

College: Points to ponder

A few observations to encourage your students to engage in discussions

Overview

Before teaching any of these lessons, read them thoroughly to assure you understand how the activities and worksheets are integral to the overall learning process. You may choose to revise these lessons to address topical needs relevant to your students. Naturally, an enthusiastic teaching style will better engage your students. Be sure to print out all of the activity sheets in advance of any course. References to worksheets appear in **bold**. Narratives appear in *italic*. The lessons presented here are designed specifically for students in college. Additional lessons are available for students in grades 9-12, as well as for adults. Any of those lessons also could be taught to college students. Plus, the auxiliary PDF files may be used to support your lessons. Please note that these lessons and activity are not accompanied with specific graphics, charts, or facts, as these are changing month by month. The percentage of oil imported into the U.S., the kilowatts of electricity generated by wind turbine, and similar statistics are not mentioned so as not to appear outdated by the time you use these courses. These PDF files include a glossary of renewable energy terms and the history and role of energy in civilization. Finally, look for Web addresses that will provide much more information in the overall cover letter.

LESSON 1

How do we waste our resources?

Examples may include:

- Throwing away food.
- Leaving lights, computers, and other electronic devices on when not in use.
- Using cars to drive one or two blocks when walking would work just as well.
- Letting cars idle while in long, unmoving lines such as at drive throughs.
- Using heat or air conditioning on days when the temperature is close to comfortable and/or when windows are open.
- Not using public transportation or car pooling when it would be practical and effective.
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Energy Audit

NOTE: As the instructor you can encourage students to consider choosing a student dorm for this project. On many campuses there may be several dorms built many years apart. Newer dorms will have been built to modern conservation standards. Older dorms may have been retrofitted or may still use older and less efficient technology. Also, a dorm allows your students the option of engaging students directly affect by conservation as it impacts their daily lives. As an alternative, this audit could be used to compare a modern dorm with an older one to measure the overall differences in energy use. Finally, this is an extensive audit. You may choose in advance or with your students to omit certain pages. One additional factor to consider: if you use Page 12 you will need to obtain the NOAA Selected Atlas (<http://ols.nndc.noaa.gov/plolstore/plsql/olstore.prodspecific?prodnum=C00534-PUB-A0001>) to obtain values for your location. Your college library or local television meteorologist may also be of assistance in determining these values. The latter may open the door to obtaining television news coverage of your project.

LESSON 2

Renewable Energy Fair and Panel Discussion

This project requires a dedicated and focused group of students. It will require planning two concurrent events from scratch. Although you will set up working groups, it is probably some students will serve on more than one group depending on the number of actual participants. In order to make this an effective exercise, set hard deadlines to accomplish the tasks on the checklist, and set a target date for the Energy Fair and the Renewable Energy Panel. When these events are scheduled, they will in effect become real while the students are still in the planning phase. This lesson does have specific notes for you as the instructor built into the text. Because of the wide variation of resources across the country, this lesson does not include specific project templates. Your planning efforts will be most successful if they are flexible enough to take advantage of local conditions.

LESSON 3

Literally Drawing Attention to the U.S. Energy Map and One's Carbon Footprint

This lesson transfers the work to your students. Instead of handing them forms and charts, they will need to conduct the research, interpret the results and schedule two energy information events in a public setting. Your role will be to get them started, keep them on course, and encourage them to take charge in developing this project from beginning to end. It is important to note this event is to create awareness of renewable energy as a viable alternative to fossil fuels. The fossil fuel industry already has its own outreach and educational programs in place. In reality, the supply of recoverable fossil fuels is limited and has serious environmental impacts, which means making a transition to renewable fuels is both natural and inevitable.

Why is it easier to believe in something than to take action to support it?

This discussion is critical in setting the stage for this lesson plan. You will want to challenge your students with additional questions as they relate to this topic. Do people use ethanol gas only if it is at the station they pull in to? Do people actually look for gas stations that disperse ethanol? Would you pay an extra dollar on your utility bill if it assured at least 20 percent of your electricity came from wind or other sources of renewable energy? What if you had to pay five dollars for 10 percent? These types of leading questions will spark a discussion among the group on how easy or how hard it is to live up to our ideals in the real world. You will facilitate this discussion, keeping it on track and looking for examples that will strengthen your students' "buy in" for the next steps.

About the Map

Graphics and facts for this map must be prepared by the students for them to gain experience in research and working together within a group. Another reason for this is that the statistics are changing monthly, so current research will be required in order to keep the project topical. You may suggest that graphics be sized small, medium, and large in order to reflect the actual output for an area. As an example, larger wind towers would be placed in the top five states as measured in number of towers or total output; medium wind tower graphics would be used for the next five states, and small towers would be placed in all states that have some installation. The same would apply to all graphics and their respective forms of energy. This option is available to you to recommend to your class.

The actual information displayed on the map may change as well depending on what your students believe is important. Your role as a facilitator is to guide the students, encourage them to explore and bring them back to practical reality when required.

The author has conducted this activity in small scale several time to test its viability as an educational tool. It works well, providing the students explore the information on the recommended websites. Using Google searches can also be helpful to find additional information, providing the students use legitimate sources.

