

## **Notes for Suitcase Air and Weather Lesson**

### **LESSON 1: What are clouds and how are they formed?**

#### **1. In advance – for teacher**

- A. Have the teachers prepare name tags for the students.
- B. Tell the teachers that the students will be working in groups of 5 or so.
- C. Ask the teacher to have kids write their best answer to:  
What are clouds and how are they formed?

#### **2. In advance – for presenter**

- A. Hang wall charts: vocabulary, water cycle, Oregon climate
- B. Set up materials for demonstrations: hot plate with Petri dish, magnifying glasses, toaster, paper spiral, candle, match.
- C. Fill plastic bottles (one for each group) 1/3 full with very warm water and keep as warm as possible before use.

#### **3. Introduction**

- A. Give your name(s) and say you are from COAS-OSU
  - 1. tell kids that you are an oceanographer
  - 2. ask for a definition of "oceanographer", why do oceanographers study weather?
  - 3. tell kids you are here to talk about weather and ocean science
  - 4. tell kids to raise their hands to be called on for answering questions
- B. Pass out worksheets

#### **4. Let's learn some basic concepts**

Begin the discussion by drawing the students' attention to a poster with a topographic map of Oregon, and a cross section from the ocean to the high desert.

What are the differences in climate? Tell the class that they will be learning some basic concepts in this lesson that will help them explain this observation.

**4.1 Evaporation and condensation:** This will be the first demonstration. Place the Petri dish with water on the hot plate and ask the students to explain what happens to the water. Introduce the word “evaporation” and explain this process. (Also, direct the attention to the other hot plate(s) with Petri dishes in the classroom. Tell them we will look at them at the end of the class to see what happened to the water the water should have evaporated by then).

Ask them to put their names on the workbook and open to page 1. Tell them to answer the first question. After they have circled the word "evaporation" on their sheets, place a magnifying glass above the Petri dish and observe the fogging of the glass. Ask for the name of this process and tell them to answer the second question. Guide them to circle the word “condensation” on their sheets. Ask for examples where they have observed this process in their everyday life. Emphasize that water that has evaporated into the air is invisible.

**4.2 Convection:** We cannot see air, but we see the motion of the air indirectly by seeing objects that move when the air moves. For example, when the wind blows we see leaves move and flags wave. We will use this paper spiral to indicate the up or down motion of the air. Hold the spiral over the cold toaster and show them that it does not spin which means that the air is not moving. Now turn on the toaster and observe the paper spiral spin. Ask the students if they know why the paper spins. Help them record the answer on page 2 of their worksheets. Ask them if they know what do we call this process and provide the answer. Then ask them to circle “convection” in their worksheets.

**4.3. Relationship between air pressure and temperature.** Guide them to page 3 of their worksheet. Remind them of the experiment they did in class using a syringe to demonstrate air pressure. Remind them that by pushing on the plunger you are compressing the air inside. Tell them that when air is compressed it warms up and when it expands it cools. Have 4 volunteers come to the front of the room and ask them to be air molecules that compress (have them come close together) and expand (have them spread apart), ask again what happens to air when it compresses (it warms up) and when it expands (it cools). Repeat this idea several times. As they do this, pass out the bottles with warm water.

**4.4 Making a cloud.** Water evaporates and warm air rises. As it rises it expands and cools, when water cools it condenses and forms clouds. We will try to make clouds in class. Explain to the students what you have done: put warm water in the bottle. Ask them to answer questions in their worksheets on page 4 (Experiment 3). Have them squeeze the bottle and note that nothing happened.

Direct them to page 5 (Experiment 4). Tell them that what we are missing in the “recipe for a cloud” is the presence of small particles in the air above the water. Dust, smog, sea salt and smoke are examples. Light a candle and hold a magnifying glass in the flame of the candle. Show the class the dark area on the glass. Explain that this dirty spot is made up of small particles and that these are in the air even when we don’t see them. Have them write in the missing ingredient: “dust.”

Have adults drop lit matches into the bottles. Tell them to squeeze the bottle and let go. Remind them that when they squeeze the bottle, the air gets compressed and it gets warmer, as they release the bottle the air will get cooler. Have them write down what happens when they release the bottle. A cloud should form. To see the cloud, clean off any condensation on the inside of the bottle by swishing the water inside the bottle. Putting a dark background behind the bottle will also help visibility. Squeeze and release again and again to see the cloud disappear and re-appear.

## **5. Discussion**

The students are asked then as a group to answer questions verbally. Ask for examples of the processes they have learned today in their everyday life: puddles drying in the summer, its warmer in the attic or upstairs, dishes drying, steam rises, cold glass gets wet outside, car windows fog up.

## **6. Water cycle and convection**

Next direct the students to a diagram of the water cycle and ask them to incorporate what they have learned on a larger scale: evaporation, convection, cloud formation. Explain that in clouds the water droplets are very small, as more and more water condenses the drop sizes will grow and eventually it will rain or snow.

## 7. Recap

A. Remind the students that what they learned today will be used in the next lesson to explain the different climate zones in Oregon, and ask them to prepare for you their best answer to the question: Why is the weather different in different places?

B. Ask them to answer the questions in the last page of their booklets

C. Collect booklets and pre-lesson sheets for assessment.

**NOTE: RELATE EACH STEP IN THE WATER CYCLE TO EXPERIMENTS IN THE LESSON- ASK RATHER THAN TELL**