



ACT

Students as Teachers

BACKGROUND: Sharing the learning experience deepens student understanding as they learn to be a teacher by explaining the concepts they learned.

Sometimes all a student needs is the time and space to reflect on what he or she has learned, and to the best of his or her ability, share his or her understanding of the concepts with others. In this activity students are asked to try out their thoughts on their teachers, peers, and the community at large and to learn how to most effectively and creatively communicate their ideas and their understanding of the concepts they have learned.

LEARNING OBJECTIVE: Students choose to educate the school and/or greater community about renewable energy forms and concepts in sustainable living practices.

TEACHING THE LESSON: INSTRUCTIONS

1. **Students as Teachers:** This activity gives the students an opportunity to be the teachers. Ask students to review what they have learned about renewable energy. Tell them it is now their turn to teach what they have learned. By sharing information, students are able to retain what knowledge they have gained, as they are now in the position to instruct.
2. Students can choose from a variety of formats on how to impart the facts about renewable energy they have learned to others. First decide on who is the audience: family members, a school assembly, or the general public. As a class or in small groups, decide on the format of presentation.

Presentation formats include:

- a. **Lecture:** Individuals or small groups give 5-10 minute reports on what they learned to an audience of family members and peers. Consider inviting community members at large to this reporting session.
 - b. **Documentary:** Video or photo montage documentary on renewable energy.
 - c. **Performance Artistry:** Small groups perform a skit on what they have learned about renewable energy.
 - d. **Public Display:** The finished product should be of a quality high enough that the students would be proud to display it in a public setting such as the school's foyer, their local library, environmental center, children's museum, or other public setting.
3. Students present and share what they have learned about wind energy in the presentation format of choice.

ADDITIONAL SUPPORT

- On the following pages are examples of student projects that can fulfill the "Act" activity. Some of these activities provide more than just opportunities for student sharing; they can also be used as a place-based service learning project where students develop citizen science skills.

Create a Project

Examples of project ideas adaptable to a variety of ages

Air Quality Comparative Study

Compare air quality in communities with one type of power generation plant. Ask students to formulate a hypothesis on which communities will have better or worse air quality, depending on the plant that is situated in their community. Include a wind farm as one of the power generation sites. Take sample readings from all sites in the study, and compare particulate matter and other air quality factors. What conclusions do your students draw from the research they conducted? What further research may be necessary to gain a deeper understanding of all the factors involved?

Biomimicry

Using nature as the model, have students explore renewable energy technologies and what inspirations in nature lead or are leading the way to advances in the field of renewable energy: <http://www.biomimicryinstitute.org/>

- E.G. Why was the first windmill invented? What was the inspiration? Research the history of the windmill and what led to its creation. Using nature as the model, brainstorm what the windmill mimics in nature. Are there models in nature that can help make the use of wind turbines more acceptable and safer? How might we better protect birds and bats from the turbines?

Clean Energy is Here Now Display

One way to spread the message is through a set of dioramas, tiles or a mural showing many examples of uses of clean and renewable energy technology such as wind turbines, solar panels, solar hot water on a roof, earth sheltered homes, or others you have learned about.

Each student can find out why an energy source or way of using energy is clean and green, imagine a picture to represent it, and then construct a 3-D model in a diorama. With the help of a carpenter, older students can design a mural they paint on a board and hang it on a wall. Box dioramas can also be stacked to create a wall art piece. Short descriptions of each clean energy example should be available to interested viewers.

Energy Watt?

Research concepts in energy conservation and energy efficiency. Students develop a list of criteria, based on their research, of what constitutes an energy efficient building and energy conservation measures. Students then compare their criteria list to their home by conducting an energy survey. Students make recommendations on how their home can be more energy efficient and how they and their family can conserve energy. Survey can also be conducted for the school.

Green Buildings

Encourage students to make a model of a green building technology, either one they saw during their site visit or one they are interested in. Examples include: a solar-electric house; a straw bale

house (straw bales make the sides of these homes); an earth-sheltered house where some of the sides of the structure are partly underground. Student research the home of interest, write-up its features, attributes, and current challenges if any. Create or find a public display area for students' models.

For more background on green buildings and the design process, check into Learning By Design. <http://www.cfafoundation.org/index.php?section=Learning>

Online Solar Data Monitoring Comparison

Visit schools online to compare solar energy output readings. Have students write a report on their findings. There are 50 schools in New York State that collect live data from their solar arrays. For lesson and to view live data from New York Schools, visit NYSERDA's School Power ...Naturally website.

<http://www.powernaturally.org/Programs/SchoolPowerNaturally/InTheClassroom/VirtualTour.asp> or http://www.sunviewer.net/portals/NYSERDA_SPN/

- For more live data activities, visit Heliotronics http://www.heliotronics.com/educators/educ_main.html

The Pen is Mightier...

Participants write poems about sustainable energy solutions; renewable energy, energy efficiency, and energy conservation. Students plan and coordinate a school wide or public poetry reading.

Research a Sustainable Energy Hero

Focus on an invention or innovation in sustainable energy. What inspired the work for this invention or innovation? Write a research paper on the inventor(s) of choice such as Michael Faraday, Charles Brush, Stanford Ovshinsky, etc.

- Create option for this research paper: writing and performing a play on the inventor and invention.

Site Visit Story

Students tell the story of the place they visited and the person they interviewed in some form of presentation.

Suggested formats for story concepts:

- Comic Strips: Start with a page of mini-sketches (thumbnails) telling the whole story before starting in one section. Make several copies of blank comic strips to work in with neat boundaries -use rulers and shapes.
- Books: Use interesting borders. Make borders around photos and drawings. Laminate the front and back. Bind the book for a quality finish.
- Power Point or Video: Think about the most interesting pictures and messages then set out the order and plan the frames.

