Preamble

The turn of the century has seen a dramatic increase in attention to the mathematics education of young children. This book is the result of a unique gathering of a diverse group of professionals involved with early childhood mathematics. In this preamble, we describe this recent focus of attention, the conference that brought the professionals together to discuss critical issues in early mathematics education, and the result of their collaborative work—this book.

Mathematics in Early Childhood

Increasing numbers of children attend early care and education programs. In 1999, 70 percent of 4-year-olds and 93 percent of 5-year-olds were enrolled in preprimary education, up from 62 and 90 percent respectively, in 1991 (U.S. Department of Education, 2000, p. 7). Several states are instituting universal preschool education, with about 1 million students enrolled in 1999, and that number is increasing (Hinkle, 2000). Various government agencies, federal and state, provide financial support for preschool programs designed to facilitate academic achievement, particularly in low-income children at increased risk of school failure. Many of these children later experience difficulty in mathematics (Bowman, Donovan, & Burns, in press; Natriello, McDill, & Pallas, 1990). For these children especially, the long-term success of their learning and development requires quality experience during their early “years of promise” (Carnegie Corporation, 1998). These children need to build the informal knowledge that provides the basis for later learning of mathematics. Thus, equity demands that we establish guidelines for quality early mathematics education for all children.

Further, in a global economy with the vast majority of jobs requiring more sophisticated skills than in the past, American educators and business leaders have expressed strong concern about students’ mathematics achievement (these concerns are echoed in international comparisons of mathematics achievement Mullis et al., 1997). For all these reasons, there has been much recent interest in, and attention to, the learning of mathematics before elementary school at both the preschool and kindergarten levels. The mathematics achievement of American students compares unfavorably with the achievement of students from several other nations, even as early as kindergarten. Some cross-national differences in informal mathematics knowledge appear as early at four to five years of age (Klein & Starkey, this volume).

Of concern too are the achievement differences between groups within the U.S. that differ in socio-economic status: “Children from different sociocultural backgrounds enter elementary school at different levels of readiness for a standards-based mathematics curriculum” (Klein & Starkey, this volume). This raises serious concerns of equity regarding children’s preschool experiences and elementary schools’ readiness to adapt instruction to children at different levels of mathematical development. According to the Glenn Commission report (2000), “at
the daybreak of this new century and millennium…the future well-being of our nation and people depends not just on how well we educate our children generally, but on how well we educate them in mathematics and science specifically” (p. 6).

Better mathematics education can and should begin early. Research shows that higher quality programs result in learning benefits into elementary school, including in mathematics (Bredekamp, this volume; Hinkle, 2000). Unfortunately, most children are not in high-quality programs (Hinkle, 2000). This is critical. Even preschoolers show a spontaneous interest in mathematics. Caring for them well, in any setting, involves nurturing and meeting their intellectual needs, which includes needs for mathematical activity (Bowman et al., in press).

In 2000, the National Council of Teachers of Mathematics (NCTM) revised its standards to include preschoolers for the first time (2000). States are creating or modifying their own mathematics standards and curriculum guidelines for preschool and kindergarten children. Nevertheless, at present, most teachers and caregivers do not know what to do about mathematics for the young children with whom they work.

The Conference on Standards for Preschool and Kindergarten Mathematics Education

As federal, state, and professional organizations begin this new enterprise, there are many opportunities to create developmentally appropriate mathematics education for preschool and kindergarten children. At the same time, there is the danger of a veritable Babel of standards, some of which may be developmentally inappropriate for young children. A lack of consistency across various standards and guidelines will continue to produce “mile wide and inch deep” (National Center for Education Statistics, 1996) curricula as publishers struggle to meeting a variety of different content standards and guidelines. At the early years, such lack of consistency has a special danger of producing incoherent and developmentally inappropriate curricula.

Therefore, early communication between, and coordination of efforts by, the relevant educational leaders and agencies is critical. A group of educators1 decided to begin with a conference on standards for preschool and kindergarten mathematics education. This work was funded by grants from the National Science Foundation and the ExxonMobil Foundation to the State University of New York at Buffalo2.

---

1 The initial idea for the conference was generated by Douglas H. Clements, Julie Sarama, Herb Ginsburg, Carole Greenes, and Robert Balfanz. Clements wrote the proposals and obtained the funds for the grant. Clements and Sarama, along with the Conference Coordinator, Ann-Marie DiBiase, ran the conferences and coordinated the work.

