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Lesson Plan - Powering Our City: Exploring Renewable Energy Sources

Center for Urban Resilience

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LESSON 7: POWERING OUR CITY:

EXPLORING RENEWABLE ENERGY SOURCES

OVERVIEW:

The goal of this lesson is for students to explore their greenhouse gas emissions and potential alternative energy sources. Using an online simulation, students explore the economic and environmental impacts of these different sources and recognize that no single alternative energy source will currently provide enough power for a city. However, by combining power from a number of sources, they can minimize the impact on the environment. Students will also discuss the strengths and limitations of this simulation. Finally students will discuss what alternative energy sources might be most viable in their own area.

SUB-QUESTION:

What are other sources of fuel to power society’s needs?

WAYS OF KNOWING URBAN ECOLOGY:



Students will...

Understand

- Understand the benefits and drawbacks of various sources of alternative energy.
- Recognize the impact of different energy sources on greenhouse gas emissions.

Talk

- Support choices of alternative energy sources to power a simulated city.

Do

- Make informed choices about which energy sources to use to power a simulated city.

Act

No specific goals connected with acting on urban ecology in this lesson.

SAFETY GUIDELINES:

No specific safety issues are associated with this lesson.

PREPARATION:

Time:

2 class periods

- Day 1: Activities 7.1 & 7.2
- Day 2: Activity 7.3 & closing

Materials:

Day 1:

Activity 7.1

Copies of student handouts

Optional: access to computers with Internet or additional information on power sources

Day 2:

Activity 7.2

For each 2-3 students, access to a computer with Internet.

Closing the Lesson

Copies of the *Renewable Potential Map* from the DOE website (http://www.eia.doe.gov/emeu/reps/rpmap/rp_contents.html) *or* a projector and computer with the map downloaded
Student notebooks

INSTRUCTIONAL SEQUENCE

Teacher Background Knowledge:

For more information on energy sources, check out this website by the U.S. Department of Energy (<http://www.eia.doe.gov/kids/energyfacts/index.html>).

For the more technologically inclined, visit TechCrunch's "Alternative Energy: A Guide to Greening Your Home" (<http://tcn.ch/alt-energy-guide>).

Activity 7.1: How would you power your city? Making the choices.

1. Put students into small groups of 2 to 3 students. (These groups should remain the same as the groups that will use the computer in Activity 8.3)
2. Pass out the handout, and review as a class the different power sources in the table.
3. In their groups, students should use the information provided to choose energy sources for their city. Students need to have eight sources of energy but may count one source for more than one (e.g., they could have two coal plants, and would then need to fill in two boxes with coal).

Concluding the Activity:

4. Have a few groups share their energy choices and justifications
5. Tell students that in the next class they will be using an online simulation to see how their choices play out.

Teaching Alternative

If time and interest allows, you might provide students with more information about each power source (either in print or online). A good source of information is the US Department of Energy's kids page (<http://www.eia.doe.gov/kids/energyfacts/index.html>).

Activity 7.2 Powering your city: Modeling your energy choices.

Introducing this activity:

1. Tell the class today they will use an online simulation to test their choices for energy use in a city.
2. Give students some to review their choices and make changes if they'd like.

Running the simulation:

In this activity, students work on computers to model their energy choices

3. Students should work in the same groups as in Activity 8.2. Each group needs access to a computer with Internet access. They will be using the website to <http://www.willyoujoinus.com/energyville/>. The simulation can be started by clicking on the "Play Energyville".
4. Students should first enter their data from their charts into the simulation.
5. Students may have to modify their plan based on the computers limitation. For example, they are required to have petroleum (the simulation was developed by Chevron). If they make changes, they should record these in the space provide on their student handouts. Students should follow along with their student handouts while completing the simulation.

Reflecting on the results:

6. In their groups, have students reflect on the results of their simulation by answering the questions.
7. Once students have completed these reflections, lead a class discussion about the results. Some important points to drive home for students include:
 - Choosing energy sources is a complicated issue with many factors to balance including environment, economics, reliability, and security.
 - Not all power sources are created equal. Some produce no greenhouse gasses, other produce a small amount, while others comparatively produce a lot. Some power sources are relatively inexpensive (like coal) whereas others are currently costly (like solar panels).
 - Renewable energies cannot currently provide enough power to replace fossil fuels, but can contribute significantly to the power grid.
 - *Energyville* is a simulation, and one funded by an energy company. It is therefore bounded by the limitations of being a simulation.
8. Below are a few potential discussion questions to help you guide this discussion.
 - Were your groups surprised by anything in the simulation?
 - Were you surprised the simulation required you to use petroleum? Is this reasonable?
 - Would you make any different changes if you were to run the simulation again?
 - What do you think would happen if we used only petroleum and coal?
 - Do you think this is a reasonable/fair simulation?
 - How would you change it?
 - Do you think the funder had any influence on the choices?

Teaching Alternative

If there is time, you might allow students to run the simulation again, making changes based on their initial results and/or using only sources of energy that emit greenhouse gasses to see the differences in their outcomes.

Closing the Lesson: Focusing on our city.

1. Show students the *Renewable Potential Map* for their region (at http://www.eia.doe.gov/emeu/reps/rpmap/rp_contents.html)
2. What renewables are possible for their area? Do they give off any greenhouse gasses?
3. Have the students reflect in their notebooks:
 - If you were in charge of restructuring where your cities' energy comes from, based on your analysis of the simulation and this map, which power sources would you choose?