

Biomimicry

A bite-sized introduction

Advance Copy, v.1



Lesson 2

Learning to Recognize Design in Nature

Duration: 1-2 class periods (~50 min each)

Grades: 6-12

What students do:

Students learn about and begin developing the skill of recognizing design in the biological world.

Learning objectives:

1. Students learn to recognize design in nature.
2. Students begin to understand why design in nature is important to the practice of biomimicry.
3. Students continue to share their ideas.
4. Students begin to learn the skills of close observation.

Materials:

- Slide deck for Lesson 2
- Human-made object(s)
- Natural object(s)
- Drawing materials
- String, ribbon, or other material for temporarily marking a 3' path on the ground

Getting Ready

- Review the provided slide deck and suggested discussion questions.
- Review the suggested activities on page 3 and select those you wish to include.

Procedure

Check in

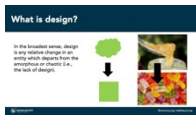
Have students share some recent entries from their biomimicry journals (see Lesson 1).

Presentation and Discussion

Present or provide the slide deck to the students. **Engage** students by facilitating a discussion based on the discussion questions provided below. (If delivered asynchronously, instruct students to reflect/write about/discuss the discussion questions together).

Discussion Guide:

Title Slide 1: Biomimicry: A bite-sized introduction. Lesson 2: Learning to Recognize Design in Nature



Slide 2: What is design? In the broadest sense, design is any relative change in an entity which departs from the amorphous or chaotic (i.e., the lack of design). If you prefer, you can pose the question, “What is design?” first to your students.



Slide 3: Design exists in physical, biological, and technological phenomena, including in human-made things. Design is everywhere. How does design come to exist in biological phenomena? (Note: Scientists generally would respond that processes of natural selection result in design in biological phenomena. Nonetheless, for the purposes of biomimicry as a professional practice, it doesn’t generally matter how biological entities become designed, only that there are reasons to believe the design may have something to teach us.)

How does design exist in non-biological phenomena (e.g., tornados)? Physical forces can shape matter so that it displays design.

How is design in non-biological phenomena different than design in biological phenomena? Design in biological phenomena helps organisms to survive and thrive on Earth. Hence, design in biological phenomena may have something to teach human designers.



Slide 4: Design can express itself through shape, texture, color, motion, interaction, behavior, and more.

If you prefer, start by asking students how design can express itself, and ask students to provide examples.

Can design exist in things you can’t see? How about in sounds? Are the echolocating sounds of bats designed? (Would they work if they were different in frequency?)



Slide 5: Why is design important? Biomimics get ideas from the biological world through how it's designed.

If you prefer, start by asking students why they think design is important in doing biomimicry.

Note: You can allude to it, but the connection between design and function is something that will be explored in subsequent lessons.

Activities

Next, have students *explore* the phenomena of design further through one, some, or all of the following activities.

- 1) **Explore a designed object.** Have each student choose something human-made in their immediate vicinity, and then have them spend a few minutes writing down a list of the various design features they can identify about the object. Have students share their observations. Relate what students identify back to the presentation/slides and discussion.
- 2) **Explore a natural object.** Have each student choose something natural (living, once living, or made by a living thing) in their immediate vicinity. This could include things in the schoolyard, their backyard, even their own bodies (e.g. their hand). Then have them spend a few minutes writing down a list of the various design features they can identify. Have students share their observations. Relate what students identify back to the presentation/slides and discussion.
- 3) **Draw a natural object.** Have students choose a different natural object or the same object as in the previous activity (#2) and draw it in detail over 5-10 minutes. Encourage students to focus in on a smaller part of the natural object for their drawing and add notes or labels indicating size, color, or other qualities they observe. Reassure students that they don't have to be great artists, just good observers. Discuss with students if/how the drawing activity changed their awareness about the object's design.

- 4) **Take a micro hike.*** A micro hike is where you pretend you've shrunken down to the size of a gummy bear. Where would you like to go exploring around you? Measure out about 3 feet of string (about the distance between your nose to the tip of your fingers on an outstretched arm) and lay this out on the ground somewhere that looks interesting to you. This is now your trail! Get down on the ground and VERY SLOWLY (a half-minute or minute per inch or so, if you can) let your eyes travel along the ground adjacent to the string. Notice as much as you can with your eyes, ears, nose, and fingertips. Feel free to turn things over and dig a little bit with your fingers. What do you notice? Take photos, make drawings, and/or write in your journal to document the most interesting discoveries you made on your micro hike. Create a 1-3 word (micro) description that sums up the best part of your micro hike, and share that with the class. Relate what students discover back to the presentation/slides and discussion.

- 5) **Go on an internet voyage.** You've gone close, now go far. Have students pull images from the internet of species from faraway habitats and share together their design observations. Relate what students identify back to the presentation/slides and discussion.

- 6) **Design scavenger hunt.** Have students participate in a design scavenger hunt using phone cameras and/or school-issued devices. Have each student go into the schoolyard/backyard and take one or more pictures of a detail from a natural object they find, and a larger picture where the natural object is easy to identify. Then have students share their detailed images, and see if other students can guess what natural object the detail is from. Again, relate what students identify back to the presentation/slides and discussion.

Lesson Feedback

This lesson is part of an advance release of five lessons within a ten-lesson unit of study that is currently in development. If you teach this lesson, we would love to hear how it went and any thoughts you may have for improving it. Please share your feedback via the following survey link: <https://forms.gle/nu72TEYbvfiUH3rN9>

* Thank you to IslandWood for this great activity.

Resources

- Introduction to Scientific Sketching < <https://www.calacademy.org/educators/lesson-plans/introduction-to-scientific-sketching>>
- IslandWood <Islandwood.org>