Preface

In 2002 the National Council of Teachers of Mathematics (NCTM) published *Lessons Learned from Research*, edited by Judith Sowder and Bonnie Schappelle. This book was a compendium of adapted or abstracted articles that had originally appeared in the *Journal for Research in Mathematics Education* (*JRME*) during the period of Sowder's editorship (1996–2000). That book addressed what many view as a longstanding problem in education—namely, the perceived disconnection between educational practice and policy on the one hand and educational research and scholarship on the other.

Although some view such disconnection as an inevitable consequence of the differences between the professional work of educational researchers and educational practitioners, many view it as a problem that can and must be solved. For many, the quest for a solution is driven by a belief that educational practice could be more effective if it were informed by the best available knowledge from educational research. Thus, making the findings of educational research available to practitioners is viewed as an important strategy for increasing the quality of education. Yet, virtually everyone agrees that the form in which research is disseminated within the research community is unlikely to be immediately comprehensible or useful to those interested in its application in classroom instruction, instructional design, or teacher preparation. As Sowder and Schappelle (2002) wrote in the introduction to their book, "Teachers rarely access original research reports, perhaps because researchers tend to write in a style that is often not teacher-friendly. Few teachers ever open an issue of the . . . *Journal for Research in Mathematics Education* (*JRME*) or, for that matter, any other research journal, unless they are assigned to do so for professional development or for a graduate class" (p. 1).

To address both the disconnection between research and practice and the inaccessibility of education research reports to teachers and other mathematics education practitioners, Sowder and Schappelle undertook the creation of a compilation based on original research reports published in *JRME* but rewritten with an audience of teachers in mind. This was a novel approach to bridge the gulf between research and practice, and it was an important first step in contemporary efforts to help researchers and practitioners find common ground and learn from each other. In the decade following the publication of that book, NCTM has sponsored reports, conferences, and awards that encourage two-way traffic across the bridge that was constructed initially by Judy Sowder and Bonnie Schappelle.

In this volume, which is a successor to the pioneering work by Sowder and Schappelle, we take another step in the journey toward bridging the gap between research and practice in mathematics education. Like the earlier book, this volume contains a collection of adapted or abstracted articles that originally appeared in the *Journal for Research in Mathematics Education*. All of the articles appeared in *JRME* during the period 2000–2010, which includes a span of four years (2000–2004) when we edited the journal. (Edward Silver was editor, and Patricia Kenney was assistant editor.) All of these contributions are based on the original research report, but they have been rewritten to make them more accessible to and useful for a teacher audience. Though the approach taken in preparing this volume is quite similar to that taken by Sowder and Schappelle, the organization of this volume is different from that of the earlier book.

We have chosen to focus this volume on research that might be pertinent to the Common Core State Standards for Mathematics' Standards for Mathematical Practice (CCSSM-SMP). The CCSSM-SMP identify important goals for students to develop through their experiences in

school mathematics, and these goals and expectations are different from—though connected to—the learning of specific mathematics content. The eight varieties of competence identified as the Standards for Mathematical Practice are: (1) make sense of problems and persevere in solving them, (2) reason abstractly and quantitatively, (3) construct viable arguments and critique the reasoning of others, (4) model with mathematics, (5) use appropriate tools strategically, (6) attend to precision, (7) look for and make use of structure, and (8) look for and express regularity in repeated reasoning (National Governors Association Center for Best Practices and Council of Chief State School Officers [NGA Center and CCSSO] 2010). We chose to focus this volume on the CCSSM-SMP because we have spoken with many mathematics teachers who recognize the importance of these practices and are eager to know more about how to develop them in their students. Yet, most teachers feel that they need more support to accomplish this goal than is provided within the CCSSM document. We hope that this volume can serve as a much-needed resource for teachers, teacher educators, professional developers, and curriculum designers, not only in the early stages of the implementation of CCSSM across the country but also as the implementation effort matures and practitioners tackle the deeper challenges that emerge in those initial stages.

One might wonder how we can claim that research produced and published prior to the advent of the Common Core State Standards for Mathematics can be germane to that document. It is important to note that we are not offering research that has studied the implementation of the CCSSM-SMP nor any attributed effects. Rather, we are offering research that investigates teaching and learning in ways that connect to the processes and practices identified as CCSSM-SMP.

It should not be surprising that we could do this, because the CCSSM-SMP processes and practices have long been of interest to mathematics educators. For example, the NCTM (2000) process standards of problem solving, reasoning and proof, communication, and representation and connections are all antecedents of the CCSSM-SMP, as are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up* (2001): adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations, and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently, and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

Some of the competencies identified within the Standards for Mathematical Practice have been extensively studied (e.g., reasoning, proving, and problem solving), whereas others are less examined (e.g., attending to precision). For the period 2000–2010, we identified twenty-eight articles that were published in *JRME* that we judged to have relevance to one or more of the Standards for Mathematical Practice. We assigned each article to one of the three sections of this book, which correspond to subsets of the CCSSM-SMP.

The first section includes articles related to reasoning and proving; the second includes articles related to one or more of a cluster of standards (communicating, sense making, and using tools strategically); and the third includes articles related to modeling and problem solving. By organizing the articles in this way we hope to provide readers with an opportunity to think not only about the content of each article individually, but also about what the collection of articles in a section might contribute to understanding a portion of the Standards for Mathematical Practice.

As a general rule we believe that research knowledge accumulates across investigations; this includes those investigations that build systematically on prior work as well as those that come from different perspectives and converge in some way on a key understanding. Though the research articles in this volume are provided individually, and we think that each has independent merit, it is by looking analytically and synthetically across these articles and other work not included here that the reader is likely to gain the most useful and useable knowledge and valuable insights that can inform and enable improvement of mathematics teaching and learning.

Preparation of this volume has increased our optimism that the gap between research and practice can be bridged. When we contacted the authors of the articles we had identified for this volume, they all agreed to participate. In fact, they agreed with enthusiasm because they saw the value of sharing their work with practitioners.

We thank the authors for their willingness to prepare adapted versions of their articles or to respond to abstracted versions that we prepared on their behalf. We also want to thank the NCTM Educational Materials Committee for initiating the request to one of us (Silver) to produce a sequel to the Sowder and Schappelle's *Lessons Learned from Research,* as well as Larry Shea and Randy White of NCTM's publications department for their assistance in producing this volume. Finally, we want to acknowledge the support of the Useable Scholarship in Education (USE) Initiative, which is funded by the University of Michigan.

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