Life of a Pine Tree	Grade 3 Growth and Changes in Plants

Lesson Plan

Safety Notes: Be careful when handling hot water.

Description

In this activity, students will explore the life cycle of a pine tree and learn what makes them different from other trees in the forest. After learning about special adaptations that allow certain pine trees to succeed, students can perform an experiment on a pine cone to see how change in temperature will affect the cones.

Materials

- 3 jars (mason jars work well)
- 3 pinecones (eastern white pine)
- Warm water
- Cold water
- Ruler
- Timer

Science Background

Trees, like all plants, begin their lives as a seed dropped from a parent tree. These seeds get dispersed by wind, water, animals and even people. If the seeds find a location with optimal growing conditions they will start to sprout. The stem will grow up towards the sun and the roots reach down into the earth to search for water and nutrients as well as provide stability for the growing plant. If the sprout receives enough water, sun, and nutrients it will continue to grow into a seedling, getting larger and growing more and more leaves. For many years the tree will continue to grow into an adult. Adult trees complete the lifecycle by reproducing and producing seeds of their own. Most trees have both male and female cones. The large wooden cones are the female cones holding the seed. But the seeds need to be fertilized, that's where the male cones come in. Pollen from the male cones is carried by wind and enters the female cone to fertilize the seed.

A coniferous tree is primarily composed of evergreen trees with needle-shaped or scalelike leaves. Think of the pine and spruce trees you see around your neighborhood, they have needles instead of the large broad leaves like a maple tree. There are many benefits and challenges to having needle leaves as opposed to broad leaves. Needles are more robust and remain on the tree year-round (there is an exception for the tamarack species). While broad leaves are able to capture more sunlight and create more energy through photosynthesis, they have to shed their leaves each fall and grow new ones in the spring. Conifers also have cones to protect their seeds. In Ontario we have a large variety of cones such as the eastern white pine, to white spruce, red spruce, eastern hemlock or eastern white cedar. The cones of unique conifer trees often have different characteristics to help maximize the seed's chance of survival and success.

The jack pine cone is one of the toughest cones, it has a special adaptation called a 'serotenous cone'. What this means is that all of the scales of the cone are closed very tight and glued together with a natural resin.The resin in the cone needs to melt in order for the cone to open and release the seeds inside. The cones need to reach a temperature of above 50 degrees celsius to open. This primarily happens during fires. Although many forest fires are caused by humans, forest fires occur naturally as well. Although forest fires are destructive, plants in wildfire-prone ecosystems often survive through adaptations, similar to the serotenous cone.

Activity Procedure

This is an experiment that will allow you to observe how different temperatures will affect other kinds of pine cones.

1. In your notebook record the length and width of each of your three pine cones. Write down any other observations about your cones.
2. Label one jar cold and another warm. The third unlabeled jar will be the control (nothing will be done to this cone).
3. Fill the jar labeled warm with warm water, and the jar labeled cold with cold water.
4. Quickly put one cone into each jar and start your timer.
5. Keep a close eye on the jars and record any changes you see!

Once you have recorded all of your finding you can continue this experiment by exploring the pine cone that was not in water. Can you find any seeds inside the cone?

Debrief

What did you notice happen to the cones? Are other kinds of cones affected by temperature? Why do you think this happened?
You can answer all of these questions on your handout.

Handout

1. **Hypothesis**: How do you think change in temperature will affect your pine cones? (Answer before conducting the experiment).

2. **Observations:** Draw or write your observations based on what happens to the cones before and after the temperature change. (example: size, colour, openness of scales)

Before	After

3. **Results:** What did you see happen when you exposed pine cones to different temperature environments?

4. **Reflection:** Why do you think this happened? Do you think other types of cones would react the same?

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Handout - Sample Answers

1. **Hypothesis**: How do you think change in temperature will affect your pine cones? (Answer before conducting the experiment).
   If the pine cone is placed in warm water then the scales will open and release seeds. If the pine cone is placed in cold water then no changes will occur.

2. **Observations:** Draw or write your observations based on what happens to the cones before and after the temperature change. (example: size, colour, openness of scales)

Before	After
Cone 1: Warm water • 10cm long • 2.5cm wide • scales closed tight • light brown	Cone 1: Warm water • 10cm long • 3.5cm wide • scales open • dark brown
Cone 2: Cold water • 10cm long • 2.5cm wide • scales closed tight • light brown	Cone 2: Cold water • 9cm long • 2cm wide • scales closed tight • dark brown
Cone 3: Control • 10cm long • 2.5cm wide • scales closed tight • light brown	Cone 3: Control • 10cm long • 2.5cm wide • scales closed tight • light brown

3. **Results:** What did you see happen when you exposed pine cones to different temperature environments?
   When the pine cones are exposed to warm and cold water, the warm water should make the pine cone open while the cold water will make the pine cone close up even more.
   Note that results will vary depending on the type of cone. The important part is being able to follow the scientific procedure.

4. **Reflection:** Why do you think this happened? Do you think other types of cones would react the same?
   The pine cone exposed to warm water opened because a warm temperature usually is a sign that spring has come. The spring time provides good conditions for seeds to sprout and grow. The cone exposed to cold water closed up to protect the seeds from the cold and wet environment. Most pine cones from Ontario will react similar to the eastern white pine cones.