Lesson 2.7
Using Snail Traits to Inspire a Design
Lesson Overview

Students use ideas they have learned about grove snails’ adaptive traits to plan a design that solves a problem. Students return to Biomimicry Handbook to read about how biomimicry engineers do their jobs. Students choose one biomimicry example to read about to help solidify their understanding of biomimicry engineering. The class brainstorm ideas for how grove snails’ adaptive traits (shell color and shell strength) can give students ideas for designs to solve problems, such as hiding something valuable or protecting something fragile. Pairs choose one idea for a design, and each pair discusses and writes about how their design is inspired by grove snails’ adaptive traits and the problem that their design will solve. Pairs create labeled drawings of their designs and evaluate how well their designs meet a set of general design guidelines. The purpose of this lesson is to engage students in key practices of engineering, specifically, using scientific ideas to plan designs and inspire solutions to problems.

Anchor Phenomenon: Over the past 10 years, the snails with yellow shells have not survived as well as the snails with banded shells.

Design Problem: Design something inspired by a grove snail trait.

Students learn:

- Engineers use scientific ideas to plan designs to solve problems.
- Organisms’ traits can inspire engineers to create designs that solve problems.
Reading About Biomimicry

Students read more about how adaptive traits inspire design in *Biomimicry Handbook.*

### Instructional Guide

1. **Remind students of the grove snail’s adaptive traits.**

   Think about the traits that made it easier for the snails with banded shells to meet their needs and survive. What are some of the grove snails’ adaptive traits in the coastal Wales environment?
   
   [A hard shell and a color that blends in with its grassy environment.]

2. **Set purpose for reading.**

   The engineers at the engineering firm you have been working with are interested in how the grove snail traits might give them ideas for designs that can solve a problem. Let’s read more about what biomimicry engineers do to plan and make designs. This will help you when you plan your own designs later in this lesson.

3. **Distribute books.** Distribute one copy of *Biomimicry Handbook* to each pair of students.

4. **Review pages 4–5.** Have students turn to pages 4–5 and review the text.

   Remember, you read that biomimicry engineers observe organisms to learn more about the structures of organisms’ parts and how these structures make them good for a particular function.

5. **Partners read page 6.** Have partners turn to page 6 and read about what biomimicry engineers do. Circulate and support students as necessary.

6. **Whole-class debrief.**

   What did you learn about what biomimicry engineers do?
   
   [Engineers learn about organisms. They try to make something that solves a problem. They test their designs. They revise their designs.]
Call on students to share their ideas. Encourage students to refer back to the text as appropriate.

7. Partners choose a biomimicry design to read about. Have partners turn to pages 14–15 and ask them to choose one design to read about.

8. Give students a few minutes to read. Have partners read about the examples they chose.

9. Students share what they read. Call on a few students to share the traits that inspired the designs they read about.

   - How did the trait of an organism help engineers get an idea for a design?
   - What problem did the design solve?

10. Ask students to consider how engineers often develop new technologies to help people.

   - In the trilobite eyes and camera example, engineers studied the structure of the trilobites’ fossilized eyes and concluded that eyes with sharp vision were an adaptive trait for these organisms. Being able to see sharp images helped the trilobite see predators in its environment. From this trait, engineers designed tiny cameras—like the ones used in cell phones—that could take very sharp photos.

   - How does this help people?
   - How was the design you and your partner read about helpful to humans?

11. Introduce new key concept.

   - Another way to say that engineers get ideas from organisms’ traits is that their designs are inspired by traits. Read aloud and post the key concept.

     So, we can say Organisms’ traits can inspire engineers to create designs that solve problems.

12. Introduce design. Hold up the design word card.

   - A design is something new made to solve a problem.

   Post the design card to the Vocabulary section of the classroom wall.

13. Introduce biomimicry. Hold up the biomimicry word card.

   - Biomimicry is getting engineering ideas from organisms’ traits.

   Post the biomimicry card to the Vocabulary section of the classroom wall.
14. Introduce the Investigation Question. Refer to the board and read aloud the Investigation Question.

How can organisms’ traits help engineers make successful designs?

You will now get to do what biomimicry engineers do: use ideas about an organism’s traits to plan what a design should be like and how it should work.

Teacher Support

Instructional Suggestion

Providing More Experience: Today’s Daily Written Reflection

Look at the structure of an octopus’s arms. Based on the structure of the arms, what might be the function of an octopus’s arms? This prompt (on page 36 in the Investigation Notebook) invites students to reflect on structure and function, using a familiar organism. Thinking about structure and function will help students draw plans for their designs.

