

Miller & Levine Biology © 2019

Where Is the PBL in a Unit?

Introduction



Problem-Based Learning (PBL)

What is it?

How do students learn?



Hey there! You may have heard some buzz around Problem-Based Learning, or PBL, but have you ever noticed that it's one of those terms that just doesn't quite mean the same thing to everyone (and not to mention, it's often used interchangeably with *Project-Based Learning*)? So, what exactly does Problem-Based Learning look like in *Miller & Levine Biology*? And how do students learn through PBL? Join me, and I'll show you how PBL can engage your students in more authentic scientific inquiry.

What is PBL?

Exit
Interactivity: Limiting Factors


Limiting Factors

Density-Dependent Limiting Factors

A limiting factor is anything that controls the growth of a population. Factors that have the greatest influence in dense populations are called density-dependent limiting factors.

Click through the gallery to see examples of density-dependent limiting factors.

Competition



When populations become large, individuals compete with one another for the full range of resources essential to life. Male springbok antelope use their long horns to fight for territory,

Use new content to solve the problem!

2 of 7

Problem-Based Learning, or PBL, is learning that is anchored in a problem or question that motivates student learning. Students take on the role of scientists as they develop and refine their own solutions!

Throughout each unit, students will learn scientific content that will help them solve the problem. So instead of learning a collection of isolated facts and practices, students will immediately apply the content to the problem solution.

Where is PBL in Miller & Levine Biology?



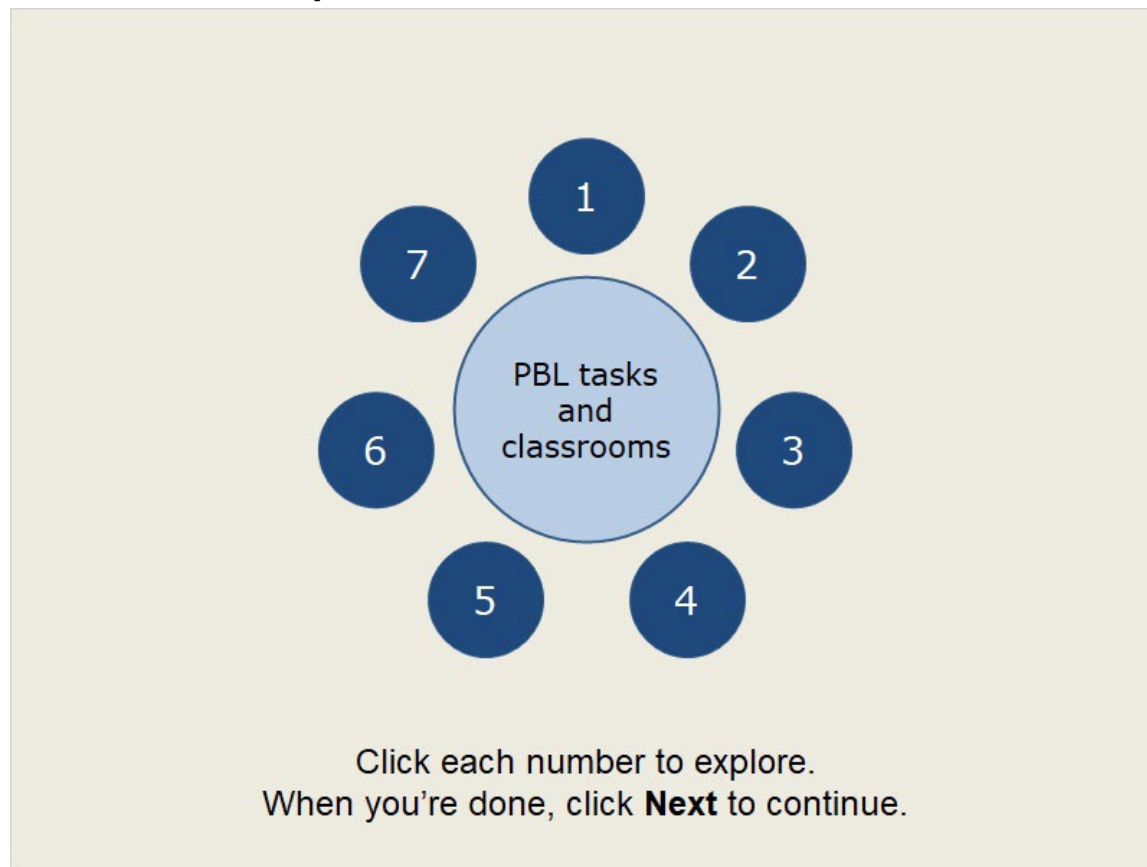
You'll be happy to hear that in *Miller & Levine Biology*, PBL lessons and activities are already woven into the program material!

