**5E Template- Science**

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| **Name: Sarah Parton** | **Date:** |
| **Content Area: Earth Science** | **Grade Level(s): 9 - 12** | **Topic(s): Renewable Energy** |

**Standards (SOL): ES 7 b**

*The student will investigate and understand the differences between renewable and nonrenewable resources*

*b: advantages and disadvantages of various energy sources.*

**Objectives (UKD’s)**

*Students will understand at least 3 different types of energy. They will explore and judge which energy source is the best for renewable energy.*

**Materials & Resources**

Small fans

Pinwheels (toys)

Whirly gigs

Wind light

Water

Small tanks

Sticks for stirring

Salt water car

Salt water

Solar powered calculator

Solar powered grasshopper

Solar powered bullet train

Black box (for darkness)

Giant solar bag

Small solar bags

**Safety Considerations**

*Students will need to be careful around the fans. They may stick their fingers into the fan and could get hurt. Students need to be careful the water stays in the tanks or someone could slip and fall if it spills on the floor.pin*

**Engage – Time Estimate: 15 minutes**

*The teacher will take the students outside. The students will observe as the teacher fills the bag up with air. They will watch the bag as the sun warms up the air inside until the bag begins to fly on its own.*

**Explore – Time Estimate: 15 minutes**

*Students will separate into 3 groups (approximately 8 to 9 people in each group). Each group will receive a solar bag, let the air fill it up, and wait for it to fly. Will also learn it takes at least 5 minutes before their bags will fly. Students Each student in the group should have an opportunity to hold the bag while it is flying so they can see how the solar power is pulling the bag up to fly.*

**Explain -- Time Estimate: 10 minutes**

*The teacher and students will return to the class and discuss the advantages of solar power. The discussion will include what happens at night, how long will the bag remain flying if it is overcast or the sun is not out? What happens to the bag there is a hurricane? How will it fly then? Can the bag continue to fly if it does not have the sun to power it?*

**Extend -- Time Estimate: 30 minutes**

*Students will remain in their 3 groups as they go around the room to test the different stations the teacher has already set up. The will be given a lab sheet to answer questions about how much energy is lost? What happens when the energy source is gone? How abundant are the sources? Is it as easy as turning on a light switch or not? Why not?*

 Station 1: Wind

1. Small fans, whirly gigs, pinwheels and wind light
2. Each group will use each one of the wind generated energy source and decide how well it would work for renewable energy.

Station 2: Water

1. Tank, water and sticks for stirring
2. Each group will try the tank with water and see how much of a current is created and decide if it is usable for energy; they will then try the saltwater car to see how much energy is created from the car.
3. They will answer the questions about hydro power

Station 3: Solar Power

1. Calculator, bullet train and grasshopper
2. Students will assemble the bullet train first, they will then use each solar energy source and observe how long it takes before they are able to use each item. They will time if and record the time. They will then put the sources into the black box and once the source is no longer working pull it out of the box and time the sources again to see how long it takes before they are able to use them a second time.

**Evaluate -- Time Estimate: 20 minutes**

*Each student will write a short essay answering the following questions: Which type of renewable energy do they prefer? Why did they choose that source? If they chose wind power, then what do they do for people who live in the desert? If they chose water, which body of water will they use for their source and how will they serve the desert? If they chose solar, how will they save energy for night time use and if they chose to store it in batteries, then what will they do with the batteries when they are no longer useful?*

**Plans for Diversity**

*Disgraphy: only one student will write for the group, the essay may be done on the classroom computer*

*Visually Impaired – student will have to be given extended time to be able to see what is happening with each source*

*Hearing Impaired – student will need to be with a group that can talk quietly about their findings*

*ADHD – student will be given a job for each station such as: do the writing for the group or help set up each experiment or at least given a chance to run the experiment even if the others have already done it*

*LD – student may need extended time to write the essay in order to organize thoughts*

*ELL – student may need to be asked questions to verify if they understand what they are supposed to be doing at each station, but they will also be in a group with others that should understand each experiment.*

*ID – student will be grouped with stronger students, and this student will probably need a shortened assignment for the essay portion of the lesson. This student should only have to write one paragraph, but must answer at least 3 questions from their choice of renewable energy source.*

**Connections**

*The teacher could introduce other forms of energy and then the students could go to the computer lab and look them up on the internet. They could find what is a good source, how it works, how much energy is lost. Then the teacher could ask them about their energy usage. What would they be willing to give up that would satisfy their lifestyle? For example what do they prefer video games over air conditioning?*