

enVisionmath2.0 © 2017 Problem-Based Learning

Introduction



Hi, **enVisionmath2.0** teachers!

Let's take a look at how problem-based learning helps your students build conceptual understanding so you can take their learning to the next level.

Problem-Based Learning (PBL)



Students:

- Work independently at first
- Discuss strategies with the group
- Explain their thinking



Problem-based learning (or PBL) involves teaching *through* problem solving. You'll use problems that students can already do in order to activate their prior knowledge. By using what they already know as a starting point, students begin to discover new concepts on their own as they solve the problems.

Students first solve problems independently and then discuss their strategies with their classmates. Each student is responsible for explaining their thinking to a partner or group.

During this process, teachers observe students and identify strategies that they want students to share with the whole group. Teachers support students who may be off track using questioning strategies.

PBL in enVisionmath2.0

STEP 1 **DEVELOP: PROBLEM-BASED LEARNING**

COHERENCE: Engage learners by connecting prior knowledge to new ideas. Students extend their understanding of addition and determine the relationship between multiplication and addition. They will confirm that multiplying or adding equal groups will give them the same results.

BEFORE

- 1. Pose the Solve-and-Share Problem**
Give 20 two-color counters (or Teaching Tool 9) to each student pair if needed.
Make Sense and Persevere Listen and look for students who analyze the numbers in the problem and understand the math they can use to find the total.
- 2. Build Understanding**
What are you asked to find in this problem? [The total number of jars that Ms. Witt bought] *What tools can you use to solve this problem?* [Counters, drawings]

DURING

- 3. Ask Guiding Questions As Needed**
How can you use counters to find the total number of jars? [Use counters to represent each jar of paint in 3 boxes.] *How can you find the total number of jars?* [Multiply 3×5 or add the total number of jars in each box.]

AFTER

- 4. Share and Discuss Solutions**
Start with students' solutions. If needed, project Phylla's correct work.
- 5. Transition to the Visual Learning Bridge**
Repeated addition involves joining equal groups and is one way to think about multiplication.
- 6. Extension for Early Finishers**
Ms. Witt bought 4 packages of paintbrushes. Three of the packages had 2 brushes. The other package had 3 brushes. How many paintbrushes did Ms. Witt buy? [9 paintbrushes]

Analyze Student Work

Phylla's Work

○○○ ○○○ ○○○
○○○ ○○○ ○○○
 $5 + 5 + 5 = 15$
Ms. Witt bought 15 jars of paint.

Ross's Work

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

Ms. Witt bought 15 jars of paint.

You'll facilitate PBL in Steps 1 and 2 of **enVisionmath2.0** lessons.

In Step 1: Problem-Based Learning, students solve a problem, the Solve & Share, in which new concepts are embedded.

In Step 2: Visual Learning, those concepts are made explicit through direct instruction that is supported by rich classroom conversations about the Visual Learning Bridge.

Step 1: Develop: Problem-Based Learning

Correct and incorrect strategies help students demonstrate the math practices

STEP 1 DEVELOP: PROBLEM-BASED LEARNING

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At the beginning of each lesson, guide students through the Solve & Share problem.

The Teacher's Edition provides teaching actions for before, during, and after this problem-based learning.

Before students begin working on the problem, use teaching actions 1 and 2 to build understanding with the whole group.

During the problem-based learning, have students work in pairs or small groups to productively struggle. Students may solve the problem any way they choose, and you can support them with guiding questions.

After students develop strategies and solutions, bring the whole group together to give students a chance to explain their thinking and hear a variety of strategies.

Consider displaying correct and incorrect strategies to help students develop the thinking habits described by the math practices. There is sample student work in the Teacher's Edition and on Savvas Realize that you can display.

Quick Tip!

The screenshot shows the Savvas Realize eText interface. At the top, there is a navigation bar with 'Welcome Jessica Palmer-Gwaltney', 'Bookshelf', 'Settings', 'Help', and 'Sign Out'. Below this is a search bar and a toolbar with various icons. A red box highlights the 'Student Edition eText' icon, which is a small icon of a person with a speech bubble. The main content area displays 'Lesson 1-1 Multiplication as' and a 'Solve & Share' problem: '5 jars of paint in e of jars Ms. Witt bo you choose.' A blue callout box is overlaid on the page, providing instructions on how to use the 'Student Edition eText' icon.

You can display the Solve & Share problem from Savvas Realize™ using the Student Edition eText and the projector icon.

Consider using the DrawPad to have students demonstrate their strategies for the whole class.

When you're done, click Next.

Step 2: Visual Learning

Visual examples

STEP 2 DEVELOP: VISUAL LEARNING

The Visual Learning Bridge connects students' thinking in Solve & Share to important math ideas in the lesson. Use the Visual Learning Bridge to make these ideas explicit. Also available as a Visual Learning Animation. Visit www.pearsoned.com.

PELize.
Personalized Learning


Learn Glossary

How Can You Find the Total Number of Objects in Equal Groups?


a Jessie used 3 bags to bring home the goldfish she won at the Fun Fair. She put the same number of goldfish in each bag. How many goldfish did she win?

I can use counters to show the groups.

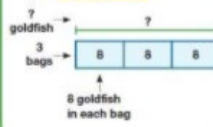
8 goldfish in each bag



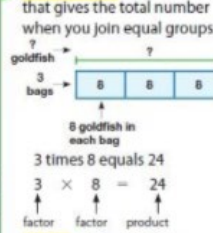
b The counters show 3 groups of 8 goldfish.



You can use addition to join equal groups.



c Multiplication is an operation that gives the total number when you join equal groups.



