Utilizing A Construction Technology Class for Home Energy Improvement

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Abstract

Students in a construction technology course in Industrial Technology Department at University of Louisiana at Lafayette are introduced to energy saving practices and processes. Students were given the task of calculating energy use in a house and designing ways to reduce energy consumption.

Introduction

A construction technology course in the Department of Industrial Technology was modified to include environmental impact considerations in areas of sustainability and alternative energy. The task of calculating energy usage in a house and designing ways to reduce the consumption was one aspect of the course. Part of the student activity was to conduct a self Home Energy Efficiency using a survey instrument which is included at the end of this article. After completing the energy audit, students were asked to develop creative and competitive solutions to an open-ended problem [1].

Project Activities

The academic definition of 'Energy' is "the capacity of a system to do work". Sound, wind, heat, and electricity are the few energy forms. Electricity is the most widely used form of energy. Today's homes heavily depend on electricity for normal operation which range from lighting to home heating and cooling systems. Investigating appliance power ratings and energy usage would benefit students planning on a career in the home construction industry, as well as, understanding the impact on the environment. Students were introduced to the use of an inexpensive meter called Kill-A-Watt meter to monitor, current, power, VA, kWh, and power factor [2]. Students used the Kill-A-Watt meter to measure power and energy consumption in as a component of their home energy audits. Two of the projects students worked were:

Home Energy Consumption Calculation: Based on the common bulb type and wattage currently used in the home, along with the average number of hours per day that an individual home used lighting, the annual energy cost can be calculated. *Wattage* is the measure of the energy usage of the bulb and the light output of the bulb is measured in *lumens.* A bulb with a lower wattage can actually have a much higher lumen output. Lighting packages today must indicate the lumens produced by a bulb. Improving the *efficiency* of a bulb requires using less energy (watts) for a given level of light output (lumens). A common measure of the efficiency of a bulb, termed *efficacy*, can be calculated by dividing lumens by watts.

In addition to learning how to save money and energy by replacing high power bulbs with more energy efficient lighting such as fluorescent or LED lighting, energy savings by adjusting heating

and cooling system thermostats is also investigated by students. The main objective is developing a systematic process to regulate thermostats in the home. These processes include increasing or decreasing the thermostat setting when no one is home, adjusting the setting to reduce usage during peak load periods, using a smart thermostat, adjusting the thermostat based on weather conditions. While understanding the environmental impact maybe difficult for some students to master, all students understood the drastic effect on the home electric bill.

Energy Audits: Energy audits of homes and improving energy efficiency of homes were conducted by students. Sensors to monitor temperature, airflow, and humidity were installed in selected homes. Data collected by the sensors was evaluated, and students were asked to develop recommendations to improve the energy efficiency for the home. The recommendations developed were provided to home owners with an estimated Return-On-Investment (ROI) for the recommended improvements.

Summary and Conclusions

The modified course was significant for the students who participated. The course was part of a series of service learning activities developed for the Industrial Technology program [3, 4]. During the course, students received real-world exposure to energy conservation and conducted energy audits for family homes. Students benefited from understanding power ratings and energy usage of electrical systems such as electrical equipment and electrical appliances found in most homes. Students used an inexpensive meter called Kill-A-Watt meter to monitor, current, power, VA, kWh, and power factor of electrical appliances. Energy audits of selected homes were conducted and energy improvement recommendations were developed by students. The opportunity to use problem-solving skills in construction technology was used for learning new applications of science and technology. Understanding a problem and developing a solution for the problem had an incredible compounding effect. Experiences stick with you more than facts, but when facts are coupled with experiences it allows you to better understand both the principles and their application [5].

References

1. G.H. Massiha, H. Hebert, and K. Rawat (Sept 2007) "Help Students Become Wise Energy Consumers", TechDirection, pp. 29-31.
2. Kill-A-Watt meter, http://www.p3international.com/products/special/P4400/P4400-CE.html
3. Moffat, J., & Decker, R. (2000). "Service-learning reflection for engineering: A faculty guide," In E. Tsang (ed.) Projects that matter: Concepts and models for service-learning in engineering. Washington, DC: American Association for Higher Education, pp. 31-40.
4. Ropers-Huilman, B., Carwile, L., & Lima, M. (2005, May). "Service-learning in engineering: A valuable pedagogy for meeting learning objectives," European Journal of Engineering Education, Vol. 30, pp. 155-165.
5. Tannenbaum, S. C., & Berrett, R. D. (2005, Spring). "Relevance of service-learning in college courses." Academic Exchange Quarterly, Vol. 9, pp. 197-202.

Test Your Home's Energy Efficiency

Answer the following questions and determine how your level of energy savings.

Weatherizing & Insulating		
a. Have you weather-stripped and caulked your doors and windows?	Yes☐	No☐
b. Have you added insulation to your attic?	Yes☐	No☐
Heating & Cooling		
Do you check your furnace's air filters monthly and have a yearly tune-up of your central heating and cooling system?	Yes☐	No☐
Water Heating		
Have you installed energy-saving low-flow showerheads?	Yes☐	No☐
Appliances		
Have you unplugged appliances you rarely use, such as a second refrigerator or freezer?	Yes☐	No☐
Lighting		
Do you use fluorescent lighting?	Yes☐	No☐

Answer: Yes (1 point) No (0 point)

- Score 0–2: There is a lot more you can do to save energy Read the website thoroughly.
- Score 3–4: you have significant savings with room for improvement. Read special sections of the website thoroughly.
- Score 5–6: Congratulations on your super energy savings. Read the website for further savings and recommended it to your friends.