

# BIOMIMICRY

## A bite-sized introduction

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### Overview

Biomimicry is an innovation practice used by professional engineers, designers, architects, and inventors of all kinds that involves borrowing ideas from the natural world to solve human challenges. Biomimicry is a fascinating and important topic that all middle and high school students should know about. It also provides an excellent opportunity for educators to connect students with nature while building creative and engaging learning experiences that strengthen students' critical thinking skills and gets them thinking differently about nature and design.

This collection of five lessons is designed to provide students with an engaging and authentic introduction to biomimicry and how biomimics (biomimicry practitioners) think and see the world. Students will experience the core elements of biomimicry through slide decks, nature observation, journaling, and research and writing activities. Although some of the activities can be used alone, we recommend teaching lessons 1-5 in order.

The lessons in this unit meet multiple science standards and can begin preparing students and teachers to participate in the Biomimicry Institute's more rigorous [Youth Design Challenge](#). This unit is particularly rich in meeting Common Core standards in Language Arts and several Crosscutting Concepts and Science and Engineering Practices in the Next Generation Science Standards. Correlations are provided with each lesson.

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\* This collection of five lessons is part of a ten-lesson unit of study that is currently in development. The complete collection will be available in early 2021. Visit [biomimicry.org](http://biomimicry.org) and sign up for the newsletter to be notified when it is released.

Approach and rationale.

This unit is designed so that any middle or high school teacher, with minimal or no previous training in the topic of biomimicry, can easily deliver the material in an effective way. All of the lessons in the unit are also intentionally designed so that they can be flexibly delivered. This includes synchronous, in-person delivery; synchronous distance learning; asynchronous distance learning; and blended or flipped classrooms. While each lesson is fully developed, it's expected that teachers will present the material using their own style and judgement, augmenting and adapting it to best meet their students' needs and circumstances. Departing from the lesson as written is recommended as warranted. The 5E model was flexibly used to inform the design of both each individual lesson and the unit as a whole. Steps in the 5E model are noted throughout using bold-italicized 5E terms.

## Additional resources and support

If you are new to biomimicry, or want to expand your understanding, you may wish to review the following additional learning and teaching resources from the Biomimicry Institute.

- **"Biomimicry" with Janine Benyus.** A 20-minute film featuring biomimicry pioneer Janine Benyus introducing biomimicry and explaining how mimicking nature can solve some of our most pressing problems. <<https://youtu.be/sf4oW8OtaPY>>
- **Sharing Biomimicry with Young People.** This publication for K-12 educators describes the foundational concepts of biomimicry and provide ideas for introducing this new way of thinking and problem solving to students. <<https://bit.ly/3iYVSwN>>
- **Biomimicry Youth Design Challenge.** A 5-8-week project-based learning experience and design competition for youth in grades 6-12. Free curriculum is provided. <<https://youthchallenge.biomimicry.org/>>
- **Biomimicry Institute website.** Learn more about our programs and how you can support our work, and join our mailing list for monthly updates. <<https://biomimicry.org>>

## Acknowledgements

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# Outline

*\*one class period is assumed to be approximately 50 minutes*

Title	Overview	Duration*
<b>Lesson 1:</b> Introduction to Biomimicry	Students are introduced to the essential features of biomimicry, embark on methods to explore the outdoors for what it can teach us, research biomimicry examples to share with peers, and begin keeping a biomimicry journal.	2 class periods
<b>Lesson 2:</b> Learning to Recognize Design in Nature	Students begin developing the skill of recognizing design in the biological world through close observation.	1-2 class periods
<b>Lesson 3:</b> Learning to Connect Function with Design	Students are introduced to the concept of functional design, and why it's important in biomimicry, through the study of human-made and natural objects and how their operating conditions inform their design.	1-2 class periods
<b>Lesson 4:</b> Learning to Explore and Communicate About Functional Design Research	Students continue exploring functional design through research. They are introduced to the AskNature website and practice describing biological phenomena in the style of an AskNature strategy page.	1 class period, plus work time
<b>Lesson 5:</b> Learning to Make Connections between Nature's Abilities and Human Aspirations	Students explore the role of analogy in biomimicry and practice making connections between nature's abilities and human needs/wants. The lesson concludes with an opportunity for students to brainstorm their own nature-inspired inventions.	1-2 class periods