SCIENCE·3D

DESERT MONSTER

In this packet, sample student answers are in red and notes to teachers are in blue.

In this **STEM Project**, students will explore the similarities between natural and human solutions to problems and understand how nature can provide inspiration for engineering solutions. Then, they will apply their understanding to design solutions to challenges of people living in deserts.

There are many of examples of biomimicry in engineering. Consider exploring the following article, which provides examples of biomimicry:
https://www.digitaltrends.com/cool-tech/biomimicry-examples/ In this activity, have students explore the natural world. For example, to help them in Activity 2, entering the search term "How do animals stay cool" they will get some great examples!

Activity 1: Getting Started

1. Describe how desert animals and people overcome similar challenges. Fill in the table below with solutions.

Challenge	How desert animals overcome the challenge	How people overcome the challenge
Storing water	Have a bladder	Carry a water bottle
Staying cool on hot days	Stay in the shade; don't go in the sun; stay in cool burrows	Air conditioning; stay in shade; go swimming
Staying warm on cold days	Have fat as insulation; bask on warm rocks	Staying indoors; fires; blankets; etc.

2. Choose one of the challenges above and **compare** and **contrast** desert animals' solutions and humans' solutions.

Good answers should include at least one way that natural and human solutions are similar and one way they are different. The comparison could involve behavior, design, or how well they work. See example below:

When it's extremely hot outside, humans can stay inside air-conditioned buildings, while desert animals cannot. Instead, desert animals have to find shade or underground burrows where it is cooler. Both options avoid the direct sun to prevent from getting too hot.

Activity 2: Defining the Problem

Now it is time to use biomimicry yourself! Read the problems listed, then find a plant or animal (or a structure created by plants or animals) that gives you an idea on how to solve these problems. For example, swimmers wanted to swim faster. This was considered the problem. Engineers looked at the skin of sharks because they move through the water easily. Engineers then built swimsuits that mimicked shark skin to increase swimmers' speeds.

Use books or the internet to research how animals or plants stay cool and keep warm. Use what you learn to design a building or an object to help people stay cool or keep warm. Remember, your design should be inspired by nature!

Problem: How to stay cool when it is hot outside

1. What was the plant or animal that inspired your solution?

2. **Describe** how the plant or animal stays cool.

3. **Draw** your proposed design to help people stay cool. **Describe** how your design works and how it is like the plant or animal that inspired your design.

Credit should be given for a wide variety of solutions as long as it makes a strong connection to a solution in the natural world and has a logical reason as to why it would work.

4. **Describe** how you would test your design.

Rationale answers would include measuring the temperature inside and outside a structure (or the temperature of a person inside or outside a structure) or by considering if people use the proposed solution.

Problem: How to keep warm when it is cold outside

1. What was the plant or animal that inspired your design?

2. **Describe** how the plant or animal stays warm.

3. **Draw** your proposed design to help people keep warm. **Describe** how your design works and how it is like the plant or animal that inspired your design.

Credit should be given for a wide variety of solutions as long as it makes a strong connection to a solution in the natural world and has a logical reason as to why it would work.

4. **Describe** how you would test your design.

Rational answers would include measuring the temperature inside and outside a structure (or the temperature of a person inside or outside a structure) or by considering if people use the proposed solution.

Extend the lesson: Have students present their designs to the class. Discuss how a design might be improved and have students modify their designs based on class feedback. This will help reinforce the iterative nature of developing solutions.