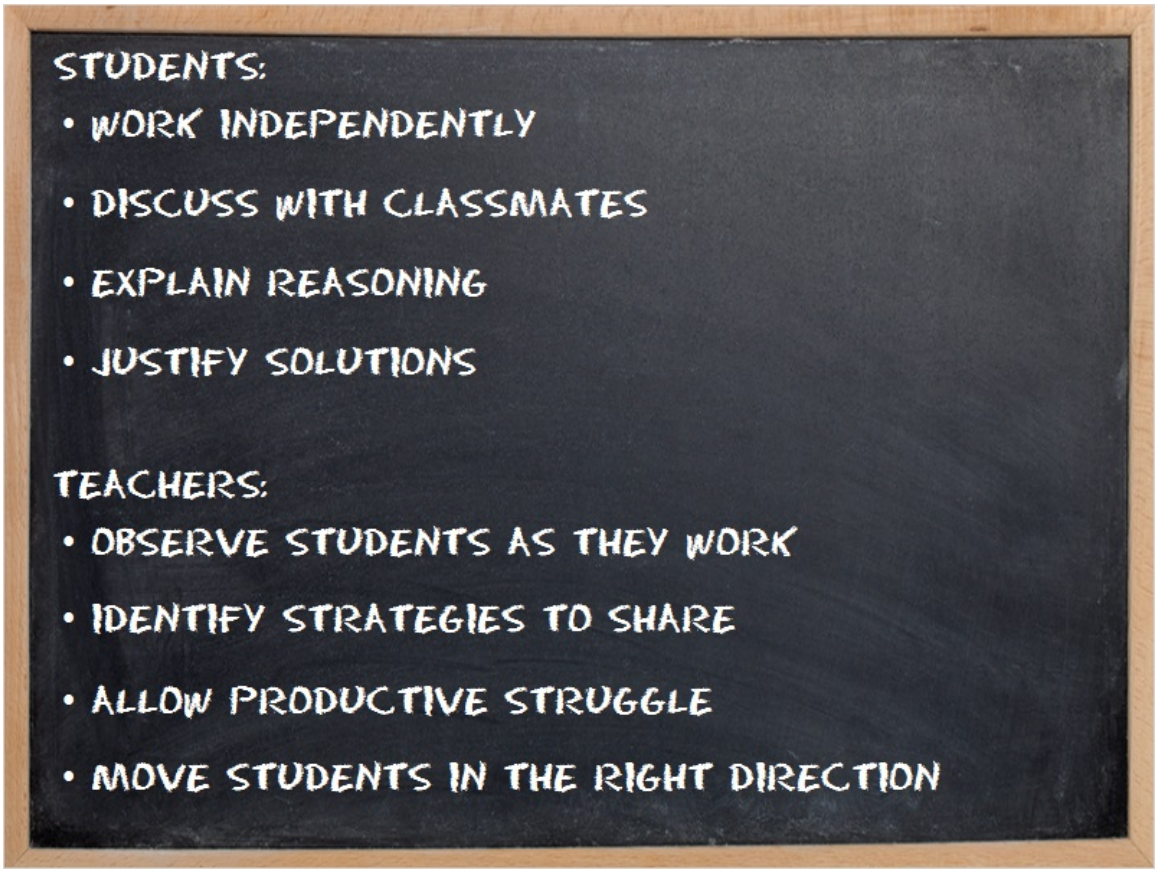
enVision A|G|A © 2018
Problem-based Learning

Disclaimer

Introduction

In this tutorial, we will explore problem-based learning in **enVision A|G|A**. We will learn how to effectively facilitate problem-based learning tasks within the **enVision A|G|A** instructional model.

