

Preface

In March 1989, the National Council of Teachers of Mathematics' (NCTM) publication of *Curriculum and Evaluation Standards for School Mathematics* launched a two-decade effort to set standards at national and state levels as a means for improving teaching and learning in most school subjects. For school mathematics, these efforts culminated in June 2010 with the release of the *Common Core State Standards for Mathematics* (CCSSM), developed under the auspices of the National Governor's Association and the Council of Chief State School Officers (<http://www.corestandards.org/>). Forty-eight states collaborated in the development of the CCSSM; to date, 45 states, the District of Columbia, and the U.S. Virgin Islands have officially adopted the CCSSM to replace existing state standards.

The CCSSM presents new challenges and opportunities for local school districts and teachers to focus on curriculum as a means of improving what students understand and can do in their study of mathematics. Effective local implementation of the CCSSM will require careful district planning and attention to phase-in models and new norms of practice, including substantial conversations and planning across grades. It will require greater attention to important mathematical practices, curriculum coherence, and vertical articulation across grades K–12. It will also require mathematical knowledge for teaching new content expectations in ways that involve sense making and reasoning.

As a part of the work of the Center for the Study of Mathematics Curriculum (CSMC), our professional development efforts have focused on encouraging teachers to have conversations within and across grades. Teachers need to interact with one another, so that students see that the work they do in one grade connects to what they learn in the next grade and beyond. Through such interaction, teachers will develop expectations about what mathematics students will have experienced in the previous grade and what students will encounter in the next grade and beyond. Our students are wonderfully adept at emptying their minds over the summer, behaving in the next grade as if they have learned little. Our response is often to reteach rather than create opportunities to review while engaging in new material. Engagement across grades can help teachers diminish the loss of instructional time that reteaching causes.

CSMC leaders have developed this volume to further the goal of teachers having opportunities to interact across grades in ways that help both teachers and their students see connections in schooling as they progress through the grades. Each section of this volume contains three companion chapters appropriate to the three grade bands—K–5, 6–8, and 9–12—focusing on important curriculum issues related to understanding and implementing the CCSSM.

To promote a deeper understanding of CCSSM-related ideas and their implications for district policy and practice, an Introduction and a series of Questions for Reflection and Collective Discussion accompany each set of three grade-band chapters in Sections II–VII. The questions and the prompted collegial discussions, curriculum and related resource audits, CCSSM implementation planning, and reports of classroom trials of new ideas are the core of this volume. We envision groups of teachers working together,

within and across grades in professional development settings, to accomplish this work. Such interactions around practice can help start conversations within and across buildings that change the culture and underscore the importance of teachers having time to learn, plan, and work together. We hope that you will find such interactions both educative and empowering as you work to interpret and implement the CCSSM effectively.

Acknowledgments

We are grateful to the National Science Foundation (grant no. ESI-0333879) for its support of the Center for the Study of Mathematics Curriculum and its multifaceted work, including the preparation of this volume. We thank the authors of the chapters for their responsiveness to our invitations and editorial suggestions and for the quality of their contributions.

We would like to thank Valerie Mills, Oakland County Schools, for reviewing the prospectus for this book and for her helpful comments and suggestions related to the book's professional development orientation.

We also wish to extend our gratitude to NCTM President J. Michael Shaughnessy for his encouragement and support.

Finally, we would like to gratefully acknowledge the superb assistance of Hope Smith at Western Michigan University in compiling, preparing, and reviewing the prepublication material.

How This Professional Development Resource Might Be Used

As the preface has indicated, we intend this volume as a professional development (PD) resource that educators can use flexibly with multiple audiences. Possible models are outlined below.

Model 1: District-Level Professional Development: A Summer Program with Follow-Up Sessions

District PD programs vary depending on the district's size and goals. One program could involve a sequence of four- or five-day sessions in the summer, focusing on understanding the Common Core State Standards for Mathematics (CCSSM) better. Before the first session, participants would download a personal copy of the CCSSM, available at <http://www.corestandards.org/>. They would review the document's structure—mathematical practices and content domains, clusters, and standards—and examine the standards related to their upcoming teaching assignment.

The summer sessions would focus on the implications of the CCSSM for the district, with the readings and Questions for Reflection and Collective Discussion in Sections I and II serving as primary resource materials. Grades K–5 teachers would be responsible for reading at least a section's first two chapters. Grades 6–8 teachers would read at least the first two chapters and scan the third, noting interesting or provocative ideas. Grades 9–12 teachers would read at least the second and third chapters and scan the first to help build a grades K–12 curriculum perspective.

Following the summer session, five follow-up, monthly, half- or full-day PD sessions would occur during the school year, one devoted to each of this volume's Sections III–VII. For these subsequent sessions, participants would preread and reflect on the appropriate section's assigned readings to prepare for the next PD session. Each session would give participants time to collaborate in grade levels or bands, discussing that section's selected questions. Each session should allow time for discussions across grades, reports on the groups' completed tasks, and summaries of implications for district planning and decision making. Note that in addition to completing readings prior to a session, participants would work on extended tasks (see, for example, page 64, question 14, and page 92, question 10) between or across sessions. This is especially true for sections that involve curriculum and instructional resource audits and readings from other sources accessible on the Web.

