Lesson 3.4
The Role of the Environment
Lesson Overview

Students complete their investigations with celery and read *Handbook of Traits* to gather additional evidence to support the idea that the environment affects inherited traits. At the beginning of the lesson, students observe the results of the celery investigation, which provide a demonstration of how the environment (colored water) can influence an inherited trait (green color). The teacher uses an example from *Handbook of Traits* to model gathering evidence in support of the idea that traits can result from both inheritance and the environment. Students then read more examples of this in the reference book and record notes about how organisms got their traits. Using the Think-Pair-Share discourse routine, students discuss the evidence they have gathered. The purpose of this lesson is for students to gather firsthand and secondhand evidence that some traits can result from both inheritance and interaction with the environment.

**Anchor Phenomenon:** A wolf at Graystone National Park does not have the same fur color as the rest of its pack, but does have the same fur color as a second pack. The wolf’s hunting style is like its own pack, but not like the second pack.

**Investigative Phenomenon:** Blue food coloring makes a piece of green celery turn blue-green.

**Students learn:**

- The environment can affect inherited traits.
- Some traits result from both inheritance and interaction with the environment.
- Scientists may find evidence in reference books to support their ideas.
Reading: Handbook of Traits

Students gather evidence to support the idea that some traits result from both inheritance and interaction with the environment.

Instructional Guide

1. **Introduce activity.** Let students know that pairs will read *Handbook of Traits* to determine whether the environment can affect inherited traits of other organisms.

2. **Distribute books.** Distribute one copy of *Handbook of Traits* to each pair of students.

3. **Project and introduce notebook page.** Have students turn to page 66, Reading About Traits, in their notebooks. Read aloud the directions and explain that you will show students how to search the reference book for evidence and then complete the table in the notebook.

4. **Model looking for and recording ideas.** Turn to page 31 in *Handbook of Traits* and have students follow along in their books.

   - The first organism I will research is the Peppered Moth.
   - Point out Peppered Moth in Column 1 of the first row of the table.

   - Now I want to decide whether any of the traits listed for the Peppered Moth result from both inheritance and the environment. So, I will see if I can find this information in the book.

   - The text on page 31 states *All caterpillars inherit instructions to turn into moths within a certain amount of time. How long it takes depends on the environment.*

   - This is an example of a trait that can result from both inheritance and the environment.

   - In Column 2 of the projected table, write “caterpillar turning into a moth.” Have students do the same in their notebooks. Remind students to record the page number where they find the information as you write “31” in Column 2.
Next, I need to explain how the organism got its trait.

The text on page 31 also states **"If there is a lot of food, the caterpillars will eat a lot and turn into moths quickly."**

We know that the trait of a caterpillar turning into a moth is inherited, and we also know that the environment affects how long this process takes. I will record both of these ideas in the last column.

- In Column 3, write “It inherits instructions to turn into a moth in a certain amount of time.” Also write “More food in the environment means that the caterpillar will turn into a moth quickly.” Have students do the same in their notebooks.

5. Point out the organisms listed in the notebook.

You will notice two more organisms have been provided for you to investigate, and you also have the opportunity to select one of your own organisms to read about.

Read about as many organisms as you can in order to determine whether the evidence in the book supports or does not support the idea that some traits result from both inheritance and interaction with the environment.

6. Partners read and complete the notebook page. Remind partners to work together as they read about organisms in the reference book and then record evidence about traits in their notebooks.

What evidence did you find in **Handbook of Traits** to support the idea that the environment can affect inherited traits?

Teacher Support

**Rationale**

**Literacy Note: Selecting Organisms in Handbook of Traits**

Not all sections in **Handbook of Traits** contain information that supports the idea that some traits can result from both inheritance and interaction with the environment. Therefore, three examples are provided in the notebook that support this idea. Students also have the opportunity to research an additional organism of their choice. Researching organisms that support and do not support this idea provides an opportunity for students to find evidence that supports an idea and evidence that should not be considered. At the end of the lesson, students should conclude that they have enough evidence from the celery investigation, **Handbook of Traits**, and **How the Sparrow Learned Its Song** (which will be used in the next activity) to support the idea that a trait can result from both inheritance and interaction with the environment.
Possible Responses

Investigation Notebook
Reading About Traits (page 66)

Row 1
Peppered Moth
Page 31: caterpillar turning into a moth
It inherits instructions to turn into a moth in a certain amount of time.
More food in the environment means that the caterpillar will turn into a moth quickly.