Problem-based Learning



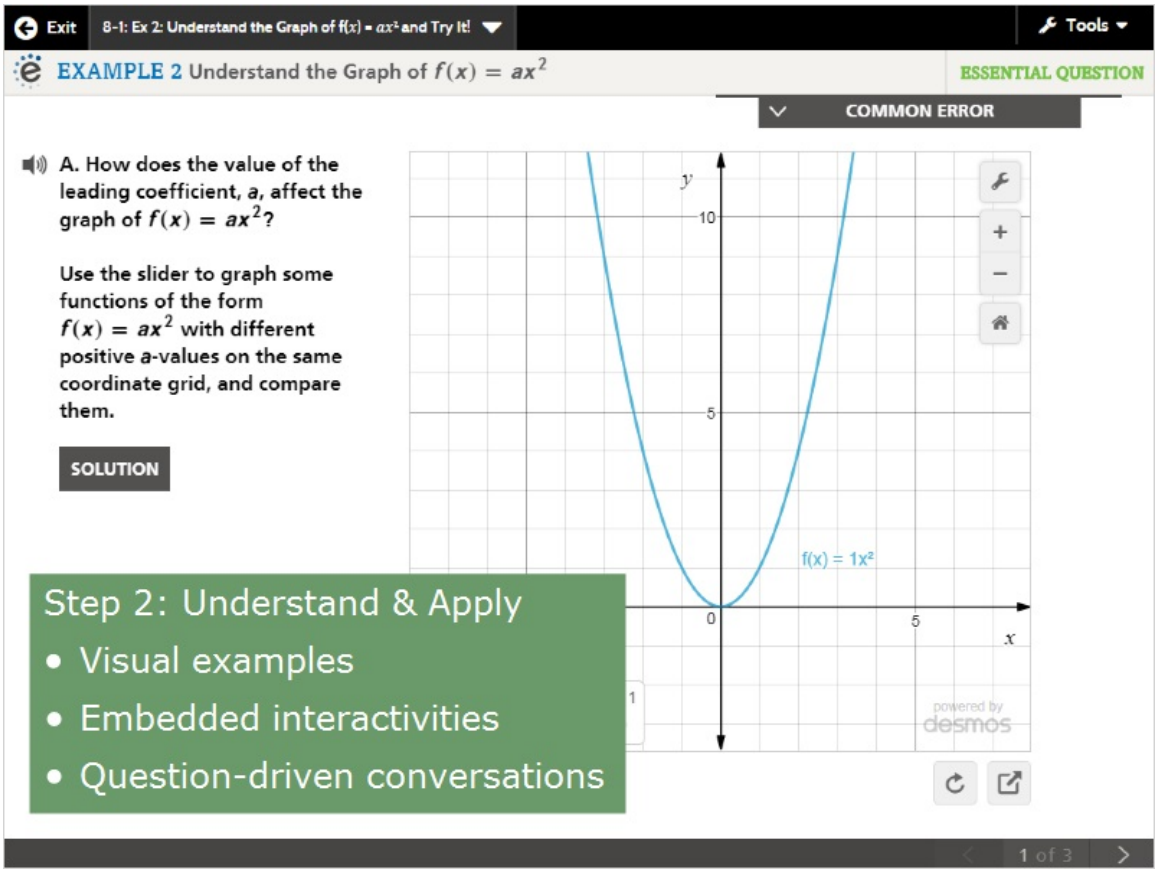
Problem-based learning (PBL) involves teaching *through* problem solving, using problems that are within students' capabilities with the goal of stretching their capabilities.

Students use what they already know to solve the problems, and make connections to new mathematics as they work. Problem-based learning focuses on building conceptual understanding.

Students first solve problems independently and then discuss their strategies and solutions with classmates. Students are responsible for explaining their reasoning and providing justification for their solutions.

During this process, teachers observe students as they work and identify strategies that they want students to share with the whole group. Teachers allow for productive struggle while supporting students who may be off track and moving them in the right direction.

enVision A|G|A Instructional Model



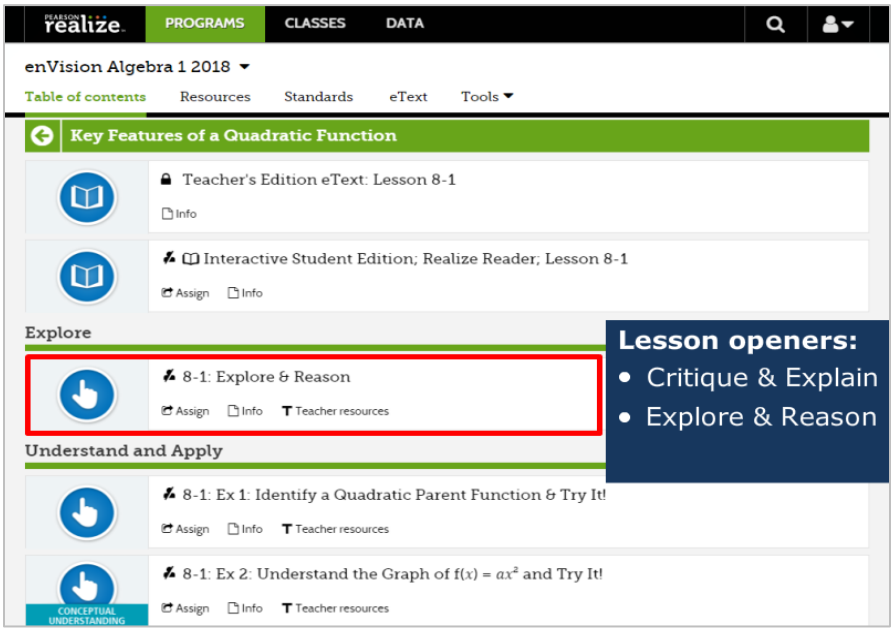
The **enVision A|G|A** four-step instructional model focuses on building conceptual understanding through problem-based learning.

