junior secondary mathematics classrooms in Beijing, Hong Kong and London found great differences between the instructional styles in the three cities. Whole-class instruction was obviously more common in Beijing and Hong Kong than in London. A salient similarity in Beijing and Hong Kong was the teachers' expository style of expounding mathematical content. Our own impression is that the popular pedagogy in Hong Kong is closer to the German model, where concepts are carefully explained but the transmission mode is still dominant.

Some disquiet has been expressed about the methodology used in the TIMSS video study, particularly concerning the taping of just one lesson per teacher. Partly because of this, a new international research project has been launched. It is called the Learners' Perspective Study, and is led by David Clarke at the University of Melbourne (Clarke 1998). The project will study fewer classrooms in each country, but each class will be videotaped over a sequence of 10 lessons. Our own study is free-standing, but has been conceived in conjunction with the Learners' Perspective Study. It focuses on classrooms in Hong Kong and Shanghai, and also uses a sequence of 10 lessons for analysis.

In characterising national norms of teaching practice, the TIMSS video study accepted certain limitations. Only one camera was used, the primary focus of data collection and analysis was the teacher, and only one lesson was videotaped for each classroom sampled. The Learners' Perspective Study intends to supplement the TIMSS Videotape Classroom Study data by in-depth documentation of the student perspective over several lessons in the same classroom. The available technology is utilised to combine videotape data with participants' reconstructions of classroom events. The project in Hong Kong and Shanghai, like others in the Learner's Perspective Study, will use two video cameras to provide a split-screen record of both teacher and student actions. It will also use video-stimulated recall in interviews conducted immediately after the lesson to obtain participants' reconstructions of the lessons and the meanings that particular events held for them personally.

To conclude, the new study will complement the TIMSS, TIMSS Videotape Classroom Study, and the Learners' Perspective Project in the following aspects:

- It will involve two different cities in China – Shanghai and Hong Kong – thus facilitating the identification of a distinct Chinese pedagogy (if any), as well as variations within it.
- It will complement emergent national norms of student achievement and teaching practices with an in-depth analysis of classroom learning from the perspective of the learner.
- It will utilise a new methodology in the analysis of the data in order to get a deeper understanding of classroom teaching from the learners' perspectives.
- It will examine the Shanghai-Hong Kong differences in teaching in light of what the students actually learn from the lessons.

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