

A NET ZERO PIONEER

8th-10th Grade Discussion Guide

Teacher: Joseph Kanke

GRADE LEVEL: 8-10

TIMEFRAME: 5-7 class periods

MATERIALS: chart paper, markers, sticky notes

KEY WORDS: Net zero, Greenhouse gas, Clean energy, Geothermal energy, Solar panels, Electric grid

SCIENCE CATEGORIES: Energy & Sustainable Science

ACTIVITY SUMMARY

Students will examine how one school has achieved net zero and consider ways in which individuals can be more conscious of their individual energy use. Following a viewing of the video clip, ask students to sketch a representation of Forest Edge elementary depicting how the school has achieved net zero. After they have created their sketch, they will switch with a partner who will be responsible for adding labels to the sketch.

Then, students will engage in a chalk talk. Around the room the instructor will hang posters with a series of questions exploring green energy and energy efficiency. Silently they will move around the room to respond to both questions and other student responses. They will then join a partner to look for themes which will be shared out full class.

Individually students will research ways to be more efficient in their use of energy and then develop a PSA promoting their findings. Students will present to their peers and field questions. In conclusion, students will reflect on what they have learned and consider what they think this information will mean three years in the future.

LEARNING OBJECTIVES

- Explain what net zero means and how a school was able to achieve it.
- Understand and explain how solar and thermal energy work.
- Understand and explain how solar panels work.
- Understand and explain how the electric grid is becoming greener.
- Consider the importance of using electricity more efficiently



BACKGROUND INFORMATION:

This episode covers the concept of net zero and what that could look like in our schools. Net zero is the idea of eliminating your carbon footprint completely.

Forest Edge Elementary School is Wisconsin's first school to achieve net zero. To explain further, net zero is the goal of offsetting the release of greenhouse gas emissions by producing more clean energy than is used. A few key components to Forest Edge being able to reach net zero are: producing the energy they use, making the building super-efficient with insulated walls and windows and using geothermal energy in the ground to heat and cool the building.

To use geothermal energy, the building put into place 99 wells that go 46 feet into the earth. Depending on the season, the building can move heated water in or out of the building to aid in heating and cooling. Aside from the geothermal wells, the school has installed 1,704 solar panels on the school roof which generate energy for the entire building. The building also uses sage glass which prevents the sun's energy to warm the building in the summer and an advanced lighting control system which can detect spaces receiving natural light and dim other lighting sources.

When the school produces more solar energy than it is using, it stores some of the energy in a large battery to use on days when the sun isn't shining or sends the energy back into the electric grid to be used by the neighboring community.

VOCABULARY:

NET ZERO: the term net zero means achieving a balance between the carbon emitted into the atmosphere, and the carbon removed from it.

GREENHOUSE GAS: gasses in Earth's atmosphere that trap heat.

CLEAN ENERGY: energy made from something that is less harmful to the environment.

GEOTHERMAL ENERGY: heat from the earth used as a green energy source.

SOLAR PANELS: a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating.

ELECTRIC GRID: an interconnected network for electricity delivery from producers to consumers.



LEARNING PROCEDURE:

Instructor states, "In the video we learned about Net Zero and how one elementary school has achieved this. Taken what you have learned, sketch a graphic of what the school has put into place without using words."

After students have had time to create a visual representation of Net Zero at the school site, instruct them to exchange their sketches with a partner. That partner will then label and briefly describe the components they recognize from the video. (If students are attached to their sketches the labeling and explanations can be made on post-it notes and placed to the side of the sketches).

Ask students to share, whole group, one thing they noticed in their partner's sketch and how it helped the school achieve Net Zero. Consider hanging the sketches with descriptions around the classroom.

ACTIVITY 1:

Chalk Talk

Inform students that based on their research they will be engaging in a chalk talk. Around the room the instructor will post various chart papers with questions on each one. Suggested questions for the papers are as follows:

1. How does solar energy work? How do solar panels work?
2. How does geothermal energy work?
3. How is the electric grid becoming more green?
4. What are some ways that communities can implement renewable energy in their homes, schools and businesses?

Briefly explain that chalk talk is a silent activity. No one may talk at all and anyone may add to the chalk talk as they please. You can comment on other people's ideas by drawing a connecting line to a new comment. Each student should have a marker to write with.

