
Improving Instruction in Geometry and Measurement: Using Cases to Transform Mathematics Teaching and Learning, Volume 3

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2005 ♦ Teachers College Press

ISBN: 0-8077-4531-6

Pedagogical Knowledge: Books

DESCRIPTION

Improving Instruction in Geometry and Measurement: Using Cases to Transform Mathematics Teaching and Learning, Volume 3, by Margaret Schwan Smith, Edward A. Silver and Mary Kay Stein, responds to the fact that middle grade students have exhibited their worst performance on national and international assessments in the areas of geometry and measurement by offering materials designed to support improved teacher preparation. This project grew out of earlier work with the QUASAR project using cognitively demanding tasks to develop conceptual understanding and help students become problem-solvers. The materials in this book support teachers of mathematics, and the leaders who prepare them, by increasing their knowledge of mathematics content, pedagogy, and student learning of mathematics to affect classroom interactions in support of student learning.

The materials in this volume are divided into two parts. Part I is a set of four narrative cases developed under the NSF-funded COMET (Cases of Mathematics Instruction to Enhance Teaching) project. Part II offers materials that support leaders with the use of the cases. The appendices provide sample responses for the opening activity and professional learning tasks from Parts I and II.

STAGE 1 LEADERSHIP DEVELOPMENT

Improving Instruction in Geometry and Measurement: Using Cases to Transform Mathematics Teaching and Learning, Volume 3, by Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein supports stage 1 development of self-knowledge, awareness, development, and modeling.

The introduction provides background information regarding the recent focus on middle-grades mathematics including reference to:

- Evidence of mediocre U.S. student performance on national and international mathematics assessments
- Efforts of professional organizations to publish policy documents supporting calls for more and better mathematics
- Development of new curricular materials that reflect more ambitious demands for middle school students

Efforts to enhance mathematics teaching and learning in the middle grades will require improving teacher preparation to build a solid foundation for effective teaching of mathematics in the middle grades and is supported by the cases and resources in this book. Information from chapter 1 provides a framework for using the cases in chapters 2-5, the related materials in chapters 6-10, and appendices A through D for reflection, analysis and, where applicable, investigation into a teacher's own instructional practices. The four cases explore:

- Reasoning about Units for Linear and Area Measure
- Exploring Area and Perimeter
- Exploring Volume and Surface Area
- Estimating and Calculating Volume

Each case is organized to include:

- Opening Activity
- Reading the Case
- The Case
- Analyzing the Case
- Extending Your Analysis of the Case
- Connecting to Your Own Practice
- Exploring Curricular Materials
- Connecting to Other Ideas and Issues

STAGE 2 LEADERSHIP DEVELOPMENT

Improving Instruction in Geometry and Measurement: Using Cases to Transform Mathematics Teaching and Learning, Volume 3, by Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein, supports stage 2 development of leaders committed to collaborating and leading change among teams of teachers and colleagues. The case-based activities in chapters 2-5 can be used to engage specialists in analyzing the teaching and learning that occurred in classrooms as students worked with cognitively demanding tasks.

Prior to analyzing each case, specialists should complete and discuss the opening activity to engage with the mathematical ideas that will be encountered in the case. Each chapter includes a task in the opening activity similar to the problem students solve in the case along with *Consider* questions which encourage reflection on the mathematics in the task. After completing the activity, specialists should refer to the related appendix which contains some solutions generated by teachers who participated in professional learning focused on the presented case.

Leaders will find the Professional Learning Task (PLT) useful for focusing the analysis of each case. Specific suggestions are provided for the reading and reflection of each case. Specialists can extend their learning by collaborating on *Connecting to Your Own Practice* activities described for each case as they:

- Enact high-level tasks in a mathematics lesson
- Analyze their own teaching
- Work on specific issues raised by the case