A problem is introduced at the beginning of each unit that students will solve by the end. Most of their work will be recorded in the **Explorer's Journal**. Each time you begin a new unit, you'll launch the problem before beginning the chapter content.

Use the Bounce Pages app on certain mobile devices to launch an introductory video at your fingertips! Once in the app, point your device at the picture that says "Bounce to activate," and the video will automatically launch and play.

At certain points throughout each chapter, students will complete activities that will inform possible solutions to the problem. Activities may include videos, labs, readings, or interactive simulations. At the end of the unit, students complete and present their solutions to a larger audience.

What Should I Expect to See and Do?



Let's look at some features of PBL tasks and classrooms. Then we'll see how each feature can be found in *Miller & Levine Biology*. Let's explore the features.

Learning is anchored to a central problem or task

PROBLEM: For what purposes should humans genetically modify animals?

» TO SOLVE THIS PROBLEM, perform these activities as they come up in the unit, and record your findings in your Explorer's Journal.

Learning is anchored to a central problem or task

Close

Multiple entry points or solutions




- Choose a species that you can successfully research from several reliable sources.
- Pick a species that is interesting to you!

Multiple entry points or solutions

Close

Student collaboration



PRESENT YOUR WORK

Decide how you would like to present your information and solution. Choose a method that will best communicate what you learned about the species, how it impacts the local ecosystem, and how your proposed solution will reduce its impact. Here are possible methods.

- Slide presentation
- Public service announcement
- Tri-fold poster
- Blog

Develop the presentation with your group. Make sure the information is clear and easy to follow.

Student collaboration

Close

Student ownership of the problem or task and the process



PRESENT YOUR WORK

Decide how you would like to present your information and solution. Choose a method that will best communicate what you learned about the species, how it impacts the local ecosystem, and how your proposed solution will reduce its impact. Here are possible methods.

- Slide presentation
- Public service announcement
- Tri-fold poster
- Blog

Develop the presentation with your group. Make sure the information is clear and easy to follow.

Student ownership of the problem or task and the process

Close

Learning environment is designed to support and challenge students



DESIGN A SOLUTION

4. Plan how you will put your solution into action. What materials do you need?

**Learning environment is designed
to support and challenge students**

Close

Support for testing and revising ideas

→ Review Other Solutions

As you listen to each group, answer the following questions.

- What do you like about the presentation?**
- How could the presentation be improved?**
- What suggestions do you have for improving the solution? Why do you think they will be effective?**

Support for testing and revising ideas

Close

Independent learning and self-reflection

Unit 1 Solution Rubric

| | EXEMPLARY Score your work a 4 if: | ACCOMPLISHED Score your work a 3 if: | DEVELOPING Score your work a 2 if: | BEGINNING Score your work a 1 if: |
|---|---|--|--|--|
| Project Design and Operation | Your solar still functioned efficiently. Your team's design met all criteria and constraints. You successfully improved your design when you redesigned and retested the still. | Your solar still was mostly efficient. Your team's design met most criteria and constraints. Your design improved somewhat when you redesigned and retested the still. | Your solar still was somewhat efficient. Your team's design met a few criteria and constraints. Your design improved only slightly when you redesigned and retested the still. | Your solar still was inefficient. Your team's design met only one or two criteria and constraints. Your design did not improve when you redesigned and retested the still. |
| Student Score _____ | | | | |
| Teacher Score _____ | | | | |
| Using the Engineering Design Process | All the steps of the engineering design process were completed. When you redesigned your solar still, you revisited any steps necessary to complete the redesign. | Most of the steps of the engineering design process were completed. When you redesigned your solar still, you revisited at least one step to complete the redesign. | Only a few of the steps of the engineering design process were completed. You attempted to redesign your solar still. | No evidence of the design process was used. You did not attempt to redesign your solar still. |
| Student Score _____ | | | | |
| Teacher Score _____ | | | | |
| Collaboration Role | You fully collaborated with your teammates and contributed to the group project wherever you could. You listened to others. You respected the contributions of others. | You mostly collaborated with your teammates and often contributed to the group project. You usually listened to others. You respected the contributions of others. | You partially collaborated with your teammates by occasionally contributing to the group project. You sometimes listened to others. You sometimes ignored others' contributions. | You rarely collaborated with your teammates and contributed very little to the group project. You rarely listened to others. You ignored others' contributions. |
| Student Score _____ | | | | |
| Teacher Score _____ | | | | |