The lesson begins with a problem-based learning activity in Step 1: Explore. Students solve a problem in which new concepts are embedded.

In Step 2: Understand and Apply, teachers make those new concepts explicit through visual examples, embedded interactivities, and question-driven classroom conversations.

Let's explore these steps in more detail.

Step 1



In **enVision A|G|A**, the problem-based learning starts in Step 1 with lesson openers called Critique & Explain, Explore & Reason, and Model & Discuss.

Each lesson opener helps students connect what they know to new mathematical concepts embedded in the problem.

The Teacher's Edition provides teaching actions you can use before, during, and after students work on the problem. These teaching actions are based on the Effective Teaching Practices (ETPs).

First, pose the Before questions to the whole class. Lead a short discussion to make sure students understand the task.

Next, have students work on the problem in small groups.

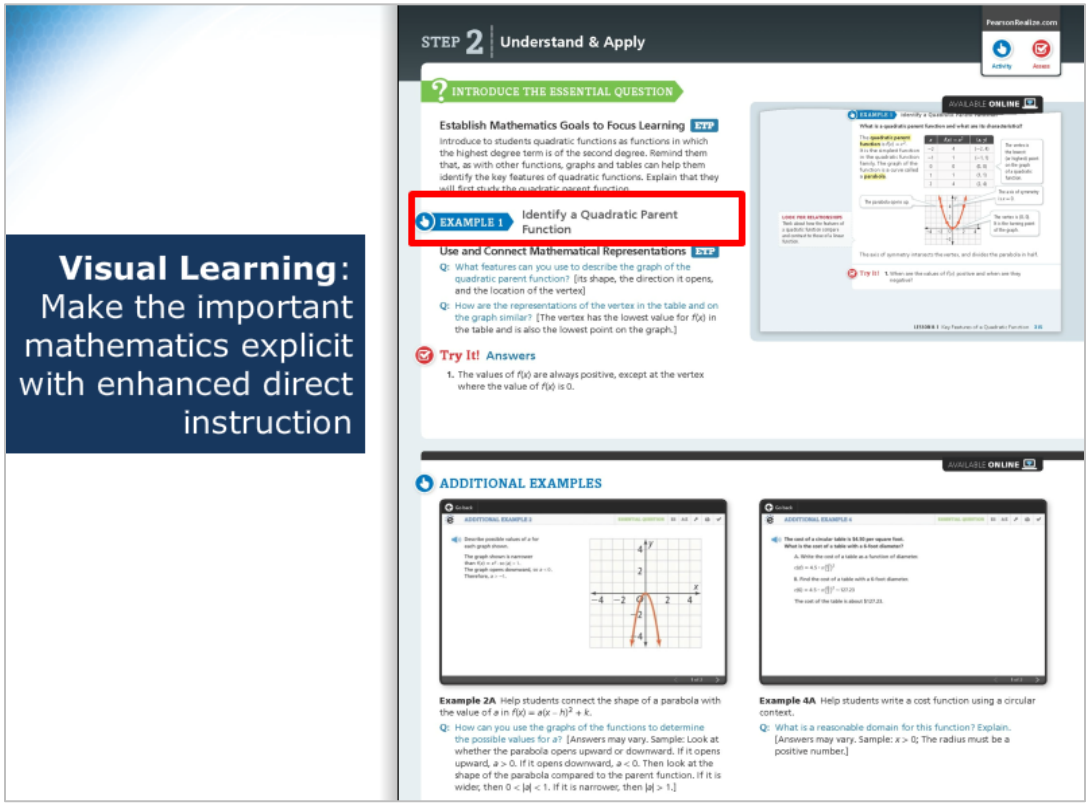
Students may solve the problem using any method they choose. Make sure to give students time to productively struggle. As they work, support students with guiding questions, and consider using the extension question for early finishers. Note any student solution strategies that you want to share with the whole group.

When students are finished working, facilitate another whole-class discussion. Discuss students' thinking and help students make connections between the various strategies presented.

You can also display the sample student work that is shown in the Teacher's Edition, which is available on Pearson Realize™.

Problem-based learning continues in Step 2: Understand & Apply.

Step 2



As you transition to Step 2 of the lesson, introduce the Essential Question to your students.

