

Solar Clovers: Using Solar to Engage 4-H Members in Hands-On STEM Activities

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Introduction

Research suggests 4-H member participation in hands-on activities can have a positive affect on student interest in STEM subjects

Solar photovoltaic (PV) systems are appearing in many locations in our communities. Largest number of systems are in grid-connected residential and light-commercial applications. Roof-mounted solar PV arrays provide the user with energy from the sun during daylight hours while energy from the utility company is used at night.

How it Works

We engaged 4-H members and parents to craft solar projects. Sharing knowledge, demonstrating skills, and working to promote a positive attitude about solar photovoltaic energy systems. Projects were exhibited at our local county fair. University of Arizona student participation including constructing family-size solar ovens and donating to Pima County 4-H and judging projects at the county fair.

Results to Date

Approximately 35 4-H members participated in the project along with 16 college students. Six projects meeting were conducted over the course of the project. Eight family-sized solar ovens were constructed, tested, and donated to the Pima Cooperative Extension Center. Twenty-five 20-watt solar modules were purchased and added to the 4-H teaching inventory. Materials for constructing approximately 25 five-gallon pump in a bucket solar fountain system, and 25 solar racers. 4-H members learned how to interpret a datasheet for a solar PV module to gain an understanding of how solar PV modules are sized and rated. These variables include watts max power (Wmp), DC voltage max power (Vmp) DC amperage max power (Imp) open-circuit voltage (Voc) and short-circuit current (Isc). Members and parents learned of different solar hand tools and how to use a digital clamp-on multi meter to measure module voltage and current. 4-H members assembled solar fountains using the materials provided, then were challenged to design, construct, and test their own solar-powered water fountains for the solar activity at the county fair.

Cost & Resources Needed

Funding for Solar Clover Project was approximately \$10,000.00. The majority of funds were used to purchase approximately 25 20-watt solar PV modules (\$75.00 apiece), five-gallon buckets, 12-volt 2.5-amp bilge pumps (\$18.00), PVC material, hand measuring and cutting tools, solar racer kits (\$55.00), pizza box solar oven materials (\$10.00), solar whirligig project materials (\$100.00), classroom solar demonstration sets (\$500.00), portable solar generator boxes (stand-alone battery storage systems constructed from plastic ammo boxes) (\$125.00), and materials for construction of the family-sized solar ovens (\$125.00).

Future Plans & Advice

With recently awarded funding, our project will expand to include 4-H programs in three tribal communities in Southern Arizona. We will train County Extension leaders and provide tools and materials. Once materials are in place, we will assist counties to become self-sustaining. We plan to collect data in the form of feedback from leaders, parents, and 4-H members to assess the effectiveness of our efforts to increase solar knowledge, develop skills, and change attitudes about solar energy systems.

