RAFT IDEAS

Topics: Weather, Clouds, Water Cycle

Materials List

- ✓ Transparency (or paper for alternate assembly)
- ✓ A slim CD case
- ✓ Mylar, reflective
- ✓ 2 CD's
- ✓ Tape
- ✓ Magnetic compass
- ✓ Blackline master of cloud mirror grid (see page 3)
- ✓ Alternate assembly will need a straight edge and a permanent marker

This activity can be used to teach:

- Weather conditions (Next Generation Science Standards: Grade 3, Earth & Space Science 2-1, Middle School, Earth & Space Science 2-5)
- Hydrosphere & Atmosphere (Next Generation Science Standards: Grade 5, Earth & Space Science 2-1)

raft resource area for teaching
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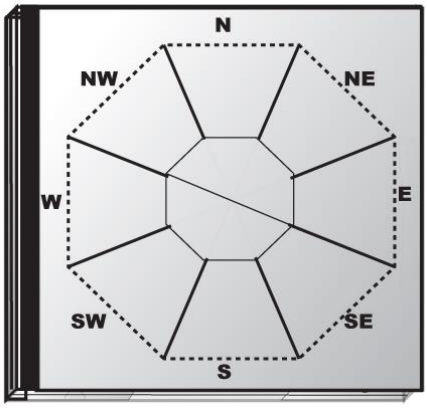
As the Clouds go Bye

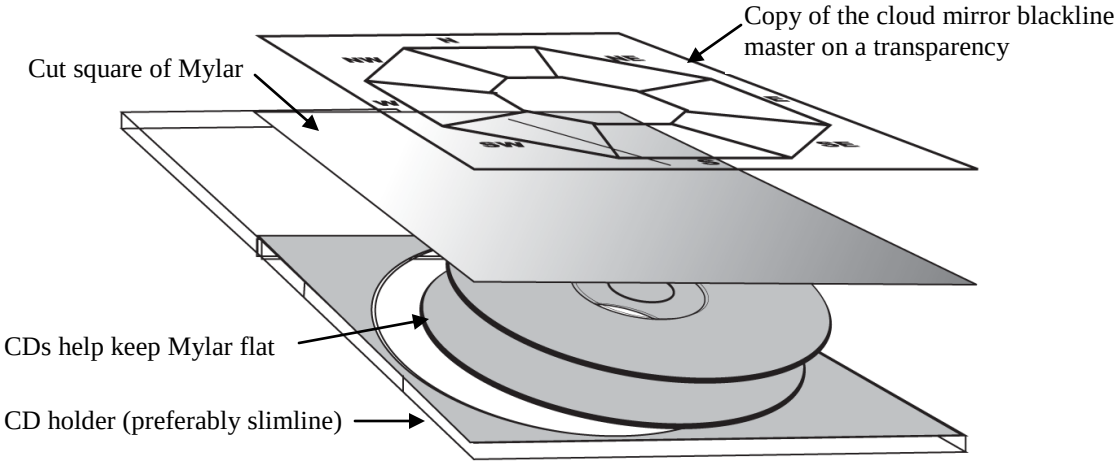
Taking weather data with a mirror for the clouds!



Make a cloud "mirror" and use to do small scale observations of the clouds and sky.

Assembly

1. Copy the blackline master, located at the end of this activity, onto a transparency.
2. Cut out a 12 cm (4-5/8") square containing the grid and compass headings.
3. Place the transparency square inside the cover of a slim CD case with the printed side against the cover. The square should fit under the 4 "D" shaped tabs molded into the sides of the cover. Trim as needed so the transparency will lie flat.
4. Cut a 12 cm (4-5/8") square of reflective Mylar. Hold by the edges and try not to touch the most reflective side, as fingerprints are very difficult to remove.
5. Place the most reflective side of the Mylar against the transparency and under the "D" shaped tabs. Trim as needed so the Mylar lies flat.
6. Place 2 CD's in the CD case. Using 2 will keep the Mylar flat against the cover.
7. Close the CD case and put tape over the sides to keep the CD case closed.



Alternate Assembly (If a copier or transparency is not available)

1. Copy onto paper, or draw, the octagon pattern and the compass headings.
2. Fold the octagon in half and cut out the larger octagonal shape. Unfold.
3. Assemble as listed above using the paper in place of the transparency.
4. To create the interior grid pattern for cloud cover estimation use a straight edge and a permanent marker to draw a grid, which matches the one shown at the end of this activity, on the CD case cover.

