

# ***Professional Standards for Teaching Mathematics***

*National Council of Teachers of Mathematics*

## **Summary**

*Professional Standards for Teaching Mathematics* expresses the vision of the National Council of Teachers of Mathematics (NCTM) for teachers who are well prepared to teach mathematics. The standards describe a set of principles accompanied by elaborations and illustrations that can be used to judge what is valuable and appropriate in mathematics teaching.

This vision of mathematics teaching includes guidance to help elementary and secondary teachers develop mathematical power for all students. Teachers need to be proficient in selecting tasks that engage students' intellect, deepening students' understanding, orchestrating mathematical discourse, using technology and tools to pursue mathematical investigations, making connections to previous or developing knowledge, and guiding individual, small group and whole class work. Guidance is also provided to help teachers shift the emphasis in teaching and learning mathematics towards classrooms as mathematical communities who use logical reasoning and provide evidence as verification, make conjectures, invent and solve problems.

## **Purpose**

The standards were designed to complement the *Curriculum and Evaluation Standards for School Mathematics* and provide a broad framework to guide reform in school mathematics. These standards were written to describe what high-quality mathematics teaching for K-12 students should comprise. They are intended to guide teachers towards excellence in teaching mathematics and communicate to the public, government, departments of education, boards of education, policy makers, and others ways to improve mathematics instruction.



## **Tool description**

The standards for teaching mathematics emphasize the important decisions teachers need to make in teaching:

- Selecting and using worthwhile mathematical tasks;
- Managing classroom discourse;
- Creating an environment to support teaching and learning, and;
- Analyzing student learning, mathematical tasks, and the environment to make instructional decisions.

The standards for evaluation of teaching mathematics include the process and substance of evaluation. Central to these standards is the assumption that evaluation should result in the professional growth of teachers.

The standards for professional development of teachers focus on what teachers, both pre-service and in-service, need to know about mathematics and pedagogy to develop

mathematically powerful students. The document addresses the following areas of professional development:

- Modeling good mathematics teaching,
- Knowing mathematics and school mathematics,
- Knowing students as learners of mathematics,
- Developing as a teacher of mathematics, and
- Teachers' role in professional development.

Finally, the standards for the support and development of teachers and teaching address the responsibilities of those who make decisions that affect the teaching of mathematics. These groups include policy makers, schools and school systems, colleges and universities, and professional organizations. The standards describe ways members from the different groups can support mathematics teaching and teachers.

## **Contents Include:**

### ***Introduction***

#### ***First Steps***

- Standards for Teaching Mathematics
- Standard 1: Worthwhile Mathematical Tasks
- Standard 2: Teacher's Role in Discourse
- Standard 3: Student's Role in Discourse
- Standard 4: Tools for Enhancing Discourse
- Standard 5: Learning Environment
- Standard 6: Analysis of Teaching and Learning

#### ***Standards for the Evaluation of the Teaching of Mathematics***

- Standard 1: The Evaluation Cycle
- Standard 2: Teachers as Participants in Evaluation
- Standard 3: Sources of Information
- Standard 4: Mathematical Concepts, Procedures, and Connections
- Standard 5: Mathematics and Problem Solving, Reasoning, and Communication
- Standard 6: Promoting Mathematical Disposition
- Standard 7: Assessing Students' Understanding of Mathematics
- Standard 8: Learning Environments

#### ***Standards for the Professional Development of Teachers of Mathematics***

- Standard 1: Modeling Good Mathematics Teaching
- Standard 2: Knowledge of Mathematics
- Standard 3: Knowing Students as Learners of Mathematics
- Standard 4: Knowing Mathematical Pedagogy
- Standard 5: Developing as Teachers of Mathematics
- Standard 6: The Teacher's Role in Professional Development

#### ***Standards for the Support and Development of Mathematics Teachers and Teaching***

- Standard 1: Responsibilities of Policymakers in Government, Business, and Industry
- Standard 2: Responsibilities of Schools and School Systems
- Standard 3: Responsibilities of Colleges and Universities
- Standard 4: Professional Organization Responsibilities

### ***Next Steps***

### ***References***

## Background

The standards were drafted by the Commission on Professional Teaching Standards which was established by the National Council of Teachers of Mathematics in 1989. The commission and working groups were comprised of mathematics educators, classroom teachers, supervisors, educational researchers, mathematics teacher educators, and university mathematicians. Members of the commission and the three working groups revised these standards in 1990.

## Design principles

The book is organized around five components that contribute to the professionalism in mathematics teaching

- Standards for teaching mathematics;
- Standards for the evaluation of teaching mathematics;
- Standards for the professional development of teachers of mathematics;
- Standards for the support and development of mathematics teachers and teaching;
- Next steps

## Using the tool

The book can be used for multiple purposes:

- **Individual teacher reflection:** The book helps a teacher understand what a mathematics classroom should look like where student understanding and learning is central to the goals of the teacher. It provides descriptions of standards that directly impact the teaching practice. Teachers will find the standards for teaching mathematics to be a valuable guide for analyzing their current practice and making adjustments to move towards the vision of the standards. A teacher can read the standards, elaboration and vignettes, try out some ideas, and reflect on ways they can implement the standards. An individual teacher can benefit from using this tool, but the teacher's learning would be greatly enhanced by sharing ideas with a colleague.
- **For professional development:** Selected readings from the book can be used in small study groups. A study group can be a comfortable environment and provide additional support for teachers. Teachers can work in grade level groups or across grade levels to discuss the important teaching and learning ideas over a period of time. Leaders of professional development, colleges and universities can assign readings to highlight different aspects of the teaching practice.

## Evaluative evidence

### Availability

Copies may be obtained through NCTM's website <http://www.nctm.org>. Members of the organization have access to full electronic versions of all of the previous standards documents along with the latest document, *Principles and Standards for School Mathematics*.

### Strengths

- Describes a vision of what high-quality mathematics teaching should look like in K-12 classrooms.

- Provides guidance to teachers, administrators, policymakers, governments, colleges, and universities and others who have a role in developing or supporting teachers in learning to teach mathematics.
- Provides an overview of each standard followed by the specific standards, elaboration and vignettes from the classroom to illustrate the standards in practice.
- Based on research.

### **Likely challenges**

- Teachers will need time to learn and implement the standards into their practice.