

Schmidt, W. H.; Jorde, D.; Cogan, L. S.; Barrier, E.; Gonzalo, I.; Moser, U.; Shimizu, K.; Sawada, T.; Valverde, G. A.; McKnight, C.; Prawat, R. S.; Wiley, D. E.; Raizen, S. A.; Britton, E. D.; Wolfe, R. G.:

Characterizing Pedagogical Flow An Investigation of Mathematics and Science Teaching in Six Countries

Dordrecht: Kluwer Academic Publishers, 1996. – 243 p.
ISBN 0-7923-4272-0

Gilah C. Leder, Bundoora (Australia)

The book brings together the experiences of a group of researchers from six different countries (France, Japan, Norway, Spain, Switzerland, and the United States) as they sought to understand student and teacher behaviours in mathematics and science lessons. The original brief for the Survey of Mathematics and Science Opportunities (SMSO) team was “to develop a theoretical model of the educational experiences provided to students and to develop a comprehensive battery of survey instruments addressing student, teacher, school, and curriculum factors” (p. ix). This was seen as a critical facilitator for understanding and explaining the findings anticipated for the Third International Mathematics and Science Study (TIMSS), then in preparation and since completed. The process, as well as the product, of the resulting four year long collaborative project proved sufficiently rich to warrant more extensive documentation than was originally envisaged as part of TIMSS. *Characterizing Pedagogical Flow* is the result.

The book comprises two parts. The more general information – planning, preparations, and conclusions reached – are found in Part I. The shorter Part II consists of case studies set in each of the participating countries. They reflect and inform the contents of Part I and lose their potency if reduced to brief summaries in a book review.

It is clear that individual input into the different chapters varied considerably. Yet the temptation to depict this through specific author attributions has been resisted. Listing of the full team as joint authors of the complete volume is an unambiguous recognition of the value of collaborative work and the additional insights so often achieved through the challenge of alternative questions and interpretations. The scope of the book is depicted most effectively through brief descriptions of each of the chapters.

Explanations of the purpose, context, and rationale for the SMSO form the core of Chapter 1. Considerable value and language obstacles confound cross cultural research, including: differences in priorities and in customs; difficulties of exact translation and of idiomatic nuances. Two examples illustrate this clearly. “In the US, a lesson period is typically 50 to 55 minutes five times a week” (p. 8). Considerably more flexibility, in duration, frequency, and sequencing, was common in many of the other countries involved in the SMSO. Allocation of teachers to classes

also showed significant between-country differences. In the US, primary teachers typically teach a single class for one year and expect to be assigned a different group of students the following year. In Japan teachers often retain the same class for three years, while in Norway teachers generally stay with the same group of students throughout their primary school life. To make sense, the methods and instruments used to elicit information need to reflect these cultural differences. Considerable experimentation with different content and format is needed before satisfactory products are achieved. Four critical questions united the team and shaped the content of the rest of the book: What are students expected to learn? Who delivers the instruction? How is the instruction organized? What have students learned?

The intended curriculum is the primary focus of Chapter 2. How might a country’s intended curriculum, as demonstrated by official curriculum documents and widely adopted texts be described? In terms of topic, developmental, and cognitive complexity according to the SMSO team. The rather coarse data presented in this chapter, readers are reminded, should be supplemented with the more fine grained material of the case studies included in the latter part of the book. It is clear that for both mathematics and science, common and distinct between-country intentions could be inferred from the relevant published materials. Most of the data reported refer to the TIMSS defined Populations 1 and 2 (the two adjacent grades in each country containing most nine- and thirteen-year-olds respectively). Briefly “the curricula in France, Spain, and to some extent, Japan seem to have been more involved and posed more varied demands on students than did those in Norway, the US, and, to a lesser extent, Switzerland” (p. 67).

Chapter 3 is concerned with the delivery of the curriculum. The chapter is shaped by the question: What characterizes the content of mathematics and science lessons in the six SMSO countries? Of primary interest is “the interplay of three key attributes – content representation and complexity, content presentation, and the nature of the classroom discourse accompanying content presentation” (p. 72). The term *Characteristic pedagogical flow* (PDF) is used to describe recurrent patterns that seem most descriptive of sets of lessons.

How subject matter is construed by teachers appears a critical determinant of the instructional practices observed in the various classrooms. After all, it is teachers who make important decisions about the organization and pace of lessons, the topics to be presented, as well as the specific sequence and method of presentation.

