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Saving Energy at School Lesson Plan

Consumers Energy's *Saving Energy at School* Lesson Supports the Michigan Grade Level Content Expectations and Common Core State Standards

Sixth

SCIENCE

Inquiry Analysis and Communication

- S.IA.06.12 Evaluate data, claims, and personal knowledge through collaborative science discourse.
- S.IA.06.13 Communicate and defend findings of observations and investigations using evidence.

Inquiry Process

- S.IP.06.15 Construct charts and graphs from data and observations

Reflection and Social Implications

- S.RS.06.11 Evaluate the strengths and weaknesses of claims, arguments, and data
- S.RS.06.16 Design solutions to problems using technology

MATHEMATICS

Statistics & Probability

- 6.SP.5 Summarize numerical data sets in relation to their context

ENGLISH LANGUAGE ARTS

Reading Standards for Informational Text (RI)

Integration of Knowledge and Ideas

- RI.6.7 Integrate information presented in different media or formats (e.g., visually quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

Writing Standards (W)

Research to Build and Present Knowledge

- W.6.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Speaking and Listening Standards (SL)

Presentation of Knowledge and Ideas

- SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
- SL.6.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Language Standards (L)

Conventions of Standard English

- L.6.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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Seventh

SCIENCE

Inquiry Analysis and Communication

- S.IA.07.12 Evaluate data, claims, and personal knowledge through collaborative science discourse.
- S.IA.07.13 Communicate and defend findings of observations and investigations using evidence.

Inquiry Process

- S.IP.07.15 Construct charts and graphs from data and observations

Reflection and Social Implications

- S.RS.07.11 Evaluate the strengths and weaknesses of claims, arguments, and data
- S.RS.07.13 Identify the need for making scientific decisions

MATHEMATICS

Statistics & Probability

- 7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest.

ENGLISH LANGUAGE ARTS

Writing Standards (W)

Research to Build and Present Knowledge

- W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

Speaking and Listening Standards (SL)

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Language Standards (L)

Conventions of Standard English

- L.7.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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Eighth

SCIENCE

Scientific Inquiry

- E1.1D Identify patterns in data and relate them to theoretical models.
- E1.2B Identify and critique arguments about personal or societal issues based on scientific evidence.
- E1.2G Identify scientific tradeoffs in design decisions and choose among alternative solutions.

Scientific Reflection and Social Implication

- E2.2B Identify differences in the origin and use of renewable (e.g., solar, wind, water, biomass) and nonrenewable (e.g., fossil fuels, nuclear) sources of energy.
- E2.4A Describe renewable and nonrenewable sources of energy for human consumption (electricity fuels), compare their effects on the environment, and include overall cost and benefits.

ENGLISH LANGUAGE ARTS

Writing Standards (W)

Research to Build and Present Knowledge

- W.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.

Speaking and Listening Standards (SL)

Presentation of Knowledge and Ideas

- SL.8.4 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.
- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- SL.8.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Language Standards (L)

Conventions of Standard English

- L.8.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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Nine-Ten and Eleven-Twelve

English Language Arts

Writing Standards (W)

Research to Build and Present Knowledge

- W.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.
- W.11-12.7 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.

Speaking and Listening Standards (SL)

Presentation of Knowledge and Ideas

- SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- 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.
- SL.9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspective are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
- SL.11-12.5 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.
- SL.11-12.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Language Standards (L)

Conventions of Standard English

- L.9-10.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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Grades 6-12 Literacy in History/Social Studies, Science, & Technical Subjects

Grade Bands 6th–8th , 9th–10th, & 11th–12th

English Language Arts Standards Science & Technical Subjects

Key Ideas and Details

- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Integration of Knowledge and Ideas

- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Research to Build and Present Knowledge

- WHST.6-8.7 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.
- WHST.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.
- WHST.11-12.7 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.

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Lesson Outcome

The student will analyze the school's energy use and propose energy efficient practices throughout the school.

Rationale / Purpose for Lesson

According to The Alliance to Save Energy, schools spend more money on energy than on computers and textbooks combined. Schools could save money by reducing energy use and becoming more energy efficient. By surveying the school's energy spending, students will familiarize themselves with energy costs in a real-world setting and make recommendations for energy efficient practices based on their findings. Through their recommendations and proposals, students will be able to see how their actions can impact the school.