Independent learning and self-reflection

Close

PBL Activities on Savvas Realize

Properties of Water

LESSON 2.2

KEY QUESTIONS

- How does the structure of water contribute to its unique properties?
- How does water's polarity influence its properties as a solvent?
- Why is it important for cells to buffer solutions against rapid changes in pH?

HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

VOCABULARY

hydrogen bond • cohesion
adhesion • mixture
solution • solute • solvent
suspension • pH scale
acid • base • buffer

READING TOOL

As you read the section of the lesson under The Water Molecule, use the table in your **Biology Foundations Workbook** to list the causes and effects of the properties of water.

INTERACTIVITY

Figure 2-8
Hydrogen Bonding

ONLINE RESOURCES

- CLASS DISCUSSION Water, Water Everywhere
- INTERACTIVITY Hydrogen Bonding
- INTERACTIVITY Unique Properties of Water
- QUICK LAB Acidic and Basic Foods
- STEM PROJECT LAB Test and Evaluate Your Solar Still
- SCIENCE SKILLS ACTIVITY Exercise and Blood pH
- ASSESSMENT Lesson 2.2 Quiz

LESSON 2.2

OBJECTIVES

2.2.1 Explain the unique properties of water.

2.2.2 Explain how water's polarity affects the way water interacts with other substances.

2.2.3 Explain why buffers are important to the survival of an organism.

CONNECT

Activate Prior Knowledge

Assign the **Class Discussion Water, Water Everywhere** and ask students to volunteer examples from their list. Ask students to suggest the reasons they know that make water the one compound necessary for life.

READING TOOL

As you read the section of the lesson under The Water Molecule, use the table in your **Biology Foundations Workbook** to list the causes and effects of the properties of water.

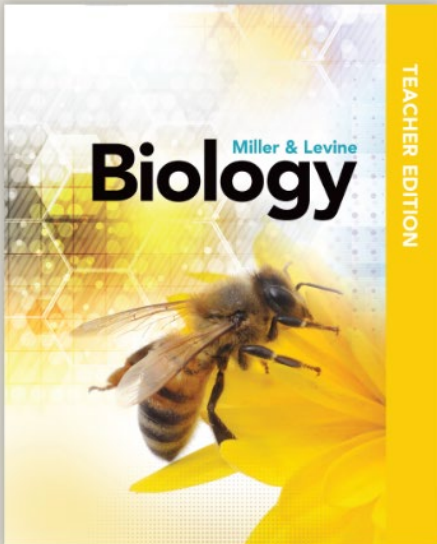
2 Page View

Back **Next**

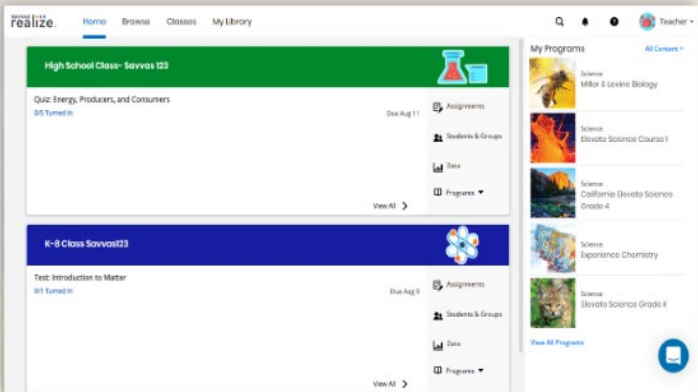
Find and assign select PBL activities directly from Savvas Realize™! When *Explorer's Journal* activities are assigned, the selections can be downloaded and printed for students to complete, or students can type their responses directly into the digital worksheet!

