Wind Like a Whale

Subject: Biomimicry

Grade Level: K-12 (younger students will need assistance)

Topic: Wind Energy

Time: 60 minutes

Learning Objectives

Students will:

- learn about inventions that were inspired by nature (biomimicry).
- explore how wind can be used as an energy source to provide electricity.
- explore how different types of whale fins and flukes and how they affect movement.
- learn about NASA research of whale flukes to design more efficient wind turbines.

Materials

box fan, extension cord, wind turbines, multimeters, 9V batteries, red and black connectors to all, cardstock, scissors, pencils, lab tape, pencils, and copies of the *Wind Like a Whale Worksheet*.

Procedure

Engage: To promote student curiosity, have students have students make a simple pinwheel. They can make their own or use this template https://www-tc.pbs.org/parents/curiousgeorge/activities/pdf/cc_pinwheel_bw.pdf

Ask: What do you notice? What is making the pinwheel spin? Can you make it spin faster? Slower? Can you make it spin in the opposite direction? How?

Explore: Help students build understanding by reading "Nature Did it First--Engineering Through Biomimicry", by Karen Ansberry. The first story in the book is about the invention of Velcro. Next, share the *Biomimicry Examples* with students and allow them to comment on each one. *Ask: How is this an example of biomimicry?*

Explain: Have students begin to show what they have learned by asking students if they can think of any other examples of biomimicry. Show students the sea shell, pine cone and turtle shell. *Ask: What inventions could these items found in nature inspire?* Encourage class discussion.

Elaborate: Have students use what they have learned by having students draw inventions inspired by animals. These can be ones they heard about in class or ones they came up with on their own.

Assessment

Evaluate: Evaluate student learning by having students answer the following questions?

- Name one animal we talked about today.
- Name one invention we talked about today.
- Can you provide a simple explanation of the word biomimicry?

Extension Activities

- Have students use recycled material to create models of their ideas for inventions.
- Select a unique animal or plant and have a class discussion about how the characteristics of this organisims could inspire inventions.

NGSS Alignment

K–2

K-PS3-1 – Make observations to determine the effect of sunlight on Earth's surface

K-2-ETS1-1 – Ask questions, make observations, and gather information about a situation people want to change to define a simple problem

K-2-ETS1-2 – Develop a simple sketch or physical model to illustrate how an object works

3–5

4-PS3-4 – Apply scientific ideas to design, test, and refine a device that converts energy from one form to another

3-5-ETS1-1 – Define a simple design problem reflecting a need or want

3-5-ETS1-2 – Generate and compare multiple possible solutions

3-5-ETS1-3 – Plan and carry out fair tests

6–8

MS-PS3-3 – Apply scientific principles to design, construct, and test a device that converts energy

MS-ETS1-1 – Define criteria and constraints of a design problem

MS-ETS1-2 – Evaluate competing design solutions using systematic testing

MS-LS1-4 – Use argument based on evidence to support how structures affect function

9–12

HS-PS3-3 – Design, build, and refine a device that converts energy from one form to another

HS-ETS1-2 – Design solutions to complex real-world problems using scientific knowledge

HS-LS1-2 – Develop and use models to illustrate structure–function relationships

HS-ETS1-3 – Evaluate solutions based on trade-offs

Created by the Girl Scouts of Northeast Ohio