Background

Crosscutting Concept: Structure and Function in Designs

In the last lessons of Chapter 2, students use what they have learned about grove snails’ shells to plan designs that solve problems. When students read Biomimicry Handbook in this lesson, they think about the structure of the body parts of various organisms and how these areas are suited for particular functions. They learn that biomimicry engineers often imitate organisms’ structures in their designs in order to serve a function and solve a particular problem. Students will go on to create a plan for their designs by using what they know about structure and function. In the next lesson, students will share their designs with their peers and have a chance to revise their plans. You may want to take opportunities that arise to have students think more explicitly about structure and function (e.g., how the shell shape covers the entire snail to help it blend in or protect all of it) as they plan their designs in this lesson and the next lesson. Students will also plan new designs in Chapter 4 as they look at different structures (in giraffes) that perform different functions.

Instructional Suggestion

Going Further: Evidence of Past Environments

In this activity, students considered how studying the fossilized structures of trilobites helped biomimicry engineers design sharp, small cameras. From studying these structures, scientists can also infer what the trilobite’s environment of the past may have looked like. The function of the small, compounded sharp eyes was to see predators. Even if fossils of large predators were not found in the same area as the trilobites, scientists can infer from the trilobite’s eye structure that predators may have existed in close proximity to the extinct species. Give students an opportunity to discuss and consider this insight into the past.
Reading About Biomimicry

Students read more about how adaptive traits inspire design in *Biomimicry Handbook*.

### Instructional Guide

1. **Remind students of the grove snail’s adaptive traits.**

   Piensen en los rasgos que le hicieron más fácil a los caracoles con corazas rayadas satisfacer sus necesidades y sobrevivir. ¿Cuáles son algunos de los rasgos adaptativos de los caracoles regineta en el ambiente costero de Gales?  
   [Una coraza dura y un color que se mezcla con el ambiente con pasto].

2. **Set purpose for reading.**

   Los ingenieros de la firma de ingeniería con la que han estado trabajando están interesados en cómo los rasgos del caracol regineta podría darles ideas para crear diseños que resuelvan un problema. Leamos más acerca de lo que hacen los ingenieros de biomimetismo para planear y crear diseños. Esto les ayudará cuando planeen sus propios diseños más adelante en esta lección.

3. **Distribute books.** Distribute one copy of *Biomimicry Handbook* to each pair of students.

4. **Review pages 4–5.** Have students turn to pages 4–5 and review the text.

   Recuerden, leyeron que los ingenieros de biomimetismo observan organismos para aprender más sobre las estructuras de las partes de los organismos y cómo estas estructuras les son útiles para una función en particular.

5. **Partners read page 6.** Have partners turn to page 6 and read about what biomimicry engineers do. Circulate and support students as necessary.

6. **Whole-class debrief.**
Call on students to share their ideas. Encourage students to refer back to the text as appropriate.

7. Partners choose a biomimicry design to read about. Have partners turn to pages 14–15 and ask them to choose one design to read about.

8. Give students a few minutes to read. Have partners read about the examples they chose.

9. Students share what they read. Call on a few students to share the traits that inspired the designs they read about.

10. Ask students to consider how engineers often develop new technologies to help people.

En el ejemplo de los ojos del trilobite y la cámara, los ingenieros estudiaron la estructura de los ojos fosilizados de los trilobites y concluyeron que los ojos con visión aguda era un rasgo adaptativo para estos organismos. La capacidad de ver imágenes nítidas ayudaba a que los trilobites vieran depredadores en su ambiente. Basándose en este rasgo, los ingenieros diseñaron cámaras minúsculas, como las de los teléfonos celulares, que pudieran tomar fotos muy nítidas.

¿Cómo ayuda esto a la gente?

¿Cómo era útil para los humanos el diseño sobre el que leyeron en parejas?

11. Introduce new key concept.

Otra manera de decir que los ingenieros sacan ideas de los rasgos de los organismos es que sus diseños se inspiran en rasgos.

Read aloud and post the key concept.

Así que podemos decir que los rasgos de los organismos pueden inspirar a los ingenieros para crear diseños que resuelven problemas.

12. Introduce design. Hold up the design word card.

Un diseño es algo nuevo hecho para resolver un problema.

Post the design card to the Vocabulary section of the classroom wall.
13. Introduce **biomimicry**. Hold up the *biomimicry* word card.

El biomimetismo es obtener ideas de ingeniería de los rasgos de los organismos.

Post the *biomimicry* card to the Vocabulary section of the classroom wall.

14. Introduce the Investigation Question. Refer to the board and read aloud the Investigation Question.

¿Cómo pueden los rasgos de los organismos ayudar a los ingenieros a crear diseños exitosos?

Ahora van a tener la oportunidad de hacer lo que hacen los ingenieros de biomimetismo: van a usar ideas sobre los rasgos de un organismo para planear cómo debería ser un diseño y cómo debería funcionar.

Teacher Support

**Instructional Suggestion**

*Providing More Experience: Today’s Daily Written Reflection*

*Look at the structure of an octopus’s arms. Based on the structure of the arms, what might be the function of an octopus’s arms?* This prompt (on page 36 in the Investigation Notebook) invites students to reflect on structure and function, using a familiar organism. Thinking about structure and function will help students draw plans for their designs.

**Background**

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