

Changing Moisture Levels



Focus: Students will, through guided inquiry investigations, discover how and why moisture changes, and communicate what they did and what they found out.

Specific Curriculum Outcomes

Students will be expected to:

- 13.0 investigate conditions that affect changes in the location, amount, and form of moisture [GCO 1/3]
- 14.0 communicate procedures and results [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- communicate ideal conditions for setting up a lemonade stand

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]
- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- describe how people's interactions with their environment have changed [2.4.2]

English Language Arts

Students will be expected to:

- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- use a range of strategies to develop effective writing and representing and to enhance their clarity, precision, and effectiveness [GCO 10]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 6 • <i>What Is the Inquiry Process?</i> poster • BLM <i>My Inquiry</i>	• identical pieces of cloth • sealable plastic bags • slices of various fruits and vegetables • digital camera (optional) • Flex Arm camera (optional) • food dehydrator (optional) • containers of various shapes and sizes (e.g., cups, saucers) • variety of materials (e.g., foil, construction paper, mirrors, plastic wrap, wax paper, felt, cotton) • heat sources (e.g., hairdryers, electric fans, or heat lamps) • students' Science Folders • small plastic cup and container it will fit in (e.g., bowl) • marker • plastic wrap • small stone • students' Science Journals • lamp (optional)	• Invite a speaker such as an Elder or an Indigenous Knowledge Keeper to speak about drying food. Alternatively, you can collect Internet resources. • Prepare slices of fruits and vegetables, all of the same thickness (at least one slice per student). • Dry slices of foods in an oven at home.	• moisture • evaporate

Science Background

- Changes in moisture levels occur primarily through evaporation and condensation. Important factors that affect the rate of evaporation are: temperature, humidity (the amount of water vapour in the air), and air movement (e.g., wind or resulting from tumbling in a dryer). If you heat a moist object, liquid water in or on the object will change to water vapour and dissipate into the atmosphere. The less humid the air around the object, the higher the rate of evaporation, regardless of temperature. However, air can hold only so much water vapour; when the maximum amount is reached, the air is saturated. In saturated air, there will be no net evaporation from a moist object and it will not dry. Finally, as an object dries, the humidity of the air closest to the object increases. When the air is moving, this moist air dissipates more quickly and is replaced by drier air, and the rate of evaporation increases. The converse is true of condensation: the rate of condensation increases as air temperature decreases, humidity increases, and air movement decreases.
- Drying (dehydrating) food is one of the oldest and easiest methods of food preservation. Most living things depend on water, including organisms that decay our food. These organisms are therefore far less able to survive on dehydrated foods. In addition, some biological processes continue in the food items themselves after harvest, such as fruit ripening. These are cellular processes which also rely on the presence of water, and are therefore prevented by dehydration.

Possible Misconceptions

- Students are likely to have had experience using heat energy to speed drying. Some students imagine heat to be a substance of some kind, so that drying is understood as water turning into heat. Many students' understanding of energy is restricted to the movement of their bodies, or they think of it as something that is used up, like a fuel. To help students build a more accurate view, place a thermometer in, or have students feel the air coming from, a hair dryer set on low. Prompt students to consider what is happening with the temperature of the air from the dryer, and how that affects drying. Ask if the dryer would still work if it didn't produce warm air.

ACTIVATE

Preserving Food

As a class, review the evidence that living things contain moisture. Describe how Mi'kmaq, Innu, Inuit, and other groups (e.g. early settlers, hunters, fishers) used or use drying to store meats, fish, or other food. Invite a speaker or share Internet resources with the class to find out more about these methods. For example, an Elder or an Indigenous Knowledge Keeper might share traditional drying methods for food preservation (e.g., Inuit drying char, Innu or Mi'kmaq drying moose or caribou into jerky, or drying berries). If possible arrange for samples of these dried foods to be available for the students to touch and taste. The visitor might also speak about the



process of removing the moisture from animal skins so they can be used to create clothing.

Share Science Card 6 with the class. Ask:

- **Which foods are moist and which are dry?**

Have students give evidence for identifying food as moist or dry. Then, ask students if they are familiar with any of the foods or have seen them prepared. Challenge them to match the moist food with its dry form. Encourage sharing of other dried foods they know about. Ask students to explain what happens when food is dried using the words “moisture” or “evaporate.”

CONNECT

Out to Dry

Get two identical pieces of cloth and moisten them with water. Wring out any excess. Place one piece of cloth in a sealable plastic bag, and lay it on an easily accessible surface in the classroom, preferably in sunlight. Alternatively, you could place it on a cooling rack (for baking) or hang it on a clothesline you create in the window using string. Place the other piece of cloth beside it, either on a tray or piece of plastic wrap if it is on a surface or directly on the cooling rack or clothesline. As you are setting up the cloth pieces, challenge the students to predict which will dry first, and to give their reasons. Leave the cloth pieces overnight, and then observe the changes in the two cloths as a class. Ask students to explain what happened. Repeat their answers back to them but rephrase using the words “condensation” and “evaporation” when possible. Add any new student questions to the I Wonder Wall.



