

## Chapter 2

### **TIMSS: A BRIEF OVERVIEW OF THE STUDY**

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The Third International Mathematics and Science Study has been the most ambitious and arguably the most successful project ever undertaken under the auspices of IEA. In the first round of TIMSS testing in 1995, data was collected from over 500,000 students of mathematics and science at five age/grade levels, as well as from their teachers and principals in more than 40 countries around the world. A second round of TIMSS data collection involving 38 countries was carried out in 1999. That study focused on the teaching and learning of mathematics and science at the Grade 8 level, or its equivalent internationally.

A third round of TIMSS—the acronym now denotes the Trends in Mathematics and Science Study—is planned for 2003, and the preparatory work for that study is currently under way. More than 50 countries have indicated an interest in participating in that study.

A great deal has been written about TIMSS, and the list includes articles in scholarly journals, monographs, book chapters, and books. The International Study Center (ISC) for TIMSS at Boston College has published reports of the international results from both rounds of testing, as well as several technical reports. All of these reports as well as the student-level data and a partial bibliography of TIMSS-related publications are available from the ISC's website, located at [www.timss.org](http://www.timss.org).

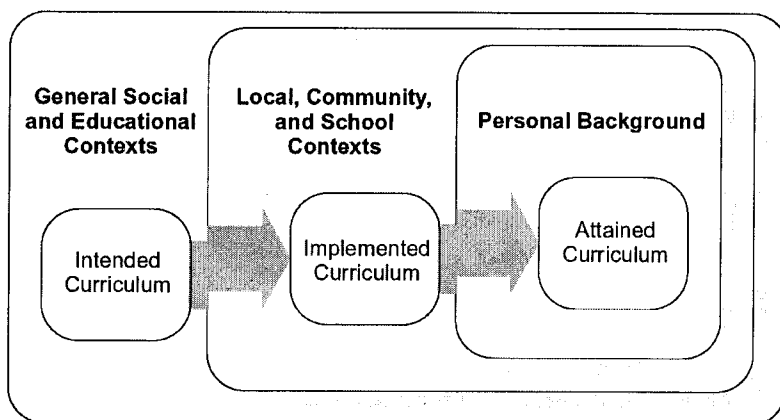
Readers who wish to obtain detailed information about any aspect of TIMSS should consult the kinds of resources referred to in the previous paragraph. Our very limited goal in this chapter is to provide those readers who may be unfamiliar with the scope and extent of TIMSS with enough information about the study to make it easier for them to understand various references to the design of TIMSS that are included in virtually every chapter in this volume.

#### THE CONCEPTUAL FRAMEWORK FOR TIMSS

The precursors of TIMSS were four studies conducted by IEA over a period of 30 years between 1960 and 1990. Those studies were:

- First International Mathematics Study, FIMS 1959-1967
- First International Science Study, FISS 1966-1973
- Second International Mathematics Study, SIMS 1976-1987
- Second International Science Study, SISS 1980-1989

The experience gained from these studies influenced the design of TIMSS in a number of important ways. In particular, the earlier IEA studies recognized the centrality of the notion of curriculum in any examination of the teaching and learning of subject matter in schools. This centrality was underscored in the conceptual framework undergirding SIMS and, later, TIMSS. Curriculum was to be examined from three viewpoints or perspectives: the curriculum as mandated at the system level (i.e. the intended curriculum), the curriculum as taught by teachers in classrooms (the implemented curriculum), and the curriculum as learned by students (the attained curriculum). That conceptual framework is summarized in Figure 1 below.



*Figure 1. Conceptual framework for TIMSS.*

The overall aim of TIMSS was to contribute to the improvement of the teaching and learning of mathematics and science in K–12 educational systems around the world. The intention was that policymakers, researchers, curriculum developers, and educators at all levels could use TIMSS data and findings to learn about the kinds of curriculum and instructional practices that were associated with the highest levels of achievement. In other words, educators from different national and cultural backgrounds could use the results of the study as a kind of mirror in which to study themselves, but not in isolation. Instead, TIMSS provided a unique opportunity for them to view themselves in the rich context provided by the participation of many other countries.

Four research questions guided the development and execution of the study, and these questions have been discussed in some detail in other publications (see, for example, Robitaille & Garden, 1996). It will suffice here to simply list the four questions for reference.

- How do countries vary in the intended learning goals for mathematics and science; and what characteristics of educational systems, goals, and students influence the development of those goals?
- What opportunities are provided for students to learn mathematics and science; how do instructional practices in mathematics and science vary among nations; and what factors influence these variations?
- What mathematics and science concepts, processes, and attitudes have students learned; and, what factors are linked to students' opportunity to learn?
- How are the intended curriculum, the implemented curriculum, and the attained curriculum related with respect to the contexts of education, the arrangements for teaching and learning, and the outcomes of the educational process?

## DESIGN OF THE STUDY

IEA studies have traditionally employed a research design based on the use of intact classes of students. This means that the studies focus on classrooms at a particular grade level, as opposed to focusing on students of a particular age. A good case can be made for either alternative, but the prevailing opinion in IEA circles is that grade-based studies are the preferred choice for studies investigating the linkages among the intended, implemented, and attained curricula. Such studies are more likely to contribute in a significant way to our understanding of what kinds of curricula and instructional practices are associated with the highest levels of student attainment. Age-based comparisons are, in some sense, easier for the research consumer to understand, because age, unlike the grade structure of schools in different countries, is calculated in the same way everywhere. However, since students of a particular age, say 13 years, may be spread across as many as four or even five grade levels within a given system, age-based studies make the investigation of relationships between teaching practices and students' achievement virtually impossible.

TIMSS has been described, quite justifiably, as the most ambitious project ever undertaken by IEA. What is perhaps less well known is that, in its original conception, the plan for the study was even more ambitious. The first discussions about the study took place in the late 1980s and involved a number of researchers, almost all of whom had had significant involvement in the longitudinal component of SIMS. Those discussions led to the establishment of the Study of Mathematics



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Secondary Analysis of the TIMSS Data

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