

Energy Teachers Community News

All the ideas we have the energy to print

Newton, MA Winter 2006-2007

A free service of EnergyTeachers.org Inc., the network for curriculum development in energy production and use.
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Dear Readers

From the Editor.

Knowing I was interested in solar cooking, an educator recently wrote me about waiting until good weather to retry some unsuccessful oven-designs. Instead of just replying individually to such concerns, I decided to publish the main story of this newsletter, which shows that I can cook with a simple design even on a windy, below-freezing day with snow all around.

If you look at both page three and the home-page on our web site, you'll see that the two formats are converging. We are trying to fit as much new information as we can onto the home page so that casual visitors can see how much we have to share. The groups of information show the many ways you can share your ideas about energy education: bibliographies, news items, calendar items, posts to a bulletin board, and useful links. Kudos to those of you who shared ideas recently.

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Solar Cooking

Cook outside with the sun on a below-freezing day.

Shawn Reeves, mentored by Sajed Kamal, with input from the classes of Gary Menin and Myra Zuckerman
February 3, 2007

This morning, I grabbed some vegetables from my freezer, poured them into a pot, put that pot in a roasting bag, and put that outside in a simple reflector. An hour later, I checked the oven thermometer I put on top of the food, inside the pot, and it read 170 degrees Fahrenheit. Not only were the vegetables thawed, not only were they hot, they were cooked tender as if they had been steamed for a long time.

Allow me to describe the apparatus and a simple recipe, then I'll share notes about using cookers in the classroom.

Parts

Pot

1 qt., dark anodized aluminum, glass lid, silicone coated handles, non-stick interior. Aluminum conducts heat well from the black exterior to the food.

Stand

A stand for a fondue pot raises the pot above the bottom of the reflector, allowing more sun to hit the pot.

Roasting Bag

A clear plastic bag that's clearly made to be used around hot food. Buy a box of three at a supermarket for about \$2. In the photo, the cooker on the left uses a glass jar instead, and there is no stand.

Reflector

The easiest design to build is simply three sides of a large box, with aluminum pasted on the



The cooker on the left uses an aluminum can painted black, inside a sealed glass jar, without a stand. It works quickly because it allows no heat to be lost through evaporation. Note the long shadows and the snow on the ground. The air was below freezing; winds gusted up to 40 kph, so I had to put weights in the bases.

inside of those three sides. I use bulldog clips to hold the reflector together. I protect the edges with clear package-tape. The box should be much larger than the pot.

Recipe

0.3 kg frozen vegetables or what fits in pot

2 tbsp. olive oil

pinch tarragon

1 tsp. garlic salt

Rinse vegetables. If you want to make a bigger impression, rinse quickly so rinse-water doesn't thaw vegetables.

Cook vegetables in solar oven 1-2 hours or until tender. Go work or play while the solar cooker does all the work, similar to a slow-cooker. Stir in remaining ingredients. The oil is just for flavor; you don't have to worry about sticking/burning to the pan because the solar cooker evenly and slowly heats. Serve with a sunny smile.

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Notes for lesson plans

Don't make this a cookbook lab; allow your students to come up with their own designs and their own questions for research. Although this design is quite practical, there are better designs for specific purposes, such as cooking eggplant or baking.

This exercise can be a lesson about thermodynamics; electromagnetic radiation/light; cooking; technology; hunger; deforestation; energy resources; insolation; aluminum; pasteurization; or materials science. I don't think this cooker should be presented simplistically as a tool to save the world; nor should it be used to try to teach all those concepts at once. I perceive in my students that once they understand some of the above concepts, they will arrive at useful conclusions about this and other technologies without me preaching to them.

The box should be much larger than the pot. The pot should not be much larger than the food in it. You and your students should examine the geometry and physics informing these points.

Notes on building the reflector



Here you see the three flaps, from a corner of a large box, covered with aluminum foil. An overlapping, fourth flap is left connected to help hold the reflector together, and to make a portfolio-shape when the reflector is folded in half for carrying. Aluminum is such a good reflector that the box doesn't heat up at all.



Next you see the reflector fully assembled. See how the fourth flap is clipped to its mate, holding the box together temporarily. I usually put the side with the clip on the bottom, since it weighs more. Notice that the aluminum is not perfectly smooth; this is not a problem at all. Although there is no focal point, this type of reflector bounces light back in the direction from which it came, so use caution and sunglasses when you are on the same side of it as the sun. I used acrylic glue to paste the aluminum to the box, then packing tape to protect the edges.



Finally, since the reflector can be folded into a portfolio-shape, it's easy to carry to wherever the sun and hungry people are..

Renewable Lessons Published for Your Use

Tested curricula for teaching renewable energy are available online

In 2003, the Renewable Energy Trust, administered by the Massachusetts Technology Collaborative, invited applications from math, science, and social studies teachers, grades 4-12, to develop curricular enhancements to bring renewable energy issues and concepts into their classroom teaching.

The following are titles from the published reports available at:

<http://www.masstech.org/cleanenergy/curriculum/overview.htm>

Reports include correlations to learning standards, concept-lists, and references to other resources.