The school district can vary how this model organizes and groups PD participants on the basis of the district's size and goals.

Model 2: District-Level Professional Development: An Academic Year Program

This model is an academic-year variation on model 1. The school year would have seven to eight half- or full-day professional development sessions, scheduled at least a month apart. Again, before the first session, participants would download a copy of the CCSSM and review the document's structure and the standards related to their teaching assignment. This first session would focus on the structure and content of the CCSSM, with support materials from Section I. The rest of the PD program would unfold much

Model 3: Building-Level Professional Development

like in model 1: participants would complete assigned readings in Sections II–VII before the appropriate session, where they would reflect on the readings and discuss related questions and implications for district policy and practice.

Building-level PD benefits teachers in many different configurations—by grades or grade bands, by course or course sequence at the high school level, in interested teachers’ groups, and as a means of enculturating new teachers into the building and the profession. What makes such PD especially useful is that it has a focus both compelling and important to the success of teachers and their students. Since the CCSSM affects both the content expectations and mathematical practices for all students, the need to work together within a building to focus on the intended mathematics and its practices is especially compelling.

This book provides both information and materials for PD that engages in productive, within-building collaboration and planning. The collection of chapters includes readings appropriate for elementary, middle, and high school study or planning groups. Although all the chapters can help one understand grades K–12 teaching challenges, grade and grade-band focuses can help build lasting collaborations more effectively within a building that enhance mathematics teaching and learning. This means that teachers talk across and within grades.

A group within a school building can make an excellent start by reading the Section I chapter by Confrey and Krupa, on CCSSM background and strategic next steps. Section II focuses on interpreting and responding to the CCSSM at different grade bands. The group can use the accompanying questions to discuss the chapter(s). A group of elementary school teachers can read the Charles chapter and discuss its ideas relative to their classroom practices. Middle school teachers can read the Reys et al. chapter and discuss how they can help their students succeed in meeting the CCSSM expectations for that grade band. High school teachers can focus on the Martin and Hart chapter to help develop their collective approaches to engaging their students in mathematics in ways that both make sense and help reach the CCSSM’s mathematical expectations.

Reading and discussing the chapters in Section III can help teacher groups focus more directly on children’s thinking and on looking for evidence that their students understand the mathematics they encounter. Chapters in Section IV focus on developing mathematical habits of mind. Reading and discussing these chapters can help teachers examine their own mathematical habits of mind. Discussing individual ways of approaching mathematical situations can result in a deeper understanding of what mathematical practices would be productive to promote with children at their various grade bands or grades.

Technology has become an aid to developing mathematical content, exploring mathematical situations, and problem solving. Chapters in Section V can help participants look more deeply into how technology can both become a learning tool *and* support and enhance students’ progress in mathematics and in developing mathematical thinking and reasoning.

Statistics is pervasive in contemporary society and has become an important part of the mathematics curriculum at all grade levels. Statistical explorations engage students at all levels. Discussion of chapters in Section VI can help participants build grade-appropriate statistical activities for their students. The chapters’ activities highlight the

usefulness of statistical reasoning and its importance in our lives. Discussions across grade bands can lead to productive consideration of learning progressions, both in statistics and, by analogy, in other mathematical domains.

For teachers within a school building, exploring this volume's final set of chapters, on vertical articulation, is especially important. Transitions between grades challenge students and teachers. Teachers need opportunities to talk across grades so that mathematics learning across grades remains seamless. Focusing on these chapters can help teachers create and maintain that seamlessness. Discussion across grades has yet another advantage for teachers: it improves their collective understanding of the important mathematics that students are studying and how that mathematics builds across a span of grades.

Model 4: A Master's-Degree Course for In-Service Teachers

Using *Curriculum Issues in an Era of Common Core State Standards* can help engage in-service teachers in considering how the CCSSM affects their school curriculum materials and instructional practices. For example, after introducing and reviewing the structure of the CCSSM, as in the case of the other PD models, this model can use each section of the book as the basis for assigned readings and class discussion (e.g., one section per session or week). The choice of which chapters in a section to assign as pre-reading material would depend on the class's makeup. For example, if the class includes only elementary school teachers, the course could assign and discuss the elementary and middle school chapters. If the class includes only middle school teachers, then they all should read the middle school chapters, be prepared to discuss them, and complete questions and activities related to them. Half the teachers in the class should also read and be prepared to report on the elementary school chapters; the other half would have similar responsibility for the high school chapters. Finally, for a class consisting solely of high school teachers, the course can assign the middle and high school chapters.

Completing such a course would position participants well to take on leadership roles in planning and monitoring CCSSM implementation in their school and district.

In a broader curriculum course, the instructor can select a subset of this book's sections for use. We recommend that all groups use Sections I and II as introductory material, and that they all make Section IV, mathematical practices, a priority.

For additional CCSSM-related resources usable in a master's course for in-service teachers, see the Center for the Study of Mathematics Curriculum website, <http://www.mathcurriculumcenter.org>.