Renewable Sources of Energy: A Research and Building Unit Plan

Brief description

The purpose of this unit plan is to help students research and share information about Renewable Sources of Energy to understand the alternatives to fossil fuel energy generation within different areas of Canada and the world. This approach acknowledges students as both teachers and learners; they will teach and learn from one another.

Learning objectives

Students will

- identify non-renewable and renewable energy sources
- research a renewable energy source
- develop a model to demonstrate the use of a renewable energy source
- present their research to their classmates

Length of Time

11 class periods

Materials

- Student backgrounders available at the re-energy.ca website:
- Renewable Energy Basics; Solar Heat; Solar Electricity; Wind Energy; Water Power; Biomass Energy; and Other Clean Energy Technologies
- Renewable Sources of Energy student worksheet
- Construction plans to build a solar oven, a vertical axis wind turbine, a water-powered electrical generator, and a biogas generator from the re-energy.ca website••
- Parts to build working models (to be gathered by students)
- Renewable Sources of Energy evaluation criteria

Procedure

Period 1

- Begin the class with a discussion of the energy we use everyday. On a white/black board, list the different ways we use energy. This could be done as a large group discussion or in smaller groups.
- Ask the students to identify the sources of energy for the energy we use everyday. Ask them what they know about these energy sources and what they think may change about the way we use energy in the future.
- Discuss the different types of energy sources. Have the students create a list of non-renewable and renewable energy sources. Discuss the types of energy sources we currently use the most. Ask the students what they know about renewable energy and if they have seen any examples of renewable energy being used in their community or region.
- Distribute the Renewable Energy Basics backgrounder to students and have them read it.

Period 2

- If possible, show David Suzuki's video "Turning Down the Heat."
- Divide the students into groups of three and distribute to each group the re-energy.ca backgrounders on the various renewable energy sources. Have each student read two of the backgrounders and provide an overview of these to the other students in the group.
- Introduce and assign the research and building project as outlined on the student worksheet.
- Have the students choose their project topic and, if desired, a partner to work with.
- Provide the students with needed information to fill in the Timeline for Completion. Ensure that they understand the requirements for each date.
- Assign the homework of gathering the resources for their research, and instruct them to bring these resources to Period 3 (Internet articles, books, etc.). The re-energy.ca website has a list of links to other websites on each of the renewable topics. The students should gather resources from a variety of sources to provide a broad perspective.

Periods 3 to 6

- In Period 3, have the students write each of the evaluation topics as a header on separate sheets of paper. For the rest of Period 3, and all of Periods 4 and 5, allow the students to read their resources and take notes in point form, allocating them to the appropriate topic.
- In Period 6, ensure the students begin to draw their flow chart of the energy conversions and their model diagram.

Periods 7

- Try and arrange Period 7 to fall on a Friday (this will allow you time to mark the students' notes, flow chart and model diagram after the end of this period and before the next one).
- Ask the students to finalize their notes, flow charts and model diagrams.
- At the end of the class, have the students submit their notes for marking.

Periods 8, 9, 10

- In Period 8, return the marked notes. You may choose to provide detailed comments and have the students resubmit their notes, flow chart and diagrams for marking after addressing your comments.
- In Periods 9 and 10, allow time for students to complete their presentation and display materials. They can type their notes at home for their presentations and displays (if you have access to an LCD projector, computer and PowerPoint software, students could create and deliver PowerPoint presentations). Students researching the same renewable energy source could be grouped together (e.g., students researching wind could become a group) and asked to collectively develop one presentation. Ensure that students know the amount of time allotted for the presentation.
- Each student will build a model at home and submit this for grading in Period 10.
- In Period 10, remind the students to practice their presentations at home.

Period 11

- Have the students present to their classmates either individually or in groups.
- Develop a timekeeping system for the presentations.
- Have the students write down any questions they have regarding the energy sources and invite them to ask these at the end of all of the presentations.
- Mark the students' presentations and add this to their earlier mark for a unit mark total.

Tips and extension activities

- For a unit introduction, have students collect their home utility bills for one month and, having blacked out any account numbers, bring copies of them to class. Have students graph the amount of energy they use (this may be electricity, natural gas, or oil) and the cost. Have them estimate the cost of utilities for one year. Discuss options for reducing utility bills.

- Plan an Energy Night for students at which time they can present and demonstrate the findings of their research to their parents. The students are typically very proud of their research and models and enjoy sharing them with their parents. A community night could also be planned to increase the awareness of renewable energy sources among a larger audience.

Renewable Sources of Energy: A Research and Building Project

Student worksheet

Research and Building Project Guidelines and Evaluation

Possible Topics

- Solar Heat
- Solar Electricity
- Wind Energy
- Water Power
- Biomass Energy
- Geothermal Energy
- Hydrogen Fuel Cells

You will need to complete the following tasks:

- Choose a topic from the above list to research.
- Decide whether you will complete the research individually or work together with one other person. Both class time as well as homework time will be needed for completion.
- Research your topic, using at least three reliable sources of information, as part of your homework. The re-energy.ca website is a good starting point for links to other reliable sources of information on renewable energy topics. Be prepared to bring your research resources with you and to complete your research in class. Reminder: the sooner you have gathered your resources, the earlier you can use class time and homework time to work on this project. Keep a list of all of your resource material.
- Once you have gathered your resources, set up your notes so you have each one of the evaluation topics as a header on series of separate pages. Record your research information by means of written notes (point form is allowed), categorizing it according to the headings.
- Draw a flow chart of the energy conversions from the energy source to useable energy. You will also need to draw a diagram of your model.
- Construct a working model.
- Present your knowledge to your peers (suggestions for presentation: PowerPoint, posters, displays, your model and/or handouts).

Timeline for completion dates:

Choose topic by _____.

Resource gathering is to be done by _____.

Resources are to be brought to school by (or before) _____.

Categorized notes (using the evaluation criteria breakdown as headings) are to be done in point form, during class time, and are due on _____.

Completed flow diagram of the energy conversions and notes are due on _____.

Proposed model diagram is due on _____.

Completed model is due on _____ (may be built at home).

Present project on _____.

Evaluation criteria:

Through your research ensure that you address the following issues in your model, presentation (PowerPoint, posters, handouts, etc.) and written notes.

Evaluation topics *For your research topic, ensure you answer or include the following information:*	**Mark**
Describe how the energy source derives its energy from the sun.	**/5**
How is this energy converted to useable energy? Draw a diagram that shows the energy conversion process from the source to useable energy. Label it with numbers to demonstrate the flow of the process.	**/10**
Provide an historical overview of the energy source. How has it been used in the past? How has its usage changed over time?	**/5**
Where (in Canada, as well as other places) is it actually used? (Or, where does it have the potential to be used?) How much energy is produced at a specific site?	**/5**
What costs are involved in setting up the technology to be used?	**/5**
What are the benefits of using this technology?	**/5**
What are its drawbacks, its dangers, its environmental impacts?	**/5**
How does the cost of this energy compare to other energy sources?	**/5**
Other interesting facts.	**/5**
What is <u>your</u> opinion? Be personal! Support your opinion well.	**/5**
Reference list.	**/5**
Model diagram.	**/5**
Model (preferably functional) appropriate to research.	**/20**
Presentation and display	**/10**
Bonus for projects that are well done and completed before the due date.	**/5**
Total	**/100**