

Miller & Levine Biology © 2019

Explorer's Journal

Introduction



Hi, there! Do your students ever ask you the question, “But why do I need to know biology?” If you give me 5 minutes of your time, I’ll give you a quick run through of the *Explorer's Journal* on Savvas Realize™—the very place that students will make those connections and see exactly how they can use biology to make a difference in their own communities!

What's the Point?



Problem-Based Learning (PBL)



At first glance, you may have just considered the *Explorer's Journal* activities as part of the supplemental materials that you don't have time to use. But these activities are where students engage in Problem-Based Learning, which is at the heart of *Miller & Levine Biology*.

In Problem-Based Learning, or PBL, authentic and relevant questions motivate student learning about each unit's science content.

PBL activities also engage students in the kind of 3-D learning advocated by Next Generation Science Standards*.

Plus, it teaches students how to monitor their own learning and engages them in the same kind of notebook practices that real scientists use.

*Next Generation Science Standards is a trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.


What's the Format?

STEM PROJECT

Design and Build Your Solar Still

Suppose you live in a community that has been devastated by a hurricane. You and your family have no access to electricity or running water. Most of the houses, including yours, and their contents have been swept away by the raging water. Now that the seawater has abated, your family's most immediate need is clean water for drinking and food preparation. You need to use the materials lying around your community to design and build a solar still. Your still should produce clean, fresh water suitable for drinking using seawater as a water source.

Timing Chapter 1, Lesson 2


DEFINE THE PROBLEM HOW CAN YOU DESIGN AND BUILD A SOLAR STILL THAT WILL PRODUCE FRESH WATER FROM SEAWATER?

1. Define the Problem In your own words, briefly define the problem you will be addressing.

There was a flood in my community and we don't have any fresh water.

Paper and pencil

Download and type!

The *Explorer's Journal* can be found on Savvas Realize. It is a digital and downloadable resource, with two options for completion: Either download and print the excerpts for students to complete as paper and pencil, or have students download and type their responses into the digital PDF form! Just keep in mind that some pages will require students to draw.

How Do I Use It?

UNIT 1 PROBLEM-BASED LEARNING

AUTHENTIC READING

HS-ETS1-3
Pacing 25 minutes Timing Lesson 1.2
Solar Still Made of Bubble Wrap Could Purify Water for the Poor An inexpensive solar still could decrease costs of solar stills dramatically, making them potentially more available to people in developing countries.
Where Is It? Explorer's Journal
How It Helps Solve the Problem Students are introduced to a simple method of purifying water using energy from the sun and cheap, common materials.
Build Reading Skills Have students outline the content of the article as they read, and ask them to trade outlines with each other. Students should discuss their outlines to see what should be added to make them complete.

STEM PROJECT

HS-ETS1-2, HS-ETS1-3
Pacing 2 periods Timing Lesson 1.2
Design and Build Your Solar Still Students will design a solar still and evaluate the solar stills of others. Go to the Teacher Support or PearsonRealize.com for suggestions on implementing this project.
Where Is It? Explorer's Journal
How It Helps Solve the Problem Proposing, building, and testing a still helps students answer the Unit Problem question and gets them ready to communicate their ideas and findings.
Research and Use Sources Have students research other types of water-purification stills. Students should compare and contrast at least one other type of still

UNIT 1 PROBLEM-BASED LEARNING
SOLVING LOCAL AND GLOBAL
Water Scarcity
For many people, getting clean, fresh water to drink is not as easy as turning on the faucet. In fact, more than 40 percent of humans are affected by water scarcity, or the lack of clean, fresh water to meet their needs. So, how do we solve this problem? Scientists are investigating many options, such as figuring out how to efficiently remove the salt from sea water. But, on a small, local level, one solution that may help is a solar still. A solar still uses the energy of sunlight to distill clean water from salty or polluted water. Although the energy source is free, many solar stills are costly and inefficient. In this activity, you will design and build your own solar still.

PROBLEM LAUNCH
Conduct research on global water scarcity and potential solutions.

VIDEO
Watch a video about water scarcity and what technologies could help with this problem.

BOUNCE TO ACTIVATE
Watch a video about water scarcity and what technologies could help with this problem.

PROBLEM: How can you make fresh water from salt water?
TO SOLVE THIS PROBLEM, perform these activities as they come up in the unit, and record your findings in your Explorer's Journal.

One thing you may be wondering is whether the *Explorer's Journal* activities will require extra time. The short answer is no! For the best estimate of how long PBL activities will take, use the pacing information provided at the beginning of each unit. Follow along with me as we browse PBL activities in Unit 1.

All of these activities are part of the PBL project for the unit, and the time is already budgeted into your science period.

Icons in the Teacher Edition will prompt you to the activities on Savvas Realize and the *Explorer's Journal* at the right time during the lesson.