Ashland Middle School: Wind and Alternative Energy

Cambridge Rindge and Latin: Wind, Alternative Energy, Electricity, and Conservation

Cambridge School of Weston: Solar Thermal, Photovoltaic, Wind, and Geo-Thermal

Milton Collicot School and Cunningham School: Energy and Renewable Energy

Runkle School: Wind and Renewable Energy

Southeastern Regional Vocational Technical High School: Wind

Wellesley High School: Electricity and Energy, Wind, Solar, and Climate Change

If you have comments on any of these lessons, please share on our forum:

<http://energyteachers.org/ETOForum/>

Recent Books and Periodicals

New items from the Bibliography at EnergyTeachers.org

Energy Switch: Proven solutions for a renewable future by Craig Morris

Careers in Focus: Energy, Second Edition from Ferguson Publishing Company.

The Essential Exponential! For the Future of Our Planet by Albert A. Bartlett

Vault Guide to the Top Energy Employers by Laurie Pasiuk.

Nuclear power is not the answer by Helen Caldicott.

Energy Exchange, a newsletter from the National Energy Education Development Project.

Exploring solar energy II : activities in solar electricity by Allan Kaufman.

We're soliciting comments on any resources in our bibliography. Use the Books Forum online.

Recent Forum Topics

New items from the FORUM at EnergyTeachers.org

Anyone can read posts, but please register and introduce yourself to others in the network.

Equipment: Dataloggers and Solar Cooking Workshop Notes

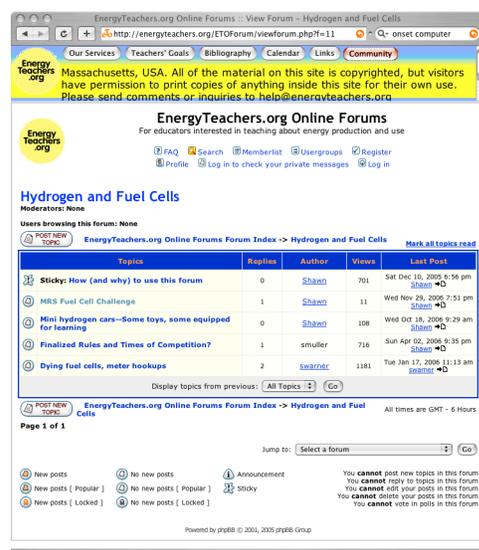
Open Forum: The Politics of Energy in the 21st Century

Open Forum: interesting energy conservation awards

Equipment: Electricity meters-- WattsUp v. Kill A Watt

Lesson Plans: Are you teaching energy tech/engineering in Massachusetts?

Lesson Plans: Building for Environmental and Economic Sustainability software



Recent Links

New urls from the Links page at EnergyTeachers.org

DATAQ Instruments Free Datalogger App for Students: DATAQ Instruments will give away one free DI-194RS (kit for using computer as datalogger, including ADC that plugs into serial port and software) per month (on average) to students for use in their science fair projects.

<http://www.dataq.com/science-fair/sciencefair.php>

Technical Briefs--Practical Action: A treasure-trove of information about energy technologies for people working in the appropriate technology field. Briefs are filled with useful facts and smart analysis of technologies like batteries and solar cookers.

http://practicalaction.org/?id=technical_briefs

Connecticut's Cool It Climate Change Challenge: A contest for CT students to develop solutions to problems associated with Climate Change.

<http://www.coolitchallenge.org/>

Bonneville Power Authority's Curriculum Page: Internal and external curriculum guides for energy-education.

<http://www.bpa.gov/Corporate/KR/ed/6-curricula.htm>

FREE--Energy Teaching and Learning Resources: Federal Resources for Educational Excellence, run by the US Department of Education, organizes links to teaching and learning resources. This is a section on energy science.

http://www.free.ed.gov/subjects.cfm?subject_id=249&res_feature_request=1

Technology and the Environment: Lots of text and drawings about many energy technologies.

<http://www.technologystudent.com/energy1/engex.htm>

News and Events

Headlines from the Calendar and Community News at EnergyTeachers.org

Red, White and Green grants for U.S. Youth: Youth Service America and the Civil Society Institute announce the second round of the Red, White and Green Climate Change Grant. This opportunity offers \$500 to young people in the United States between the ages of 15-25 and to organizations that engage youth ages 15-25.

Cape Cod Energy Education Conference March 8: Hyannis, March 8, 2007; A conference for educators, just \$25 including materials and lunch. Join us for a day of hands-on activities and engaging conversation surrounding the field of energy., how we use it, and how we teach it, just for educators!

National Environmental Education Week April 15-22 2007: Participate in the single, largest environmental education event in US history.

Massachusetts Environmental Ed. Society annual conference March 7 Worcester: Join your fellow teachers both formal and informal, museum and nature center staff, and everyone who is dedicated to providing experiences that educate, excite and commit all generations to preserve the environment and to promote its responsible use.

2007 MA Secretary's Awards for Excellence in Environment Education: The Massachusetts Executive Office of Environmental Affairs is now accepting applications for the 2007 Secretary's Awards for Excellence in Environmental Education. Deadline for submitting your application is March 16th at the close of business.

Green Building Conference, March 13-15, Boston: Northeast

Sustainable Energy Association presents this annual conference for green building practitioners and educators, three days of workshops, speeches, and exhibits about sustainable architecture and technology.

EPA announces new climate change kit for high-school students: Climate CHECK is a free, user-friendly, Excel-based kit that teaches high-school students about the science, drivers, and impacts of climate change and provides them with the knowledge, tools, and resources to increase climate-change awareness and to help them reduce greenhouse gas emissions at their school.

Virtual Field Trip about Renewable Energy by Bureau of Land Management: Register now for a virtual field trip, online at efieldtrips.org, about renewable energy, presented by the US Bureau of Land Management.

Please check the calendar and news page on our website for details and updates