Clouds and Garden Light

Reference: Adapted from Corvallis School District second grade Air and Weather Science Unit

Overview: Students will observe clouds in the school garden and construct a polytunnel to transmit more light to growing plants.

Subject Area: Science

Grade Level: 2nd

Objective: Students will be able to identify different types of clouds and construct a garden polytunnel.

Next Generation Science Standards:
K-ESS2 Earth's Systems
- **K.ESS2.1** Use and share observations of local weather conditions to describe patterns over time.

K-PS3 Energy
- **K-PS3-1** Make observations to determine the effect of sunlight on Earth's surface.

Prep time: 15 minutes

Lesson time: 30 minutes

Materials needed:
- PVC pipes (¾-1 inch in diameter and 12 feet long; amount needed will vary based on garden bed size)
- Rebar (2 feet long; amount needed will vary based on garden bed size)
- Garden clips or large binder clips
- Large plastic sheet
- White board and markers

Space needed: School Garden

Staff needed: 1-2

Preparation steps:
1. Research how to setup a polytunnel. The provided link has very similar polytunnel construction methods and materials to those used in this lesson (the only exceptions being the use of rebar rather than brackets, and garden/binder clips to attach the plastic sheet instead of staples): http://www.onehundreddollarsamonth.com/how-to-build-a-small-poly-tunnel/
2. Measure your garden bed to determine the number of PVC pipes and rebar needed.

Presentation steps:
In the classroom
1. Discuss the following with students:

a. *What are some of the different types of clouds?* Review cumulus, stratus, and cirrus clouds.
b. *What are clouds made of?* Clouds are made of water droplets and, if they are high and cold enough, ice crystals.
c. *How do you think clouds form?* Clouds form as air rises. As a mass of air rises, it expands and gets colder. The colder air cannot hold as much water as warmer air. As the temperature and air pressure continue to drop, tiny water droplets group together into clumps called cloud droplets. At this point, the mass of air becomes a visible cloud. If the cloud keeps going up, the cloud droplets will clump together and form water droplets. These water droplets are too heavy to float in the air and they fall from the sky as either rain or snow.

2. Ask students, *what do plants need to grow?* Sun, soil (nutrients), water, air, space.
    a. *Which of the above factors do you think are affected by clouds?* Sun and water
    b. *Let's focus on the sun! When it is gray and cloudy all winter, do we see the sun much? How do you think this affects plants?* Plants need a lot of light—due to persistent cloudy conditions during the fall and winter months, they don't get enough light to grow very much.
    c. Ask*, How do you think we can adapt our garden to "capture more sunlight" in the winter months?*
3. Introduce the idea of a polytunnel (also known as a cloche, greenhouse, hoophouse, cold-frame). Explain that the polytunnel captures energy from the sun's rays and transfers it to the plastic, which radiates more light to the plants. In this way, along with capturing thermal (heat) radiation, the plastic helps plants to grow more than plants that are not covered.

<u>In the garden:</u>

4. Lead class outside, and observe the sky. Ask, *what type of clouds do we see today?* Help students to identify the types of clouds, and what that might mean for the weather.
5. Then lead students to the designated garden bed and construct the polytunnel over an already planted or soon-to-be planted area.
    a. Equally place the rebar along the two long sides of the garden bed (about 12-16 inches apart), sinking each piece 18 inches into the ground, with 6 inches remaining out.
    b. Place the PVC pipe over each piece of the exposed rebar on just one side of the garden bed.
    c. Bend each PVC pipe and insert the opposite end over the exposed rebar on the other side of the garden bed.
    d. When all the "hoops" are in place, drape the sheet of plastic completely over the bed.
    e. Secure the plastic at the opposite ends of each hoop using garden or binder clips.
6. If time allows, the class can plant overwintering or cool season crops in this bed.

Conclusion: After the polytunnel is constructed, gather the class together and ask: *How do clouds affect the living and non-living things in the garden? What do you think would happen to our plants if it were cloudy year round?*