2 See the preface.
The Conference on Standards for Preschool and Kindergarten Mathematics Education was held on May 15-17th, 2000, in Arlington, VA. This was a historic event: To our knowledge, it was the first conference to have ever brought together such a comprehensive range of experts in the diverse fields relevant to the creation of educational standards. Participants included representatives from almost every state developing standards for young children’s mathematics; federal government officials; mathematicians; mathematics educators; researchers from mathematics and early childhood education, and psychology; teachers; policy makers; and representatives from national organizations such as the NCTM and the National Association for the Education of Young Children (NAEYC).

The purpose of the Conference was to facilitate early communication between, and coordination of efforts by, the educational leaders and agencies that are developing mathematics standards, curricula, and teaching methods for young children. We also wished to facilitate communication between these people and experts in related fields, with an emphasis on the latest research findings concerning early mathematical thinking and education. Using resources such as research from a variety of disciplines (e.g., psychology, mathematics education), advice from mathematicians, a compilation of standards and goals from various U.S. states (see the Appendix), and the recent NCTM Principles and Standards for School Mathematics (PSSM), the main goal was to work collectively, to help those responsible for framing and implementing early childhood mathematics standards.

All audiotapes of the discussions, especially those of the working groups, were transcribed and studied. Based on these sources, the editors of the book produced an initial draft of the main points and recommendations that emerged from the conference. An 18-person working group met at the ExxonMobil Foundation site in Irving, TX, in October 2000 to critique and complete this report. The first draft of the working group’s report was disseminated to a representative sample of the main conference’s participants for their reactions. Their advice guided the working group in developing this book, which will be disseminated to all participants, as well as other pertinent federal and state agencies, other organizations, and all ExxonMobil teacher leaders.

The reader will note that this book has its roots in the initial conference, which emphasized mathematics education in the preschool and kindergarten years. However, because many of the speakers and participants discussed NCTM’s full range of preschool to grade 2, the standards and recommendations we provide covers all these ages.

---

3 This group included the following: Mary Ellen Bardsley, Arthur J. Baroody, Douglas Clements, Chris Confer, Juanita Copley, Carol Copple, Ann-Marie DiBiase, Karen Fuson, Herbert Ginsburg, Joe Gonzales, Amy Kari, Alice Klein, Mary Lindquist, Jean Moon, Maggie Myers, Julie Sarama, Carolyn Trammell, and Jennifer Ware. In addition, Edward Chittenden, Richard Lehrer, Leslie Steffe, and Chuck Thompson reacted to and helped revise portions of the report.
Audience

We expect that the readers of this book will be diverse. One main audience includes those people in departments of education and curriculum developers—indeed, anyone creating guidelines and curricula, or teaching young children. This would include school district administrators and curriculum coordinators, curriculum writers, publishers of mathematics education material, and teacher leaders. The work should also be of interest to undergraduate or graduate students, early childhood trainers and teacher educators, and faculty in mathematics education.

Organization of the Book

The book is organized into two parts. Part One, Major Themes and Recommendations, consists of conclusions drawn from the expertise shared at the Conference and specific recommendations for mathematics education for young children. These recommendations provide specific guidelines for policy, curriculum, and teaching, and thus are intended to facilitate the creation of standards and curriculum materials for early childhood mathematics that are consistent and inclusive, rather than incoherent and confusing, and are developmentally appropriate—attainable yet challenging—for young children. Part Two includes (a) a compilation of papers written by the invited presenters, organized into coherent sections and (b) introductory notes by the editors introducing and connecting these papers.

Both parts are organized into five sections. Standards in Early Childhood Education deals with general policy and pedagogical issues related to the creation and use of standards for young children, including different types of standards and the advantages and disadvantages of standards for the early childhood years. Mathematics Standards and Guidelines includes research summaries about young children’s development and learning of specific mathematical topics and builds on this knowledge base to describe the “big ideas” of important mathematical topics at four progressive levels of detail, designed for different audiences. Curriculum, Learning, Teaching, and Assessment includes descriptions of approaches to curriculum, instruction, and assessment that have been supported by research and expert practice. The Professional Development section describes research and expert practice that addresses the dire need for better preparation of teachers and child care workers. Finally, Towards the Future: Implementation and Policy presents issues and recommendations that we believe must be considered when putting all these recommendations into practice.

References


