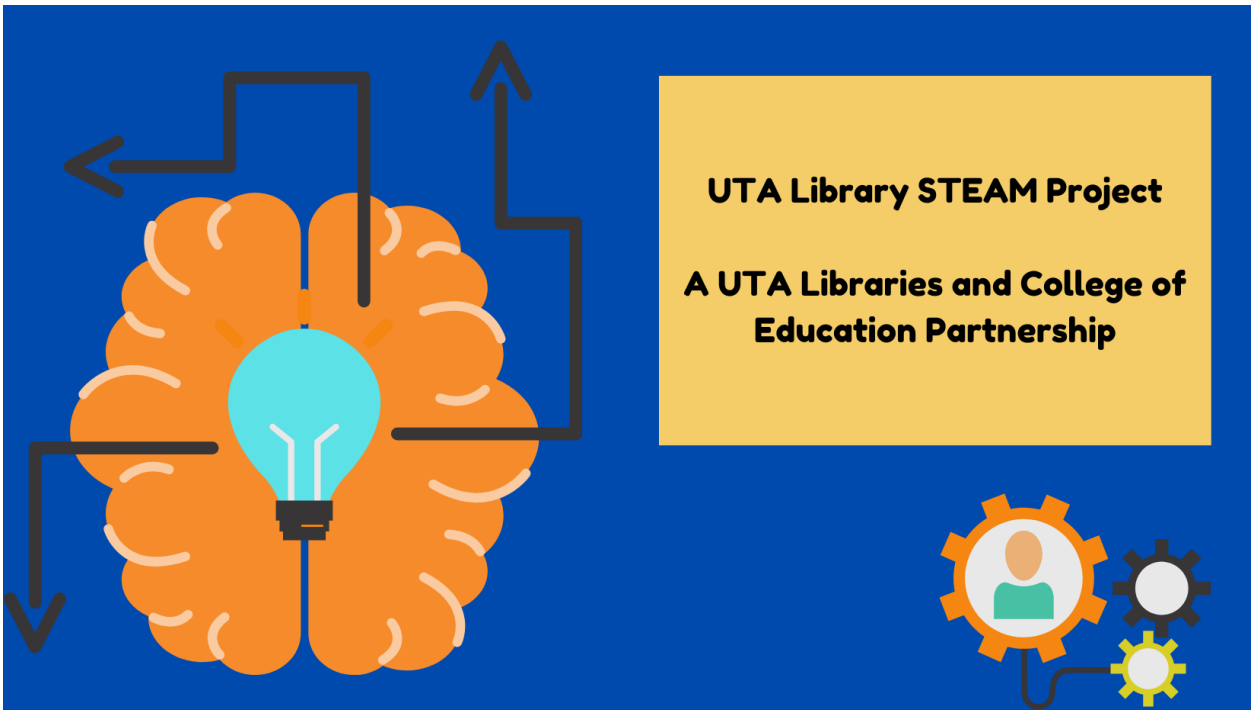


Candidates: Rachel Edwards, Anna Nguyen, Tim Prince Capone, Jacqueline Aguero **Lesson Date:** April 7, 2023 **Grade:** 4-8 **Subject:** Science	**Number of Minutes:** 90
Enduring Understanding and/or Essential Question	What is renewable energy and how can we use it for our future energy use?
Content Standards (TEKS)	5.4.A identify and use patterns to explain scientific phenomena or to design solutions; 4.11.A identify and explain advantages and disadvantages of using Earth's renewable and nonrenewable natural resources such as wind, water, sunlight, plants, animals, coal, oil, and natural gas; 6.8.B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis; 6.11.B explain how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources.
English Language Proficiency Standards (ELPS)	Listening, 2.I demonstrate listening comprehension of increasingly spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs Speaking, 3.E share information in cooperative learning interactions Writing, 5.B write using newly acquired basic vocabulary and content-based grade-level vocabulary

Prior Learning/Prior Thinking	Students should have some knowledge about renewable energy.

Learning Objectives and Aligned Assessments

Objectives	Pre-Lesson Assessment	During-Lesson Assessment	Post-Lesson Assessment
Objective #1: SWBAT: Discuss the advantages and disadvantages of renewable energy and how they have changed over time	**Questioning during Read-Aloud** An interactive read-aloud will activate prior knowledge of renewable energy. Student responses will show what they already know about renewable energy.	**Individual written responses on worksheet** Students will write their individual responses for the disadvantages and advantages chart on the worksheet.	**Student responses during whole group discussion** After the lesson, students will be able to summarize and share what they learned from the lesson. This would include advantages and disadvantages of renewable energy.
Objective #2: SWBAT: Explain how structures such as the wind-powered gravity battery, can store renewable energy for later use.	**Questioning when introducing Full-size Wind-Powered Gravity Battery** Students will be asked to share how they think the wind-powered battery works.	**Individual written responses on worksheet** Students will write their individual responses for the gravity battery questions on their worksheet.	**Wind-Turbine Activity** After students assemble their wind turbines, they will share their responses to the questions from the worksheet.

