



Turf Mutt Lesson Plan #2

Title: Using Plants to Save Energy

Grade Level: 3-5

Lesson Overview: This lesson allows students the chance to explore the concept of how green space helps control temperatures. In winter, green materials help naturally warm areas and therefore less energy is needed. In the summer, green material helps shade and cool areas, also helping to conserve energy. Energy conservation leads to less use of fossil fuels. This is one of the environmental benefits of green space and landscaping.

Learning Objectives:

Students will be able to:

- Measure and compare temperatures of different environments with various plant material.
- Build a small structure with green roof material and observe the effects plant material has on temperatures.
- Link temperature control to energy conservation.

Time Frame: 2 sessions

One 45 minute session for Engage and Explore with several days for growth of plants

One 60 minute session for Observations, Explain and Extend

Materials for the teacher:

Model structure with no plant material

Thermometers

Online and print resources on energy conservation and fossil fuels

Materials for students:

Thermometers

Building materials such as cardboard, Popsicle sticks, small pieces of wood, tape, glue ,etc.

Small shallow trays (approximately 1cm – 3 cm deep)

Grass or mustard seed and other ground cover seed options

Soil

Computers with internet access

Science Journals

Classroom Activities:

Session 1:

Engage

1. Ask students to share what they know about thermometers and measuring temperatures. Distribute thermometers to students. Allow them to explore using the thermometers to measure various temperatures of objects and substances in the classroom.

2. If the weather permits, take students outdoors and ask them to stand in a sunny spot and then in a shady spot. Ask students to predict the temperature differences in the different areas and record these predictions in their science journals.
3. Students can work in pairs to use thermometers to measure the actual temperature difference in shade and full sun. Ask students to compare their predictions with the actual measurements.
4. If going outdoors is not possible, the students may complete this activity in an area with heat lamps and without heat lamps.

Explore

1. Students will use thermometers to measure temperatures of various landscapes and hardscapes around their school community. Encourage students to measure temperatures of asphalt and concrete versus areas with heavy plant cover or tall grasses.
2. Ask students to record their results on chart paper in the form of a bar graph so that other classmates can observe the temperature differences.
3. Students will then work in small cooperative groups to plan and create a mini model of a building or home with green materials and plants on the roof.
 - a. First, students will use small pieces of wood, cardboard, and Popsicle sticks to create a basic structure.
 - b. Then, students will choose a plant material and grow it on a shallow tray on the roof of their model building. Plant material will take several days or more to grow.
 - c. After several days to a week, students will measure temperatures of their model buildings. Students will compare the temperatures in their buildings with other groups in the class. Students should use a model containing no plant material as the control.
 - d. After students have given the plant time to grow indoors, they may take their buildings outdoors and into other environments to observe the effect that this new environment has on the temperature of their buildings.

Session 2:

Explain

1. Several days after the first session, after students have had 15-20 minutes to explore results, gather students as a whole class to summarize their learning and make conclusions. Ask students to explain why controlling temperatures might be an important factor in environmental science. Why would it be important to keep cool in the summer and warm in the winter? What are the effects of using too much energy to keep cool or warm? How does plant material help the cause of using less energy?

Extend

1. Allow students to further investigate concepts such as energy conservation and the effects of fossil fuels on the environment through viewing videos and reading materials.
2. Allow students to begin to explore the concept of solar energy by exploring the Solar Decathlon as an extension to this lesson. <http://www.solardecathlon.gov/>
3. Allow students to explore some images of green roofs already being used across the world today. Students can visit the following websites. If possible, find a local building and encourage students to visit a location with a green roof.
 - a. http://en.wikipedia.org/wiki/Green_roof
 - b. <http://greenroofs.wordpress.com/contact-us/>
 - c. <http://ngm.nationalgeographic.com/2009/05/green-roofs/cook-photography>
 - d. <http://www.environmentalgraffiti.com/green-living/8-incredible-green-roofs/10914>

Evaluate

Ask students to independently answer the following questions in their science journals.

1. Why are more schools and buildings being built with plant material on the roofs?
2. Explain a cause and effect related to temperatures and green spaces.
3. What are two reasons to conserve energy use?

Home Connections:

1. Ask students to complete a long term project where they will keep track of their energy use at home and experiment with different ways to reduce the use of heating and/or air conditioning in their homes.
2. Encourage students to identify two different buildings that are surrounded by different plants. With an adult, students can interview the home or business owners about the costs of heating and cooling the different buildings and then compare the results.

Use this lesson toward your *Landscapes Across America* contest submission!

1. As students investigate the effects of plant material on temperature during the “Explain” activity, encourage them to think of the effects of local plants on your region’s temperature.
2. Display the photographs that the students took previously and lead a brainstorming session about how these plants may affect the temperature of your community.
 - a. What would happen to your region’s temperature if there was no turf?
 - b. Why are your region’s unique plants important?
3. Record and save your students’ observations to include in your classroom slideshow.

National Science Education Standards Addressed:

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| 4ASI1.1 | Ask a question about objects, organisms, and events in the environment. |
| 4ASI1.2 | Plan and conduct an investigation. |
| 4ASI1.4 | Use data to construct a reasonable explanation. |
| 4FSPSP4.2 | Changes in environments can be natural or influenced by humans. |
| 8BPS3.6 | The sun is a major source of energy for changes on the earth’s surface. |