

Bird Biomimicry

Total time to complete activity: 45 minutes

BIG IDEA

Students explore how humans use biomimicry to create technological solutions to problems.



IN THE FILM

In *Superhuman Body*, we see some of the many prosthetics engineers have designed for people with limb differences and we watch Paralympians competing. Track and Field Paralympians use a “blade” prosthetic, designed to mimic the legs of cheetahs.

NGSS STANDARDS

K-2-ETS1-1

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3

Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

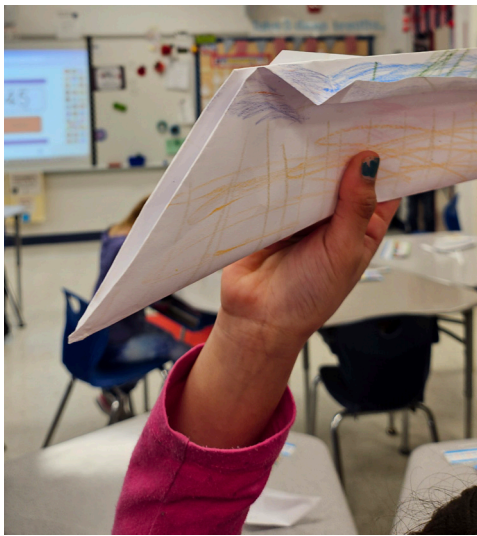
1-LS1-1

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.



MATERIALS

- Paper
- Biomimicry Matching Game
- Scissors
- Painter's tape
- Laminator (optional) and laminating sheets



OBJECTIVES

1. Students will sort and compare photographs of technologies and the animals they were inspired by.
2. Students will plan, create, and test the efficiency of paper airplanes, using aspects of biomimicry to inform their designs.

LESSON PREPARATION

Before students arrive, make sure to review the lesson materials. Review background information. Gather materials and set up the classroom.

Material preparation:

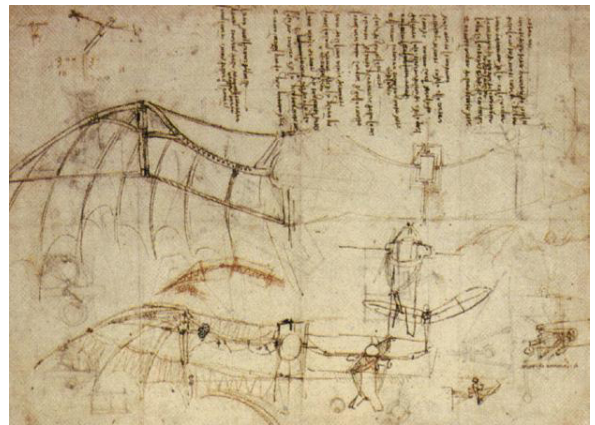
- Print, laminate (optional), and cut one set of the Biomimicry Matching Game for each group.
- Create paper airplane examples.
- Determine an area of the room for students to test their paper airplanes. Their goal will be to hit a piece of paper on the wall. Tape a piece of paper on the wall in the designated area. Place a piece of tape on the floor 4 ft. (level 1), 6 ft. (level 2), and 8 ft. (level 3) from the wall to mark where students should throw from.

BACKGROUND INFORMATION

Biomimicry: Solving design problems by mimicking solutions from nature.

The idea of **biomimicry** has existed long before we had a name for it. Thousands of years ago, historians believe Chinese inventors realized large leaves repelled and redirected water. This inspired them to create umbrellas.

In the 1480s, Leonardo Da Vinci used bird anatomy as inspiration for his flying machines. Engineers still use biomimicry today and we can find examples in common items, such as Velcro, inspired by burrs and wind turbines based on humpback whale fins.



Leonardo Da Vinci's sketches for flying machines

Bird Biomimicry

BACKGROUND INFORMATION (continued)



Peregrine Falcons are the fastest animals on earth. While they usually fly at speeds near 40 mph, these birds hit their record speeds of 150 mph or more while diving for the smaller birds they hunt as prey. A unique combination of traits makes this possible including stiff feathers and wings that bend back to create a more streamlined shape than other birds.

PROCEDURE ANTICIPATORY SET

1. Explain to students that engineers often get ideas from nature when they're solving problems. This is called **biomimicry**.
2. Pass out one set of the Biomimicry Matching Game per group. Explain that this game includes technologies and the animals they were inspired by. Their group's job is to match the technologies to the animals. If they're not sure, that's okay! They should be making their best guesses.

DIFFERENTIATION TIPS:

For more advanced groups, consider having students play this as a memory matching game. In this version of the game, all cards should be face down. Then students will take turns flipping two cards. If they think those cards are a match, they will take them. Once all cards are gone, announce the correct matches to the group. Each correct pair is worth one point.

For groups that need more support with this activity, consider finding matches as a whole group under a document camera.