At both of the population levels studied, there were clear consistencies among the SMSO countries in the core topics covered in mathematics. Yet instructional practices were far from uniform. Differences were noted in the visibility of specific subject-matter content (for Population 1) and, for example, the method in which homework was incorporated into the lesson structure (for Population 2). In science, despite the similarity of the intended curriculum inferred from formal documents and texts, extensive differences were noted in the content covered (for Pop-

ulation 1) and in content complexity (for Population 2). More specifically, natural science topics seemed to dominate the science curriculum of the younger students in the US and Japan; social science those of Switzerland and Norway. French and Spanish science lessons for Population 2 contained more complex forms of topics treated less intensively in the other countries.

Brief overviews of the most important descriptors of CPF, as they emerged from classroom observations, are given separately for the participating countries in the remainder of the chapter.

“The basic findings of this chapter are simple but fundamental Lessons do differ in important ways along the key dimensions of CPF. Characteristic national practices can be identified – and seem so fundamental that, not only are they qualitatively different, but, with sensitive instruments to gather appropriate data, inter-country variation may well outweigh intra-country variation.” (p. 106)

The development of the survey instruments used in the SMSO project is discussed more fully in Chapter 4. Even though school, student, and teacher questionnaires were produced, the chapter focuses predominantly on the last.

As already foreshadowed earlier, the classroom observations led to a substantial reorientation of the format and content originally envisaged for these questionnaires. Ultimately, measures of classroom practices, of pedagogy, of pedagogical beliefs, and of the complexity of the subject content covered were gauged from teacher responses to a carefully crafted questionnaire, within the constraints dictated by other commitments. For example, items which described optimum student responses expected by teachers were omitted from the final version, largely because of the time needed to complete this section. In brief, allowing for practical constraints, the questionnaires covered those aspects considered most descriptive of CPF. Examples of actual items included in the chapter are informative indicators of the scope of the information elicited and allow readers to make their own judgment on the instruments’ effectiveness. The authors themselves caution: “There obviously are limitations inherent in the instruments developed for TIMSS – limits of survey methodology, elimination of items in seeking cross-national agreement on items, ...” (p. 123).

Chapter 5, which concludes Part I, reiterates the aims of the SMSO study, the work accomplished, the limitations recognized, and the compromises inevitably made in this cross-national comparative research project. Brief, succinct, country-specific lesson summaries are given:

“The Swiss lessons were characterized by student subject matter exploration and investigation through learning activities and teacher demonstrations. Similar to Norway, there was an emphasis on students’ responsibility for their own learning. They were expected to come to understand subject matter information and facts through the learning activities prepared by the teacher. There was comparatively greater diversity in what students were expected to do (cognitive complexity) than in some other countries. Textbooks, however, showed a preponderant emphasis on students’ knowing, using and understanding information. Consistent with this emphasis, teachers often asked students for their observations, conjectures, or conclusions during lesson development.” (p. 131)

Most importantly, however, the chapter reinforces yet again that there is a strong cultural component to the teaching of mathematics and science. The methodologies, instruments, and analyses used in cross-cultural research must be planned and selected accordingly.

The six case studies included in Part II provide thicker, more detailed glimpses of teacher motivations and behaviours, as well as of classroom practices observed in the participating countries. Selections cover mathematics and science, for Populations 1 and 2. While these cameo excerpts can to some extent stand alone, their real value is in supporting the inferences drawn in the earlier part of the book about the many features and routines which describe teaching and learning in mathematics and science classes.

In Australia, as well as no doubt in many of the other countries which participated in TIMSS, considerable publicity was given into the “league table” aspect of student achievement on the mathematics and science tasks as soon as international performance summaries were published. Country specific findings have already been published in separate books, and no doubt more are on the way. Mathematics and science educators have already been called on to explain why students in their country or state performed as they did.

There is no doubt that much can be learnt from cross-cultural research such as TIMSS. But the dangers of simplistic and perhaps inappropriate comparisons, of focusing on readily quantifiable data rather than on more subtle but richly informative cross-country measures, cannot be ignored. Stark generalizations are often preferred to cautious and qualified summaries, particularly by journalists and politicians. *Characterizing Pedagogical Flow* exposes readers to the behind-the-scenes-decisions and compromises which are required if sound cross-cultural research is to move beyond the planning into the execution stage. Viewing mathematics and science teaching genuinely through a cultural lens imposes new responsibilities, sensitivities, and demands. The contents of this book offer a realistic appraisal of progress already made and challenges still to be overcome. It is essential reading for those wishing to understand more fully the strengths and limitations of the TIMSS data.

Author

Leder, Gilah C., Prof., La Trobe University, Graduate School of Education, Bundoora, Victoria 3083, Australia.
g.leder@latrobe.edu.au
<http://www.latrobe.edu.au/www/gse/index.html>