Developed and written by Michael Pollock (RAFT); illustrations by Jay Gluckman (RAFT)
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To Do and Notice

1. Place the "cloud mirror" outdoors on a level surface, or indoors for steps 3 and 7.
2. To use as a reflecting nephoscope, a tool to observe cloud movements, first use a compass to correctly aligned the cloud mirror's compass headings.
3. Practice using the cloud mirror indoors by looking at the mirror and having another person move an object overhead that can represent a passing cloud.
4. When a "cloud's" reflection passes over the center of the mirror note which compass heading the cloud moves toward or crosses over.
5. Make and record outdoor observations of cloud movements on different days.
6. The cloud mirror can be use as a model of a nephometer, a device to help estimate the percentage of cloud cover. This small, flat mirror will only show a small part of the sky so different students can obtain very different estimates.
7. To practice making cloud cover estimates indoors first place simulated sky/cloud posters on the ceiling.
8. Look down at the mirror and count the number of grids covered by the clouds' reflections. Count a grid section as covered only if the section is covered 50% or more by the clouds' reflections.
9. Make and record outdoor observations of cloud cover on different days.

The Science Behind the Activity

Air contains water vapor (a gas), of which almost 90% comes from the evaporation of liquid water from oceans, lakes, and rivers. The rest comes from plants and animals with a tiny amount from the sublimation of ice and snow (solid water turning into a gas without first becoming a liquid). The water vapor in the air can condense to form liquid water droplets so tiny that they are invisible. Warmer air can hold more water vapor than colder air; a property utilized in clothes dryers. Under certain conditions the water vapor in the air will form droplets we see as condensation on a cold beverage container, dew, fog, and clouds. Clouds are composed of huge numbers of tiny droplets of liquid water. A typical cloud droplet is a hundred times smaller than a raindrop. Cloud droplets usually form around microscopic particles of dust and salt, rather than condensing solely due to cooling.

Clouds are formed in the Troposphere, the lowest portion of the Earth's atmosphere, 8 to 14.5 km (5 to 9 miles) above the Earth's surface. To avoid turbulence, most commercial airplanes cruise above the clouds, at around 12 km (36,000 ft) in the upper Troposphere.

There are three main cloud types: Cumulus clouds are puffy in appearance – they usually indicate fair weather, unless they get very tall and turn into thunderclouds; Stratus clouds look like flat sheets –they indicate an overcast or rainy day; Cirrus clouds are high, feathery clouds that are made of ice particles. There are a number of more complex types of clouds; their names often indicate their altitude.

See the RAFT Idea Sheet ***Thar She Blows*** for the science behind the wind that moves the clouds.

Cloud cover is the amount of the sky that is covered by clouds and is usually measured in tenths where 0.0 indicates a clear sky and 1.0 indicates the sky is completely with covered with clouds. An earlier system, still used in some countries, measures cloud cover in eighths. The units were called "oktas" ranging from 0 to 8 oktas.

Early nephometers were made with a convex (domed shaped) mirror, so as to be able to see the whole sky at once. The early nephometers divided the sky into 6 sections, 1 central and 5 radiating.

Taking it Further

- Design other grid patterns to divide the sky into 6, 8, or 10 parts.
- Do any countries still use oktas to measure cloud cover?

Web Resources (Visit www.raft.net/raft-idea?isid=486 for more resources!)

- Evaporation - http://ga.water.usgs.gov/edu/watercycleevaporation.html
- Transpiration - http://ga.water.usgs.gov/edu/watercycleevapotranspiration.html
- Oktas - -http://worldweather.wmo.int/oktas.htm
- Water cycle and clouds - http://ga.water.usgs.gov/edu/watercyclecondensation.html