Introduce the visual examples to make important lesson concepts explicit. Use the guiding questions in your Teacher's Edition and embedded interactivities powered by Desmos to facilitate enhanced direct instruction.

Quite often, the important mathematics will come naturally from the classroom discussion around students' thinking and solutions for the visual examples. Use questioning to help students connect their work on the lesson opener to the new mathematical ideas that emerge from the visual examples.

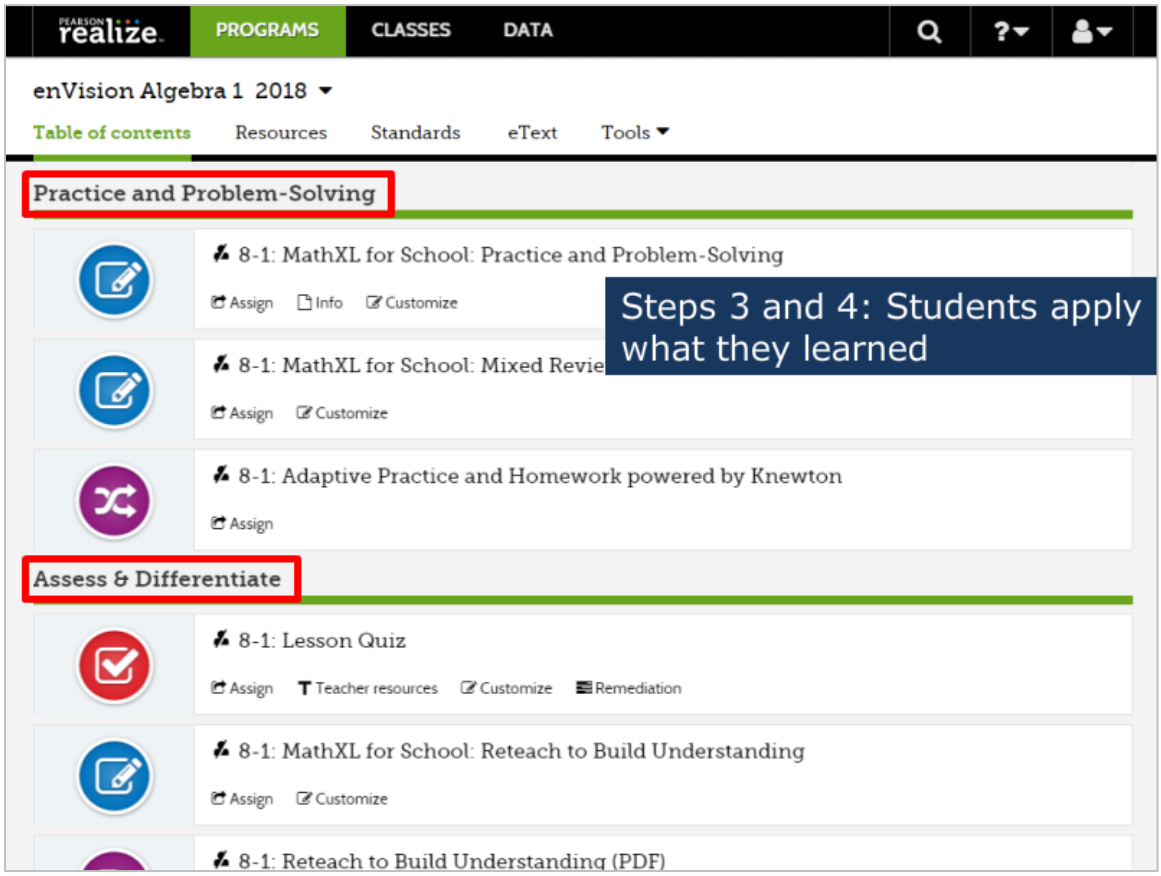
Then have students complete the corresponding Try It! exercises on their own to check for understanding.

Use the differentiation notes, questions, and strategies to support the range of learners in your classroom.

Lead a classroom conversation about the Concept Summary to help students connect ideas and multiple representations.

Finally, have students complete the Do You Understand? and Do You Know How? formative assessments. Use the results and Common Error notes to address misconceptions before transitioning out of problem-based learning for the last two steps of the lesson.

