Exploring Microclimates

Purpose
To understand factors that influence air temperature or surface temperature and therefore influence microclimates.

Overview
Students will sketch their school grounds and predict how various factors, such as structures and landcover, influence temperature. Students will then select two areas to investigate further and collect either air or surface temperature data at each site. To conclude, students will compare their observations to their predictions.

Time
- Predictions (Task 1-3): approximately 30 minutes
- Outside Temperature data collection and analysis (Task 4-5): approximately 30 minutes

Materials
- Student worksheet or journals
- Alcohol-filled thermometer per student group OR
- Infrared thermometer

Prerequisites
Optional – Create satellite image of school grounds to review prior to Task 1.

Students may wish to review *GLOBE Current Air Temperature Protocol*.

Background

A microclimate is a local atmospheric zone where the climate differs from the surrounding area. The term may refer to areas as small as a few square meters (for example a garden bed) or as large as many square kilometers (for example a small town).

Microclimates exist, for example, near bodies of water which may cool the local atmosphere, or in heavily urban areas where brick, concrete, and asphalt absorb the sun's energy, heat up, and re-radiate that heat to the ambient air; the resulting urban heat island is a kind of microclimate.

Another contributing factor to a microclimate is the slope or aspect of an area. South-facing slopes in the Northern Hemisphere and north-facing slopes in the Southern Hemisphere are exposed to more direct sunlight than opposite slopes and are therefore warmer for longer periods of time.

Some cities or large areas are renowned for their microclimates and may have a wide range of extremes of temperature due to the influence of physical factors.

> From GLOBE's What is Your Climate Classification Climate Foundations Activity
> http://classic.globe.gov/fsl/pdf/2011/What_Is_Your_Climate_Classification.pdf

Preparation

Collect thermometers for each student or for each student group.

It may be helpful to use a satellite image of your school grounds (can be pulled from Google Earth) to lead a discussion about the area surrounding the school grounds and factors that might influence temperature.

What to Do and How to Do It

Ask students to think about their school site. *Does the temperature feel the same at all locations?* If students have trouble with this, you can lead the discussion by asking students if the air temperature is the same in a field versus over an asphalt parking lot.

Tell the students that they will be investigating *microclimates*. A microclimate is a local atmospheric zone where the climate differs from the surrounding area. This can occur on a small scale, such as different areas of their school site, or larger scale such as a city.

Discuss with the students that microclimates can exist because of the different land covers, buildings, and water in an area. All of these factors influence temperature. Tell the students that today they are going to think about factors that might influence temperature. They will make predictions of how those factors will influence temperature then go out to a couple sites and measure the temperature.

After the students sketch their school grounds and predict how the factors will influence temperature, tell the students to go outside and collect temperature data from two sites. To ensure student safety, teachers may need to set boundaries for where students should collect data.

Adaptations for Younger and Older Students

For younger students: Teachers may need to select two locations that have a large contrast and have the entire class investigate those two sites. This data will not be submitted to GLOBE, so teachers may choose to use a different thermometer.

For older students: Teachers may choose not to structure the data collection and instead discuss data collection and experimental design. For example, at the end of task 5 ask the students if all the data was collected in exactly the same way. If not, have the students discuss how the data should be collected and decide on common data collection norms. The students should then go back outside and collect data following these new norms. This is the reason we use Protocols in GLOBE.

Exploring Microclimates
Activity Sheet

Task 1: Think about your school grounds. Sketch a map of your school grounds below, or use an additional sheet of paper.

Task 2: Think about all the factors that may affect temperature in different areas of your school grounds. For example, you may note that some surface areas are covered in asphalt while others are covered in grass. In the table below, record the factors that you think may affect air temperature readings. Next to each factor identify if you think this factor positively or negatively impacts temperature. If you think the factor increases temperature label it with a "+", if it decreases temperature label it with a "-", if the factor does not impact temperature label it with a "=",or if you are not sure label it with a "?".

Describe Factor (i.e. grass surface, brick building close)	**Impact on Temperature +, -, =, or ?**

Task 3: Refer back to your school sketch. Select two areas of your school grounds to compare. Circle both areas on your sketch and label the areas. Predict how the air or surface temperature in these locations will compare with one another.

How will the air or surface temperature in each area compare? Why?

Task 4: Following the directions found in the *Current Air Temperature Protocol or the Surface Temperature Protocol*, collect temperature measurements in each selected area. Record any other details that may impact your comparison.

Date of Observation:			
Area	**Record Area Observations (i.e. patchy grass, plant species)**	**Air or Surface Temperature**	**Other Important Details**

Task 5: Compare your findings to other students' findings. Describe how your predictions compare with observations.

Did your predictions on the microclimate of the two areas you selected match with your observations?

Provide possible explanations.

What other factors could affect air or surface temperature?