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# Improving Instruction in Algebra: Using Cases to Transform Mathematics Teaching and Learning, Volume 2

Smith, Margaret Schwan; Silver, Edward A. and Stein, Mary Kay

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Pedagogical Knowledge: Books

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## DESCRIPTION

*Improving Instruction in Algebra: Using Cases to Transform Mathematics Teaching and Learning, Volume 2*, by Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein, addresses the persistent challenge of developing an understanding of important mathematical ideas related to algebra. Middle school students are expected to describe, extend, and make generalizations about patterns using tables, graphs, words, and symbolic rules. This book supports teachers and leaders working to make sense of the relationships to improve their instruction. The materials were developed under the NSF-funded COMET (Cases of Mathematics Instruction to Enhance Teaching) program and include:

- Four cases from urban, middle school classrooms illustrating an instructional episode in a standards-based mathematics classroom
- The teachers' perspective as they interact with students and with the key aspects of the mathematics content
- Cognitively challenging mathematics activities that engage the reader with the mathematical ideas presented in the cases
- Facilitation chapters to help leaders use the cases with colleagues
- Appendices that provide sample responses for the professional learning tasks

The four cases explore important mathematical ideas about algebra including:

- Examining Linear Growth Patterns
- Examining Nonlinear Growth Patterns
- Comparing Linear Graphs
- Interpreting Graphs of Time versus Speed

## STAGE 1 LEADERSHIP DEVELOPMENT

*Improving Instruction in Algebra: Using Cases to Transform Mathematics Teaching and Learning, Volume 2*, by Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein, supports stage 1 development of self-knowledge; awareness, development, and modeling of content knowledge; knowledge of mathematical pedagogy; and student learning of algebra. The materials in this volume are divided into two related parts. Part I is a set of four narrative cases. Information from chapter 1 provides a framework for using the cases in chapters 2-5 and the related materials from Part II.

As an opening to Part II, chapter 6 provides important information for building pedagogical knowledge and knowledge of student learning. As teachers take up the challenge of using cognitively challenging tasks, learning how to support students to engage with and successfully complete these tasks is addressed. Opportunities for readers to identify and understand ways of supporting students' learning have been purposefully built into the cases again and again, in different contexts and in slightly different forms. Each facilitation chapter includes specific information on *Considering How Student Thinking is Supported*, identifying teacher moves that support student learning and specific examples of the moves in each case. The related appendices provide sample responses for the professional learning tasks from Parts I and II that readers will find helpful as they read and respond to the case materials.

## STAGE 2 LEADERSHIP DEVELOPMENT

*Improving Instruction in Algebra: Using Cases to Transform Mathematics Teaching and Learning, Volume 2*, by Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein, supports stage 2 development of leaders committed to transforming teacher practice. The case-based activities in chapters 2-5 might be used to engage teachers or specialists in analyzing the teaching and learning that occurred in the classrooms as students worked with cognitively demanding tasks. The facilitation chapters in Part II provide information that will be helpful for planning and facilitating the use of the cases and activities. Leaders will find the Professional Learning Task (PLT) activities useful for focusing the reading and analysis of each case.

Prior to analyzing each case, participants 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 that contains some solutions generated by teachers who participated in professional learning focused on the presented 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 during by the case