Consider making these comments as appropriate to encourage your students to think carefully about the impacts of fossil fuels and value of renewable energy

What will be the shock to U.S. economy if a transition from fossil fuels to renewable energy is sudden and unplanned due to serious disruptions in supply? Examples of these disruptions could be war in the Middle East, a major refinery fire in the U.S., or a natural disaster such as an earthquake that affects pipelines and thus supply.

In France more than 75 percent of electricity comes from nuclear power. France has a national policy to be energy independent. Because of this, France has low-cost electricity that it exports to other European nations. It is the world's largest exporter of electricity. And, France has electrically powered passenger trains whose average start to stop speeds are in excess of 170 mph. This too is because France has developed a modern and efficient electrical infrastructure.

Nuclear power in the U.S. generates nearly 20 percent of all electricity. All of these operating plants were built before 1974. Opposition to nuclear power by some groups has been intense, effectively reducing public support for future plants. Safety concerns have been heightened due to serious nuclear disasters at Three Mile Island in the U.S. in 1979, Chernobyl in Russia in 1986, and Fukushima in Japan in 2011. Concerns have been expressed about the disposal of radioactive nuclear fuel, and of the ability of nations to use nuclear power plants to generate the material needed to build nuclear bombs.

The U.S. alone has a vast supply of coal, especially low-sulfur content coal in Northeastern Wyoming and Southeastern Montana. Some types of coal mining cause significant environmental damage. Some forms of coal release hazardous or harmful emissions when burned. Yet coal is an affordable and reliable source of energy. It is transported to power plants within the U.S. and is exported to other nations. Coal causes relatively little environmental damage in the event of spills in transit. In some situations, power plants are built next to coal mines to greatly minimize delivery costs. Ten years ago coal fired power plants produced half of all U.S. electricity. That has dropped to 40 percent, mostly replaced by natural gas that has become much less expensive. Natural gas also has the benefit of producing lower amounts of undesirable emissions.

Coal and crude oil fuel the world. High energy content, worldwide availability, and extensive mining, refining, and delivery systems assure these fuels a dominate place across the globe. When it comes to transportation, as in planes, trains, trucks, and automobiles, petroleum products have no equal. Gas, diesel fuel and jet fuel move people and products. Farming and food production depend on crude oil. That said, crude oil makes a big mess when it spills. Offshore oil wells have exploded (BP in the Gulf of Mexico, 2010), gas pipelines have ruptured and burned in residential neighborhoods (Mounds View, Minn., 1986), huge oil tankers have broken open at sea and caused huge environmental disasters (Exxon Valdez near Alaska, 1989), and oil wells have been set afire by terrorists and as a result of war (the Persian Gulf War, Kuwait, 1991).

Gasoline as a car fuel has a built in advantage based on historical market dominance. The oil companies grew hand in hand with auto manufacturers and highway building efforts. Gas was the only choice really offered to motorists. Gas provides a lot of power for its volume and weight. It works well in the type of engines used in cars, trucks, many airplanes, small boats and lawnmowers. With some 150,000 gas stations nationwide, this fuel is incredibly convenient and completely entrenched in the American way of life.

Renewable forms of energy such as water and wind have been in use for hundreds of years. Biofuels have been around since the beginning of the automotive and aviation industries. Scaling up all of these industries to offset fossil fuels is challenging for technical reasons, and because of opposition by industries and individuals who have something to lose. And because of the Not In My Back Yard (NIMBY) attitude. If one community welcomes a wind farm, but the next one down the road objects to having the transmission lines cross the area, who wins and who loses, especially when you consider the regional impact beyond either community. Money has a way of silencing critics. Not sharing in the wealth has a way of creating critics.

Although the energy industry is extremely complex, there is overall agreement by professional that affordable and available fossil fuels will run out and that these fuels cause significant environmental damage that has been accumulating for centuries. The question is how to balance convenience against true costs. The U.S. military spends billions of dollars every year to maintain safe passage of oil tankers in and out of the Middle East. Terrorism, wars, and embargoes that cripple the world economy are directly linked to the production of oil. Mountain top mining of coal in the eastern United States has caused environmental and economic damage to communities.

Some people believe wind turbines compromise the landscape. Consider that rural areas also have power lines, larger electric transmission lines, grain elevators, water towers, processing plants and smokestacks that also “litter” the horizon. We tend to be blind to what we grew up with but sharply focus on what represents something new. Naysayers are common in our society. It is easy for people to be critical of anything, far more difficult for them to offer viable alternatives or solutions. People will take sides on an issue without necessarily giving consideration to the opposite point of view, or listening with an open mind to professionals who are well versed on technical matters. You have both a right and responsibility to research these topics, ask tough questions of the people and companies and agencies involved, and to have a voice in your energy future.

–College Sources: U.S. Energy Information Administration, U.S. Department of Energy, U.S. Department of the Interior, Bureau of Reclamation, American Wind Energy Association, Growth Energy, Illinois Department of Natural Resources, The Center for Green Schools, U.S. Green Building Council, LEED Certification, National Renewable Energy Laboratory, Midwest Renewable Energy Association, Center for Rural Affairs, National Energy Education Development Project, the PEW Environmental Group.