

Lesson Plan

Animal-Inspired Inventions

Book: *Medical Technology Inspired by Nature*

Series: Technology Inspired by Nature

Level: Navigator

Objective

To help students compare and contrast two chapters from different books about inventions inspired by animals.

Supplies

- *Medical Technology Inspired by Nature* book
- *Everyday Inventions Inspired by Nature* book (or attached handout)
- Animal-Inspired Inventions worksheet (attached)

Before the Activity

Print an Animal-Inspired Inventions worksheet for each student. Then divide students into two groups. Give one group a copy of the *Medical Technology Inspired by Nature* book. Give the other group a copy of the *Everyday Inventions Inspired by Nature* book (or handout).

Activity

Scientists often study animals to get ideas for their inventions. Each group will look at the first chapter of a book about nature-inspired inventions. As students read this chapter, they should look for the answers to the questions in Part 1 of the Animal-Inspired Inventions worksheet. Students can work together to find the answers, but each student should write the answers on his or her own worksheet.

Give students plenty of time to read the chapter and answer the questions. Then come back together as a large group. Have each student find a partner who was part of the opposite group. Each pair of students should compare their answers to each question in Part 1 of the worksheet. Then they should write answers to the questions in Part 2.

Evaluation

Collect each student's worksheet. Use the attached answer key to give each student 12 points for Part 1 and 6 points for Part 2, for a total of 18 points.

Standards

This lesson may be used to address the Common Core State Standards' reading standards for informational texts, grade 5 (RI 5.3, 5.6, 5.9) and the National Science Education Standards' Content Standard E, grades 5–8.

ANIMAL-INSPIRED INVENTIONS

Part 1

Book Title: _____

1. What part of a gecko's body did scientists study?
2. How does the gecko use this body part?
3. What invention mimics this ability?
4. How is this invention similar to the gecko's body part?
5. List four facts about this animal or invention that are in the chapter's sidebar.
6. What other animal is mentioned in the chapter's main text?
7. What special ability does this animal have?
8. What invention mimics this ability?
9. How is this invention similar to the animal's ability?

Part 2

Partner's Name: _____

What facts about geckos appeared in both books?

What facts about geckos were only in *Medical Technology Inspired by Nature*?

What facts about geckos were only in *Everyday Inventions Inspired by Nature*?

What were some other facts that appeared in both books?

What were some other differences between the two books?

What were some facts that only appeared in a sidebar?

ANIMAL-INSPIRED INVENTIONS ANSWER KEY

Part 1

Book Title: *Medical Technology Inspired by Nature*

1. What part of a gecko's body did scientists study? (1 point)
the feet (p. 6)
2. How does the gecko use this body part? (1 point)
Tiny hairs on the gecko's feet allow it to cling to surfaces or climb walls and ceilings (p. 5).
3. What invention mimics this ability? (1 point)
a new type of surgical tape (p. 6)
4. How is this invention similar to the gecko's body part? (1 point)
The tape's surface mimics the gecko's feet to hold a wound together so it can heal. The tape is also easy to remove (pp. 6–7).
5. List four facts about this animal or invention that are in the chapter's sidebar. (4 points)
Gecko-inspired tapes have been used since 2001; the tape can release medicine; the tape causes less swelling than other tapes; sometimes the tape can dissolve in a person's bloodstream (p. 8).
6. What other animal is mentioned in the chapter's main text? (1 point)
the sandcastle worm (p. 7)
7. What special ability does this animal have? (1 point)
The worm creates a sticky substance to glue sand and seashells together underwater (pp. 7–8).
8. What invention mimics this ability? (1 point)
a glue that seals holes in people's hearts (pp. 7–9)
9. How is this invention similar to the animal's ability? (1 point)
The glue repels water by soaking into a heart and making a waterproof seal (pp. 7–9).

Part 2

Answers will vary. Give students 1 point for each correct answer (6 points total).

ANIMAL-INSPIRED INVENTIONS ANSWER KEY

Part 1

Book Title: *Everyday Inventions Inspired by Nature*

1. What part of a gecko's body did scientists study? (1 point)
the feet (p. 6)
2. How does the gecko use this body part? (1 point)
Stiff tendons on a gecko's toe pads help it grip. Tiny hairs stick to a surface when pulled one way and release when pulled another way (p. 7).
3. What invention mimics this ability? (1 point)
a stiff adhesive (p. 8)
4. How is this invention similar to the gecko's body part? (1 point)
The adhesive is very strong, but it releases easily when pulled upward (p. 8).
5. List four facts about this animal or invention that are in the chapter's sidebar. (4 points)
Geckos can cling to wet surfaces; geckos stick best when surfaces are not completely wet; their toes create air pockets to keep their feet dry; people may make waterproof adhesives based on gecko toes (p. 9).
6. What other animal is mentioned in the chapter's main text? (1 point)
the cat (p. 6)
7. What special ability does this animal have? (1 point)
A cat can retract its claws (p. 6).
8. What invention mimics this ability? (1 point)
a safer kind of thumbtack (p. 6)
9. How is this invention similar to the animal's ability? (1 point)
A plastic sheath covers the tack's pin until it is pressed against a hard surface (p. 6).

Part 2

Answers will vary. Give students 1 point for each correct answer (6 points total).

CHAPTER 1

Around The House

An invention is a new product, process, or way of doing something. Many inventions make certain jobs easier to do. Others help solve specific problems. One way inventors and scientists are solving problems is through biomimicry. In this process, scientists use nature as a guide. First, they observe patterns in nature. Then, they create designs that are similar to nature's designs.

Nature has inspired many everyday objects around the house. For example, in 2011, one inventor studied cats' claws to create a safer thumbtack. Regular tacks have sharp pins. They are easy to drop on the floor, where people can step on them.

The pins on the new tacks can be drawn in, similar to the way a cat retracts its claws. In this design, a sheath covers the pin. The sheath is made of a rubberlike plastic. The pin stays tucked inside the sheath until pressed into a hard surface.

Other scientists studied the feet of geckos. These small lizards can climb up walls. Geckos have stiff tendons on their toe pads. These tendons help the gecko grip surfaces. Geckos' toe pads also have millions of tiny hairs. To climb, the gecko places its toe pad on a surface. When it pulls the toe back, the hairs stick to the surface. The hairs unstick when the gecko pulls in a different direction.

Most adhesives are gooey or soft. In 2012, geckos gave scientists a new idea. The scientists created a stiff adhesive. The adhesive is so strong that one small piece can hold up to 700 pounds (318 kg). But it can still be removed easily. The material peels off when pulled upward.

Thanks to cats and geckos, thumbtacks and adhesives are safer and easier to use. Plants and animals are nature's engineers. They are able to adapt and thrive on Earth. They do not harm their environments with waste or pollution. Many scientists believe inventions should work more like the natural world.

SIDEBAR: STICKING WITH GECKOS

Geckos can cling to wet surfaces. They crawl on wet leaves and branches in their rainy habitats. However, geckos stick best to surfaces that are not completely wet. Their toes create air pockets that keep their feet dry. Scientists hope to make waterproof adhesives based on gecko toes.

(pp. 5–9 of *Everyday Inventions Inspired by Nature* by Samantha S. Bell)