Lesson 1.1
Pre-Unit Assessment
Lesson Overview

Students' Initial Arguments

In this lesson, students are introduced to the unit and to their role as ecologists studying ecosystems. Students write initial arguments about the growth of organisms in an ecosystem. The arguments they provide in this lesson serve as a Pre-Unit Assessment for formative purposes, designed to reveal students’ initial understanding of some of the unit’s core content, both unit-specific content and the crosscutting concept of Energy and Matter, prior to instruction. As such, students’ arguments offer a baseline from which to measure growth of understanding over the course of the unit. These arguments can also provide the teacher with insight into students’ thinking as they begin this unit. This three-dimensional assessment will allow the teacher to draw connections to students’ experiences and to watch for preconceptions that might get in the way of students’ understanding. After the Pre-Unit Assessment, students explore the unit’s digital Simulation. Students also receive their Ecosystem Restoration Investigation Notebooks and learn some of the ways that scientists use notebooks. The purpose of this lesson is to frame the unit for students and to offer students an opportunity to express their initial ideas about unit content.

Investigative Phenomenon: Snakes are not growing and thriving in a forest ecosystem.

Students learn:

- An ecologist is a scientist who studies ecosystems.
- Reflecting on what you understand and don’t understand allows you to prepare for learning new things.
- Ecologists and other scientists often make and use simulations to study things that they cannot see or measure directly.
Exploring the Simulation

Students explore the *Ecosystem Restoration* Simulation and share their initial discoveries.

**Instructional Guide**

1. **Project Guidelines for Using Apps.** Introduce students to the expectations for using apps and digital devices in the classroom.

   **Guidelines for Using Apps**
   
   - Only one person “drives” at a time.
   - Anyone can make suggestions about how to use the app.
   - Talk about what you observe.
   - Rotate the role of “driver.”

   Throughout the unit, we will be using a Simulation to help us figure out what an ecosystem is and what it needs in order to thrive.

2. **Project the Ecosystem Restoration Simulation and explain its purpose.** Go to the Student Apps Page. Show students how to select the *Ecosystem Restoration* unit, then the Simulation, and then Box 1.

3. **Distribute digital devices.** Distribute one digital device to each pair of students and have them go to the *Ecosystem Restoration* Simulation. Let them know they will have about 10 minutes to explore the Simulation.
4. Give partners several minutes of free exploration time. Circulate as students explore the Sim, encouraging them to discuss what they are observing with their partners. Listen for student questions and ideas about the Sim. After five minutes, provide a signal for partners to switch “drivers” if they have not done so already.

5. Collect digital devices. When the exploration time is up, collect digital devices so students can focus on the discussion that follows.

6. Discuss observations. Get students’ attention and ask them to share what they observed with the class.

What did you observe while exploring the Sim?

7. Discuss how the Sim works. As students share something they figured out about how the Sim works, project the Sim and demonstrate what each responding student tells you to do.

What did you figure out about how the Sim works?

Point out the following features if students don’t bring them up in the discussion:

- Living things can be removed or added to the ecosystem by pressing them and selecting YES or NO to turn them on or off.
- The sun, carbon dioxide, and water can each be removed separately. (Note: To remove water, you can press on any area within the soil.)
- The speed of the Sim can be adjusted by selecting 0.5x, 1x, 2x at the top right of the screen.
- The Sim can be paused/unpaused to spend more time looking at something of interest.

8. Consider students’ questions.

What did the Sim exploration make you wonder about?

9. Connect the Sim to students’ role as ecologists. Explain that students will work with the Simulation many times during the unit and that it will help them investigate ideas about ecosystems.

Ecologists and other scientists often make and use Simulations to study things they cannot measure directly.

Teacher Support

Background

Crosscutting Concept: Energy and Matter Across This Unit
This unit’s focus is primarily on tracking the flow of matter and energy through ecosystems. The initial problem with which the class is presented is that there are fewer animals in the project area and that those animals are not thriving. Students learn that *growing and thriving* involves the addition of matter to an organism’s body for growth and body
repair and to have the energy it needs for warmth (in the case of animals) and movement. Where do those animals get their matter? From other animals or from plants. Students track the matter that plant-eating animals get and discover that the plants in the project area are not growing and thriving either. Where do plants get their matter? From carbon dioxide in the air, water molecules, and sunlight. Over the course of the unit, students learn that matter flows between the air and soil and among plants, animals, and microbes as these organisms live and die. The Ecosystem Restoration Simulation is designed to enable students to actually visualize these transfers. Pointing out to students that they are tracking the flow of matter and energy will lay the groundwork for students’ beginning understanding of the importance of matter and energy in the natural world and will prepare them for learning about ecosystems.

