



Social impacts of solar cooking



Materials list

- Solar Balloon Energy Kit(s) ([SB52005](#))
- Digital laboratory thermometer ([SB33552](#))
- Measuring cup ([WA29913](#))
- Graph paper, 8½" x 11" sheets ([9706099](#))
- Hot pad for handling pan ([SB01889](#))
- Hand lens ([SB16445](#))
- Water
- Blue plastic wrap

Objectives

Students will...

- Learn there are more than 3 billion people in the world that need to gather fuels for cooking
- Learn there are more than 2 million premature deaths each year due to cooking pollution
- Research people's activities in finding cooking fuels
- Discuss the impact of the human activities on the environment and society
- Build a solar cooker based on the Solar Balloon Energy Kit
- Estimate the total amount of water that can be pasteurized by the cooker
- Estimate lives, trees, and money that may be saved by using the solar cooker
- Estimate the job and business opportunities that may be created by solar cooking
- Develop a plan to help people in need by providing solar cooking technology
- Apply critical thinking to solving the cooking and heating related problems in the world
- Experience team building and real-world problem solving

1. Introduction

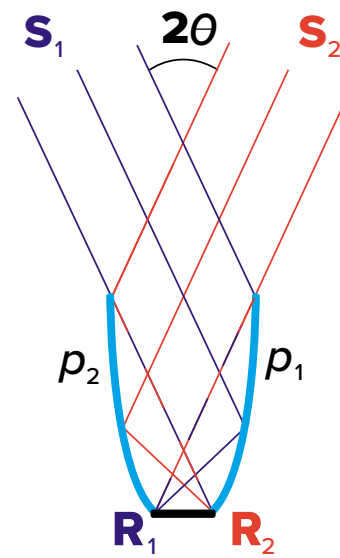
More than 3 billion people in the world do not have sufficient energy for cooking and heating. They often have to cut and burn trees to pasteurize water to make it safe for drinking. There are more than 2 million premature deaths each year due to open-fire cooking pollution. Cutting down trees for cooking and heating accelerates deforestation. Burning fuels indoor for cooking and heating represents a significant health problem. Spending time looking for trees or spending money for buying cooking and heating fuels also limits the resources for social development. Introducing community-oriented solar cooking technology and developing user-friendly solar cooker products helps solve the environmental, health, and social development issues. Encourage students to develop plans to help people in need.

2. Build a solar cooker

Based on the number of students in the class and the available Solar Balloon Energy Kits, divide the students into several groups. Each group gets one Solar Balloon Energy Kit to build a solar cooker according to the instructions that come with the kit. Encourage students to be creative. Younger students may need more guidance.

3. Heating water (Choose a sunny or partially sunny day)

Each group of students use the measuring cup to add 1 cup of water to the black cooking pan. Use the digital thermometer to measure the temperature of the water in the black pan. Record the time of the measurement and the water temperature. Put the black pan with water into the cooking sleeve under the small end of the balloon. Orient the balloon toward the sun. Measure and record the temperature of water in the black pan and the ambient temperature every two minutes until the water temperature reaches 160° F, at which water is fully pasteurized. Plot the water temperature and the ambient temperature as a function of the time on the graph paper. Calculate the time needed to pasteurize 1 cup of water. Then calculate the quantity of water that can be pasteurized in one day, presuming 12 hours of sunshine every day. Finally, each group of students calculates the total amount of water that can be pasteurized in one year if there are 300 sunny days.



4. Needed fuels calculation

Based on the calculation results of the total amount of water that can be pasteurized by the Solar Balloon Energy Kit over one year, each group of students will choose one of the fuels (dry wood, heating oil, natural gas, electricity) to calculate the quantity of fuels needed to pasteurize that same amount of water. Presuming the wood-burning stove efficiency is 30%, students can calculate how much dry wood is needed, and how many trees may be saved if the Solar Balloon Energy Kit is used. Then estimate how much money can be saved.

Fuel	Efficiency	Heating Values (MJ/kg)
Dry wood	30%	21
Heating oil	30%	45
Propane	30%	50
Electricity	30%	36 (MJ/10kWh)

5. Plan to help people in need (optional)

Encourage students to develop a plan to help people in need of cooking and heating fuels by providing solar cooking technology to them. Students may do research to identify communities where help is needed, and then work with NGOs, government agencies, and manufacturers to raise funding, develop technology, and deliver products to communities in need.

Assessment

Teacher observation, participation in activities, cooperation, handling materials, participation in oral discussion, completeness of projects, written work, and illustrations.