

CREATE AN ANIMAL ROBOT: DESIGNING FROM NATURE

OBJECTIVE: Students will study the anatomy of an animal and use what they learned to design a robot that has similar characteristics.

TIME: 45 minutes

MATERIALS: “Create an Animal Robot” student worksheet, pens or pencils

LESSON PLAN

- 1. Make Observations:** Show students images of several different types of animals, such as an alligator, a shark, a crab, and a bat. For each animal, ask students to describe the animal’s features and their function. How do these features help the animal survive? Prompt students to consider how the animal moves, how it eats, features that keep it warm, etc. (For example, an alligator has four legs to walk on land and a tail that moves to help it swim and balance on land; a crab has 10 legs, eight that help keep it stable on the seafloor in moving water and two that are used to grasp things; a shark has sleek skin, strong jaws, and fins that help it move through the water; a bat has wings to fly; etc.)
- 2. Link Observations to Engineering:** Show students a photo of an airplane. Ask students how they think scientists came up with the idea for the design of an airplane. (It has wings like a bird.) Explain to students that engineers are scientists who design new devices or objects in order to solve problems. Explain that engineers often look to organisms in nature for ideas about how to design new inventions. Instruct students to consider the features of the animals included in your classroom discussion. Brainstorm ways their characteristics could be useful in engineering design. (For example, the characteristics of a shark’s skin may help make objects that move faster through the water; ocean-exploring robots may be designed with bodies that move easily through the water.)
- 3. Design a Nature-Inspired Solution:** Hand out the “Create an Animal Robot” student worksheet

STANDARDS FOCUS:

Science (NGSS)

Science and Engineering Practices: Asking Questions and Defining Problems; Developing and Using Models; Constructing Explanations and Designing Solutions; Obtaining, Evaluating, and Communicating Information

LS1.A: Structure and Function

ETS1.B: Developing Possible Solutions

Language Arts (CCSS)

W2: Write informative/explanatory texts to examine complex ideas

SL5: Make strategic use of visual displays to express information

Art (National Core Arts Standards)

VA—Cr1: Generate and conceptualize artistic ideas and work

VA—Cr3: Refine and complete artistic work

and have students complete it independently. When everyone has finished, have the students share the models of their designs with the class for feedback. Give students the opportunity to revise or improve their designs based on the feedback.

EXTENSION

Engineering Design Process: Explain that engineers follow a series of steps to plan or build new objects. This is called the engineering design process. Review the steps below with the students. Ask students to analyze how they used the process.

STEP 1 Ask What Is the Problem?

STEP 2 Do Background Research

STEP 3 Identify Design Requirements

STEP 4 Brainstorm Possible Solutions

STEP 5 Make Models of Design

STEP 6 Build Design

STEP 7 Test Design

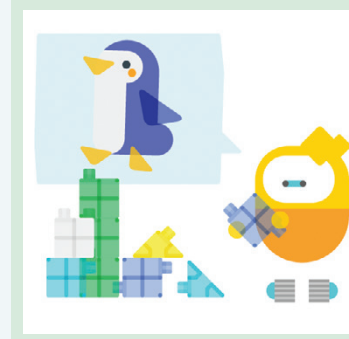
STEP 8 Improve Design

DIVE DEEPER WITH KOOV

KOOV’s building blocks can be used to build working robots based on animal designs. Start by going deeper into the Block Artist Learning Course. Open KOOV and go to the Learning Course: Become a KOOV Block Artist. Complete Stage 4 of the course: “Learn by Watching and Copying.” As students build, prompt them to analyze which parts of the robot are based on the animal’s anatomy. Once they have completed this stage, have students move on to one of the Robot Recipes. These step-by-step guides for building robots are available in four different skill levels, and include examples with and without code. Once students have mastered the recipes, they can use what they learned to build their own designs based on a different animal.

CREATE AN ANIMAL ROBOT

DIRECTIONS: Engineers often look to nature for inspiration when designing new inventions. For example, some robots built to explore the ocean are shaped like fish with fins that help them swim through the water. When trying to build a robot that can run fast, scientists copied the leg shape of a cheetah—the world’s fastest land animal. Suppose that you are an engineer who is designing a new type of robot. How might studying an animal help you to design it? Answer the questions below to plan how you could make a robot that has features similar to those of an animal in nature.



- 1 What do you want your robot to be able to do?

- 2 What is an animal that has a shape or ability similar to what you want in your robot?

- 3 What features of the animal allow it to have that ability? For example, does it have an unusual shape or special feet? Do Internet research to find out more about your animal.

- 4 How do you think this ability helps the animal survive in the wild?

- 5 Explain how the animal’s ability would be useful in your robot.

- 6 How would you design a robot that has the same shape or ability as your animal? Think about the materials you would use and how you would build important features of the body, such as parts that can move. Draw a model of your robot in the box to the right. Be sure to label different parts in your sketch. Use a separate piece of paper if necessary.

- 7 Create a poster or presentation to share your design with your class.

