INSTRUCTIONAL MODEL

What is the core instructional model for enVision® Mathematics?

There has been more research in the past fifteen years showing the effectiveness of problem-based teaching and learning, part of the core instructional approach used in **enVision**® Mathematics, than any other area of teaching and learning mathematics (see e.g., Lester and Charles, 2003). Furthermore, rigor in mathematics curriculum and instruction begins with problem-based teaching and learning.

As shown in Figure 4 below, there are two key steps to the core instructional model in **enVision**® Mathematics.

"Research shows that conceptual understanding is developed when new mathematics is introduced in the context of solving a real problem in which ideas related to the new content are embedded."

STEP 1 PROBLEM-BASED LEARNING

Introduce concepts and procedures with a problem-solving experience.

Research shows that conceptual understanding is developed when new mathematics is introduced in the context of solving a real problem in which ideas related to the new content are embedded (Kapur, 2010; Lester and Charles, 2003; Scott, 2014). Conceptual understanding results because the process of solving a problem that involves a new concept or procedure requires students to make connections of prior knowledge to the new concept or procedure. The process of making connections between ideas builds understanding. In **enVision**® Mathematics this problem-solving experience is called *Solve and Share*.

STEP 2 VISUAL LEARNING

Make the important mathematics explicit with enhanced direct instruction connected to Step 1.

The important mathematics is the new concept or procedure students should understand (Hiebert, 2003; Rasmussen, Yackel, and King, 2003). Quite often the important mathematics will come naturally from the classroom discussion around students' thinking and solutions for the *Solve and Share* task. Regardless of whether the important mathematics comes from discussing students' thinking and work, understanding the important mathematics is further enhanced when teachers use a high-cognitive-level classroom conversation to explicitly present and discuss an additional problem related to the new concept or procedure.

The second step in the core instructional model is called *enhanced* direct instruction because making the important math explicit through an additional problem should always begin by connecting the students' thinking and solutions for the *Solve and Share* to the new ideas of the lesson.

Every lesson in **enVision**® Mathematics provides a worked-out problem in the student materials that introduces the important mathematics of the lesson through a series of visual illustrations that promote understanding. This is called the *Visual Learning Bridge*. It is a *bridge* because it connects the students' thinking and solutions for the *Solve and Share* to the new mathematical ideas of the lesson. In other words, it is not left to chance that students will take away the important mathematics from their work with the *Solve and Share*; the important mathematics is made explicit in the student materials.

Making the important mathematics explicit through the *Visual Learning Bridge*, in addition to further developing understanding, has the added benefit of providing a resource for teachers, students, and parents. Every *Visual Learning Bridge* in **enVision**® Mathematics is available as an online *Visual Learning Animation Plus*, thus facilitating teacher-led classroom conversations. Also, every illustration inside each *Visual Learning Bridge* is accompanied in the teacher materials by high-cognitive-level questions for teachers to use with students.

STEP 1 PROBLEM-BASED LEARNING
Introduce concepts and procedures with a problem-solving experience.

STEP 2 VISUAL LEARNING
Make the important mathematics explicit with enhanced direct instruction connected to Step 1.

Figure 4: *The core instructional model for* ***enVision***® *Mathematics*

Earlier we mentioned that consistent, everyday engagement with math practices enables learners to develop understandings and use mathematics with understanding. It is clear from research that problem-based teaching and learning is THE best vehicle for developing expertise with math practices. Every *Solve and Share* in **enVision**® Mathematics requires the student to select, implement, and manage multiple math practices. Math practices are reflected in the questions provided for teachers for each *Solve and Share,* and particular questions to highlight are noted in the teacher materials and in the student materials. For the *Visual Learning Bridge*, the comments in the student materials and the conversation-starter questions in the teacher materials connect to multiple math practices.

Some Final Thoughts

The authors deliberately chose not to perpetuate the instructional approach that has been used in traditional elementary grades' mathematics curricula for many years because that approach simply does not develop the depth of understanding needed for student success and higher achievement in mathematics. The traditional approach is one driven by direct instruction: the teacher walks students through one or more examples, then students practice doing what the teacher just showed them. A slight variation of this approach, one that should not be mistaken for problem-based teaching and learning, is to begin lessons with an "activity," the kinds of activities included in elementary mathematics curricula for many years. These traditional activities often have students work together and use manipulatives, important elements in problem-based teaching and learning, but these activities also direct students in what to do and think; they are in fact teacher-directed activities. Telling students what and how to think using direct instruction, with or without teacher-directed activities, does not develop student understanding as well as problem-based teaching and learning.

Finally, the promise for **enVision**® Mathematics grows from the organization of the program and the core instructional model used daily. However, there are many other elements that contribute to making **enVision**® Mathematics a high-quality curriculum. The remainder of this Teacher's Edition Program Overview shares many of these and further shows why the promise of **enVision**® Mathematics is real.

Thank you for using our program!

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"It is clear from research that problem-based teaching and learning is THE best vehicle for developing expertise with math practices."

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