3 times 8 equals 24

$$3 \times 8 = 24$$

factor factor product

Factors are the numbers that are being multiplied. The product is the answer to a multiplication problem.


d You can write equations.

An unknown is a symbol that stands for a number in an equation.

Addition equation:
 $8 + 8 + 8 = ?$
 $8 + 8 + 8 = 24$

Multiplication equation:
 $3 \times 8 = ?$
 $3 \times 8 = 24$

Jessie won 24 goldfish.



After the Solve & Share, continue the PBL by guiding your students through a completed problem that introduces the important mathematics of the lesson through a series of visual examples.

This is called the Visual Learning Bridge. It's a bridge because it connects the students' thinking and solutions for the Solve & Share problem to the new mathematical ideas of the lesson. In other words, it's not left to chance that students will take away the important mathematics from their work with the Solve & Share; the important concepts are made explicit through visual learning.

Continue the PBL by asking students guiding questions to expand their thinking and reinforce the math practices as they explore the multiple representations in the Visual Learning Bridge.

Quick Tip!

The screenshot shows the Savvas Realize interface for 'enVisionmath2.0 Grade 3 2017'. The top navigation bar includes 'realize.', 'PROGRAMS', 'CLASSES', and 'DATA'. Below the navigation bar, there are links for 'Table of contents', 'Resources', 'Standards', 'eText', and 'Tools'. The main content area is divided into sections: 'Develop: Problem-Based Learning' and 'Develop: Visual Learning'. Under 'Develop: Visual Learning', there are three resources listed: 'Multiplication as Repeated Addition: Visual Learning', 'Multiplication as Repeated Addition: Convince Me!', and 'Multiplication as Repeated Addition: Practice'. The 'Multiplication as Repeated Addition: Visual Learning' resource is highlighted with a red box, and its icon is also highlighted with a red box.

Every Visual Learning Bridge in enVisionmath2.0 is also available as an online Visual Learning Animation Plus video that you can play from Savvas Realize to engage your students.

When you're done, click **Next**.

Interactive Exercise

LESSON OVERVIEW:
MATH ANYTIME

STEP 1
DEVELOP:
PROBLEM-BASED LEARNING

STEP 2
DEVELOP:
VISUAL LEARNING

STEP 3
ASSESS AND
DIFFERENTIATE

realize.
All materials available at
PearsonRealize.com

Digital

PROBLEM-BASED LEARNING

C Solve and Share in the Student's Edition

- **Introduces a lesson** by engaging students with a problem in which new math ideas are embedded.
- **Coherence** is facilitated as students connect prior knowledge to the new math ideas.
- **Students solve the problem any way they choose.** Give students time to struggle. Research shows that as they think, conceptual understandings emerge.

D Solve and Share in the Teacher's Edition


- **Teaching actions** are given for before, during, and after this problem-based learning.
- **Before** Use Teaching Actions #1 and #2 to start understanding. This is whole-class discussion.
- **During** When students are stumped, use #3. Students should be working together as you facilitate.
- **After** This is another whole-class discussion. Use #4 and #5 to discuss students' thinking and work, and to make math ideas explicit. Use #6 as needed.


E Solve and Share Online

- **Helps during Teaching Action #4**, which is Share and Discuss Solutions.
- **Use the DrawPad** to have students come up and write their solutions. Or you can write on the screen yourself during a whole-class discussion.
- **Display sample student work** that is shown in the Teacher's Edition and is also provided in a digital file at PearsonRealize.com.
- **Assignable online** to individual students at PearsonRealize.com. Students do not have access to the sample solutions.

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
- **Foster communication.** Have students share their thinking with a partner, small group, or the whole class.
- **Be encouraging.** Show that you value students' thinking even when they struggle.
- **Use the language of the math practices** during discussions.





Teacher's Edition
Program Overview
Grade 3

enVisionmath2.0

Try these tips from the *Teacher's Edition Program Overview* to facilitate PBL in your classroom.

Set Expectations

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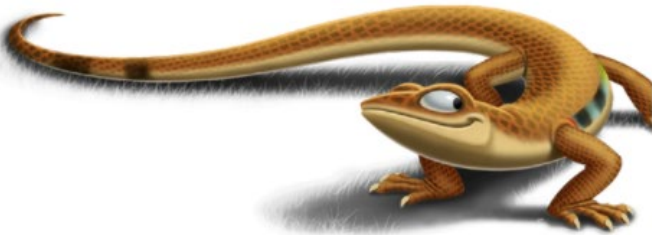


First, set expectations. Make sure students know you expect them to work through the problem, identify the strategy they used, and explain their thinking.

Foster communication

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
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- **Use the language of the math practices** during discussions.



Second, foster communication by asking open-ended questions. Have students share their thinking with a partner, in a small group, or with the whole class.

Be encouraging

Tips for Facilitating Problem-Based Learning

- **Set expectations.** Make sure students know you expect them to do the thinking.
- **Foster communication.** Have students share their thinking with a partner, small group, or the whole class.
- **Be encouraging.** Show that you value students' thinking even when they struggle.
- **Use the language of the math practices** during discussions.



Third, be encouraging. Show that you value students' thinking even when they struggle to identify the solution or explain their ideas clearly.

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.
- **Foster communication.** Have students share their thinking with a partner, small group, or the whole class.
- **Be encouraging.** Show that you value students' thinking even when they struggle.
- **Use the language of the math practices** during discussions.



And, finally, use the language of the math practices during discussions to encourage students to become better thinkers and problem-solvers.

Closing



Thanks for learning more about PBL and **enVisionmath2.0** today!

Hopefully you've identified some resources and tips to help you facilitate PBL with your students.

Keep digging into MySavvasTraining.com for more information about Savvas Realize and **enVisionmath2.0**.