CLOUD TYPES AND FORMATION OF CLOUDS

STUDENT EXPECTATIONS

Upon completion of this unit, students will be expected to know or have an understanding of:

- How clouds form
- Cloud types and the weather associated with them
- Use of technology to record clouds
- Basic gas laws

STATE STANDARDS

The following **Colorado** Model Content Standards for Science will be met or exceeded:
(Unless otherwise noted, the standards for grades 5 through 8 are used.)
Standards: 1,2,2.1, 2.2, 2.3, 4.2, 4.3, 5 and 6

The following **Texas** Essential Knowledge and Skills for Science will be met or exceeded:
(Unless otherwise noted, the TEKS for Middle School Science are used.)
TEKS 6.1A,B, 6.2A,B,C,D,E, 6.3A,C, 6.4A, 6.6A,C, 6.8B, 6.9A,B, 6.12B, 6.14C, 7.1A,B, 7.2A,B,C,D,E, 7.3A,C, 7.4A,B, 7.6A,B, 7.14A,B, 8.1A,B, 8.2A,B,C,D,E, 8.3A,C, 8.4A,B, 8.5A,B,C, 8.7A,8.10A,B,C

NOTES TO TEACHER

Too many teachers get bogged down trying to identify the exact type of cloud by using a cloud chart, and not realizing that no two clouds are alike and most of the time they may be looking at more that just one type of cloud. RELAX!! Identifying clouds is not only challenging, it is a judgment call and no one is perfect! That is why building a cloud picture scrapbook is so useful.

The “cloud in a bottle” activity comes from the Project Atmosphere training, but the idea of gas laws was added. The atmosphere of course must obey the gas laws too!

Many meteorologists say that clouds are the greatest free show on Earth, and for good reason. They are among nature’s most beautiful creations, but can be among nature’s deadliest enemies to the farmer, rancher and society in general depending on what the cloud is bringing us.

*Note: Cloud charts can be obtained from your local National Weather Service Office. Just call, write, or e-mail them and they will be glad to help. It is part of their job.

ACTIVITY DESCRIPTION

Since this is an ongoing activity, you might want to assign certain students at different times of the day, and on different days to photograph the clouds that day (if you have clouds that day). After you have a large collection of clouds and other weather related phenomena, then you will need the students to classify and compile the scrapbook. Make certain they have their eyes open for contrails, fog, sun dogs, sun pillars, rainbows etc.

Basically there are three levels of clouds:

- Low level – stratus, stratocumulus, cumulus, and cumulonimbus
- Middle level – altostratus, altocumulus, nimbostratus
- High level – cirrus, cirrostratus, cirrocumulus

If you do not have access to a digital camera, purchase a couple of disposable cameras and have prints developed. (Some Wal-Mart stores have been known to donate the cameras and developing if they know what the project is for.)

MATERIALS

- Digital camera (or other camera as mentioned above)
- Scrapbook (3 ring binder)
- Cloud chart or guide book
- Dividers for the scrapbook/3-ring binder
- Paper and pen

METHODS/PROCEDURES

(You might want to make this a nearly year long project and display it on “parent night”.)

- Students will be assigned to take cloud and weather related photographs during the year, making certain to make notes when, where and what time the photograph was taken.
- At some point all the pictures will be gathered and a scrapbook or “cloud library” will be made.
- Decide which pictures will and will not be used.
- Classify the pictures as low, middle, or high clouds or other weather phenomena

- Mount each picture to a sheet of paper and make certain the date, time, and place are noted on the paper. (It would be nice to have a page with lines for this purpose.)
- Separate the categories of clouds/phenomena by dividers in the scrapbook.
- Have the scrapbook on display to share with visitors/parents.
- On the back of each picture or on a sheet between each picture make notes of weather conditions when the picture was taken and any weather changes that took place after the picture was taken.

*Note: Make certain students do not point the camera at the sun or near the sun as this could damage their eyes or the camera.

RESULTS/CONCLUSIONS

Remember, when you are classifying the cloud pictures, none of them are going to look **exactly** like the clouds in your book or on the cloud chart, and that some may actually overlap and be both low and middle at the same time. Once again, it sometimes is a judgment call, so use your best judgment.

Of course on a class project like this, results will vary, however students should be able to answer the questions on the student activity form. This can be a fun and enriching experience for them as well as for the teacher. You might even have a drawing or contest to see who gets the cloud album at the end of the year.

CLOUD IN A BOTTLE
OR
BOTTLING UP THE GAS LAWS

STUDENT EXPECTATIONS

Upon completion of this activity, students will be expected to know or have a better understanding of:

- How clouds form
- Boyle's gas law
- Charles' gas law
- The strength of a plastic bottle

TEACHER NOTES

This activity came from Project Atmosphere training. The gas law information was added. People weighing well over 250 pounds have stood on 2 and 3 liter soda pop bottles without them bursting.

Boyle's law – there is an inverse proportion between volume and pressure if the amount of gas remains the same. (If volume is decreased, pressure is increased.)

Charles' law – there is a direct proportion between pressure and temperature if the amount of gas remains the same. (Increased pressure causes an increase in temperature.)

By standing on the bottle, the students decrease the volume, and increase the pressure which causes the temperature to go up. When your students get off the bottle, pressure decreases and temperature goes back down.

The reason we used a 3 x 5 note card to tape the thermometer to is to make certain we are taking the inside air temperature and not the temperature of the floor.

When the drops of water (humidity) are added to the bottle and then temperature and pressure released, a cloud will form in the bottle, just as when an air pocket rises in the

atmosphere with humid air and temperature and pressure are released, condensation must occur. The smoke particles from the match are condensation nuclei for the water to condense on, much like dust, smoke, or salt in the atmosphere.

Even the atmosphere must obey the gas laws!

ACTIVITY DESCRIPTION

In this activity, students should work in pairs so as one is standing on the bottle (which is laying on its side) the other can read the temperature inside the bottle.

MATERIALS

- Dry, clear, (no labels) 2 or 3 liter bottle with lid. (3 liter bottles are best because they have a larger opening.)
- Liquid crystal aquarium thermometer
- 3 x 5 note card
- match
- few drops of water
- tape

METHODS/PROCEDURES

- Fold the note card in 3 equal lengthwise sections to make a triangle
- Tape the ends of the triangle together.
- Tape the liquid crystal aquarium thermometer to the triangle
- While the bottle is still DRY, put the triangle into the bottle and put the lid on tightly.
- Lay the bottle on its side and stand on it while your partner watches the thermometer. You might want to put your hand on a desk or something to help you balance.
- Observe what happens to the thermometer.
- Now, get off the bottle, take the lid off, and put a few drops of water in the bottle and shake the bottle making humidity in the bottle.
- Strike a match and immediately blow it out causing the smoke from the match to go inside the bottle.
- Screw the lid back on and repeat the procedure.
- After you have stood on the bottle for 30 to 60 seconds, step off and see what happens!

RESULTS/CONCLUSIONS

1. How was Boyle's gas law demonstrated by this exercise?

2. How was Charles' law demonstrated by this exercise?

3. What happened to the temperature inside the bottle when you stood on the bottle?

4. What was the purpose of blowing smoke into the bottle?

5. Describe how this would be similar to cloud formation.

6. What type of precipitation may be formed if the humid air rises very high in the atmosphere and the updrafts are very strong?