Now let's look closer at an activity-the STEM Project.

Teacher Edition

The screenshot shows the Teacher Edition interface for Lesson 1.2: Science in Context. The interface is divided into three main sections:

- Table of Contents (Left Sidebar):** A list of units and lessons. The current lesson, "p.15 Lesson 1.2: Science in Context", is highlighted.
- Main Content Area:**
 - Header:** "Science in Context" with a large "1.2" in a yellow circle.
 - Image:** A photograph of a scientist in a lab coat working with a green plant in a test tube.
 - Text:** "The testing of ideas is the heart of science and engineering. In their quest for understanding, scientists engage in many different activities: They ask questions, make observations, seek evidence, share ideas, and analyze data. These activities are all part of the dynamic process of science."

The process of science typically consists of the components shown in **Figure 1-4**. Notice that the parts of the process do not proceed in a linear fashion. Real science usually involves many activities that loop back on themselves, building up knowledge as they proceed. In fact, science is at its heart a creative endeavor. Scientists take many different paths through the process depending on the questions they are investigating and the resources available to them.
 - Figure 1-4:** A circular diagram showing the process of science with arrows indicating a continuous loop between "Exploration and Discovery" and "Testing and Evaluation".
 - Key Questions:**
 - What attitudes and experiences generate new ideas?
 - Why is peer review important?
 - What is the relationship between science and society?
 - What practices are shared by science and engineering?
 - Vocabulary:** bias
 - Reading Tool:** Before you read, study **Figure 1-4**. As you read, list examples of each of the different aspects of science in the table in your **Biology Foundations Notebook**. Then use **Figure 1-9** to add examples for engineering.
- Right Sidebar:**
 - ONLINE RESOURCES:**
 - VIDEO Exploring Extremes
 - QUICK LAB Replicating Procedures
 - INTERACTIVITY The Process of Science
 - INTERACTIVITY The Processes of Science and Engineering Design
 - STEM PROJECT Design and Build Your Solar Still
 - ASSESSMENT Lesson 1.2 Quiz
 - OBJECTIVES:**
 - 1.2.1 Describe how attitudes and experiences generate new ideas.
 - 1.2.2 Explain why peer review is important.
 - 1.2.3 Explain the relationship between science and society.
 - 1.2.4 List practices common to both science and engineering.
 - CONNECT:**
 - Activate Prior Knowledge:** Assign the **Video Exploring Extremes** and point out that these scientists test the limits of science by exploring these extreme environments. **Ask** What is there to gain by exploring these environments?

The Teacher Edition cues me that students will work on the project during this lesson.

Savvas Realize

The screenshot shows the Savvas Realize digital program interface. At the top, there is a navigation bar with links for Home, Browse, Classes, Data, and My Library. A search icon, a bell icon, and a user profile icon labeled 'Teacher' are also present. Below the navigation bar, a blue banner reads 'Savvas Realize™ digital program'. The main content area is titled 'Synthesize' and displays a list of activities. Each activity has an icon, a title, a brief description, and an 'Assign' button. The activities listed are:

- EJ-PBL Authentic Reading: Solar Still Made of Bubble Wrap could Purify Water for the Poor**: In this authentic reading worksheet from the Explorer's Journal students will read and analyze an article about how fresh water can be made from salty or dirty water...
- EJ-PBL STEM Project: Design and Build Your Solar Still**: In this STEM project worksheet from the Explorer's Journal students will use the engineering design process to design and build a working model of a solar still. (The 'Assign' button for this activity is circled in red.)
- EJ-PBL Engineering Interactivity: Optimize Solar Stills**: This digital activity accompanies the Explorer's Journal and provides an opportunity for students to design a solar still and use the engineering design process as l...
- EJ-PBL Engineering Worksheet: Optimize Solar Stills**

Below the third activity, there is a large icon of a hand pointing at a screen and a section titled 'Teacher Resources:' with a link to 'EJ-PBL Answer Key: Optimize Solar Stills'.

I can assign it, along with the other PBL activities, from Savvas Realize.

Teacher Edition 2

realizereader

... > p.15 Lesson 1.2: Science in Context > p.20 Quick Lab: Replicating Procedures [continued...]

CHAPTER 1

Science and Engineering Practices

Build Vocabulary Skills

Write the word *bias* on the board and discuss what it means to be biased against something, and how that might cause problems in science and everyday life. Ask students to give a synonym for bias.

Build Writing Skills

Write Explanatory Texts Write the word *bias* on the board and ask students to define it using their own words; and talk about different types of bias they have experienced in their own lives.

Ask Why is avoiding bias in science so important? (To remain objective and fair, results of experiments are not manipulated or influenced by judgment or preference.)

Use Visuals

Use **Figure 1-9** to compare similarities between "Scientific Inquiry" and "Engineering Design" using a Venn diagram.

