

Solar-Energy Education: Making a Miniature Solar Oven

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Solar energy is a common renewable-energy resource that can be easily demonstrated via simple solar ovens. There are many kinds of solar ovens that are available at affordable prices. Solar ovens introduce the benefits of solar energy within Japan's environmental activities, albeit they are affected by the weather.

One lesson plan we propose involves using an electric lamp upon a miniature paper-'solar oven' that would not be affected by the weather. Moreover, we can do experiments in an empirical and quantitative way. For example, we can estimate radiation energy that is received by the miniature solar oven. We can compare the performance of different types of solar ovens.

Solar ovens introduce scientific concepts. For example, we can teach the energy density of solar radiation, the principles of heat transfer, the law of light reflections, green-house effects and so on. We may ask students to design their own solar oven based on such scientific knowledge. Although a student's design and building of a solar oven using cardboard are already being implemented in many countries, our proposal starts with making a miniature solar oven and testing a solar-oven's performance in a laboratory. Eventually we expect to have a practical and efficient model of a solar oven.

A solar cell is a popular teaching material for solar-energy education. In our lesson plan, we suggest comparing the performance of a solar cell to the same-size solar oven using an electric lamp within a laboratory. The heat & light energies are studied for their strong & weak points. For example, a solar oven is more efficient for heating a cup of water than a solar cell. However, it is not easy to store heat energy versus electric energy. We may also extend our lesson to include the more-recent sophisticated solar-energy technologies.

Through our lesson plan, students will deepen not only solar energy but also renewable-energy technology in order to build sustainable society and address climate change.