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## How does *Addison Wesley Mathematics Makes Sense* support the Use of Manipulatives?

- ✓ The *Addison Wesley Mathematics Makes Sense* Lesson model emphasizes the importance of manipulatives.
  - Manipulatives play an important role in helping students understand and solve problems. Each phase of a lesson emphasizes this message. *Explore* and *Show and Share* invite students to model their thinking to make sense of the problem, and to communicate with their peers. Commercial manipulatives, grid paper, charts, and drawings are utilized as “thinking tools” to build understanding.
  - *Connect* uses pictures and diagrams to build bridges from students’ personal representations to other ideas, strategies, and notations. This supports reading and mathematical understanding.
  - During *Practice* and *Reflect*, students typically model their thinking to clarify their understanding, justify their solutions, or communicate their strategies. While students are encouraged to model their thinking in a variety of ways, they are also called upon to determine when and what manipulatives would be appropriate.
- ✓ *Addison Wesley Mathematics Makes Sense* balances the benefit of multiple representations with the need for students to become deeply familiar with a single manipulative.
  - Research suggests that students need time to explore the attributes of a manipulative in order to see its mathematical relevance (Hiebert and Wearne, 1996). Because of this, *Addison Wesley Mathematics Makes Sense* utilizes fewer manipulatives more frequently over the course of a year. Furthermore, only one manipulative is used per lesson, to allow students to focus on the significant meaning embedded in the model.
  - Often, multiple representations are required to examine a concept from a variety of perspectives. In this case, *Addison Wesley Mathematics Makes Sense* uses a variety of manipulatives, over several lessons, to develop understanding of concepts from different perspectives. The cumulative impact of each of these manipulatives adds to students’ understanding, and provides additional models for discovering or explaining new learnings.
- ✓ *Addison Wesley Mathematics Makes Sense* believes that manipulatives are important for all students.
  - In every lesson, *Addison Wesley Mathematics Makes Sense* calls upon all students to work with models or use manipulatives, not only students who need extra support. The use of manipulatives serves many purposes:
    - It enables kinesthetic students to have hands-on experiences.
    - It provides a concrete model for visual students to observe.
    - It enables verbal and auditory learners to have a conversation grounded in this common experience.
  - While all students benefit from using manipulatives and concrete models, manipulatives do not comprise the endpoint in learning. As students internalize the concepts, students move from the concrete to the pictorial stage of learning. At this latter stage, students must be able to justify their strategies and solutions to teacher and peers using visual models.
- ✓ *Addison Wesley Mathematics Makes Sense Teacher Guide* supports teachers in developing management routines around manipulatives.
  - *Building a Math Community* provides teachers with practical suggestions for using, storing, and distributing manipulatives.
  - Throughout the Teacher Guide, *Teacher Tips* provide strategies and suggestions to establish successful routines in the classroom.
  - In the Teacher Guide, charts list the materials needed and provide suggestions for alternatives.



## Features and Philosophies:

### ***Addison Wesley Mathematics Makes Sense* believes Manipulatives**

- play an important role in the formation and understanding of concepts.
- provide students with “thinking tools” with which to understand and solve problems.
- do not automatically develop a concept; students require sufficient time and effective language to discover the relationships among the object, the symbol, and the mathematical idea.
- encompass 3-D objects, drawings, diagrams, pictures, symbolic expressions, charts, etc.; exploring a concept typically requires multiple representations.
- include links to technology, such as virtual manipulatives (for example, *Addison Wesley Mathematics Makes Sense* e-Tools), computer applications, and calculators, allowing students to explore mathematics in a dynamic and interactive environment.
- benefit all students in developing, clarifying, and communicating mathematics.
- acknowledge a diversity of learners and recognize multiple intelligences.
- help students recognize and correct their errors in thinking.
- can provide visualization and mental models that enable students to work more efficiently in a makes-sense way.
- provide a common experience around which students and teachers can engage in conversation.
- provide a window through which teachers gain insights into the way students interpret and think about the mathematics.
- build bridges from a student’s notation to other more conventional representations.
- require classroom routines to maximize learning.
- should be accessible for students to select and use freely, and should be a part of all elements of the lesson model.
- build upon a student’s natural curiosity and increase the overall enjoyment of mathematics.
- facilitate a learning community that is characterized by experimentation, conjecture, justification, and the freedom to think.