Background

Science Note: About the Ecosystem Restoration Simulation
The Ecosystem Restoration Simulation allows students to study an ecosystem at both the observable scale and the molecular scale. The Simulation is a dynamic model that shows how organisms in an ecosystem interact with one another and how matter and energy flow through an ecosystem by way of plant-food production, eating, death, and decomposition. Open exploration in the Simulation enables students to begin to get a sense of how matter and energy flow through an ecosystem as students embark on studying these concepts in the unit. This will prepare students to be able to use the Simulation to search for evidence to support claims about what an ecosystem needs in order to thrive.

Rationale

Pedagogical Goals: Exploring the Ecosystem Restoration Simulation
The first time students use the Simulation, they need a few minutes to freely explore its features. Students are generally quite facile in discovering Simulation features independently or with a partner. This type of open-ended exploration serves many important purposes. Use of Simulations in the classroom provides time for student exploration, which enhances student interest. Additionally, it provides students with the opportunity to share their thinking and learn from their peers. Giving students this exploration time initially reduces distraction in later Sim activities that have more focused goals.

Instructional Suggestion

Technology Note: Sharing Digital Devices
Throughout this unit, pairs share digital devices. We recommend that instead of working individually, students work with partners so they can engage and talk to each other while investigating in the Simulation. Establish clear expectations for the use, handling, and storage of digital devices in order to decrease transition time between activities as well as minimize any potential conflict that could arise from sharing a limited number of devices.
Exploring the Simulation

Students explore the *Ecosystem Restoration* Simulation and share their initial discoveries.

**Instructional Guide**

1. **Project Guidelines for Using Apps.** Introduce students to the expectations for using apps and digital devices in the classroom.

   - **Reglas para usar aplicaciones**
     - Solo una persona “maneja” a la vez.
     - Todos pueden hacer sugerencias sobre cómo usar la aplicación.
     - Hablen sobre lo que observan.
     - Roten en el rol de “conductor”.

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5. **Collect digital devices.** When the exploration time is up, collect digital devices so students can focus on the discussion that follows.

6. **Discuss observations.** Get students’ attention and ask them to share what they observed with the class.

   ¿Qué observaron mientras exploraban la Simulación?

7. **Discuss how the Sim works.** As students share something they figured out about how the Sim works, project the Sim and demonstrate what each responding student tells you to do.

   ¿Qué averiguaron acerca de cómo funciona la Simulación?

   Point out the following features if students don’t bring them up in the discussion:

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8. **Consider students’ questions.**

   ¿Sobre qué cosas les hizo preguntarse la exploración en la Simulación?

9. **Connect the Sim to students’ role as ecologists.** Explain that students will work with the Simulation many times during the unit and that it will help them investigate ideas about ecosystems.

   A menudo los ecologistas y otros científicos hacen y usan simulaciones para estudiar cosas que no pueden medir directamente.

**Teacher Support**

**Background**

**Crosscutting Concept: Energy and Matter Across This Unit**

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Students learn that growing and thriving involves the addition of matter to an organism’s body for growth and body repair and to have the energy it needs for warmth (in the case of animals) and movement. Where do those animals get their matter? From other animals or from plants. Students track the matter that plant-eating animals get and discover that the plants in the project area are not growing and thriving either. Where do plants get their matter? From carbon dioxide in the air, water molecules, and sunlight. Over the course of the unit, students learn that matter flows between the air and soil and among plants, animals, and microbes as these organisms live and die. The Ecosystem Restoration Simulation is designed to enable students to actually visualize these transfers. Pointing out to students that they are tracking the flow of matter and energy will lay the groundwork for students’ beginning understanding of the importance of matter and energy in the natural world and will prepare them for learning about ecosystems.

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