CTM’s Principles and Standards for School Mathematics (2000) addresses preschool mathematics education, which is a first for the NCTM’s Standards documents. We celebrate this initial coverage but wonder whether Principles and Standards has enough detail for early childhood teachers and caregivers. We are concerned that although the document offers a good start, it might not provide sufficient guidelines. Without these guidelines, we face the danger that a wide variety of incoherent standards will be produced, some of which may be developmentally inappropriate. A lack of consistency across various standards and guidelines will continue to result in “mile wide and inch deep” curricula (National Center for Education Statistics 1996) as publishers struggle to meet a variety of different content standards and guidelines.

Because we believe in the importance of supporting early communication and coordinating efforts among educational leaders and agencies, we held a national Conference on Standards for Preschool and Kindergarten Mathematics Education in May 2000, in Arlington, Virginia. This conference was funded by grants from the ExxonMobil Foundation and the National Science Foundation (NSF) to the State University of New York at Buffalo. The conference was a historic event, the first to bring together a comprehensive range of experts in the diverse fields concerned with creating educational standards. The participants included representatives from state departments of education and the U.S. Department of Education; mathematicians; early childhood teachers and mathematics teachers; early childhood policymakers and researchers; mathematics education researchers; curriculum developers; representatives from NCTM, including the writing group for grades pre-K–2 of Principles and Standards; and representatives from the funding foundations, NSF and ExxonMobil.

The conference was, according to the participants, a resounding success. The presentations and panels were lively and informative. The discussions, in which ideas were shared, were also productive and enjoyable. Information from the conference, including transcripts of every discussion, will soon be published in a book. This article touches the surface of the extensive information from the conference and in the book.

Conference Highlights

With so many different perspectives represented in the discussions, we would expect to find many disagreements. Surprisingly, the most passionate debate centered on a single question: Should we establish standards for young children at all?

Those connected with NCTM’s Principles and Standards were in support of standards and wanted
to elaborate on those in the organization’s document. Several other people, especially teachers, were concerned about, and even vehemently argued against, the very notion of standards for early childhood learning. The discussion revealed that these two groups were talking about two different types of standards, thereby leading to the following conclusion from the conference:

There is a substantial and critical difference between standards as a vision of excellence and standards as narrow and rigid requirements for mastery. Only the former, including flexible guidelines and ways to achieve learning goals, is appropriate for early childhood mathematics education at the national level.

The conference participants also addressed the question of whether standards should be established for children or for programs or for both. Sue Bredekamp, one of the creators of the ideas of “developmentally appropriate practice,” answered the question by saying, “We need both.” Most participants agreed that although standards for children can certainly be abused, we can avoid abuses and realize four advantages in setting standards. First, standards for children can demystify beliefs about children’s abilities. Teachers usually welcome more specific guidance on learning goals that are linked with age and grade levels, such as those published in a recent joint position statement on developmentally appropriate practices in early literacy (NAEYC and International Reading Association 1998). Second, standards can give teachers of young children needed guidance about appropriate expectations for children’s learning. Moreover, they can focus that learning on important knowledge and skills, including critical thinking skills. Third, standards can help parents better understand their children’s development and learning and provide appropriate experiences for them. Finally, standards can help achieve equity by ensuring that the mathematical potential of all young children is developed throughout their lives.

Having agreed on the advantages of setting standards, the conference participants made two
### Developmental guidelines for number and operations—a sample continuum

<table>
<thead>
<tr>
<th>Topic</th>
<th>PreK*</th>
<th>Ages 4–5</th>
<th>Ages 5–6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Counting</strong></td>
<td>Make and imagine small collections of one to four items nonverbally, such as seeing <strong>2</strong>, which is covered, then putting out <strong>2</strong>.</td>
<td>Counting can be used to find out <em>how many</em> in a collection.</td>
<td></td>
</tr>
<tr>
<td>Counting</td>
<td>Find a match equal to a collection of one to four items, such as matching :: or four drum beats to collections of four with different arrangements, dissimilar items, or mixed items (e.g., ✯ • ∆).</td>
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<td></td>
<td>Verbally count by ones from . . . ————————————————————–&gt; 1 to 10 1 to 30 (and more), with emphasis on counting patterns (e.g., knowing that twenty-one, twenty-two . . . is parallel to one, two . . .).</td>
<td>1 to 100, with emphasis on patterns (e.g., the decades, such as sixty, seventy, parallel the corresponding ones, six, seven; also, the teens, such as fourteen to . . .).</td>
<td></td>
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<tr>
<td></td>
<td>Flexibly start verbal count-by-one sequence from any point; that is, start a count from a number other than 1 (ends early in first grade for some).</td>
<td>Flexibly state the next number word . . . ————————————————————————–&gt; after 2 to 9 with a running start. after 2 to 9 without a running start to 9; also, state the word before any number from 2 to 9.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbally count backward . . . ————————————————————–&gt; from 5.</td>
<td>Verbally count backward . . . ————————————————————–&gt; from 10.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skip count . . . ————————————————————–&gt; by tens.</td>
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<tr>
<td><strong>Object counting</strong></td>
<td>Count the items in a collection and know that the last counting word tells how many. ———— 1 to 4 items 1 to 10 items 1 to 20 items</td>
<td>Count out (produce) a collection of a specified size; this ability lags a bit behind counting items in a collection. ———— 1 to 4 items 1 to 10 items 1 to 20 items</td>
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<td></td>
<td>Verbally subitize (quickly “see” and label with a number) . . . ———— collections of 1 to 3. collections of 1 to 5. collections of 1 to 6; patterns up to 10.</td>
<td>Represent collections with a finger pattern . . . ———— for 1 and 2. up to 5. up to 10.</td>
<td></td>
</tr>
</tbody>
</table>

