

Inquiry-Based 5E Model Climate Literacy Lesson

Energy Explorers

Grade Level: 3<sup>rd</sup> – 4<sup>th</sup> Duration: 45 minutes

# Lesson Overview.

Enabling student to see where their energy comes from and the future of renewable energy.

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AGA | Center for Climate, Society and the Environment

Disciplinary Area: Energy Conversion Key Concepts:

- Energy
- Renewable Energy
- Nonrenewable Energy



# Key Lesson Information

# Lesson Development Acknowledgement

This lesson was developed in collaboration with the <u>Gonzaga Science in Action</u>! program. The Science in Action! Program helped test the kits included in these lessons and helped guide Gonzaga undergraduates in developing the accompanying lessons. We thank Gonzaga SIA! for their collaboration and support!

# NGSS Performance Standards Addressed

NGSS Standard 4-PS3 Energy	
Disciplinary Core Idea	Make observations to provide evidence that
4-PS3-2	energy can be transferred from place to place
	by sound, light, heat and electric currents.
Disciplinary Core Idea	Apply scientific ideas to design, test, and refine
4-PS3-4	a device that converts energy from one form to
	another.

#### Learning Outcomes:

Using the energy conversion sets the students will gain the knowledge and experience of energy conversion and will be able to make connections between work with the kits to energy in their lives.

- Students <u>will be given a definition of energy and will identify several sources of</u> <u>energy</u>. They will learn the differences between renewable and nonrenewable energy.
- Students will visibly see how energy is transferred from one source to another.
- Students will be helped to draw connections between the work they did and how renewable energy can help to power cities.

# Key Vocabulary List:

- **Renewable:** Something we will never run out of and can use as much as we want of, like wind, or sunshine.
- **Non-renewable:** Something we will run out of. There is only a certain amount of this thing and once it is all used up, we can't get it back-- like fossil fuels.



# Materials List

This lesson requires the materials listed below and are available in the pre-assembled kits at your school.

Material	Units needed
Energy Conversion Set	6
AA rechargeable batteries	12
1500 lumens Flashlight	6
Sunglasses	24 pairs
Vornado Fan	3
Multimeter	6



# <u>5E model part 1: Engage (10 minutes)</u>

# Introduction and Background

Using the Energy Conversion Set, students will gain hands-on experience with the idea of renewable energy. Using the stations of the energy conversion kit, the students will get to have a tangible example of energy, how it is made, transferred, and converted. Students will be able to draw connections between the kits and the real world.

Goal: Initial introduction to the students about key concepts such as *energy, renewable energy, and renewable energy* through instruction and physical observations.

#### What is energy?

To begin the lesson, students must first get a grasp on what they think <u>energy</u> is and how they use it in their lives. The lesson will begin by asking students to point to things in the room that they think use energy. This should be the lights, the board, computers, etc. We will review what the students identified with the use of images via PowerPoint. Next, students will be asked a series of questions to begin orienting themselves with the idea of energy and transportation.

Questions like:

- How many have ridden in a car? Did you use the bus to get to school?
- Have they seen cars that charge vs cars that use gas?

Explain that all these actions need energy too.

#### How do we get our energy?

Play the BBC Bitesize video that explains where energy comes from and then review the following below:

#### Renewable And Non renewable Energy | BBC Bitesize | science

Engineers and scientists throughout the years have found ways to use energy to heat our homes, turn on the lights in our schools, etc. Engineers use technology and machines like generators to convert things like gas or oil into energy.

We will review the process of gas, how it is extracted from the ground and made into an energy source for transportation. Track the process of oil to gas, gas to power, power to powerlines the run to our homes and schools. Speaking of other types of nonrenewable energy, discuss coal. Through explaining how coal is bad for the air and it is now widely



used, students can get a sense of how nonrenewable resources may be bad for the environment.

- Ask students if they can guess why the burning of coal, oil, gas, etc. may be bad for the environment.

#### Introduction of renewable energy.

It turns out that there is another type of energy! What we call <u>renewable energy</u>. This type of energy uses things like: wind, water, and the sun to make energy. Smart scientists have found a way to take the wind and the heat from the sun to make energy. Today, we are going to make our own renewable energy! Use of physical images to display the different types of energy.

5E model part 2: Explore (25 minutes)

# How is Energy Created?

Today, you will be creating <u>three</u> types of energy. There will be 6 stations of sets where students can split up into groups of 4 to test out the kits.

