

**CREATE: A Renewable Energy Professional Development Program**

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### **Introduction**

Growing interest in STEM education with connections to agriculture has aided agriculture educators link science and math concepts to agriculture science (Acker, 2008). Renewable energy topics are popular as school districts are adopting and installing grid-connected solar and wind energy systems to curb energy costs of local facilities. Not all schools are sending unused electrical power to the grid. The STAR School located in Leup, Arizona is the first off-grid charter school in the country. Energy needs for the K-8 school of 150 students is provided primarily by multiple solar photovoltaic arrays and wind turbines located on-site. Water is supplied by submersible well and is pumped on the weekends to make optimum use of the school's 48-volt energy storage system. The school has been in existence for over 20 years.

A professional development program addressing renewable energy systems is the focus of this project. The American Association for Agricultural Education (AAEE) National Research Priority Area #2 addresses adoption of new technologies, practices, and products. The AAEE Research Agenda Priority Area #5 Efficient and Effective Agricultural Education Programs, targets Professional Development (Roberts, Harder &, Brashears, 2016).

The Center for Renewable Energy Advanced Technical Education (CREATE) has conducted three to five-day workshops in solar, biofuels, energy efficiency, and shorter duration trainings on wind, hydro, and geothermal power. The solar workshops have always been in the greatest demand, and in many years the number of applicants exceeded the capacity by a factor of more than 3X. The number of participants in the other sectors is not as large, so the information gathered from those groups is probably too small to provide meaningful statistics. The information included below is taken from the solar workshops for which organizers have the largest data set. The descriptions and findings for the solar workshops are representative of the larger body of CREATE professional development programming for faculty.

### **How it Works**

Teachers with an interest in developing knowledge on renewable energy topics and hands-on skill development are encouraged to register to attend a workshop. Madison College began the solar train the trainer activities in 2009 through a partnership with Solar Energy International (SEI). SEI had recently created a teaching laboratory at its campus in Paonia, Colorado. Organizers felt this lab served as a model that others could replicate to magnify the impact and respond to the growing solar industry. Over the next six years, 150 high school, community college, and university STEM instructors received training with Madison College and SEI through this partnership. Many of these participants led energy programs at schools that created new solar teaching laboratories based on principles and designs demonstrated at SEI.

In 2015, CREATE transitioned the solar training model to providing instruction at the new laboratories built by community colleges. A plan was developed to expand the number of host training sites to more broadly meet the needs of faculty on a national geographic scale.

Each institute includes classroom presentations, hands-on activities, (activities which teachers can easily replicate with their own students), and a pre and post institute survey. The material is presented so participating teachers with little to no previous experience can attend and feel successful in the knowledge gained and skills developed. Lists of materials and costs are shared. The institutes are funded primarily from federal grants.

### **Results to Date**

To date, CREATE held solar train-the-trainer professional development workshops at Madison College, Madison WI (2015-2019), Shoreline Community College, Shoreline, WA (2017-2019), Delaware Technical and Community College (2019) and Heartland Community College (2019). These regional workshops have trained an additional 165 individuals as of 2019. The 2020 workshops have been cancelled due to the COVID-19 virus, but CREATE is working to deliver virtual content, and hopes to resume the face-to-face workshops and add an additional site at Central Carolina Community College, Sanford, NC in 2021. Teachers report success in implementing teaching strategies and renewable energy content into their local program curriculum. The curriculum materials are tied to science standards so teachers can provide information to administrators, and address specific topics.

### **Future Plans /Advice to Others**

To promote the professional development workshops labeled as the *CREATE STEM Educator Renewable Energy Institutes*, the CREATE website ([www.createenergy.org](http://www.createenergy.org)) was developed and features free webinars, down-loadable teaching materials, newsletters, publications, and announcements for on-site STEM workshops. Recorded webinar topics include: *Clean Energy Jobs; Solar Training & Hiring Insights; Solar Training Network; Battery Storage; Solar PV: Battery Storage & Charge Controller; The Solar Schools of the Future; Career Mapping; and Charging Forward- Renewable Energy During COVID-19*. Available teaching materials include both student worksheets and instructor keys. Materials include mapping to Next Generation Science Standards (NGSS).

Topics include solar and wind. The announced STEM Institutes for 2020 included Delaware (Delaware Technical Community College, Dover); Illinois (Heartland Community College, Normal); Washington (Shoreline Community College, Shoreline); and Wisconsin (Madison Area Technical College, Madison).

### **Costs/Resources Needed**

The primary costs of the STEM institutes are for participant support. This includes airfare/mileage expenses, lodging, meals, and a stipend paid to encourage teacher participation. These costs have varied over the years depending on the duration of the training events (typically 3-5 days), their location, the distances traveled by the participants, and the number of participants per workshop. Since transitioning to the regional workshops held at community colleges, travel distances have decreased, and the duration of the workshops has been reduced from five days to three. Accordingly, the participant support costs have decreased from approximately \$2,150 per person for the workshops held at SEI, to \$1,000 per person for the regional workshops.

## References

- Acker, D., & National 25x'25 Agriculture/Forestry Steering Committee. (2008). Research and Education Priorities in Agriculture, Forestry and Energy to Achieve the 25x'25 Renewable Energy Vision. *NACTA Journal* 52, (1): 55-59.
- Roberts, T. G., Harder, A., & Brashears, M. T. (Eds). (2016). American Association for Agricultural Education national research agenda: 2016-2020. Gainesville, FL: Department of Agricultural Education and Communication.