Steps 3 and 4

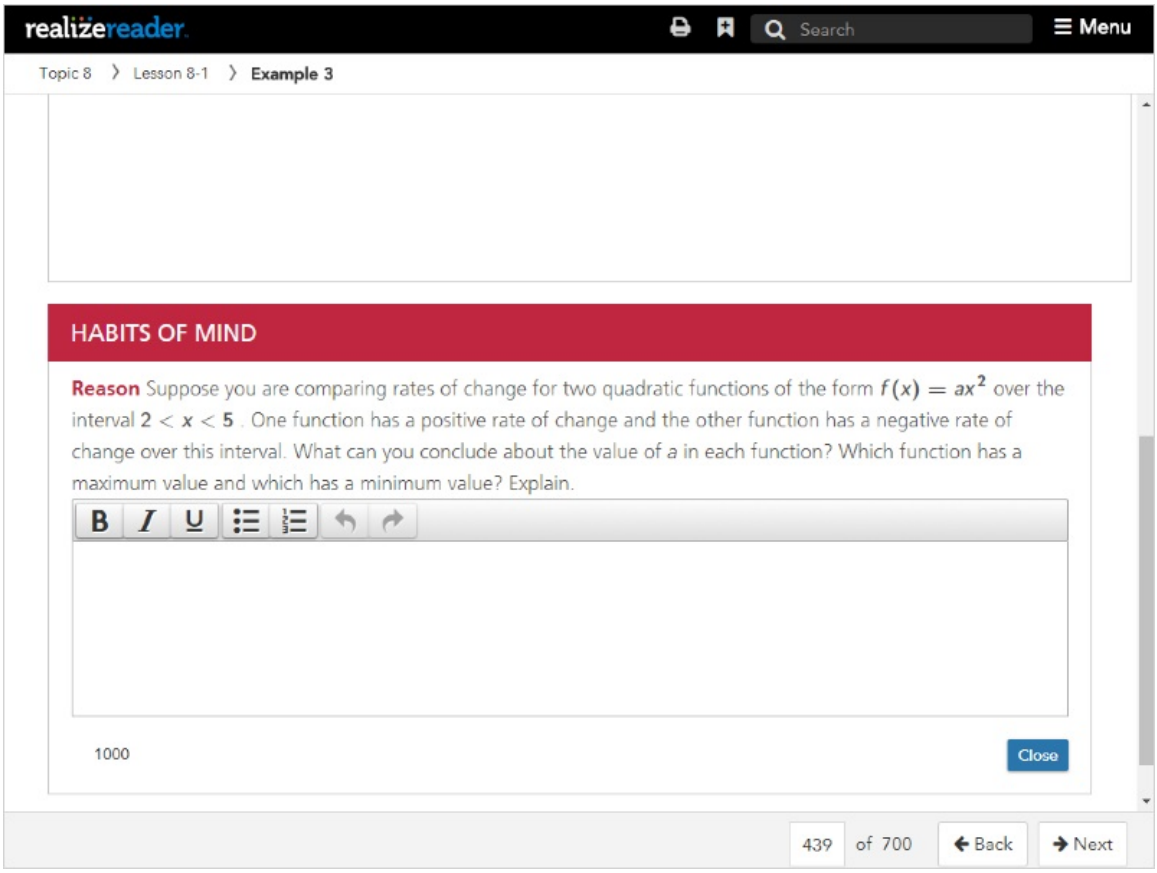


In Steps 3 and 4 of each lesson, students have opportunities to apply what they learned during the previous problem-based learning steps.

The Step 3: Practice and Problem Solving activities help students build mathematical proficiency as they work independently.

In Step 4: Assess and Differentiate, assign the Lesson Quiz and use the results to prescribe differentiated remediation or enrichment.