INTERACTIVITY

The Processes of Science and Engineering Design Use this interactivity to help students understand that science and engineering use

STEM PROJECT

Design and Build Your Solar Still Encourage students to conduct this activity to design a solar still using science and engineering skills.

INTERACTIVITY

Learn how the science and engineering practices are similar.

Figure 1-9
Experimental Methodology

The experimental methodology used in scientific inquiry and engineering design are adaptations of the same approach to scientific research.

AVOIDING BIAS Scientists aim to be objective, but they have likes, dislikes, and biases. A **bias** is a personal, rather than scientific, point of view for, or against, something. Examples of biases include preferences for, or against, certain kinds of people or activities.

Given this background, it is no surprise that scientific data can be interpreted in different ways by scientists with different personal perspectives. Recommendations from scientists with personal biases may or may not be in the public interest. But if enough of us understand science, we can help make certain that science is applied in ways that benefit individuals and society.

READING CHECK Explain What might happen if a scientist were biased?

Science and Engineering Practices

In contrast to scientists, engineers design, and build machines and structures. Although this book focuses on the science of biology, many of the methods and practices—the things that scientists and engineers actually do—are very similar. As a result, when you practice and master science skills, you also are learning skills that are useful in engineering. For additional information about these skills, see the Science and Engineering Handbook.

If you wonder how the "testing ideas" part of science compares to the kinds of things that engineers do, look at **Figure 1-9**. Although some of the specifics vary, the steps in scientific inquiry and engineering design are basically the same. Not surprisingly, engineers are trained in basic science as well as the principles of their profession.

Scientific Inquiry	Engineering Design
Planned or chance observations, and/or personal or outside motivation generate a question.	Colleagues and/or clients present a need to be solved through engineering design.
Define/refine the question with colleagues/collaborators.	Define/refine a design problem that addresses the need with colleagues and clients.
Research how others may have answered the same question.	Research how others may have solved the same design problem.
Brainstorm hypotheses and choose one.	Brainstorm design solutions and choose one.
Design and conduct pilot experiment to test hypothesis; gather and analyze data.	Design and create a prototype/model; test it to gather and evaluate performance data.
Refine hypothesis and/or experimental protocol as needed; conduct revised experiment; gather and analyze data.	Redesign prototype based on performance data.
Draw conclusion; write paper.	Test revised prototype; gather and evaluate performance data.
Submit paper for peer review; respond to constructive feedback.	Finalize design; make drawings.
Finish the project.	Present best available solution to client; respond to client feedback.
	Build the project.

When I see the icon for the STEM Project, I can direct students to the activity to complete.

Explorer's Journal

STEM PROJECT

Design and Build Your Solar Still

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Timing Chapter 1, Lesson 2

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1. **Define the Problem** In your own words, briefly define the problem you will be addressing.

Explorer's Journal


Unit 1 The Nature of Life | Stem Project

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Students can download the pages from Realize and fill in their answers directly into the PDF form, or you can print out copies for them to complete!


Students as Independent Learners

 **Solve the Problem**

Each activity in this unit brings you one step closer to solving the problem.
Track your progress as you complete each activity.

Activity	What I learned.	How it helped me solve the problem.	Questions I still have.
VIDEO WATER, WATER EVERYWHERE Beginning of Unit 1			
PROBLEM LAUNCH SOLVING LOCAL AND GLOBAL WATER SCARCITY Beginning of Unit 1			
AUTHENTIC READING SOLAR STILL MADE OF BUBBLE WRAP COULD PURIFY WATER FOR THE POOR Chapter 1, Lesson 2			

Unit 1 The Nature of Life | Introduction 4 Copyright © Pearson Education, Inc. or its affiliates



Metacognitive reflection

True scientific inquiry is student-driven rather than teacher- or curriculum-driven. So, at the beginning of each unit in the *Explorer's Journal*, students will find a few tools to track their learning over the course of the exploration.

First is a diagram that maps each activity in the learning path so they can see where they're going. They'll check each activity off as they complete it. (Who doesn't love the feeling of checking things off your to-do list?)


Next, they'll use a table like this to record how each activity contributed to their learning and project goals. Noting questions they still have will make the next activities more purpose-driven.

How Do I Assess the Explorer's Journal?

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 _____				

Self-assessment rubrics



Finally, students will find a self-assessment rubric in the *Explorer's Journal* at the end of each unit. Introducing this rubric early in the unit will help them see what their goals should be for their work. After they complete their work, they can compare it against the rubric to see how their work measures up!

Use this as a grade if you wish, but try to make sure the student's voice is reflected.

Closing



Thanks for sticking with me! I hope I've convinced you that the *Explorer's Journal* is a valuable tool for engaging students in authentic scientific inquiry.

And for more information about *Miller & Levine Biology* and Problem-Based Learning, visit some of the other tutorials on My Savvas Training!