Biomimicry Matching Game

Blade prosthetic



Cheetah legs



Wind turbine



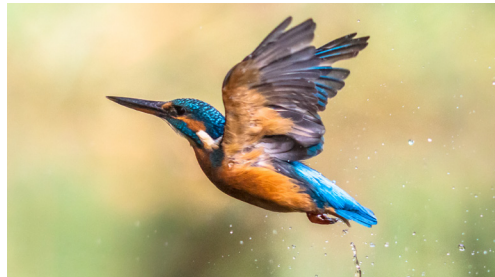
Humpback whale fin



Bullet train nose



Kingfisher beak



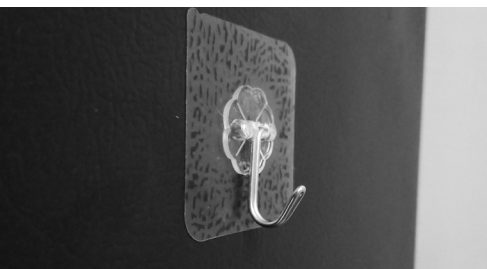
Velcro



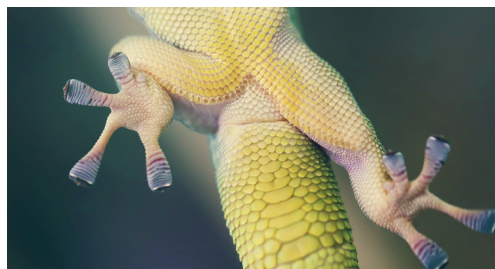
Burr



Adhesive wall hooks



Gecko feet



ACTIVITY

1. Tell students that now they will get a chance to be engineers and use biomimicry.
2. Play [“Why peregrine falcons are the fastest animals on Earth”](#). Ask if anyone knows the fastest animal in the world. It’s the Peregrine Falcon! Have students pay close attention to how the Peregrine Falcon changes its shape when it’s gliding slowly compared to when it’s diving quickly.
3. After playing the video, ask students what they noticed. What does a peregrine falcon do to move at speeds over 150 mph?
4. Have students extend their arms like they’re a Peregrine Falcon gliding slowly through the air. Encourage them to change their shape to look more like a Peregrine Falcon speeding through the air while it dives. Peregrine Falcons pull back their feet and pin their wings back when they do their fast dives so they can shoot quickly through the air. Students should tuck their limbs in so they’re a straight line to model this.
5. Now students work like engineers using biomimicry to create paper airplanes using their knowledge of Peregrine Falcons. Show students the target on the wall. Their goal is to be fast and precise, like a Peregrine Falcon. Show students the markers on the floor for levels 1, 2, and 3.
6. All students should attempt to solve the challenge from the level 1 starting point before attempting levels 2 and 3. Model throwing an example paper airplane at the target from the starting points. Ensure students understand that planes should only be tested in the testing area, not thrown in other parts of the room, for safety.
7. Pass out paper and scissors. If students know how to make paper airplanes, they may start experimenting. If students have access to technology, consider allowing them to research paper airplane tutorials. If they would like to learn a basic paper airplane, walk them through the following steps.
 - Fold the paper in half hot dog style.
 - Open the paper and fold two corners to meet at the center line.
 - Again, fold these corners down so the edges meet the center line.
 - Fold the edges down.



DIFFERENTIATION TIP:

If students are still developing the fine motor skills required to fold paper airplanes, consider making this a team activity. Ask who already knows how to make a paper airplane and pair them with students who are still learning. You can also simplify this activity by pre-folding basic paper airplanes and allowing students to alter them with scissors and additional folds.



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ACTIVITY (continued)

- Walk around as students work, asking them to describe how they are modeling their designs after the Peregrine Falcon. Are they designing a plane that's wide and allows the plane to glide slowly or compact that will move quickly and accurately?

Monitor the testing area and use guiding questions to help students' problem solve if they're not successful. For example, "Is your plane having trouble with accuracy or distance? Why might it be curving to the right?"

WRAP-UP

Review and Discussion Questions:

How did your knowledge of Peregrine Falcons help you in the challenge?

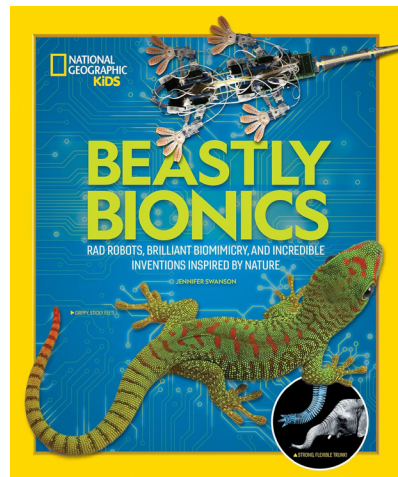
Have you seen any examples of biomimicry in the everyday items that you use?

ADDITIONAL LEARNING



READ

Learn more about real technology inspired by nature with ***Mimic Makers: Biomimicry Inventors Inspired By Nature*** by Kristen Nordstrom and ***Beastly Bionics: Rad Robots, Brilliant Biomimicry, and Incredible Inventions Inspired by Nature*** by Jennifer Swanson.





WATCH

Super Sema's town is being polluted by a villain's jet! See how she problem-solves to help her neighbor's using biomimicry in "[Mission Biomimicry](#)" by Super Sema.



Sing about biomimicry and see more examples of biomimicry with "[The Biomimicry SONG | Science for Kids | Grades K-2](#)" by GenerationGenius.



Read along and learn more about Peregrine Falcons in "[Meet the Animals 15 | Peregrine Falcon | Wild Animals | Little Fox | Animated Stories for Kids](#)".

DO

Extend this activity by giving students a new goal to design a paper airplane that flies the farthest. Should this airplane look more like a Peregrine Falcon gliding or diving? Are there other animals they could use as inspiration?

Encourage students to keep an eye out for technology that could be inspired by biomimicry in their everyday life. If they notice something, they can sketch the item and animal they believe it's inspired by to share with the class.