Mathematical Practices

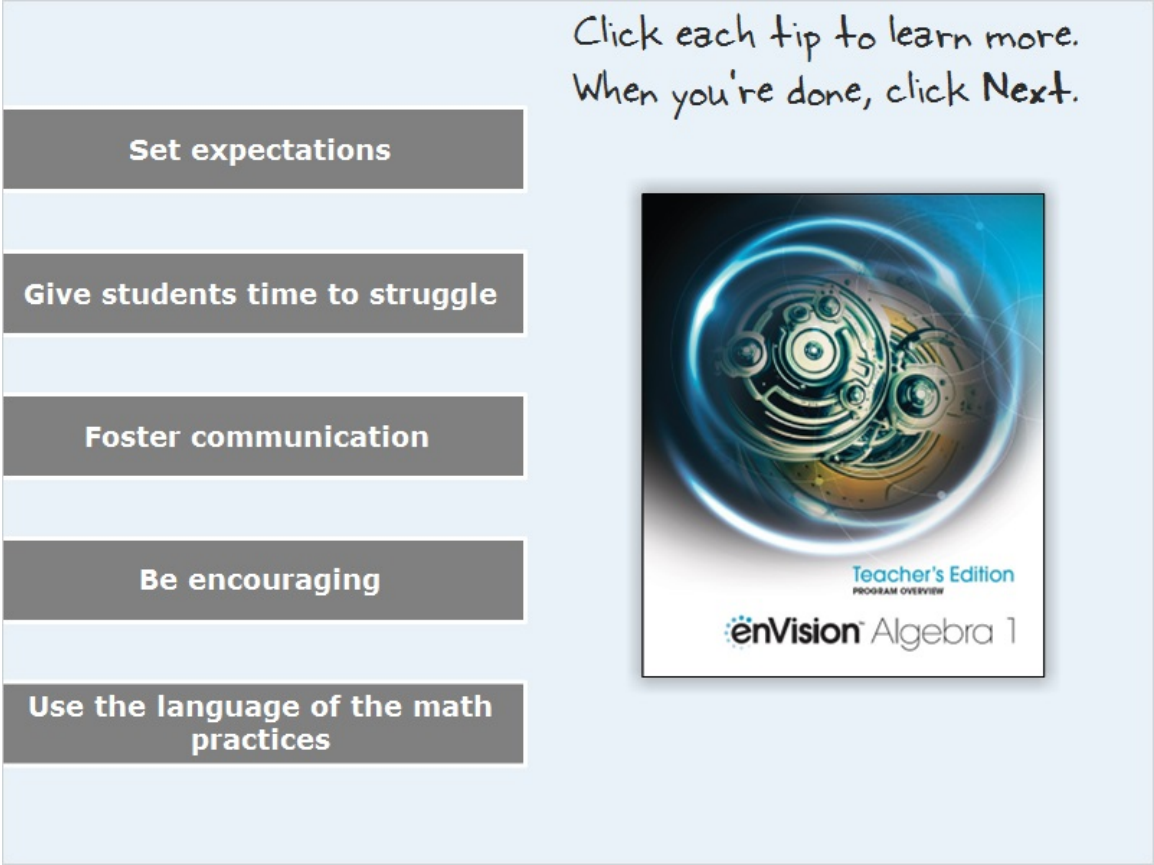


The question-driven classroom conversations that you facilitate during problem-based learning have many benefits for students. These conversations during Steps 1 and 2 of each lesson lead to deep conceptual understanding.

Not only can you use questioning and formative assessments to monitor students' progress on lesson concepts, you can also assess students' development of the mathematical practices.

Additionally, pose the Habits of Mind questions to students during Steps 1 and 2 of each lesson. These questions help guide students' thinking in a way that supports development of the math practices. Students can answer these questions in their Realize Readers using the Interactive Notebook feature to record their reasoning and justifications.