Create a Project

Examples of projects suitable for middle school and older

Build an Anemometer

Construct an anemometer that will accurately measure the wind speed at your school. They may need school staff assistance in mounting the anemometer in an appropriately high location.

Build and Cook Meals on a Solar Oven

To help you get started, here's a great site to learn about cooking with solar ovens and a lot of global culture around the topic. The Solar Cooking Archive, Solar Cookers International.
www.solarcooking.org

Build a Model Fuel Cell Car

Learn about the exciting technology of hydrogen fuel cells.

Kits are available to make and conduct experiments and races with model cars. To get started, visit www.fuelcellstore.com.

Build a Model Solar Electric Car

Or for the oldest teenagers, mentor a team of builders. There's a whole program called Junior Solar Sprint for kids up through 8th grade—teams can enter their car in race and design events. Adults or even older teenagers could serve as mentors and organizers for a team of middle school age youth. The Northeast Sustainable Energy Association provides fun workshops for anyone interested in helping middle school age teens take on this project. See <http://www.nesea.org/k-12/juniorsolarsprint/>

Create a Lesson or Activity on Energy Generation

Have students research one of the following topics to create an activity that they can facilitate for the class. Suggested activities:

- Compare speed and distance relative to power and energy and how this relates to energy generation
- New York State's current electricity source mix and potential for expanding clean green resources for electrical generation.

Create a Model Wind Turbine

The web site www.KidWind.org has many great instructions on how to build model wind turbines that actually produce power when placed in a strong breeze or in front of a large fan. Write up the benefits of wind power and display these with your creation, or a photograph of it, in a public place.

Create a Web Site on an Energy Issue

You and your class can become experts on a specific topic and help make all the important connections for other kids. For instance, if you chose global warming you might include

information on the carbon cycle, how burning fossil fuels creates carbon dioxide, and how carbon dioxide traps the sun's energy in the atmosphere. You could review other web sites that talk about how global warming may affect our planet's ecosystems, make links, and recommend the best.

Create a Lesson or Activity on Wind Generation

Research wind generation to create an activity that they can facilitate for the class. Suggested topics for activities:

- New York State's current electricity source mix and potential for expanding wind energy for electrical generation;
- Take an electrical generator apart and put it back together.
- Have students videotape the above activity to show it a larger audience. Students can create a step by step power point presentation of how to construct an electrical generator.

Create a Web Site on the Pros and Cons of Wind Energy

Having learned about wind energy; its attributes, possibilities, and applications; and its limitations, create a website that is fact-based and interesting that teaches the greater community about wind energy from a student's perspective.

Decibel Levels Study

Conduct a decibel level study at several wind turbine sites to determine loudness and intensity of sound at various ranges, from directly beneath the turbine out to a 3-5 mile radius. Have students post their findings with comparative values in the communities in which they conducted their study. Posting can be through flyers at community gathering areas and/or local cable television network and local newspapers.

Energy Information Exhibits

You've been to fairs and you know what attracts people to a booth. Can you make a booth fun, interactive, and informative? Develop some demonstrations and models, interactive if possible, and make handouts for visitors. Join an earth day event, or have each individual become an expert on their own topic and run a section of booths or your own fair. Make it a traveling exhibit for classrooms, school assemblies, or other groups.

Home Energy Audit

Learn about energy conservation and save your family money while you are at it by helping your family investigate your home's energy use with the Home Energy Audit calculator at this Lawrence Berkeley National Laboratory site: <http://hes.lbl.gov/hes/vh.shtml>.
To get answers to frequently asked questions, check out: <http://hes.lbl.gov/hes/answerdesk.html>

Inheriting the Wind Video

Create a reenactment documentary on the history of wind power use and where we are today. Students may also conduct interviews with stakeholders in wind generation placement.

Property Values Study

Conduct a study on property values in communities with wind farms. Compare those to communities with other types of power plants such as coal, hydro-electric, and nuclear. Is there evidence that demonstrates a marked increase or decrease in property values depending on the power plant that is situated in the community?

Public Access TV

Get show time. Many adults would likely be eager to help you create an energy panel discussing important issues on air.

Research Distributed Generation

Look into small-scale energy generation options for your community. Do site analysis to ascertain if your community is or could be generating power locally. If your town could generate its own power from renewable energy sources present findings to your town or city. Set up a presentation at a local library. Present findings to your Select Board or Mayor. You may also consider as a project **virtual power plant** options, i.e., a cluster of towns pulling together their resources to create electricity within the local region. Are there towns in your area that could create and distribute power locally? This is one way a small region could be locally sustainable.

Research Finance Options to Incorporate Renewable Energy into Your School

Is your school in a location that could support electrical generation with solar and/or wind energy? Interested in having a wind turbine or a solar array at your school to generate power for the school and operate as a learning laboratory? Visit other institutions that already have wind turbines or PV in operation and collect scientific data.

Research Solar panels and Advancements in Solar Technologies

How does one manufacture a solar panel? What is the solar panel comprised of and how does it work? What advancements are taking place currently to make solar technology more competitive with other sources of energy?

Solar Kinetic Sculpture

Once students have learned how electric circuits, solar panels, and motors work, they can play around and create some sculptures with parts that move from the power of the sun.

- E.g., solar fountains, solar electric toys, simple inventions

Virtual Tour of a Wind Farm

Create a video tour of a wind farm after having visited one or more farms. Students can take their audience inside the turbine and show how it works and pan out to describe siting.