Feb. : Unit 2 B: The Sun as the origin of other forms of energy

Content Area: **Science**
Course(s):
Time Period: **February**
Length: **2 Weeks**
Status: **Published**

Unit Overview

The first known source of alternative energy can be traced back to 2000 B.C., when the Chinese used coal for energy. In this concept, you will learn about the history of alternative forms of energy and how the Sun is the origin of many types of energy on Earth.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Explain how the sun generates its energy through fusion.
- Explain how energy from the sun is transferred throughout Earth's systems.
- Explain how the energy in fossil fuels originally came from energy in sunlight.
- Describe the energy transformations that transform the energy in sunlight to the energy in wind, water, and biofuels.

Essential Questions

- **Overarching Question**
    - How is energy transferred and conserved?
- **Focus Question**
    - How is energy transferred between objects or systems?
- **Lesson Questions**
    - Where does solar energy come from?
    - What role does the Sun play in the cycling of materials within and among Earth's systems?
    - How is solar energy transformed into other forms of energy?
- **Can You Explain**

- What sort of energy transformations characterize the relationship between the energy in sunlight and the energy in wind, water, fossil fuels, and biofuels?

Instructional Strategies & Learning Activities

The Five Es

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students are presented with the phenomena of how the Sun affects conditions on Earth. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (90 minutes)

  Students investigate questions about solar energy by using evidence from text and media assets. Students complete a Hands-On Activity and create a digital food web.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how energy from the Sun is created, how it drives Earth's systems, and how it is transformed into other forms of energy.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of the Sun as the origin of other forms of energy as they learn about research conducted by polymer scientists, such as the development of solar shingles to collect the Sun's energy.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Projects: Lemon Battery and Future of Energy Google Slide Presentations.

Integration of Career Exploration, Life Literacies and Key Skills

	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
9.4.8.CT	Critical Thinking and Problem-solving
	Multiple solutions often exist to solve a problem.
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technolgy and Design Integration

Technology is fully integrated with the Discovery Techbook

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections

	contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.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.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.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.
LA.WHST.6-8.8	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.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.10	Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Differentiation

Struggling Students

1. Remind students that it may be useful to make a sketch of the fusion process based on what they have read and seen. If they get stuck, encourage them to re-read the text and view the video, and revise or add to the sketch as needed.
2. Help students reframe or break down Lesson Question 2 by asking questions like, “How does the sun’s energy help move water from the ocean and land into the atmosphere?” and “How does the sun’s energy help

ELL

1. Be aware that some students will need assistance understanding everyday academic terms such as release, drives, convert, and portions. Encourage students to use the Highlight tool to mark portions of the text that they are unfamiliar with so that you can follow up with them later.
2. Make sure students have a thorough understanding of the word “transform” and related terms such as “transformation,” and synonyms such as “change” and “convert.”

Accelerated Students

1. Have students investigate Einstein’s equation E = mc2. What does the E stand for? (energy) What does the m stand for? (mass) How is this equation related to what happens during nuclear fusion in the sun? (Some of the mass of two hydrogen atoms is converted into energy when they fuse.)
2. Challenge students to use their prior knowledge to describe additional paths that solar energy takes as it travels from place to place on Earth, or describe paths in more detail.
3. Have students find out

move carbon from the air into plants and then into the ground?"

3. If students have trouble answering Lesson Question 3, break it down for them by asking, "How do people use sunlight for lighting?", "How do they use it or heating?", "How can it be converted into electricity?"

exactly how a photovoltaic cell works. Students should make a labeled sketch of the system, and a sequence diagram to show the steps involved in generating an electric current from sunlight. What materials do people need to make solar cells?

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

IEP and 504 Accommodations will be utilized.

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

The students will complete two summative benchmark tests administered by the teacher via Google Forms and Google Classroom. There is one benchmark test administered in the middle of the year around January, and a second one administered in May.

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in the unit link above.

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

First Benchmark test will be given during this portion of the academic year covering material taught between Septemeber and January.

Projects:

-Making a Lemon Battery

-Future of Energy presentation

Instructional Materials

See materials located in Unit above.

Standards

MS-PS3	Energy
MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. Assessment does not include calculating the total amount of thermal energy transferred. Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
PS3.A	Definitions of Energy

	Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.
PS3.B	Conservation of Energy and Energy Transfer
	Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
ETS1.B	Developing Possible Solutions
	A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.
	Energy and Matter
	The transfer of energy can be tracked as energy flows through a designed or natural system.
MS-LS1	From Molecules to Organisms: Structures and Processes
MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
PS3.D	Energy in Chemical Processes and Everyday Life
	The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.
MS-ESS1	Earth's Place in the Universe
MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
ESS1.B	Earth and the Solar System
	This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.
MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
ESS1.B	Earth and the Solar System
	The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.