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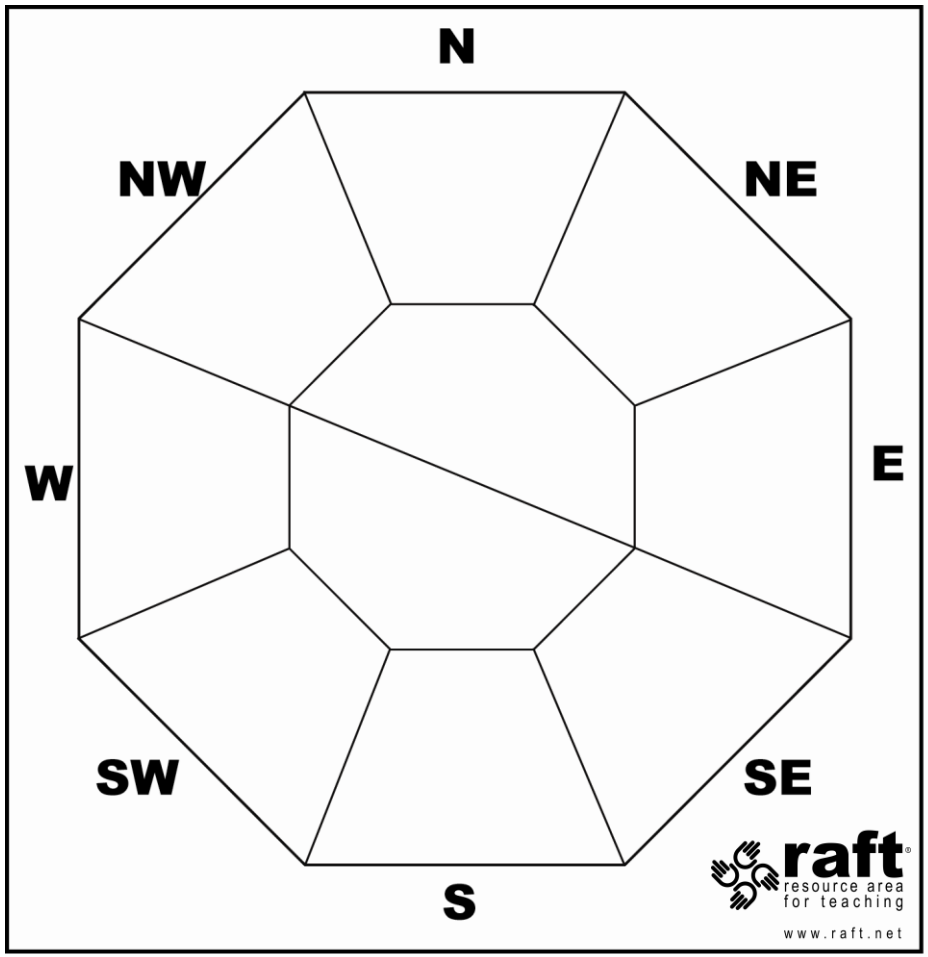

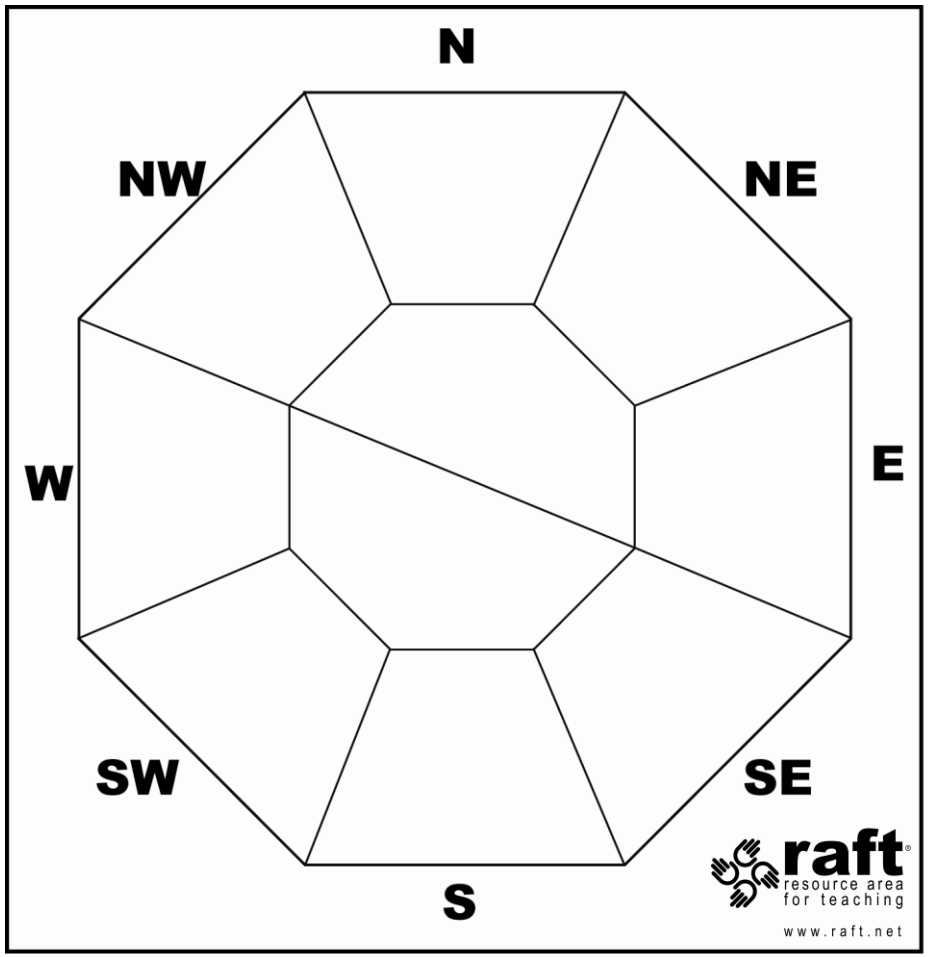

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