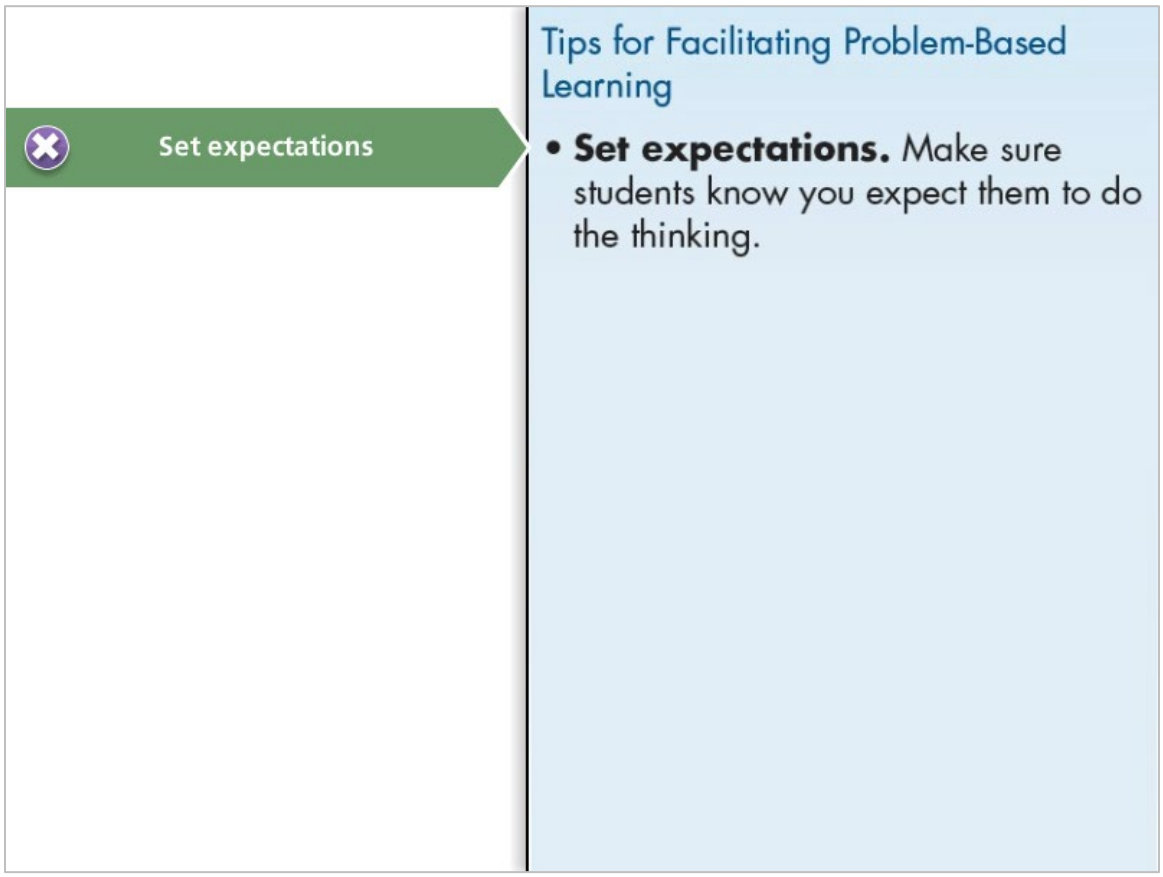
Tips for Facilitating PBL



Follow these tips from the *Teacher's Edition Program Overview* as you facilitate problem-based learning.

Now let's review each tip.

Set expectations



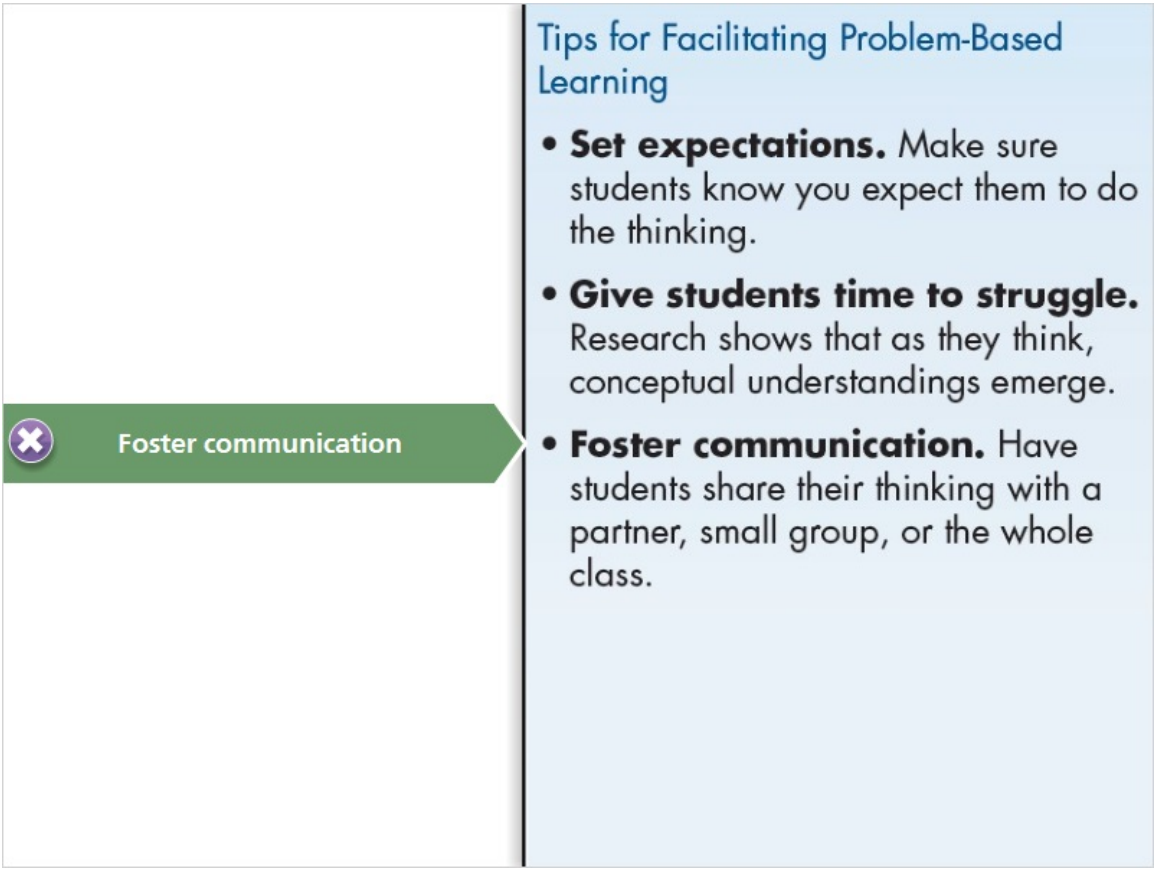
Give students time to struggle

Give students time to struggle

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
- **Give students time to struggle.** Research shows that as they think, conceptual understandings emerge.