Row 2
Snowy Owl
Page 39: laying several eggs at a time
Females inherit the trait of laying several eggs at a time.
More food in the environment means more chicks.

Row 3
White Willow Tree
Page 45: makes a chemical to stay healthy
Trees inherit the trait of making a certain amount of this chemical.
Weather affects how much of the chemical the tree can make.
**Reading About Traits**

Directions:
1. In *Handbook of Traits*, locate the organisms listed in Column 1. You can also choose your own organism to research.
2. Decide whether any of the traits listed for the organism result from both inheritance and the environment. Record those traits in Column 2.
3. Use information from the text to explain how the organism got its trait. Record that information in Column 3.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Trait that results from both inheritance and the environment</th>
<th>Explain how the organism got its trait.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peppered Moth</td>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>Snowy Owl</td>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>White Willow Tree</td>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Page:</td>
<td></td>
</tr>
</tbody>
</table>
Students gather evidence to support the idea that some traits result from both inheritance and interaction with the environment.

**Instructional Guide**

1. **Introduce activity.** Let students know that pairs will read *Handbook of Traits* to determine whether the environment can affect inherited traits of other organisms.

2. **Distribute books.** Distribute one copy of *Handbook of Traits* to each pair of students.

3. **Project and introduce notebook page.** Have students turn to page 66, Reading About Traits, in their notebooks. Read aloud the directions and explain that you will show students how to search the reference book for evidence and then complete the table in the notebook.

4. **Model looking for and recording ideas.** Turn to page 31 in *Handbook of Traits* and have students follow along in their books.

- El primer organismo que investigaré es la polilla moteada.

  - Point out Peppered Moth in Column 1 of the first row of the table.

- Ahora quiero decidir si alguno de los rasgos enumerados para la polilla moteada es el resultado tanto de la herencia como del ambiente. Entonces, veré si puedo encontrar esta información en el libro.

- El texto en la página 31 afirma que *Todas las orugas heredan instrucciones para convertirse en polillas dentro de un cierto periodo de tiempo. Cuánto tiempo se necesita depende del ambiente.*

- Este es un ejemplo de un rasgo que puede ser el resultado tanto de la herencia como del ambiente.

  - In Column 2 of the projected table, write “caterpillar turning into a moth.” Have students do the same in their notebooks. Remind students to record the page number where they find the information as you write “31” in Column 2.
5. Point out the organisms listed in the notebook.

6. Partners read and complete the notebook page. Remind partners to work together as they read about organisms in the reference book and then record evidence about traits in their notebooks.

Teacher Support

Rationale

Literacy Note: Selecting Organisms in *Handbook of Traits*
Not all sections in *Handbook of Traits* contain information that supports the idea that some traits can result from both inheritance and interaction with the environment. Therefore, three examples are provided in the notebook that support this idea. Students also have the opportunity to research an additional organism of their choice. Researching organisms that support and do not support this idea provides an opportunity for students to find evidence that supports an idea and evidence that should not be considered. At the end of the lesson, students should conclude that they have enough evidence from the celery investigation, *Handbook of Traits*, and *How the Sparrow Learned Its Song* (which will be used in the next activity) to support the idea that a trait can result from both inheritance and interaction with the environment.
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Reading About Traits (page 66)

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## Leer sobre los rasgos

**Instrucciones:**

2. Decide si alguno de los rasgos enumerados para el organismo resulta tanto de la herencia como del ambiente. Apunta esos rasgos en la columna 2.

<table>
<thead>
<tr>
<th>Organismo</th>
<th>Rasgo que resulta tanto de la herencia como del ambiente</th>
<th>Explica cómo el organismo obtuvo su rasgo.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polilla moteada</td>
<td>Página:</td>
<td></td>
</tr>
<tr>
<td>Búho nevado</td>
<td>Página:</td>
<td></td>
</tr>
<tr>
<td>Sauce blanco</td>
<td>Página:</td>
<td></td>
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<td></td>
<td>Página:</td>
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