PREFACE

Researchers who participate in IEA studies have a unique opportunity to work collaboratively with their counterparts from many different countries and disciplinary backgrounds over a period of several years on questions of shared academic interest. Once the data for a given study have been collected and the first round of international reports published, however, opportunities for that kind of collaboration tend to be much less frequent.

A major strength of IEA studies compared to other large-scale, international studies is that they are classroom based, thereby making it possible for researchers and policy makers to investigate linkages between students' achievement and a wide range of variables. Those variables could be related to instructional practices, to students' and teachers' background and attitudes, to school organizational patterns, or to opportunity to learn, to name a few. The research questions that TIMSS was designed to address make it clear that these kinds of relational, multi-variate analyses were among the major goals of the project.

The international reports of the TIMSS–95 results that were published by the International Study Center at Boston College between 1996 and 1999 were intended to provide comprehensive coverage of the basic findings of the study. They were not intended to provide in-depth analyses of research and policy issues; instead, their main purpose was to make the basic findings of the study widely available in a timely manner. This they certainly did.

The goal of the present volume is to make available the findings from a number of secondary analyses that researchers in many of the TIMSS countries have carried out since the data were collected in 1995. Thanks to the financial support provided by the U. S. National Science Foundation under Grant #REC-9815180, it has been possible to carry out some secondary analyses, and the results of those analyses are the focus of this volume. The grant made it possible to bring together 37 scholars from 10 countries for two meetings to discuss the structure of the volume and to provide feedback to them regarding their planned analyses. The grant also provided funds to provide technical support for authors in carrying out their analyses and for editing the papers they produced. Any opinions, findings, conclusions, or recommendations expressed in this book are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The topics covered in this set of papers are almost as varied as the researchers who wrote them, and they illustrate the range of investigations that this kind of data makes possible. For the sake of convenience, the papers have been partitioned into

several sections on the assumption that some readers would be more interested in some topics than in others. The first, or introductory section of the book includes 2 chapters and is designed to provide a brief introduction to TIMSS as a whole as well as to this volume. The second section (Chapters 3 to 8) focuses on papers related to mathematics; the third section (Chapters 9 to 12), on science; and the fourth (Chapter 13 to 19), on topics that are more cross-curricular in nature. The fifth section (Chapters 20 to 24) contains a set of papers related to measurement and methodological topics. The sixth and last section consists of closing comments from the editors regarding a number of lessons learned from TIMSS and some suggestions for further research.

The two papers in Part I provide an introduction to the volume. In Chapter 1, Hans Wagemaker, the executive director of IEA, highlights the importance of international comparisons in education and the role of IEA studies in that effort over the past 40 years. Chapter 2, written by David Robitaille from the University of British Columbia and Al Beaton of Boston College, both of whom were heavily involved in all phases of TIMSS, is a brief introduction to the study for readers who are not familiar with its scope and extent.

Part 2 consists of six chapters focusing on aspects of the mathematics component of TIMSS. John Dossey (Illinois State University), Chancey Jones (Educational Testing Service), and Tami Martin (Illinois State University) present an analysis of students' responses to constructed-response items, using the two-digit scoring codes developed for use in the study. The next paper, from David and Alan Taylor of the University of British Columbia, summarizes changes in students' achievement results over a period of about 20 years between SIMS, the second mathematics study, and TIMSS. John Dossey (Illinois State University) and Mary Lindquist (Columbus State University) discuss the influence of TIMSS on the development and dissemination of the curriculum and evaluation standards developed by the National Council of Teachers of Mathematics. Eizo Nagasaki and Hanako Senuma from the National Institute for Educational Research in Japan present an analysis of the TIMSS mathematics results from their perspective in Japan. In the next two papers, Geoffrey Howson of the University of Southampton, shares his insights about the curricular and instructional implications of the Population 2 mathematics results in Chapter 7 and of the Population 3 results in Chapter 8.

Part 3 consists of 5 chapters related to the TIMSS science results. In Chapter 9, Svein Lie and his colleagues from the University of Oslo explore students' understanding of a number of fundamental concepts in science. Chapters 10 through 13 provide reflections on the science achievement results from a range of international perspectives. These include the Czech Republic Jana Paleckova and Jana Strakova), Hong Kong (Nancy Law), Russia (Galena Kovalyova), and Scandinavia (Marit Kjærnsli and Svein Lie). In each case, the authors identify and discuss the implications of the science achievement results for informing the debate about how to improve the teaching and learning of science.

The seven chapters, Chapters 14 through 20, included in Part 4 discuss a range of issues that relate to teaching and learning, but not necessarily to mathematics or science specifically. For lack of a better term, the section is described as focusing on cross-curricular issues.

In Chapter 14, Al Beaton and Laura O'Dwyer of Boston College address separating school and classroom variance using the TIMSS data. Four scholars from UCLA discuss the correlation between students' achievement in mathematics and in science in Chapter 15. Their analysis focuses on results from the United States only. Skip Kifer from the University of Kentucky provides an analysis of the student attitude data in Chapter 16. In Chapter 17 Ina Mullis and Steve Stemler from the International Study Center at Boston College focus on an analysis of gender differences in achievement in TIMSS. Chapter 18, written by Jay Wilkins, Michalinos Zembylas, and Ken Travers, provides insight into the design of and into senior secondary students' performance on the TIMSS mathematics and science literacy study. In Chapter 19, Hans Pelgrum and Tjeerd Plomp from the University of Twente summarize finding from TIMSS having to do with the impact of technology on the teaching and learning of mathematics and science. Chapter 20 was written by Dick Wolf of Teachers' College. His paper focuses on the importance of out-of-school tutoring or coaching in various countries. Chapter 21, by Tom Kellaghan of the Educational Research Centre in Dublin and George Madaus of Boston College, use data from the TIMSS teacher questionnaires to examine the sources of teachers' information about issues related to assessment and evaluation.

Part 5 of the volume focuses on issues related research methodology. In Chapter 22, Laura O'Dwyer from Boston College discusses a new technique based for estimating between-classroom variance using what she describes as a "pseudo-classroom" approach. In Chapter 23 Dana Kelly from the American Institutes for Research describes her work on the development of international benchmarks of student achievement through scale anchoring analysis. In Chapter 24, Kadriye Ercikan and Tanya McCreith from the University of British Columbia use differential-item-functioning technology to explore the impact of translation effects on item difficulty in selected countries.

Part 6 consists of a brief concluding chapter by the editors. The goal of this chapter is not to serve as a summary of what has gone before, but rather to provide an opportunity for the editors to reflect on some of the lessons learned from TIMSS, to speculate about the kinds of research that remain to be done, and to put forward a few suggestions for the consideration of researchers who will be doing these kinds of studies in the future.

As editors of this volume, we are grateful to many individuals who helped us bring this task to a successful conclusion. We are deeply indebted to Larry Suter and the U. S. National Science Foundation for the moral and financial support provided to the authors and us throughout the process of bringing this book to publication. We are, of course, very grateful to our many authors for their patience in dealing with editorial demands and for their prompt responses to our many questions and editorial suggestions. We also grateful for the support extended to us by IEA, and particularly by its Executive Director, Hans Wagemaker, throughout the process.

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On the west coast, at the University of British Columbia, Katy Ellsworth and Bonnie Davidson took on major responsibility for getting the manuscript ready for submission to the publisher. Katy's involvement tapered off somewhat toward the end of the project as she focused on the forthcoming birth of her second child. Bonnie filled the gap admirably, and we are grateful to both of them for their contributions.

David Robitaille
Al Beaton