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## Extending Children's Mathematics: Fractions and Decimals: Innovations in Cognitively Guided Instruction

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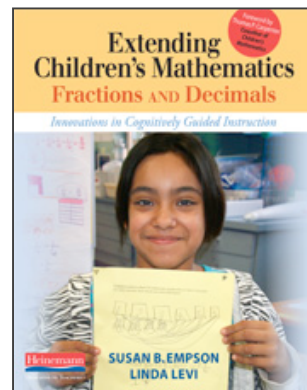
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Pedagogical Knowledge: Books

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### DESCRIPTION

*Extending Children's Mathematics: Fractions and Decimals: Innovations in Cognitively Guided Instruction*, by Susan B. Empson and Linda Levi, provides support for teachers working to help children develop understanding of fractions and decimals. In the process of exploring children's thinking, readers have the opportunity to deepen their own mathematical knowledge along with their own ability to think flexibly and creatively about mathematics problems. The book uses problem types and children's strategies for solving these problems to unpack students' emerging understanding of fractions and decimals. Throughout the book, strategies students use to solve problems are categorized and descriptions of the development of these strategies are provided. In addition, examples of classroom episodes highlight ways that teachers may direct discussions to make the mathematics in the problems explicit. Using effective listening in a responsive way to act upon what is heard is exemplified throughout the book. Using instruction in fractions to foster the development of students' use of algebraic relationships is also explored. The book focuses on three themes:



1. Building meaning for fractions through problem solving and discussion
2. Understanding the progression of children's strategies for solving fraction and decimal problems
3. Designing instruction integrating algebra into the teaching and learning of fractions

### STAGE 1 LEADERSHIP DEVELOPMENT

*Extending Children's Mathematics: Fractions and Decimals: Innovations in Cognitively Guided Instruction*, by Susan B. Empson and Linda Levi, supports stage 1 development of leaders working to improve their practice. Specialists in the role of coaching may work independently or with colleagues to use this book as a resource to deepen their own content and pedagogical knowledge. The book provides a research-based framework of problem types along with discussions of students' strategies and their development over time. Readers work the problems as they are presented in the text and then consider the discussion provided. Problem types include:

- Equal Sharing Problems
- Multiple Groups Problems
- Understanding Fraction Equivalence and Order
- Understanding Decimals
- Understanding Operations on Fractions and Decimals

Additional sets of problems representing various levels of sophistication are provided for each of these types. Along with the sets of sample problems, coaches might use the related *Instructional Guidelines* to design opportunities for their own work with students using the guidelines given for each grade level. Specialists will find these *Instructional Guidelines* a valuable resource for listening to students and reflecting on the strategies and understanding of students.

Chapter 9, “The Long View,” provides insight into listening responsively to students. This chapter highlights some of the skills that make up this ability including:

- Posing problems for children to solve using their own strategies
- Choosing problems that elicit a variety of valid strategies and insights
- Adjusting problem difficulty
- Sequencing problems and number choices
- Asking probing questions
- Conducting classroom discussions
- Identifying the important mathematics in children’s thinking

## STAGE 2 LEADERSHIP DEVELOPMENT

*Extending Children's Mathematics: Fractions and Decimals: Innovations in Cognitively Guided Instruction*, by Susan B. Empson and Linda Levi, supports stage 2 development of leaders working to engage teacher teams in the collaborative development and implementation of instructional strategies needed to support every learner. Teacher teams will not find a formula for teaching or a collection of curriculum materials in this book, but they will find a great deal of support to help them:

- Understand their students’ thinking,
- Select and sequence appropriate problems,
- Introduce notation to represent students’ strategies, and
- Engage students in productive discussion.

Teacher teams will find the chapters in the book useful for developing their knowledge of the topics bulleted above. As participants read and discuss each chapter, the authors suggest trying some of the problems with students. Participants may want to start by working with only one student or a small group. As students work, participants should observe their strategies and listen to their explanations. Reflecting on their experiences and sharing experiences with others in the group will provide valuable opportunities to collaborate on the implementation of instructional strategies.