
How Students Learn: History, Mathematics, and Science in the Classroom

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Pedagogical Knowledge: Books

DESCRIPTION

How Students Learn: History, Mathematics, and Science in the Classroom, by the National Research Council, uses research on cognition, teaching, and learning to provide answers to the questions that are confronted in classrooms in ways that can be used immediately by teachers and teacher leaders. The book focuses on three levels of work in K-12 settings, elementary, middle, and high school, and on three subject areas. Organized by discipline, each section begins with a chapter that generally explores learning in the context of the discipline. The mathematics section consists of four chapters. Chapter 5 provides a general overview and the three chapters that follow treat specific mathematics topics:



Chapter 6: Fostering the Development of Whole-Number Sense: Teaching Mathematics in the Primary Grades

Chapter 7: Pipes, Tubes, and Beakers: New Approaches to Teaching the Rational-Number System

Chapter 8: Teaching and Learning Functions

This is not a “how-to” book but a discussion of strategies that ties three fundamental principles of learning to teaching and to the design of classroom and school environments. The three principles of learning include:

- 1: Engaging Prior Understandings
- 2: The Essential Role of Factual Knowledge and Conceptual Frameworks in Understanding
- 3: The Importance of Self-Monitoring

STAGE 2 LEADERSHIP DEVELOPMENT

How Students Learn: History, Mathematics, and Science in the Classroom, by the National Research Council, supports stage 2 development of leaders working to collaborate and implement research-informed best practices and the use of effective instructional planning and teaching strategies. Chapters 5 and 6 might be used with a group of mathematics specialists and/or teachers working together to improve the teaching and learning of number sense in elementary schools. Suggestions for using the text for professional development, referred to as *Next Steps*, are included in chapter five and include the use of teacher video clubs and lesson study.

A good starting place for a group or individual might be reflecting on preconceptions about mathematics that may be held by students and teachers alike. These may include:

- Mathematics is about learning to compute.
- Mathematics is about “following rules” to guarantee correct answers.
- Some people have the ability to “do math” and some don’t.

This reflection might lead to the discussion of two related instructional challenges:

- Teaching mathematics so students come to appreciate it is about solving important problems and not about computation and following rules,
- Linking formal mathematics training with students’ informal knowledge and problem-solving capacities

Improving teaching and learning provides the focus for a group reflecting on the vignettes, activities, and topics from chapter 6 including:

- Deciding What Knowledge to Teach
- Building on Children’s Current Understandings
- Acknowledging Teachers’ Conceptions and Partial Understandings
- The Case of Number Worlds