

To our teachers:

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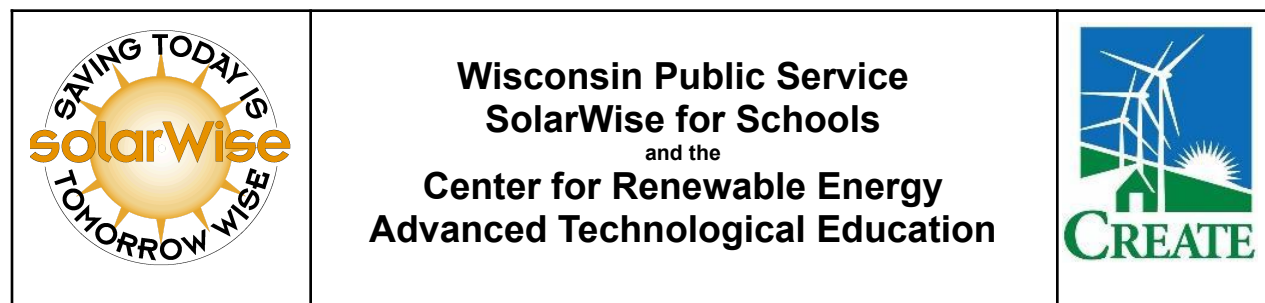
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It Pays To Save In Your Home

INSTRUCTOR'S GUIDE and ANSWER KEY

Grade Level: High School, Technical College, Community College
Lesson Length: 3-6 hours, depending on planning, coverage, emphasis, and student reporting method
Author: Scott Liddicoat
Created: January, 2023

Objectives:

- Students will understand the energy savings problems faced by most homeowners.
- Students will research energy savings questions faced by most homeowners.
- Students will attempt to maximize savings, while minimizing costs in developing realistic answers to energy savings questions.
- Students will summarize and report on their research.
- Students will analyze class research to prioritize recommended homeowner energy savings.

The Main Thing:

Energy savings always come first—*before* renewable energy. Energy efficiency, conservation, and savings are almost always more economical than placing a renewable energy generating system (solar, wind) on or around a home. Even though renewable energy is the foundation of the SolarWise program, energy efficiency, conservation, and savings must always be considered first.

Conservation and renewable energy have a lot in common. As students will see in this activity, energy conservation saves money in the long run, and so can renewable energy systems. Conserving energy also means preserving natural resources and saving on air emissions. Renewable energy systems do the same. In addition, one of the themes of another lesson, **Building a Passive Solar Home**, is reducing a home's energy load profile. Conserving energy reduces a home's energy load profile too, so this activity links nicely to that one. Bring these parallels up as you proceed through this unit and this lesson.

In this activity students will consider many common, potential energy saving situations in a home, research questions surrounding them, and report on their findings. Students will learn that saving energy comes first, well before applying renewable energy technologies. They will also learn which kinds of energy saving should always be considered and applied first

Activity and Teacher Notes:

The teacher of this lesson has great flexibility in how to teach it and will have to make several decisions about how to proceed through the lesson before beginning. Class, class size, the grade level of the students, time, and the materials available will all play a role in these decisions.

It Pays To Save In Your Home is designed to have students perform assigned research on energy savings, then report on research-based answers to questions they have been directed to answer. Twenty-two different energy savings situations are presented. Decisions will have to be made on which of the twenty-two situations to use (if not using them all), and whether or not to have students work individually or in groups. As written, the lesson assumes that student research will be done online. A decision will also have to be made on the method students will use to report their research findings.

The lesson is written to have students make a poster for display of their research findings. Whole-class conclusions can then be drawn by having all students circulate throughout the room to view all of the posters--a "poster fair." But the lesson could easily be modified to have students produce an oral report, a written report, or a PowerPoint presentation. The teacher of this lesson will need to set timelines and guidelines for student research, poster production, and the concluding "poster fair."

