Strength of Plants	Grade 5: Forces Acting on Structures

Lesson Plan

Description

There is lots to be learned from the strength of plants and their ability to withstand the potentially harmful effects of force. This lesson explores that learning and how various Indigenous peoples have learned from nature to create strength in structures.

Learning Outcomes

- Physical characteristics can help plants withstand forces in nature
- These characteristics are adaptations to their environment
- Anchors and flexibility help plants like grasses withstand strong winds
- Physical characteristics of plants are utilized by various Indigenous peoples

Specific Expectations

A3.3 analyse contributions to science and technology from various communities

D2.4 describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces

Introduction

There are many forces in nature that animal and plant species must withstand. One of the ways species can withstand forces is by their physical characteristics. These characteristics are structural adaptations that have developed over time. An adaptation is when an organism becomes better suited to its environment.

Common forces of nature are air and water. There are many examples of physical adaptations to these forces in animals and plants. Anole lizards living in the Caribbean have developed longer front limbs and larger toe pads to better anchor themselves during storms. Birds and fish have stream-lined body shapes to provide less resistance to air (when flying) and water (when swimming), respectively. Some animals, like turtles, have hard outer shells to protect them from forces. Seagrasses have a special horizontal root system to anchor them to the ocean floor to withstand strong currents. Pine trees have flexible branches to withstand heavy snow without breaking. Similarly, palm trees have flexible trunks that can bend up to 50 degrees without snapping during hurricanes, as well as an extensive root system to keep them anchored to the ground.

In this lesson, we will be examining the physical characteristics of Great Plains grasses. Many plants have the same characteristics that allow them to withstand forces: root systems to anchor and flexibility to prevent snapping. These are the adaptations grasses also possess to withstand strong Great Plains winds.

There are hundreds of different species of grasses on the Great Plains, but one with particular significance is sweetgrass. Various Indigenous peoples across Canada consider sweetgrass a sacred plant, such as the Anishinaabe, Haudenosaunee, Wolastoqiyik (Maliseet), Mi'kmaq, Ktunaxa, and Nuxalk (Bella Coola). On the Great Plains, the Siksika (Blackfoot) call sweetgrass "sipátsimo". The grass is braided and burned ceremoniously. In addition to its spiritual significance, sweetgrass is used for practical purposes due to its ability to be weaved into strong structures, such as baskets, mats, and saddles.

Photos by Nancy J. Turner

Students will explore the physical characteristics that allow grasses to withstand wind and use these physical characteristics to make a traditional Indigenous structure.

Action

Activity 1: Anchorage

In this activity, students will investigate how strong anchors can withstand force, relating the activity to plant characteristics.

Materials:

- Container
- Substrate (sand or soil)
- Something to represent a plant (popsicle stick, pipe cleaner, etc.)
- Materials to create an anchor (erasers, coins, rocks, etc.)
- Adhesives (tape or glue)

Procedure:

Hand out materials to each student and have students create their own anchor system.

1. Fill the container 3 inches deep with substrate

2. Create an anchor on your "plant" (popsicle stick or other material) by adhering different materials to the bottom of it. The other "plant" will not have an anchor.
3. Bury the end of one "plant" in the container of substrate with no anchor on it.
4. Bury the end of the other "plant" in the container of substrate with the anchor.
5. Pull both plants out of the substrate. Which comes out easier? Have students record their results on the handout.

Talk to students about how their anchor represents root systems of plants that help them withstand forces (such as when they pulled on their "plant").

Activity 2: Flexible vs rigid materials

In this activity, students will investigate how different materials can withstand force, relating the activity to plant characteristics.

Materials:

- Popsicle sticks
- Crackers
- Pipe cleaners
- Pool noodles
- Plastic forks
- Large rubber erasers
- Safety goggles

Procedure:

1. Give each student one of each of the materials
2. Have the students try to bend each material and record their results on the handout

Make sure to tell students to stop pushing if it feels like a material is about to break.

Explain that our hands were exerting a force on the materials, like forces such a wind do in nature. Some materials are flexible, while others were rigid. The rigid materials snapped or did not move while the flexible materials bent. Plants developed characteristics to help them withstand forces, like flexibility.

Activity 3: Basket-weaving

In this activity, students will weave their own baskets, akin to various Indigenous peoples.

Materials:

- Paper plates
- Pencil
- Something round to trace
- Yarn
- Scissors
- Glue

Procedure:

1. Trace a circle in the bottom of your plate. Next make an uneven number of marks, evenly spaced around the edge of the paper plate. Then draw a straight line to connect each mark to the circle that you drew.
2. Cut along each line, stopping at the circle.
3. Fold each section at the circle line and bend the sections up to make a bowl shape.
4. Slip a piece of yarn between one of the cuts, leaving a tail, which you can hold down with your thumb while you get started. Weave in and out of the cuts around the bowl. Keep the sections of your bowl folded upwards as you weave. If you flatten them down, your weaving will not resemble a bowl.
5. To change to a new colour, snip your yarn, leaving a tail, and tie on a new piece of yarn, leaving another tail. You can trim these tails and tuck them in when you finish weaving.
6. Stop weaving about 5 mm away from the top of the bowl. Cut your yarn and leave a tail.
7. Fold the remaining top edge of each section down and crease firmly to create the bowl's rim.
8. Cover the bottom of the bowl in glue and use yarn to create a spiral to cover the bottom.
9. Tuck in any loose pieces of yarn.

Paper Plate Weaving - Colourful Bowls - Happy Hooligans

Consolidation/Extension

Students can complete the handout and answer the associated questions to consolidate learning.

The lesson can be extended by having students go outside and collect grass and examine its physical properties. Students can observe other plants and animals and brainstorms what forces they may have to withstand and other physical characteristics they may possess to help them withstand these forces.

Accommodations/Modifications

Different types of materials can be used for Activities 1 & 2 depending on availability and student needs.

Students can be given more time to weave their baskets according to their needs.

Assessment

Teachers can monitor the student work as Assessment *for* Learning. Gather information from the students throughout the activity to gauge their level of understanding.

The handout can be collected and utilized as an Assessment *for* Learning to evaluate how well students have understood the lesson's content and if they require anymore clarification. Furthermore, it can be used as an Assessment *of* Learning if you wish to evaluate your students in a summative manner.

Additional Resources

Traditional Plants and Indigenous Peoples in Canada | The Canadian Encyclopedia
Sweetgrass | The Canadian Encyclopedia