Resources / Materials Required

- Copies of "Survey the School" handout (below)
- "Let's Save Energy at School" sheet (below)
- Ability for students to speak with administrators or building/grounds keepers to answer questions from the "Survey the School" handout.
- Materials for presentations, such as computer used for slideshow presentations, poster board, markers, or paper for brochures and posters.

Anticipatory Set

The Cost of Electricity lesson plan on our website would be a good introduction to this lesson to give students background knowledge on energy costs and energy efficiency. However, this lesson can also be done independently.

- In a class discussion, have students list all of the ways the school uses energy. Encourage students to think of the energy uses both in and out of the classroom.
- Ask the students what type of things impact energy use. Give the students an example, such as drafty doors or windows that ultimately require the school to either use more heat or set the heating system at a higher temperature.

Procedures

- Break students into five groups. Assign each group one of the areas on the "Survey the School" handout. Have student groups complete the questions for their assigned section.
- Have student groups compile and report their findings to the whole class. If time allows, have students put together a presentation with pictures or other examples of their findings.
- Using the gathered information, have students determine if the school is using energy wisely or if there are areas that could be improved.
- After students consider all of the ways the school uses energy and possible areas of improvement, have each student group select an area of the school to promote energy efficiency. (Areas could include lighting, windows, doors, food service, or appliances such as computers, and heating and cooling.) For their selected area, each group should:
    - Define the problem.
    - Research energy efficient options. (www.energystar.gov, www.eia.doe.gov)
    - List viable options for improvement, including associated costs.
    - Choose one option and create a method for sharing recommendations with the whole class.
- Implement the recommendations of each group. See the "Let's Save Energy at School" handout for ideas on implementing the energy-saving techniques.

Closure

After recommended strategies have been implemented, track monthly energy savings for the school.

Extensions

Have students discuss ways to save energy at home.

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Name: _____ Date: _____

SURVEY the SCHOOL

You know that the school uses a lot of energy to operate, but how does the school's design and energy-using systems impact the school's energy use? Investigate and answer the following questions to become more familiar with your school.

School Overview

1. When was the school built?
2. How many hours per week is the school in use?
3. In addition to the school itself, what else on the school property uses energy? (Such as athletic areas, storage or facilities areas, outdoor lighting, transportation, etc.)
4. What type of energy is used to power lighting, heating, cooling, and water heating?
5. Who is responsible for controlling the school's energy use? Is there a developed system for monitoring the school's energy usage?
6. Is there a developed system for maintaining energy-powered equipment?

Building Exterior

1. What material is the building made of? The roof? What is the general condition of the building exterior?
2. How many exterior windows does the school have? What is the general condition of the windows? (Note any broken windows.)
3. Are there any drafty exterior windows or doors?
4. Examine and record the school's ability to receive sunlight. Which direction does the school face? Are there shade-providing trees near the school? Are there awnings on the windows?

Lighting

1. What type of lighting is used in the school?
2. How are the lights controlled? Can they be turned on and off? In which areas of the school? Can the lights be dimmed? If so, where?
3. Examine and record the natural lighting of the school?
4. What type of lighting is used when school is not in session?

Heating

1. What type of heating and cooling system does the school use?
2. How is the temperature for both heating and cooling controlled?
3. Investigate and record the maintenance of the heating and cooling systems.
4. How is the school's water heated?
5. How is the water's temperature set and controlled?
6. Does the water heating system have any leaks? Are the pipes insulated?

Appliances

1. What type of appliances does the school use, in the office, computer labs, and kitchen?
2. What year were the appliances purchased? Are they Energy Star products?
3. Is there a system developed for maintaining the appliances?
4. What are the procedures for using the appliances?

**Building Survey questions adapted from The National Energy Education Development Project. (www.need.org)

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Let's Save Energy at School!

Here are some ideas. What else can you come up with?

1. Present your survey findings and recommendations to other classes, the school board and administrators, and parent-teacher organizations.
    - Create a pamphlet or brochure.
    - Create a school display or art project to communicate your findings on energy, efficiency, and the environment.

2. Involve the entire school – students, teachers, administrators, food service, main office, and counselors.

3. Get help from outside sources, such as local businesses or non-profit organizations. These outside sources could provide information or presentations on energy efficiency, or they could donate time, money, or materials to help your school become more energy efficient.

4. Establish "energy patrol" teams to ensure new practices are being followed.