Sun, Land, Wind: Building a Sustainable Terrace Town
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SUN

color / light / temperature

- On a sunny day, go outside to let students feel the difference a dark or light color can make. Wrap one student's arm in the light colored cloth and the other arm (of the same student) in dark colored cloth. Place both of their arms in direct sunlight. After a few minutes, ask the student if both arms feel like they are the same temperature, or does one arm feel warmer than the other? Which one feels warmer? (They should answer: the arm in the dark cloth.)

shadow lengths (time of day, time of year)

- Take a walk with your class to find shadows. What are the most interesting shadows they can find? How long are they? Record the time and day. What cast these shadows? Where is the sun? Trace around some of the shadows with sidewalk chalk. Later, come back to the area to see how the shadows have moved and changed shape.
- Play a game of shadow tag twice during the school day with your students. Around noon, students will find their shadows are much shorter than at the beginning or end of the school day.

orientation (N, S, E, W)
sun path
latitude

- Go outside on a sunny day and find a sunny spot. Mark each edge of the paper as north, south, east, or west. Use a compass to orient the paper on the ground to those directions. Place a small object (such as a coffee mug) near one edge of the paper so that the entire shadow of the object falls on the paper. Trace around the base of the object and record the date. Trace around the shadow of the object and record the time. Do not move the object. Wait 5–10 minutes, then trace around the shadow again and record the time. Do not move the object. Repeat the process of tracing the shadow and recording the time every 5–10 minutes for 30–40 minutes. Older students might be introduced to the concept of how latitude affects the path of the sun.

shadows – sun vs. artificial light

- Because the sun is so large and is 93 million miles away from the earth, the sun's rays are always parallel to each other when they hit the earth. Therefore, the edges of a building's shadow always are parallel as well. However, when light comes from a small source such as an overhead streetlight, the light rays spread and the shadows are angled outward from the building's edges.

LAND

population density
the view

topography
permeable vs. impermeable (water runoff)

- Experiment with various types of ground cover and test which material does a better job in retaining the water. Cut five 1" holes in the bottoms of four plastic milk containers. All of the holes should be a similar size and shape. Place each plastic container in its own metal pan. The fifth pan will serve as the control to measure and compare water volume. Fill each milk container with a different material: 6 cups of dirt, 6 cups of sand, 6 cups of rocks / gravel, or 6 cups of wood chips. Pour 4 cups of water into the empty pan. Use the ruler to measure the height of the water. Record this information. Pour 4 cups of water into each of the four plastic containers. Wait 5 minutes for the water to run through the material and drain out into the pan. Then use the ruler to measure the height of the water in each pan. Record this information. Compare these results with the height of the water in the water-only pan. Compare the overall results with the predictions of the class. Which material does the best job in retaining the most water?

green roofs

- If your school building has a flat roof (or a secure place on the ground), you may want to consider having your students plant their own garden. A child's plastic wading pool filled with dirt works well as a container for growing flowers or vegetables. Lettuce and radishes grow quickly.

local materials

- Using the internet, older could students could choose a building material to research and find answers to some of the following questions:
    - How is this building material made?
    - What raw materials are used in the manufacturing process?
    - Where in the country does this raw material come from?
    - What building materials are found and / or produced in Wisconsin?
    - How long does it take to manufacture this product from a raw material?
    - Where is this building material made?
    - How is this building material used in construction?
    - What is the life-span of this building material?
    - What unit sizes does this building material come in?
    - What are some of the qualities of this building material?
    - What are some of the advantages and disadvantages of using this building material?

WIND

wind as a force
active vs. passive systems

orientation (N, S, E, W)
cross ventilation

- Gather a hairdryer and for each team of 3 – 4 students: a large shoebox, scissors, tape, some strips of Kleenex, and a marker. Each team will test out their skills to design the best location for four windows in order to maximize airflow on a hot and windy summer day. The box = model of a room on a hot windy day, while the wind equals the hairdryer – blowing from east to west. Have students mark N, S, E, W directions on top of box – their choice. Each team should cut only 4 openings total in the box. Each opening can be no larger than 25% of any one wall or ceiling surface. Kleenex taped over openings illustrates wind flow as the hairdryer blows through the box. Have students compare their results.

stack effect ventilation (solar chimney)

- On a warm day or on a cold day (when your classroom's heater is working hard) record the temperature of the air near the floor and near the ceiling. Take similar readings throughout your school, choosing rooms with different ceiling heights. Compare the results. Reinforce the fact that hot air rises.