ACTIVITY

RENEWABLE ENERGY & INNOVATION CHALLENGE

Time: 200-250 min

Grade Level: Primary Learners

Days of Implementation: 3- 4 days

Designed by: Nouf Youssef

Alignment with STEAM subjects

Science: Understanding the transfer of energy, the various types of renewable energy sources, and the environmental impact of energy sources.
Technology: Exploring the conservation of energy and energy efficiency.
Engineering: Designing and constructing working models through an innovation challenge.
Arts: Creating designs, artistic sketches,and final presentation materials.
Mathematics: Measuring energy output, calculating efficiency ratios, and conducting voltage calculations.

Related or achieved SDGs

- SDG 7: Affordable and Clean Energy: Promotes awareness and hands-on experience with clean energy technologies.
- SDG 9: Industry, Innovation, and Infrastructure: Encourages innovation in renewable energy solutions.
- SDG 17: Partnerships for the Goals: Fosters teamwork and collaboration to address energy challenges.

Objectives

By the end of the class, students will be able to:

- Identify different types of renewable energy and discuss their significance in addressing global energy challenges.
- Research various types of renewable energy, their applications, and the challenges associated with them.
- Design and construct a functional prototype of a renewable energy system.
- Test, analyze, and refine prototypes to improve efficiency.
- Present their findings and reflect on the real-world applications of their projects.

Materials Needed

- Research tools (tablets, books, printed career sheets)
- Small solar panels, mini motors, LED lights
- Wind turbine blades (DIY or 3D printed), water wheels
- Multimeters for measuring voltage
- Cardboard, tape, glue, blueprint templates
- Padlet, Google Forms for sharing research

Lesson Plan

Pre-lesson Preparation (Teacher)

Before starting the lesson, teachers have the option to create collaborative workstations for each phase of this activity. Students work in small groups (3–5 students per group) at designated STEAM stations with tools and materials. Set up the classroom with four designated stations:

1. Research & Sketching Area: Equipped with books, tablets, and drawing materials.
2. Prototype Construction Zone: Consisting of tables for each team that contain design and construction materials.
3. Testing & Data Collection Area: An open space for testing wind turbines, solar cars, and hydro models.
4. Presentation Stage: A designated front-of-class area for students to showcase projects.

Introduction

Energy access is essential for people's well-being, economic growth, and reducing poverty. Our dependence on fossil fuels is unsustainable and harmful to the environment. Therefore, we need to transform our energy production and consumption practices. In this interactive activity, students examine clean energy technologies and their crucial significance in combating climate change.

1. Inquiry & Exploration

Hook**:**

Show a short video or bring up real-life examples of renewable energy, such as wind farms, solar cars, or hydroelectric dams. Some examples include:

- How do wind turbines work? - Rebecca J. Barthelmie and Sara C. Pryor
- How do solar panels work? - Richard Komp
- How Dams Work (Hydro Dams)

Discussion Questions:

- What are the different types of renewable energy?
- How do they work?
- Why is renewable energy necessary for our future?

Group Brainstorming:

- Have the students discuss real-world energy challenges.
- Give them the following prompt: *how can we generate energy in an environmentally friendly way?*
- Through the group brainstorming, students should identify a problem they want to solve.

2. Investigation & Research

Team Research:

Divide the students into groups and assign each team a renewable energy type: wind, solar, hydro, etc. Have the teams research:

- How it works
- Examples of real-world applications
- Advantages and challenges
- Possible models and prototypes for their renewable energy type. For example:
    - Wind turbines, for those who choose wind energy;
    - Solar panels, for those who choose solar energy;
    - Hydroelectric generators, for those who select hydropower energy.

Sketching Designs:

- At the “Research and Sketching” station, have students sketch possible designs for their renewable energy prototype in STEAM Journals or digitally. Some ideas include:
    - Wind turbines Easy DIY wind turbine | Light Wind - Science Snack activity;
    - Solar panels Solar Energy - How To;
    - Hydroelectric Generators IMechE STEM Activity: Water Turbine.

- Before moving to the design phase, students should present their ideas to other members of their group.

3. Implementation & Design

Building Prototypes:

- In the “Prototype and Construction” station, guide teams in constructing their models using provided materials.
- Encourage each of the teams to experiment and modify their designs.

4. Testing & Reflection

Prototype Testing:

- Before moving onto the next phase, have students test the prototypes that they have created. Below, you will find some examples of how students can test their renewable energy prototypes:

- Wind Turbines: Have students measure the voltage generated from their wind turbines using a fan.
- Solar Panels: Have students test these under different light conditions.
- Hydroelectric Generators: Have students test the efficiency of water flow and power output using a sink, tank, river, or other similar body of water.

Data Collection:

- Instruct the teams to record the energy efficiency and performance of their prototypes.
- Support the teams to make modifications to improve their prototypes.

Reflection Questions: (student reflection post-testing prototypes)

- What worked well?
- What challenges did you face?
- How could this prototype be used in real life?

5. Presentation & Action

Final Presentations:

Teams present their prototypes to the class, explaining their functions, real-world applications, and connections to SDGs 7 and 9.

Criteria

- Prototype Functionality (20%)
- Stating the Correctly Achieved or Related SDGs (20%)
- Research and Explanation (20%)
- Teamwork and Collaboration (20%)
- Presentation Skills (20%)

Reflection

- Did students fully understand?
- What should I improve for next time?
- Was the lesson interesting enough for the students?