

SINK, TILT OR STAND? (MODIFIED FOR ADEED)

INSTRUCTIONS



Science Concept:

Permafrost changes as it thaws.

Objectives:

The student will:

- describe changes seen when permafrost thaws;
- make inferences about changes caused by thawing permafrost; and
- make a Venn diagram to compare/contrast houses built on permafrost.

GLEs Addressed:

Science

- [3] SD1.2 The student demonstrates an understanding of geochemical cycles by describing the water cycle to show that water circulates through the crust, oceans, and atmosphere of Earth.
- [3] SA1.1 The student demonstrates an understanding of the process of science by asking questions, predicting, observing, describing, classifying, making generalizations, inferring, and communicating.
- [3] SE1.1 The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by identifying local problems and discussing solutions (L).

Math

- [2] S&P-1 The student demonstrates an ability to classify and organize data by constructing a variety of graphs from realistic situations.

Vocabulary:

damp - slightly wet

heat - the quality of being hot; high temperature

melt - become liquefied by heat

thaw - to change from a frozen mixture to a thawed state by gradual warming; to become warm enough for snow and ice to melt within that mixture

Venn diagram - a diagram representing logical sets pictorially as circles, common areas of the sets being represented by the areas of overlap among the circles

water cycle - the processes by which water circulates between Earth's oceans, atmosphere, and land, involving precipitation as rain and snow, drainage in streams and rivers, and return to the atmosphere by evaporation and transpiration

Materials:

- Quart-size food storage containers (two per group)
- Sand
- Dried moss
- Garden soil
- Hand warmers (two per group, plus extra)
- Small rocks or gravel
- Ice cubes
- Crushed ice or snow
- Water
- Craft sticks
- Glue
- Aluminum foil
- Science journal

- Computer with Internet access
- Pictures of houses on stilts and houses with ground foundations found either via Internet or magazines

Activity Preparation:

1. Assemble and freeze ten quart-size containers of “permafrost.” To make each container of “permafrost,” combine sand, rocks, garden soil, ice cubes, and crushed ice/snow. Fill the containers about three-quarters full with this mixture and top with a layer of moss. Dampen the “permafrost” with water and freeze overnight.
2. Prepare a KWL Chart. (Teacher’s Note: A KWL chart is a three-column chart to be filled in during student discussion. The first column should be labeled “K (What I KNOW),” the second column “W (What I WANT to Know),” and the third column “L (What I LEARNED).”)
3. Make a model of a house on stilts and a model of a house not on stilts, using the craft sticks, as an example of each type of home.
4. Bookmark **Tunnel Man: Episode I** movie at: <http://www.uaf.edu/permafrost/>.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear up

Process Skills: observing, asking questions, and communicating

1. As a group, have students complete a KWL chart to assess knowledge about permafrost. Ask students what they know about permafrost and what they want to know about permafrost. Record their responses in the appropriate sections of the chart. Write each student’s initials or name next to his or her response.
2. Watch **Tunnel Man: Episode I** movie and discuss as a class.

Explore

Process Skills: observing, predicting, and communicating

Teacher’s Note: Start this activity early in the day to allow time for thawing.

3. Show students a variety of pictures of houses on stilts and houses with ground foundations.
4. Divide students into small groups.
5. Tell students, as a group, they will make two houses from craft sticks. The base of each model must be big enough to accommodate a hand warmer. Distribute craft sticks, glue, and two hand warmers to each group.
6. The foundation of the first house will have an aluminum foil “floor.” As groups build their models, cut a piece of foil to the same dimensions as the model and set the house on top of the foil. The second house will be on stilts. The floor can be foil or wood.
7. When groups are done building their models, instruct them to place each one on a piece of “permafrost” (see Activity Preparation).
8. Ask groups to place one active hand warmer in each of the houses.
9. Instruct groups to draw an illustration of each of the houses as they appear on the frozen permafrost. Draw a second illustration that demonstrates their prediction of what will happen to the permafrost and to their houses when the permafrost thaws.
10. Set the models aside for several hours to allow some thawing. Instruct students to make an observation. Write student observations on a chart. Continue this procedure until the ground has completely thawed under one of the houses. (NOTE: This may require overnight.)
11. Check the hand warmers throughout the observation period and replace if necessary.

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Generalize

Process Skills: observing, communicating, and inferring

12. During each observation period, ask the following questions and record student answers:
 - a. How do you think your permafrost model will look in an hour?
 - b. What is happening to the permafrost?
 - c. What changes to the houses have you observed?
 - d. Why do you think the permafrost is becoming damp?
 - e. What will happen to the water in the soil as the permafrost thaws?
 - f. What do you think would happen if the family living in the house with its foundation on the ground kept their house at a warmer temperature?
13. Ask students what they learned about permafrost. Use their responses to complete the KWL chart. Ask leading questions, such as, "What made the soil soggy?" At the time of the last observation for the day, review the list.

Apply

Process Skills: communicating and inferring

14. Ask students to pretend they are going to ride their bike five miles to a friend's house for a party. It is a hot day and they have promised to bring the ice cream. Ask students how they will pack the container so that the ice cream won't melt on the ride. Students should write their responses in their science journal.

Extension Idea:

Ask students to research the following questions:

- a) Why do Eskimos wear fur parkas?
- b) Why do you think Eskimos wear their parkas with the fur on the inside instead of the outside of the garment?

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RUBRIC

Assessment Task:

Pretend you are going to build two houses in your town. They will be built on permafrost.

In your journal:

1. Write at least three sentences describing what would happen to the water, land and/or houses after the permafrost thaws.
2. Write at least two inferences about the changes in the land and houses after the permafrost thaws.
3. Draw and label a Venn diagram to compare and contrast the two houses. Write at least three facts in each of the areas of the diagram.

Rubric

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student describes changes when permafrost thaws.	[3] SD1.2	The student writes zero-two sentences describing changes as the permafrost thaws. He or she includes any changes to the water, ground surface, or houses.	The student writes three sentences describing changes as the permafrost thaws. He or she includes any changes to the water, ground surface, or houses.	The student writes four sentences describing changes as the permafrost thaws. He or she includes any changes to the water, ground surface, or houses.
The student makes inferences about the changes caused by thawing permafrost.	[3] SA1.1	The student makes zero-one inference about the changes in the appearance of the land and houses.	The student makes two inferences about the changes in the appearance of the land and houses.	The student makes more than two inferences about the changes in the appearance of the land and houses.
The student makes a Venn diagram to compare/contrast houses built on permafrost.	[2] S&P-1	The student draws a Venn diagram. It may or may not be labeled. Each part of the Venn diagram contains two or fewer facts.	The student draws a Venn diagram. Each house is labeled. Each part of the Venn diagram contains three facts.	The student draws a Venn diagram. Each house is labeled. Each part of the Venn diagram contains more than three facts.