A straightforward approach for using this lesson would be to introduce the topic and lesson (lesson **Introduction** and **Procedure**), placing it in the context of the overall theme for the unit being taught. Explain to students that they will be performing research on how to save energy in an existing home that they have just fictitiously purchased. They will be reporting on their research in the form of a display poster.

Once introduced, distribute the energy savings **Situation** and **Research Questions** to individuals and/or groups. Students read their specific situation and then answer the assigned research questions. Students will organize their poster display around the answers to these questions.

You may wish to review the **Poster Production Guidelines and Requirements** included for this lesson at this time. Reviewing them will help students visualize their final poster display product. Remind students to consult them during the research and assembly process for their poster display. You may wish to emphasize certain requirements for student display posters. For example, students may need instruction on how to use information they may wish to quote, and in citing research sources so that they do not cross the line to plagiarism.

Specific procedures, materials, groupings, guidelines, and timelines students will use to perform and present research will need to be communicated. The **Procedure** portion of this exercise, written for the student, introduces them to the home they have fictitiously just purchased. It only introduces them generally to the fact that they will be doing research and reporting on it to the class. Note that the **Materials** section of the student portion of this lesson makes no mention of anything beyond the use of a computer. The other materials you make available will, of course, be based on the approach you use in teaching this lesson.

Student online research will then begin. You may wish to direct students to the WPS SolarWise for Schools website. Suggested websites for this lesson may be found there. It is recommended that you review them before beginning this lesson.

You will note that almost all **Research Questions** include questions like these two:

- *Roughly* how much would it cost?
- *About* how long would it take to recover the cost?

You will have to decide in advance how specifically you would like students to present this information. It will probably not be possible to have all students/groups answer these questions in the same way, which will make later comparisons difficult. Nonetheless, students should be able to arrive at a rough estimate of the cost of their appliance or system. The cost recovery time may be more difficult to establish. Providing students with some simple methods for establishing a crude recovery time may be useful. For example, an appliance that is 20% more efficient than its counterparts will have a cost recovery time of roughly 5 years (20% each year for 5 years = 100% recovery ---- $100\% / 20\% = 5$). Establishing cost and recovery cost is a very important part of this lesson, however, because it is vitally important in the "real world." Assist students in establishing answers to research questions as needed.

Once research is done, student poster displays should be completed. Once that is complete, it is time for an “energy savings expo” or “poster fair.” If research has been properly done, students will naturally conclude which energy savings situations should be addressed first, second, third, and so on.

To assist with this, **Summary Notes** are provided for students to use in circulating around the poster fair. Using this, students take short, but directed notes on each display. This will assist them in developing answers to the questions posed in the **Student Lesson Summary Guide**.

It is intended that each student complete the **Student Lesson Summary Guide**. The three questions posed there are different. However, between their research, and your teaching, students should form several important conclusions from this lesson:

- *Smaller, simple, less expensive energy savings measures are always the first and most important measures to take.* These almost always result in dependable, effective, and faster energy savings. Saving energy faster almost always means faster money savings, faster resource savings, and faster emissions savings. They also make sense in other ways. Simple, inexpensive measures like shutting drapes, the installation of a programmable thermostat, and weather stripping make better sense to do before the installation of a new furnace that loses much of its efficiently produced heat to the outdoors. This might be called “picking the low hanging fruit.”
- *Energy saving measures always come before the installation of a renewable energy system.* As stated above, energy saving measures almost always result in faster cost recovery. But they also reduce a home's energy load profile. A homeowner who may be aiming to install an expensive renewable energy system would then be able to install the smallest system possible to meet their expected energy consumption and demand. This might be called “picking the ripe fruit.”

In the end, students should come to understand these two important “truths.” They will arrive at them by performing the same kind of research a responsible homeowner would perform.

Take the time to remind students that saving energy also results in coal and air emissions savings. These savings take place every day that energy savings have been improved. We will not take the effort to try to quantify coal and emissions savings in this lesson. But they are measurable and significant (see our lesson titled: **What’s The Cheapest Watt?**).