Assessment and Instruction Accommodations for Students with IEP/504 plans

Giving extra time to complete tasks, printed out questions we will ask throughout the lesson

Assessment and Instruction Accommodations for Multilingual Students

Plenty of visual aids, printed out questions we ask, encourage student groups of mixed ability, provide sentence stems for discussion and written portions

Academic Language

Academic Language Demands and Supports

Demands (Vocabulary, Function, Discourse, Etc.)	Supports
• Discuss renewable energy including the advantages and disadvantages of renewable energy and how renewable energy has changed over time • Write a reflection summarizing a gravity battery and how it affects renewable energy • Define the vocabulary word gravity battery	• Guided notes • Whole class discussion • Teacher modeling

Instructional Procedures

Materials

- 3D prints of turbine and gravity battery
    - Can find an online demonstration video of gravity battery if cannot 3D print one
    - Can build any wind turbine whether 3D printed or not if cannot 3D print parts
- White Board
- Dry Erase Markers
- History of Renewable Energy Timeline -https://i0.wp.com/www.ecomena.org/wp-content/uploads/2020/09/Renewable-Energy-Timeline-scaled.jpg?ssl=1
- Renewable Energy Worksheet
- *Renewable Energy: Discover the Fuel of the Future With 20 Projects* by Joshua Sneideman (Book)
- Ball bearings (approximately 8 for full turbine)
- Sticky notes
- Super glue
- Fan or Blow Dryer

Lesson Component	Activities/Teacher Actions	Guiding Questions
Anticipatory Set/Opening Read-Aloud (10 min)	Intro discussion question: Read some paragraphs from *Renewable Energy: Discover the Fuel of the Future With 20 Projects* by Joshua Sneideman Ask students:	"What is renewable energy?" Questions to ask throughout reading: "What are two renewable resources that were used in the early years?" - e.g., wind, water-hydro, etc. "What are the 3 fossil fuels?" - e.g., coal, oil, natural gas, etc. "90% of the world's electricity is produced using fossil fuels. What are two examples?" - e.g., driving cars, power computer, heat and cool homes, refrigerate food. "What are the harmful emissions caused by power plants when generating electricity?" - e.g., greenhouse gases, carbon dioxide, methane. "What are advantages or disadvantages of renewable energy?"

<u>Advantages and Disadvantages Chart (15 min)</u>	Students will record individual answers on worksheet first. Regroup students and using a white board, draw a t-chart with one side titled, "advantages" and the other being, "disadvantages" Touch on energy storage Transition to Renewable Energy Timeline	Guiding Question: "What happens for solar panels at night or wind turbines when the wind isn't actively blowing? e.g., disadvantages: if wind isn't actively blowing, or if the sun isn't actively shining, then we can't harness that energy This leads to the disadvantage of still having to store the energy for later use "Energy storage is the ability to store energy so that it can be used when we need it." "What are some examples of energy storage?" - (e.g., batteries, hydroelectric dams, etc.) - Guiding questions "what do you have in your house that you need to make a flashlight work or a tv remote work?" explain how batteries store this energy for later use "Today we will focus on two aspects of energy: using gravity to store energy and learning about the history of renewable energy."
Procedures <u>History of Renewable Energy Discussion (10-15 min)</u>	Show students the History of Renewable Energy Poster. Ask students to fill out their timeline on the worksheet as you discuss the events on the timeline Focus on these events on the timeline: - Paleolithic Age - 500-900 - 1300s - 1854 - 1980 - 1991	"Renewable energy has evolved over time and has been used for different purposes."

	Ask students: Students record their individual answers on blank side of worksheet. Regroup and write their answers on whiteboard. Read paragraph from page 7 of book.	"How has renewable energy changed and improved over time?"
<u>Present Full-size Wind Powered Gravity Battery (5min)</u>	Present the full-size wind powered gravity battery and explain how it stores energy for future use. Note that the wind powered gravity battery is a newer development in renewable energy.	Questions to ask: "Does anyone want to try explaining how it works?" "Can you think of any disadvantages of renewable energy this battery could help solve?"
<u>Wind Turbine Building Activity (30 min)</u> <u>Class Discussion (15 min)</u>	Demonstrate how to assemble the wind turbine. (Show how to connect the motor, propeller, and battery.) Encourage students to work together to assemble their own wind turbine. Ask students to think about how they can optimize their wind turbine for maximum energy generation. After class is finished building the wind turbine, bring the class back to whole group and ask students to share their observations and findings: Individuals write their responses on worksheet. Ask students: Pose a question for students to think about:	"As you're assembling your wind turbine, think about how you would change the wind turbine to generate the most energy?" - E.g., positioning the wind turbine, layout, or design of a - wind turbine farm, etc.) "What did you guys notice as you were assembling your wind turbine?" "Think about how your wind turbine works. How does this relate to the history of renewable energy?" "How can you use your understanding of renewable energy to make a difference in your life and community?"
Closure		

Wrap-up Discussion and Reflection (5-10 min)	Flip worksheet to the blank side and ask students to summarize or list what they learned from this lesson. Ask students to share what they wrote. Summarize the main points of the lesson, including the history of renewable energy, and principles of the wind turbine operation. Emphasize the importance of renewable energy and the role that it will play in our future energy needs.	

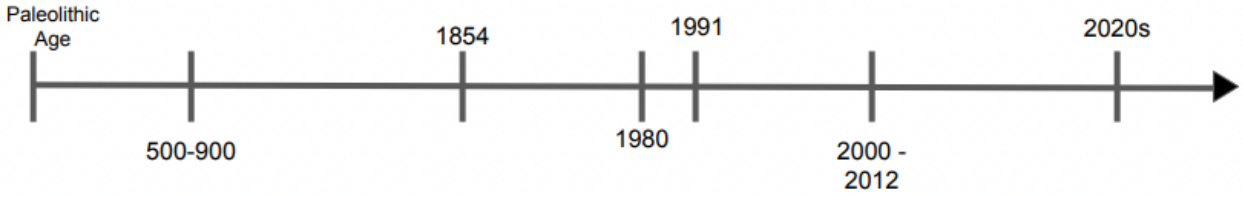
Name:_____

Renewable Energy

What is renewable energy?

Advantages of Renewable Energy	Disadvantages of Renewable Energy

History of Renewable Energy:



Gravity Battery:

What is it?

How does it work?

How does it help?