
Developing Essential Understanding of Mathematical Reasoning

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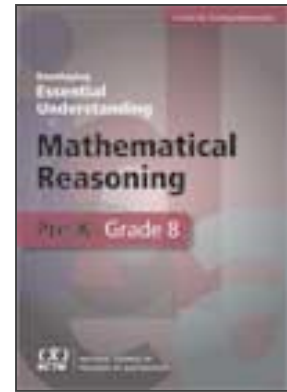
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DESCRIPTION

Developing Essential Understanding of Mathematical Reasoning, by John Lannin, Amy Ellis, Rebekah Elliott, and Rose Mary Zbiek, argues that mathematical reasoning is the essence of mathematics and is critical for developing a deep understanding of mathematics. While a complete discussion of all mathematical reasoning ideas and connections would be quite lengthy, the authors of this book have included only those ideas essential for pre-kindergarten to grade 8 mathematics teachers to be effective in the classroom. This book focuses on the development of reasoning about general mathematical relationships and the key role of reasoning to engaging in mathematics.



Chapter 1 is organized around one big idea related to reasoning and nine essential understandings that support the big idea. The big idea is that mathematical reasoning is an evolving process of developing and evaluating arguments through conjecturing, generalizing, and investigating why.

The nine essential understandings include:

- Developing Conjectures
- Generalizing to Identify Commonalities
- Generalizing by Application
- Conjecturing and Generalizing Using Terms, Symbols, and Representations
- Investigating Why
- Justifying Based on Already-Understood Ideas
- Refuting a Statement as False
- Justifying and Refuting the Validity of Arguments
- Validating Justifications

STAGE 1 LEADERSHIP DEVELOPMENT

Developing Essential Understanding of Mathematical Reasoning, Pre-K–Grade 8, John Lannin, Amy Ellis, Rebekah Elliott, and Rose Mary Zbiek, supports stage 1 leadership development of leaders working to collaborate and implement the NCTM Teaching and Learning Principle. Coaches wanting to deepen their understanding of mathematical reasoning and the challenges in teaching reasoning will find this book a useful tool. Working alone or with a colleague, coaches may begin by

reading and reflecting on the mathematical ideas in chapters 1 and 2. With this perspective in mind, continue reading about and reflecting on the challenges of teaching, learning, and assessing reasoning along with possible approaches to them in chapter 3. The vignettes in chapter 3 provide a look at how the task, teacher, and student actions, and classroom norms work to shape the learning and teaching of reasoning in the classroom.

The suggested teaching actions on page 86 provide some good first steps and continued steps in promoting the development of reasoning in mathematics classrooms. The suggestions are grouped under three headings that describe actions to promote mathematical reasoning:

- Writing and adapting tasks to promote making conjectures and generalizations
- Asking students to evaluate validity, explain their statements to another student in a lower grade, and answer questions about when statements are true
- Establishing classroom norms that
 - promote reasoning through the use of justification to confirm correctness
 - hold all students accountable for understanding why they think a statement is true
 - encourage students to take risks by sharing their reasoning.