SOCIETY OF PHYSICS STUDENTS
An organization of the American Institute of Physics

Marsh White Award Final Report

Project Proposal Title	Renewable Energy: Sustainable and Attainable
Name of School	University of the Sciences
SPS Chapter Number	5619
Project Lead (name then email address)	Austin Vantrease avantrease@mail.usciences.edu
Total Amount Received from SPS	$500.00
Total Amount Expended from SPS	$500.00

Summary of Award Activities

The SPS chapter at University of the Sciences participated in The Philadelphia Science Festival as an exhibitor at the science carnival. We had a perfect booth location right in front of the Franklin Institute. As exhibitors at this event, we engaged community members of all ages in understanding physics concepts of renewable energy in an interactive and hands on manner.

Statement of Activity

Overview of Award Activity

Our Project had demonstrations including the Crook's Radiometer, Solar Starter Kit, Horizon Wind Energy Science Kit, Bike Generator, and a station for kids to make slime. The focus was simple explanations and visual demonstrations that showed how movement, whether it came from the kids peddling the bike or the wind spinning the miniature turbine, could generate electricity. With the older kids and college students, we then explained how the rotation through a magnetic field creates a current. The Solar panel showed that we can harness energy from the sun, store it in a battery, and use the battery to power anything we want. We used it to power spectators' phones and a small fan.

We highlighted the physics underlying solar and wind energy, approaches to energy generation, transformation, and distribution. We educated the public on the fundamentals of energy conversion, from accessible and free sources like wind and sun to mechanical and electrical energy that can be used in everyday life. There is no doubt that the hands-on demonstrations helped promote a huge interest in physics.

In general, our SPS chapter has been extremely involved with outreach activities the past three years. We have participated in six outreach events and plan to continue this tradition in the future. Furthermore, our department always seeks opportunities to apply our theoretical knowledge learned in the classroom to hands-on projects that deepen understanding.

Impact Assement: How the Project/Activity/Event Promoted Interest in Physics

Goals:

- Promote general interest in physics and science
- Show that physics is not a subject to fear, rather it is a subject that looks to explain the natural world in a concise, mathematical way
- Show and explain how wind, solar, and mechanical energy are converted to useful sources that power our everyday life

We were extremely successful in meeting all the above-mentioned goals. The assessment plan was based mostly on the feedback we got from participants, students and teachers involved, and the public at the Science Carnival. We had an evaluation sheet at our booth asking the following questions:
1.) What was your favorite demonstration? What did you learn about?
2.) On a scale of 1-10, with 1 being the least and 10 being the most, what is your interest in **physics**? Did today influence your opinion?
3.) Using the same scale from above, what is your interest in **any science**? Did today influence your opinion at all?
4.) After learning about renewable energy, do you think it is important? Why or why not?

The results from the assessments were overwhelmingly successful. There was a variety of "favorite demonstrations," such as the slime, bike generator, solar panel, and radiometer. Many of the spectators voted 9 or 10 for interest in physics with about half reporting that the demonstrations influenced their opinions in a positive way. Lastly, according to the responses, we have raised awareness on the importance of renewable energy and how easy it is to make it more prevalent in society.

The project not only influenced the public; students that worked to put it together benefited greatly as well. We learned to work as a team to achieve a goal; the bike generator took a lot of time to construct and get working properly. As physics majors, we do less building things and more theoretical work, but this project put our engineering skills to the test and was a fun challenge.

Key Metrics and Reflection

Who was the target audience of your project?	**Anyone ages 5+**
How many attendees/participants were directly impacted by your project? Please describe them (for example "50 third grade students" or "25 families").	**about 500 young kids from age 5-15 about 50 college age students few adults**
How many students from your SPS chapter were involved in the activity, and in what capacity?	**9-10 involved, 4-5 very involved**
Was the amount of money you received from SPS sufficient to carry out the activities outlined in your proposal? Could you have used additional funding? If yes, how much would you have liked and how would the additional funding have augmented your activity?	**The amount was perfect for what we did, but if we had more I'm sure we could have constructed more ambitious projects.**
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	**Yes, the bike generator and solar panel will be used in the Physics Girls camp this summer at Usciences and the bike generator is also being considered for use in the Intro Physics Labs**
What new relationships did you build through this project?	**Relationships with other students; it promoted teamwork between senior and more junior physics majors as well as chemistry majors**
If you were to do your project again, what would you do differently?	**Make the bike generator and solar panel stations even more of a visual learning experience.**

Expenditures

Expenditure Table

Item	Please explain how this expense relates to your project as outlined in your proposal.	Cost
Voltage Regulator	Used to regulate the voltage output form the bike generator into the battery	8.27
LED USB fan	Powered by the solar panel to provide a visual energy output	26.99
USB hub	used to plug in spectators phones to charge them from the solar panel and bike generator	9.49
Motor	Used as a generator to generate electricity	39.99
Radiometer	Shows radiating power of sun	26.99
Solar Panel	Shows solar power	91.16
Horizons Wind Energy Turbine	Energy conversion from wind	126.95
Chain tool	Fix the chain on bike generator	16.99
Chain for motor	Chain that connected bike to generator	23.87
Power meter	Showed power output from solar panel	18.99
Inverter	Used to convert DC to AC on bike generator	44.98
Diodes	Used so current could move only into battery on bike gen.	6.99
Bike Tire	Used to make contact with the motor-turned-generator	25.00
Bike Grips	Used so spectators had a good grip on the bike	13.00
Bike Tube	Used to put air in the rear tire of	8.00

	bike	
Bell	Used to excited young kids while on bike	10.99
Gas	Transport students/supplies to and from the festival	10.00
	Total of Expenses	508.65

Usciences SPS will absorb the excess over the approved budget.

Activity Photos

Six Usciences physics majors posing before setting up the demos the morning of the carnival.

Alyssa Petroski, 2017/2018 SPS Chapter President explains how electricity is generated.

Usciences President, Dr. Paul Katz, testing out the bike generator.