Foster communication



Be encouraging

Be encouraging

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
- **Give students time to struggle.** Research shows that as they think, conceptual understandings emerge.
- **Foster communication.** Have students share their thinking with a partner, small group, or the whole class.
- **Be encouraging.** Show that you value students' thinking especially when they struggle.

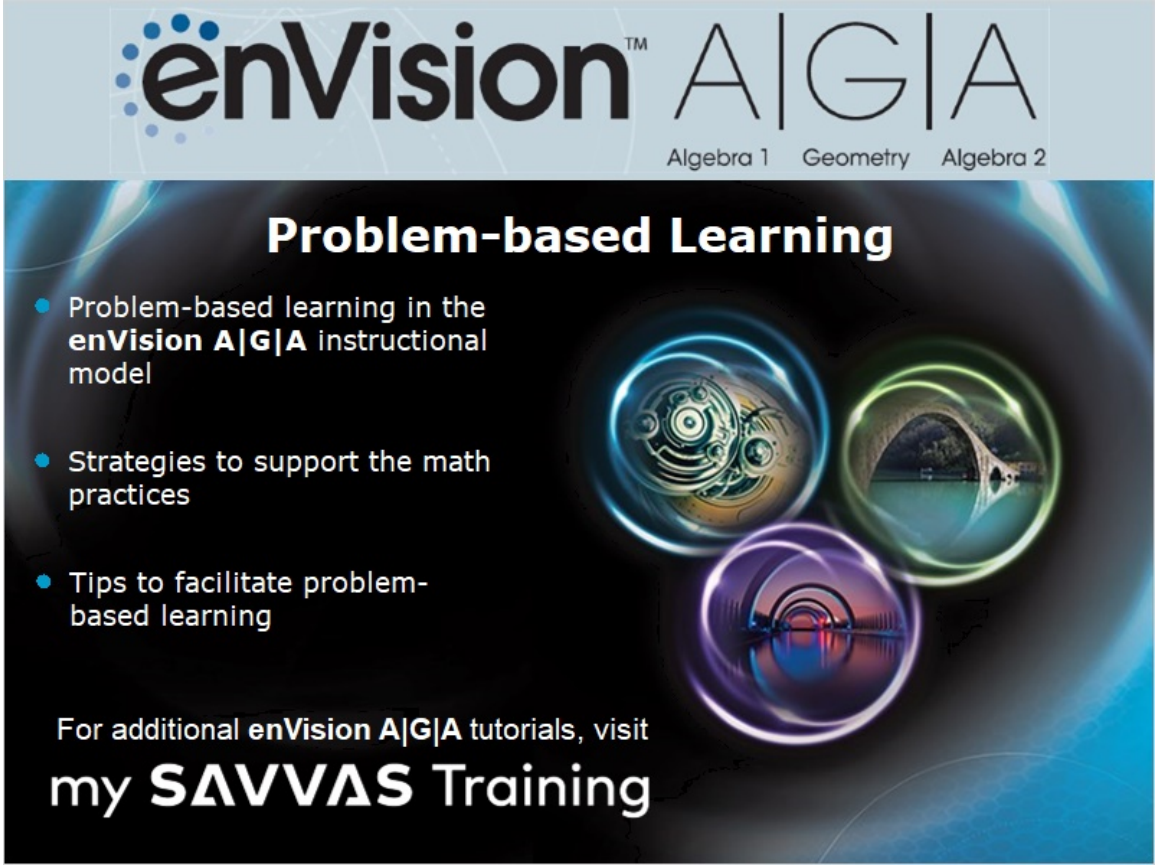
Use the language of the math practices

Use the language of the math practices

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
- **Give students time to struggle.** Research shows that as they think, conceptual understandings emerge.
- **Foster communication.** Have students share their thinking with a partner, small group, or the whole class.
- **Be encouraging.** Show that you value students' thinking especially when they struggle.
- **Use the language of the Math Practices** during discussions.

Closing



In this tutorial, we saw how the **enVision A|G|A** instructional model focuses on problem-based learning to help students build conceptual understanding. We also reviewed strategies that help students develop the math practices during problem-based learning. Finally, we reviewed some tips to help you facilitate problem-based learning in your classroom.