Students will complete digital activities, like videos and modeling simulations, directly on Savvas Realize. You'll see EJ-PBL next to PBL activities on Savvas Realize, and you'll see this STEM Project icon in your Teacher Edition when PBL activities are included in a lesson.

Unit Walk-through



Find the Unit 1 PBL launch in the Teacher Edition.



Ready to put it all together? Browse through Unit 1 in this virtual Teacher Edition eText and Savvas Realize platform to find some of your PBL resources. Start by finding the PBL launch!

Teacher Edition

The screenshot shows the Savvas Realize Teacher Edition interface. On the left is a navigation menu with a 'Table of Contents' section. The main content area displays a lesson plan for 'p.4 Problem-Based Learning: Solving Local and Global Water Scarcity'. A blue callout box with the text 'Nice job! You found the launch activities.' points to the 'PROBLEM LAUNCH' section. This section is highlighted with a red box and contains the following information:

PROBLEM LAUNCH

VIDEO

Pacing 5 minutes **Timing** Unit 1 start
Water, Water Everywhere The video discusses the issue of water scarcity and how technology might help solve the problem.
Where Is It? SavvasRealize.com
How It Helps Solve the Problem Students will be introduced to a method of purifying water that will make fresh water more readily available to people around the world.
Lead a Discussion After students watch the video, ask them questions to supplement their understanding of the importance of the development and improvement of solar stills.
Ask Why is fresh water important to human life? (Fresh water is essential for human survival. Humans cannot live without fresh water.)
Ask How do solar stills convert salt water into fresh water? (They use the sun to heat salt water, and the water evaporates, leaving salt behind. The pure water vapor condenses as it cools and drips down into a collection container.)
Ask What are some major problems with the current designs of solar stills? (They are not very efficient or cost effective.)

PROBLEM LAUNCH

HS-ETS1-2, HS-ETS1-3

Pacing 30 minutes **Timing** Unit 1 start
Solving Local and Global Water Scarcity The activity introduces this problem to students: How can you make fresh water from salt water? Students then research how to improve the efficiency of the existing solar still.
Where Is It? Explorer's Journal
How It Helps Solve the Problem Solar stills that are currently used are costly and inefficient, so students will come up with ideas to improve the design of the solar still to decrease the cost and increase the efficiency.
Use Visuals Have students create an illustration of a

Great work! Most PBL activities will be found on Savvas Realize and in the Explorer's Journal, but pacing information and overviews are provided in your TE.

Savvas Realize

SAVVAS realize Home Browse Classes My Library

Miller & Levine Biology

Click the Unit 1 PBL Introduction on Savvas Realize.

Search resources Search Filters Standards

Table of Contents

- Show Distance Learning Resources Off
- Distance Learning Support
- Unit 1 Resources and Explorer's Journal: The Nature of Life
- Chapter 1: The Science of Biology
- Chapter 2: The Chemistry of Life
- Unit 2 Resources and Explorer's Journal: Ecology
- Chapter 3: The Biosphere
- Chapter 4: Ecosystems
- Chapter 5: Populations
- Chapter 6: Communities and Ecosystem Dynamics
- Chapter 7: Humans and Global Change
- Unit 3 Resources and

Browse by Category

- Activities
- Assessment
- Books / Readers
- Practice
- Presentations
- Program Resources
- Teacher Support
- Video / Audio

Featured Resources

- Careers
- HHMI Videos and Interactivities
- Hands-On Labs

Copyright © 2022 Savvas Learning Company LLC. or its affiliates. All Rights Reserved. [User Agreement](#) | [Privacy Policy](#) | [Credits](#) | rev. 728da58

SAVVAS

Closing



Thanks for following along with me! I hope you feel a little more confident in using Problem-Based Learning to engage your students in more authentic scientific inquiry.

And for more tutorials about *Miller & Levine Biology* and Problem-Based Learning, visit My Savvas Training!