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*Ages reflect those typically found in classes or groups of children; for example, in the first category, ages 2–4 years, a typical classroom of three-year-olds may begin the year with some two-year-olds and end the year with some children who are just turning four.*
assumptions about developing standards for early childhood learning. First, emphasis should be placed on standards for programs and for teaching. Given the wide range of development in the early years, rigid standards for young children are not as useful as standards for high-quality programs and teaching. However, curricula and teaching must be built on extensive knowledge of young children's mathematical acting, thinking, and learning.

The second assumption was that knowledge of what young children can do and learn, as well as specific learning goals, is necessary for teachers to realize a vision of high-quality early childhood education. How is this knowledge communicated if not as rigid standards? The decision at the conference was to structure this knowledge as curriculum standards—descriptions of the ideas and skills that programs should enable children to understand and perform. We believe that mathematics curriculum standards for early childhood education should be written as flexible guidelines along learning paths for young children's mathematical understanding. These guidelines should meet the following criteria:

1. Guidelines should be based on available research and expert practice.
2. Guidelines should focus on the “big ideas” in mathematics for children.
3. Guidelines should represent a range of expectations for outcomes that are developmentally appropriate.

We specified big ideas for each of the five main topics of Principles and Standards (see fig. 1). We knew that teachers, curriculum developers, and others also needed far more specificity. For the finest level of detail, we designed a developmental or learning continuum for each idea in each topic. The goal of these representations is to illuminate potential developmental paths and to encourage teachers to present their students with activities that are appropriate to their abilities, that is, activities that can be mastered but are challenging for each child. Figure 2 shows a small portion of the continuum for number, which is one of the topics.

We caution readers that the competencies in these paths are developmental guidelines, not detailed directions for curriculum, teaching, or assessment. The activities in which children engage to acquire these competencies should provide rich, integrated experiences that enable them to develop several competencies simultaneously, including ones that go beyond those in the continuum. For example, consider the activities from the Building Blocks project, which is an NSF-funded project to develop and evaluate an innovative
The Building Blocks program incorporates both old and new technologies, from blocks and puzzles to multimedia computer programs. Preliminary evaluations show that the program’s approach of finding the mathematics in, and developing mathematics from, children’s everyday activities allows children to learn and do more mathematics than was previously thought possible.

In the Double Trouble activity from Building Blocks, the teacher tells a story of Mrs. Double, who is throwing a birthday party for her twins. The twins like their cookies to have the same number of chocolate chips. Pretending that rugs are cookies and children are chips, the teacher has children act out situations from the story. For example, one group of four students might sit on a rug cookie and pretend to be chips, and another group makes a cookie with the same number of chips. Several follow-up activities can be conducted. The Double Trouble computer activity has numerous levels of difficulty. In one, the on-screen character Mrs. Double asks children to make a “twin” cookie with the same number of chips as a cookie that Mrs. Double has made. A later activity is similar, but Mrs. Double makes a cookie, then covers it with a napkin.

Another group of follow-up activities consists of cookie games that children play on a mat that contains a picture of a dinner plate at the top and cookies with no chips below. Player 1 rolls a die and puts that many chips, say, six, on her “plate.” Player 2 must agree that player 1 is correct. If so, player 1 puts the chips on her cookies, trying to get four (or whatever number the children are working on that day) on each. For example, if player 1 rolled six, she could put four chips on one cookie and start another cookie with two chips. Players take turns. The winner is the first player to get four chips on each cookie. Teachers should usually try to have all children be “winners,” one after another.

These simple activities are appropriate for preschool, and they meet multiple goals. For example, the cookie game addresses almost all the goals in figure 3. Children make small collections, nonverbally if they prefer; that is, a child sees two on a die and puts two chips on the plate. Children also subitize, or quickly see a group and tell how many. They count by ones and learn that the last counting word tells “how many.” Children count out, or produce, a collection of a specified size. To check one another, children identify whether collections are the “same number.” As do all good activities, whether planned, such as these, or the equally important incidental, informal activities of the day, the cookie game helps children develop several skills and concepts at once.

Further Information
Please visit our Web site, www.gse.buffalo.edu/org/conference/index.htm, for more information and news about the upcoming publication of the book. We will also keep site visitors informed about one final, exciting outcome of the conference: the NCTM and National Association for the Education of Young Children have formed a committee to issue a joint position statement on early childhood mathematics.

References

Time to prepare this material was partially provided by three grants, two from the National Science Foundation (NSF): ESI-98-17540, “Conference on Standards for Preschool and Kindergarten Mathematics Education” (www.gse.buffalo.edu/org/conference/index.htm), and ESI-9730804, “Building Blocks—Foundations for Mathematical Thinking, Pre-Kindergarten to Grade 2: Research-Based Materials Development” (www.gse.buffalo.edu/org/building blocks/), and one from the ExxonMobil Foundation, also titled “Conference on Standards for Preschool and Kindergarten Mathematics Education.” Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of either foundation.