# Activity: Energy Exploration

Students will be split into groups of 4 to test out the energy conversion kits. Students should focus on the Big Question: How is energy created?

# Essential Concepts

Identify the three types of energy they will be generating: wind energy, solar energy, and hand generators.

In the use of the kits, the students should be guided through the steps below, together as a class and then be given time to explore.

Step 1: Energy maker windmill connects to energy user light.

- Step 2: Energy maker solar connect to noise maker.
- Step 3: Energy maker crank connect to fan.
- Step 4: Energy maker wind to energy user battery.

Step 5: Battery to any attachment.



# **Activity Procedure**

In your station, you will find:



- 1. Using the black and red wires, connect the Wind Mill energy maker to the Light and turn on your fans. The fans will blow the Wind Mill and make it turn.
- 2. Connect the hand crank to the battery charger and charge your batteries by turning the crank in a circle.
- 3. Connect the solar panel to the fan attachment and shine your light on the panel.
- 4. Make your own creations by connecting the energy makers to different energy users.

#### **Reminders:**

- The circled parts: Windmill, Hand Crank, Solar Light are your energy makers.
- The noise maker, fan, light, and battery are your energy users.
- Each energy maker needs an energy user!
- You must match the red and black wires with the red and black holes.



# 5E model part 3: Explain (5 minutes)

# Time to check in and recap!

Moving the windmill with the hair dryer creates wind energy! Using the flashlight's power creates solar energy, and how we move the hand crank to generate energy can also be done by water like a river.

Challenge students to use the information that they just learned and make some of their own combinations with plugging in the wires. Encourage trial and error. If some combinations do not work, that is the point.

Question for reflection as students and use W/set true of an environmental her and in

<u>Question for reflection as students conclude:</u> What type of energy would be good in the summer? In the winter? What would be best for Washington? Arizona?

# Key Takeaway:

Some types of energy might be more suited for different tasks and locations.

# Important Concept Check in: Key Terms

#### Key Terms List:

- **Renewable:** Something we will never run out of and can use as much as we want of, like wind, or sunshine.
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# 5E model part 4: Elaborate (5 minutes)

#### The future is bright!

Using PowerPoint, show what a city run off of renewable energy could look like. Now the engineer can use renewable energy. Some cars and buses can be plugged in instead of going to the gas station.

Even though renewable energy is better for the environment, it is more expensive. To have renewable energy become normal we must change our old systems. We are still improving renewable energy and need super smart scientists like you to help figure out the most efficient ways to implement renewable energy into our cities. Expanding that energy that they created today could one day be used to power entire cities.

<mark>....</mark>.......

Tell someone at home one new thing you learned today!

# <u>5E model part 5: Evaluate</u>

Informal assessment of teacher's choosing.



# By the end of this Lesson

# **Concepts Learned:**

- Students have been introduced to key concepts such as energy, renewable energy, and nonrenewable energy.
- Students can define energy and identify several sources of energy.
- Students can define the differences between renewable and nonrenewable energy.

# Connection/Evidence Gathered:

- Students can draw connections between the activity and how renewable energy can help to power cities.
- Students can visibly see how energy is transferred from one source to another.

#### Learning Outcomes:

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What is it? Where does it come from? How do we use it?



# Nonrenewable Energy sources of energy that can not be easily replaced





# Renewable Energy sources of energy that can be easily replaced



# Let's look at what you'll find in your box!

 $\blacklozenge$ 





# What I learned today

- Where our energy comes from
- The difference between <u>renewable</u> and <u>nonrenewable</u> energy
- Types of renewable energy
- We need energy explorers like you to create renewable cities!







We use energy everyday at school and at home. It powers our cars, computers, phones, heaters, and more! But where does our energy come from?



#### **Energy Explorers!**

Grade: \_\_\_\_\_

# 1. Did this lesson help me understand how energy is created?

- □ Yes! I totally know how energy is created.
- □ I kind of know how energy is created.
- □ No. I do not know how energy is created.

# 2. Can I identify different types of clean energy?

- Yes.
- □ I could label a few.
- No.

# 3. The activities today were fun and helped me learn.

- □ Yes!
- □ Kind of.
- No.

4. What are different types of <u>nonrenewable energy</u>?

5. What are different types of <u>renewable energy</u>?