



MAKING A COMET IN THE CLASSROOM

ACTIVITY E-3

GRADE LEVEL: 4-9+

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What's This Activity About?

Comets are wonderfully mysterious things for our students. Since Halley's return in 1985, the only widespread images of comets have been artistic pictures prompted by the Shoemaker-Levy 9 impact at Jupiter in 1994. This activity give students a chance to observe the uneven surface, dark composition, delicate character, and even venting of trapped gas of a "mock" comet. All of these traits are based on the information scientists have gathered from watching comets over the years, and especially from the fly-by of Halley.

"Making a Comet in the Classroom" can be done as a teacher demonstration or a student activity and is one of the most fun and accurate activities about comets.

What Will Students Do?

Students will observe as a comet is created from common ingredients (dry ice, dirt, water). For later grades, with appropriate facilities and enough dry ice, students can make their own comets.

Tips and Suggestions

- Be careful with the dry ice. Always use gloves, or oven mitts! If students handle the dry ice, review proper safety procedures and what to do if the ice contacts skin.

- For lower grades, use this activity as a demonstration. Ask students to note the proportions of ingredients, the color and surface characteristics, the jets, and the slow disintegration.
- For later grades, have the students create their own comets by mixing all of the ingredients in a plastic bag. If you're brave, allow the students to let their comets "fly" by throwing them outside in an open area.
- To simulate movement of the comet through the solar system, carry the comet as you walk around a bright bulb (the Sun) in a darkened room. Far from the bulb, walk very slowly, and comment on the low temperature and feeble light. Closer to the bulb, describe passing Saturn and Jupiter, and near Mars warming up so much that the tail begins to form. Walk more quickly toward the bulb (the increasing gravitational pull between the Sun and the comet causes the comet to travel faster), swing around it, and head away, tumbling the comet as you go. Follow up this activity with pictures of Halley's comet, taken by the Giotto spacecraft as it flew by.
- Places to get dry ice: ice cream stores, grocery stores, butcher shops.

What Will Students Learn?

Concepts

Composition of comets
Liquids and gases at different temperatures
Reflectivity

Inquiry Skills

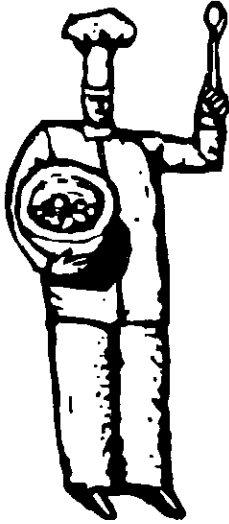
Observation
Visualizing
Describing

Big Ideas

Structure
Energy

Making a Comet in the Classroom

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A dramatic and effective way to begin a unit on comets is to make your own comet right in front of the class. The ingredients for a comet are not difficult to find and watching a comet being "constructed" is something the students will remember for a long time.

The "ingredients" for a six-inch comet are:

- 2 cups of water
- 2 cups of dry ice (frozen carbon dioxide)
- 2 spoonfuls of sand or dirt
- a dash of ammonia
- a dash of organic material (dark corn syrup works well)

Other materials you should have on hand include:

- an ice chest
- a large mixing bowl (plastic if possible)
- 4 medium-sized plastic garbage bags
- work gloves
- a hammer, meat pounder, or rubber mallet
- a large mixing spoon
- paper towels

Dry ice is available from ice companies in most cities (look under "ice" in the Yellow Pages for a local source). Day-old dry ice works best, so you might want to buy it the afternoon before the day you do the activity. Keep the dry ice in an ice chest packed with newspaper and tightly closed. Most ice companies have a minimum on the amount of ice they will sell (usually 5 pounds). But having extra dry ice on hand will be useful because some will evaporate and also because it is advisable to practice this activity at least once before doing it with the class.

The Activity

Here are the steps for making a 6-inch comet (students make good baker's assistants for this exercise!):

- 1) Cut open one garbage bag and use it to line your mixing bowl.
- 2) Have all ingredients and utensils arranged in front of you.
- 3) Place water in mixing bowl.

- 4) Add sand or dirt, stirring well.
- 5) Add dash of ammonia
- 6) Add dash of organic material (e.g. corn syrup), stirring until well mixed.
- 7) Place dry ice in 3 garbage bags that have been placed inside each other.
(Be sure to wear gloves while handling dry ice to keep from being burned.)
- 8) Crush dry ice by pounding it with a hammer.
- 9) Add the dry ice to the rest of the ingredients in the mixing bowl while stirring vigorously
- 10) Continue stirring until mixture is almost totally frozen.
- 11) Lift the comet out of the bowl using the plastic liner and shape it as you would a snowball.
- 12) Unwrap the comet as soon as it is frozen sufficiently to hold its shape.

Now you can place the comet on display for the students to watch during the day as it begins to melt and sublimate (turn directly from a solid to a gas—which is what carbon dioxide does at room temperature and comets do under the conditions of interplanetary space when they are heated by the Sun).

The comet is reasonably safe to touch without getting burned by the dry ice, but it is still best to have a spoon or a stick for the students to use while examining it. As the comet begins to melt, the class may notice small jets of gas coming from it. These are locations where the gaseous carbon dioxide is escaping through small holes in the still-frozen water. This type of activity is also detected on real comets, where the jets can sometimes expel sufficient quantities of gas to make small changes in the orbit of the comet.

After several hours, the comet will become a crater-filled ice ball as the more volatile carbon dioxide sublimates before the water ice melts. Real comets are also depleted by sublimation each time they come near the Sun. Ultimately, old comets may break into several pieces or even completely disintegrate. In some cases, the comet may have a solid, rocky core that is then left to travel around the comet's orbit as a dark barren asteroid.