Allow between 10 and 20 minutes for chalk talk. During this time no one should be sitting down. Comments should add to discussion and not attack another person's comment.

At the end of the silent chalk talk, allow students to form pairs and walk around to each poster looking for themes for five minutes. This portion is not silent, but rather students should be engaging in discussion with their partner. Share out whole class in round robin style until all the noticed themes are exhausted.



ACTIVITY 2:

In the clip we saw several examples of how one elementary school is using electricity more efficiently to achieve net zero. For this activity we want to take into consideration how individuals can use electricity more efficiently. Individually, you will be responsible for designing a public service announcement (PSA) encouraging your audience to change their behavior to be more efficient in their energy use.

If you would like to share a sample PSA in video format, there are many online.

Instruct students that in beginning to plan for their PSA they should consider the following:

1. The intended audience of each PSA and why the particular actors were chosen to play their roles.
2. The tone and persuasive tactic each PSA uses to communicate the message.
3. Whether the videos use positive or negative reinforcement to spark a behavioral change.

Also inform students that although the sample PSA was in the form of the video, there are many other formats of PSA they can choose from. Some examples include, but aren't limited to, billboards, buses, packaging, radio commercials as well as videos.

Students should begin by conducting research and creating a list of actions that individuals can take to use energy more efficiently and then make a decision on which one or few connected actions they would like to highlight in their PSA.

Students will be expected to show their PSA, more deeply explain their thinking and be prepared to field questioning from their peers.



CONCLUSION:

So What?

Have students answer this prompt: What takeaways about using less electricity and moving towards net zero will be important to know three years from now? Why?

EXTENDING THE LESSON

Create a single frame cartoon that uses a minimum of 4 colors. The caption should have a maximum of 2 lines. Beneath your cartoon, identify the science concept being shown. Then provide a paragraph explaining how the cartoon depicts or addresses the concept you identified.

Acrostics are powerful memory devices. To write an acrostic, select a key word that is central to the concept you are studying. Write the letters of that word vertically. Then make a list of companion words that describe the concept. Find a way to partner them with the original letters you wrote vertically. Write an acrostic for: solar energy, thermal energy, net zero or solar panel.

Write a 2-3 paragraph long newspaper article suitable for the school newspaper about how your school could adopt more energy efficient practices to work towards net zero. 1. The article must contain the H5W (How, Who, What, When, Where, Why) about the concept. 2. The article must have at least two interesting facts people could use in common day conversations. 3. There must be a graphic or illustration representing the concept being applied. 4. There must be a caption of 2-3 sentences explaining the graphic.

Develop a 3D model which demonstrates how solar or geothermal energy works.

RELATED LINKS

[About Forest Edge Elementary School](#)

[First Net Zero School in WI](#)

[What is Net Zero?](#)

[How Solar works](#)

[How Geothermal works](#)



Educational Standards

ELA Standards

8th Grade

CCSS.ELA-LITERACY.RI.8.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
CCSS.ELA-LITERACY.W.8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-LITERACY.W.8.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.8.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
CCSS.ELA-LITERACY.SL.8.1.B	Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

- CCSS.ELA-LITERACY.SL.8.1.C** Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
- CCSS.ELA-LITERACY.SL.8.1.D** Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- 8.2.** Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
- 8.4.4.** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- CCSS.ELA-LITERACY.SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- CCSS.ELA-LITERACY.SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

9-10th Grades

- CCSS.ELA-LITERACY.RI.9-10.1** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- CCSS.ELA-LITERACY.RI.9-10.2** Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
- CCSS.ELA-LITERACY.W.9-10.2** Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCSS.ELA-LITERACY.W.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 9-10.6.** Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- 9-10.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- 9-10.8.8.** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

- CCSS.ELA-LITERACY.SL.9-10.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-LITERACY.SL.9-10.1.A** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- CCSS.ELA-LITERACY.SL.9-10.1.B** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- CCSS.ELA-LITERACY.SL.9-10.1.C** Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- CCSS.ELA-LITERACY.SL.9-10.1.D** Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
- CCSS.ELA-LITERACY.SL.9-10.2** Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
- CCSS.ELA-LITERACY.SL.9-10.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6-8th Grades

MS-ESS3-3 Earth and Human Activity

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

Performance Expectation

Grade: Middle School (6-8)

9-12th Grades

HS-ESS3-4 Earth and Human Activity

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

Performance Expectation

Grade: High School (9-12)