Consumer Preferences in Lighting

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Background (taken almost entirely from Min et al.)

Lighting accounts for nearly 20% of U.S. electricity consumption and 18% of residential electricity consumption. Incandescent bulbs are responsible for the majority of residential lighting electricity usage. A transition to alternative energy-efficient technologies, like compact fluorescent lamps and light-emitting diodes, could reduce this energy consumption considerably. However, household adoption of such alternatives remains modest.

Studies show that environmentally minded consumers have preferences for a certain bulb type (CFLs) while politically liberal consumers have preferences for low energy consumption. However, perceived personal experiences of health issues, previous use or purchase of CFLs, awareness on climate change, income and education levels were not significant in explaining choices. Statistically significant preference for lower energy consumption and longer life was observed in conditions where estimated operating cost information was provided. Providing estimated annual cost information to consumers dramatically reduces their implicit discount rate, thus fostering adoption of efficient alternatives.

Objectives

Students will be able to:
- Understand different lighting technologies (e.g.: CFL, LED, fluorescent, incandescent).
- Discuss the state of lighting energy requirements in the country and it may be mitigated.

Materials Needed
- Powerpoint presentation, "Consumer Preferences presentation.pptx"
- Projector
- Various different light bulbs and their respective power supplies

Safety Concerns

Some of the light bulbs may become hot.

Vocabulary
- Energy efficiency: Employing more efficient technology that meets previous expectations/output and also reduces electricity demand.
- Energy conservation: Altering expectations/output to reduce electricity demand.
- Energy: the capacity of something to do work; an amount. Measured in watt-hours, kilowatt-hours, megawatt-hours.

- Power: describes how much energy can be produced in a given time. . Can also mean to supply a device with electricity; the product of voltage and current. Measured in watts, kilowatts, megawatts, etc.
- Voltage: the difference in the electric charge of two places. A common unit of measurement is a *volts* (V).
- Current: flow of electric charge, or the flow of electrons. A common unit of measurement is an ampere, or amp (A).
- Resistance: a material's opposition to electric current. A common unit of measurement is an ohm (Ω).

Procedure

Time	Activity	Description	Supplies
35 minutes	Lecture	1. Relevant energy concepts a. Unit of measurements 2. Energy use pattern per capita a. Compare to energy needed for ipod, car, etc. b. Estimate the amount of coal burned to produce such amount of energy.	Projector, "Consumer Preferences presentation.pptx"
	Experiment	1. Turn on four different lightbulbs/ 2. Students rank the light bulbs according to their preference (uninformed decision making) 3. Introduce the different light bulb technologies presented in the above experiment. Explain how a light bulb works and the difference between the lighting technologies: a. Heat emitted b. Energy required (ex. Pedaling to produce light) c. Brightness d. Color e. Life cycle cost and related health effects 4. Students rank the light bulbs according to their preference (informed decision making) 5. Based on their experiment, students rank the set of lighting technology attributes.	Various light bulbs and power supplies, "Consumer Preferences presentation.pptx"
10 minutes	Discussion	1. Group discussion on ranking. 2. Discuss Additional Choice Tasks	"Consumer Preferences presentation.pptx"

Additional Resources
Reputable
Min et al. Energy Labels Increase Demand for Compact Fluorescent Bulbs: Analyzing Consumer Preferences for Lighting Technologies Using Discrete Choice Analysis. USAEE.
[http://www.usaee.org/usaee2012/submissions/Abs/USAEE%20abstract%20-%20Jihoon%20Min.pdf]

Next Generation Science Standards Alignment
PS3.A: Definitions of Energy
ETS1.A: Defining and Delimiting an Engineering Problem