Where's the Juice?

Show students previously prepared slices of various fruits and vegetables (at least one slice per student). If possible, use the same types of fruits and vegetables students sorted by moisture level previously (see *Which Is Juiciest?*, page 35). Slices should all be of the same thickness. Tell students that they are going to leave the slices out in the air for the next four days. Ask:

- **Do you think the slices will stay the same as they are now? Why?**
- **How do you predict they will change? Why?**
- **What kind of evidence will you look for?**

Have each student write her or his name on a piece of paper or foil, and then choose and place one slice on it. Leave the slices somewhere they won't be disturbed. Each day, have the students check their slice and record any changes using drawings or digital photographs. Encourage students to use as many of their senses as they can to observe changes (sight, smell, touch). However, ensure that students do NOT taste the slices! You may also use a Flex Arm camera to create a time lapse video of the changes. Students might create a multimedia poster of the fruit using Glogster.

After the four days of observation, have each student use their photos or drawings to create a timeline showing the changes in the samples, along with any other observations that were noted. Post the timelines in the classroom.

As a group, discuss the timelines, and have the students agree on an order in which all the various fruit slices dried. Guide a discussion of how this order relates to how much moisture the fruit contained and where that moisture went. Extend the discussion by asking for suggestions as to how they might make their fruit dry more quickly.

After the investigation, allow students to experience how the taste of foods changes when they are dried. Dry foods in an oven at home and bring them into class, along with undried samples. Alternatively, dry fruit or vegetable slices in a food dehydrator in class.

What Do You Want to Know About Evaporation?

Wonder aloud to the class about factors that affect evaporation. For example, say:

- **I wonder if a lake evaporates as fast as a puddle?**
- **I wonder if clothes dry as fast in the shade as in the sunshine?**
- **I wonder what I can use to stop water from evaporating?**

Ask students what they wonder about evaporation. Record their questions, then inform them that they are going to have the chance to find answers to these questions.

In a central location, provide a variety of shapes and sizes of containers (e.g. saucers, cups) and materials (e.g., foil, construction paper, mirrors, plastic wrap, wax paper, felt, cotton). Provide some sources of heat and/or air movement (e.g., hairdryers, electric fans, heat lamps) and inform students that you will help them if they want to use these tools.

Divide the class into groups of three or four students. Have each group choose one of the questions you recorded during the initial discussion and use the materials to try to find an answer. Remind students about the steps of the inquiry process by pointing out the *What Is the Inquiry Process?* poster. Have students record their plan, results, and conclusion on BLM *My Inquiry* (see page 81). Completed BLMs can be stored in the students' Science Folders.

Provide materials for students to record their observations. If possible, have students record their observations with a digital camera, or do so for them. When student work is complete, have each group communicate what they did (the procedure for their investigation) and what they observed (their results) as a digital presentation.



CONSOLIDATE

Lemonade for Sale!

Tell students that they are going to create a plan for a lemonade stand, and to make sure their customers are happy, they will need to use what they have learned about the three states of water, and how water changes from one state to another. Begin with a whole group brainstorming session by asking questions such as:

- Where will you put your stand? Will it be in the shade or the sunshine?
- Will you keep your lemonade in a large pitcher until someone buys a cup, or pour out several cups beforehand?
- Where will you store the ice? What kind of container will you use?
- Should you put ice in the pitcher of lemonade before you pour it for a customer, or put some in one cup at a time when someone buys a glass?

Record students responses on a chart, but do not agree or disagree with any suggestions. Have students work in small groups to create a poster, flyer, or Webpage to describe their lemonade stand. Tell students to include all the answers to these questions in their description. Have students present their work to the class and ask them to explain the choices they made.

EXPLORE MORE



The Magic Cup

Show students a small plastic cup and a larger container it can easily fit in, such as a bowl, and tell students that you are going to move water from the cup to the container without touching anything. Fill the cup about half full with water, and mark the level with a marker. Make sure students understand that the line marks the height of the water. Place the cup into the larger container and cover it with plastic wrap. Place a small stone in the centre of the plastic wrap. Have students draw a picture of this apparatus in their Science Journals.

Leave the apparatus in sunlight or under a lamp for the remainder of the day, then leave it overnight in darkness. The next day, check the apparatus with the class. Water vapour that formed under the plastic wrap under the heat of sunlight or the lamp will have condensed, and run into the larger container. Check the level of water in the cup relative to the marker line; it should be lower. Have students make a drawing that shows how they think the water moved.