



Animal Engineers

Subject: Biomimicry

Grade Level: 2-5

Topic: Engineering Design Process

Time: 60 minutes

Learning Objectives

Students will:

- identify animals who build their homes.
- use the design process to build a working dam.
- troubleshoot and make improvements to designs.

Materials

Litter pan for each group, metal sheet pan, water, building items (crayons, colored pencils, straws, sticks, clay, marbles, rocks), *Design Process Cheat Sheet*, *Animals as Engineers photos*, *Who Built It? sheet*

Procedure

Engage: To promote student curiosity, Ask: "What kind of structures do humans build? What purposes do our structures serve? Are animals able to build or engineer structures?"

Have students list animals capable of building. What purpose do their structures serve?

Explore: Help students build understanding by showing students the Animals as Engineers photos. Discuss what the animals and structures are, and why they build them the way they do.

Explain: Have students begin to show what they have learned. Divide students into groups. Give each group one *Who Built It* photo. Have each group come up with a story explaining the engineering they see. Encourage them to be creative--it does not need to line up with reality! Have each group share their picture

and the story they came up with. After all groups have shared, collect the photos and tell the whole class what each image is actually of, who made it, and why.

Elaborate: Have students use their new knowledge by giving each group a *Design Process Cheat Sheet* and go over the steps. Do animals follow the Design Process? Do they build for a specific purpose/to solve a specific problem? Do they tear down and rebuild their structures? Do they learn to build differently based on trial and error?

Assessment

Evaluate: Evaluate student learning by having students build like an animal. They will work in their groups to build a beaver dam using the Design Process. Their dams should be capable of holding back water in a large metal sheet pan. Supply each group with a sheet pan propped up on a book so the pan is sloped. Put the litter pan on the floor to catch any overflow. Allow groups to collect building supplies. Instruct them to use their supplies to build a strong dam that can hold back water. When they are done, have them slowly add water to the uphill side of the tray.

Does the dam work? They can continue to work on their build to see if they can improve the design. Have them consider what worked, what did not, and why.

Extension Activities

- Invite a local biologist or zoo employee to talk about how animals build.
- Have students visit a local park or nature reserve to look for bird nests, spider webs, ant hills, etc.

NGSS Alignment

Grade 2

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.

Grades 3–5

3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.



Created by the Akron Zoo