

Energy Crisis

Science Literacy

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Grade Level	9th – 12th Grade	**Time Frame**	3-5 class period(s)
Subject	Science	**Duration**	200 minutes
Course	Environmental Science		

Essential Question

How do alternative energy resources—such as biomass, nuclear, solar, hydroelectric, geothermal, and wind—depend on natural resources, and which of these resources might be sustainable/economical solutions to the energy crisis?

Summary

Students will research, present, and analyze the pros and cons of various forms of alternative energy.

Snapshot

Engage

Students will watch a trailer for a documentary about Vermont's desire to use renewable energy and compare their thoughts on the video in small groups.

Explore

Students will be given a memo from the town of Greeneville requesting their assistance. Students will select an alternative energy resource and form a company to help Greeneville solve their energy crisis. Students will prepare a 20-minute presentation for Greeneville's town council.

Explain

Students will present to the town council on the benefits, misconceptions, and general process description of their alternative energy resource. The other companies will ask three questions of the presenting company concerning their alternative energy resource.

Extend

Students will work together to complete a pros/cons document for each alternative energy resource based on presentations. Students will discuss their ideas with the entire class.

Evaluate

Students will vote on the best alternative energy resource for Greeneville. Students will cite evidence from their research, peer presentations, and class discussions to support their claim (vote). If possible, students will interact with an energy company representative or selected field expert offering additional information/perspective from an individual in the field.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD301: Select two or more pieces of data from a simple data presentation
IOD505: Analyze presented information when given new, simple information
EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

Next Generation Science Standards (Grades 9, 10, 11, 12)

HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Oklahoma Academic Standards (Environmental Science)

EN.ESS2.6 : Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
EN.ESS2.7 : Engage in argument from evidence for how the simultaneous co-evolution of Earth's systems and life on Earth led to periods of stability and change over geologic time.

Attachments

- EVALUATE Ballot - Spanish.docx
- EVALUATE Ballot - Spanish.pdf
- EVALUATE Ballot.docx
- EVALUATE Ballot.pdf
- EXPLAIN Individual Group Member Evaluation - Spanish.docx
- EXPLAIN Individual Group Member Evaluation - Spanish.pdf
- EXPLAIN Individual Group Member Evaluation.docx
- EXPLAIN Individual Group Member Evaluation.pdf
- EXPLAIN Peer Evaluations - Spanish.docx
- EXPLAIN Peer Evaluations - Spanish.pdf
- EXPLAIN Peer Evaluations.docx
- EXPLAIN Peer Evaluations.pdf
- EXPLORE Alt Energy Sign Up - Spanish.docx
- EXPLORE Alt Energy Sign Up - Spanish.pdf
- EXPLORE Alt Energy Sign Up.docx
- EXPLORE Alt Energy Sign Up.pdf
- EXPLORE Memo - Spanish.docx
- EXPLORE Memo - Spanish.pdf
- EXPLORE Memo.docx
- EXPLORE Memo.pdf
- EXPLORE Project Guidelines - Spanish.docx
- EXPLORE Project Guidelines - Spanish.pdf
- EXPLORE Project Guidelines.docx
- EXPLORE Project Guidelines.pdf
- EXPLORE Project Rubric.docx
- EXPLORE Project Rubric.pdf

Materials

- Memo from Greeneville (one per student or just one copy enlarged and posted in the classroom or projected onto screen)
- Student sign up sheet (one for each class period)

- Presentation guidelines (at least one per group)
- Computer lab (with Internet access) for 2 days
- Projector/computer for presentations
- Pros/cons sheet (at least one per group for each alternative energy company)
- Poster/butcher paper and tape (one for each alternative energy company)
- Ballot (one for every student)

Engage

Show this video to students about Vermont's plan to use renewable energy. Use the strategy Three Sticky Notes to summarize what the video is about. Students should share their Post-it responses in small groups.

Embedded video

https://youtube.com/watch?v=TdNcKwPoALA

Teacher's Note

If Post-its aren't available, students can write their responses on three small pieces of paper.

Explore

Give or read the memo from Greeneville to the students. Ask students to identify alternative energy resources.

Sample Responses

Wind farms, solar, hydro or water, biomass, nuclear, geothermal

Have students sign up for an alternative energy resource company using the attached sign up sheet.

Students who sign up for the same alternative energy resource will form a "company" and work together for the remainder of the lesson.

Each alternative energy resource is limited to no more than five students in any one group.

Go over the expectations for their research and hand out the presentation guidelines to each group.

Give students one class period with optional out-of-class research time to gather information independently.

Teacher's Note

Have students divide the research. For example, one student might be responsible for looking at cost and savings, another student may focus on misconceptions, another on energy processes, and one student may be engaged in research to formulate questions for other groups.

After the initial research is conducted, allow one class period for students to compare research and develop their presentations. Allow part of a third day to finish up presentation preparation.

Helpful Websites For Alternative Energy Research

Alternative Energy AE News Massachusetts Energy and Environmental Affairs Department of Energy

Explain

Allow each company team to present their alternative energy resource to the "town council" aka the teacher and other students not in their group.

Energy companies not involved in the presentation should be filling out the presentation evaluation.

After each presentation have each of the other companies ask the presenting company three questions.

Teacher's Note

Suggested time is 20 minutes per group.

Extend

Ask each company to fill out the pros/cons sheet based on their research and peer presentations.

Using poster/butcher paper, have each group write the name for their energy company at the top and create two columns labeled "pros" on the left side and "cons" on the right side.

Have each company post their paper around the room. Then, ask each group to rotate around to each team's poster and write the pros/cons they noticed on each poster, making sure not to duplicate anything already written. They may place a check next to a comment to indicate duplication. This is usually referred to as a Gallery Walk.

After the class has completed writing pros/cons, give each company team an opportunity to address any of the cons listed as a rebuttal before the final vote.

Evaluate

Have each student vote, using the provided ballot, on the best alternative energy resource for Greeneville, citing evidence from their research, peer presentations, and class discussions to support their claim (vote). .

Optional

Invite a local energy company representative or a selected energy field expert to talk to the class. Have students prepare questions for the representative/expert or invite the visiting expert to listen to group presentations and provide feedback to the teams.

Differentiations

This lesson can be modified for grades 5-10 by limiting the number of alternative energy resources, reducing the amount of time for presentations, or limiting/expanding the requirements for the information that will be presented.

Resources

- Engage Video: https://www.youtube.com/watch?v=TdNcKwPoALA
- Massachusetts Energy and Environmental Affairs: http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/
- Alternative Energy News: http://www.alternative-energy-news.info/
- Alternative Energy Website: http://www.altenergy.org/
- Department of Energy Website: http://www.energy.gov/science-innovation/energy-sources/renewable-energy
- K20 Center. (n.d.). Gallery Walk / Carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). Three Sticky Notes. Strategies. https://learn.k20center.ou.edu/strategy/153