Hydroelectric Power

Strand Matter

Topic Investigating water

Primary SOL 6.5 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include
e) the importance of water for agriculture, power generation, and public health.

Related SOL 6.2 The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include
c) nonrenewable energy sources;
d) renewable energy sources; and
e) energy transformations.

Background Information

The first human settlements were established near springs, rivers, and lakes. Reliable fresh water sources and irrigation systems allowed civilizations to grow and flourish. As cities grew, different strategies, such as tunnels, aqueducts, wells, cisterns, pumps, and reservoirs, were employed to access, collect, and store water.

Water is an important resource used in electric power generation. Hydroelectric power plants make use of the kinetic energy of water as it flows downhill through turbines. Also, water is heated in some power plants and turned to steam, which is used to turn turbines to generate electricity.

Materials

- Resource materials on hydroelectric power generation
- Internet access
- Presentation software
- Poster paper
- Markers
- Copies of the attached handout

Vocabulary

alternative source of energy, electricity, energy transformation, fossil fuel, generator, hydroelectric power, nonrenewable, renewable, turbine

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Assess students' knowledge of the importance of water, using the following questions:
   - Where did early Americans establish their first settlements? Hint: Think of Jamestown. *(On bodies of water—rivers, lakes, and oceans)*

- Why were the first settlements established near waterways? *(To have a supply of water; for transportation)*
- How did colonists use water to help with agricultural efforts? *(Irrigation)*
- How did the colonists harness the power of moving water to grind corn and wheat? *(Water wheels operating a water mill)*

Procedure

1. Organize the class into teams of four or five students each, and pose the following scenario:

   The rising cost of fuels (oil and gas) has astounded the people of Virginia. They are concerned about the risk of expending our supply of nonrenewable fossil fuels and becoming even more dependent on other countries for this crucial source of energy. The burning of fossil fuels has added large amounts of carbon dioxide gas into the air. This adds to the Greenhouse Effect and may increase global temperatures everywhere. In response to these problems, the governor has asked the Department of Energy to develop a plan to establish alternative sources of energy in Virginia. To help the Department of Energy, the governor is asking students across the state to research alternative sources of energy. Our class has been assigned the task of researching the use of water to generate electric power.
2. Have each team work together to develop a presentation on hydroelectric power generation. The presentation should include the history of waterpower usage, a description of the hydroelectric power process, a summary of the possibilities for using tidal energy, information about the costs involved, and a list of advantages and disadvantages. Each student should focus on a different aspect of the topic and become an "expert" on that aspect. The presentation should include a written report as well as visual images (e.g., posters, flowcharts, graphs, electronic presentations).
3. On day 1, have teams work on research.
4. On day 2, instruct teams to organize their presentations.
5. On day 3, allow teams to present their presentations, with each "expert" presenting his/her own topic.

Observations and Conclusions

1. Have students draw a picture of the process of hydroelectric power generation and write a brief summary of it.
2. Have students complete the attached Hydroelectric Power Flowchart or create their own.

Assessment

- **Questions**
  - What is hydroelectric power? How is it generated?
  - Why is water essential to agriculture?
  - How is water used in the production and preparation of food?
- **Journal/Writing Prompts**
  - Explain how colonists generated power, using water sources.
  - Identify which use of water is more essential today—use for power generation or use for agriculture. Explain why.

- **Other**
  - Use students' presentations and flowcharts for assessment.

Extensions and Connections (for all students)

- Have each team of students research a different source of energy in the same way as they did in the lesson.
- Have students write persuasive letters to a fictitious state or national leader, making reasonable arguments for increasing the use of alternative and renewable energy sources by Virginians or by all Americans.
- Have students design, build, and test a hydroelectric power source using a natural or artificial water source.

Strategies for Differentiation

- Show a video presentation about the Hoover Dam. (Search the Internet, using the key words "Hoover Dam makes electricity.")
- Have students record research for a category on a graphic organizer, such as a four-square.
- Have students work in pairs to research and develop a category for the presentation.
- Have students locate, cut, and paste pictures as appropriate for the presentation.
- Have students create 3-D representations of aspects of the presentation, such as models or dioramas of river systems.
- Have students work in pairs on a selected topic and then expand in jigsaw fashion to larger groups. Regrouping will continue the flow of information.
- Have students review vocabulary by writing each word on an index card along with its definition, a sentence that uses it, and a picture of the concept.
- Have students record the brainstorming idea, form an outline for the presentation, and record the final product.
- Provide a template for students to use when creating an electronic presentation.
- Provide an organizer to help students summarize their research.

Hydroelectric Power Flowchart

Name: _____ **Date:** _____ **Class:** _____