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

Marsh White Award Report

Project Proposal Title	TechFest 2019: Electro-Physics Exhibit
Name of School	University of Dayton
SPS Chapter Number	1500
Project Lead (name then email address)	Dallas DeBruin debruind1@udayton.edu
Total Amount Received from SPS	$220.00
Total Amount Expended from SPS	$361.04

Summary of Award Activities

The University of Dayton's SPS chapter used the Marsh White Award funding to build new electrostatics and electromagnetics exhibits for our outreach programs, especially Sinclair Community College's TechFest 2019. Highlights included a polar molecule demonstrator using a water stream deflected by statically charged wands, a magnetic propulsion train and static-based fun-fly-sticks (mylar levitation). Our table was a great success as we had over 1000 students and their parents interact with our exhibit. In particular, the fun fly wands were extremely popular with students as they experienced using an invisible force to levitate seemingly benign objects.

Statement of Activity

Overview of Award Activity

Our Chapter participates in TechFest annual in Dayton, Ohio as an exhibitor and proponent of physics engagement. This is a two day event lasting about 6 hours each day where we engage and excite children and families that attend. The UD chapter of SPS has been an exhibitor at TechFest every year for the past decade, but this year we were looking to expand our footprint by developing two larger, interactive exhibits centered around teaching fundamental Electrostatic and Electromagnetic phenomena. For the Electrostatic exhibit we started attendees with levitating and attracting mylar and then gave them the opportunity to bend running streams of water. For Electromagnetism, we started attendees with teaching polarity of magnets and demonstrating the magnetic field with iron filings. We then gave them the opportunity to put together their own magnet propulsion train to test within a portable wire-wrap track.

This year's exhibits were a resounding success with over 1000 parents and elementary & middle school students interacting with our exhibits (vs. a typical year of 300-400). This event is one of the best showings for the physics program at the University of Dayton and the UD SPS chapter within the Dayton community, and mirrors our chapter's focus on outreach and engagement with younger Daytonians, such as our attendance to local schools and science fairs doing similar programs.

The best experience we had from the event were with 4-5 students all chasing after flying mylar with their fun fly sticks, only to be confronted by two exhibitors dressed in Star Wars outfits when the mylar got too close. These exhibitors had been watching our demonstrations for several hours by this point and took it upon themselves to show these young students what happens with electrostatic shock by touching the mylar (it was charged during the demo). They, of course, used their acting skills to full effect, and had the students declaring victory over the evil empire with their static wands. Afterwards those same students asked more questions about the actual phenomena and who we were (SPS from UD) than any group we interacted with during the event.

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

In our original application submission, we outlined the following goals for our new exhibits and outreach:

1. To give children memorable and useful experiences around fundamental physical phenomena.
2. To teach simple and complex lessons in Electromagnetism and Electrostatics using our proposed exhibits.
3. To instill a desire to pursue STEM careers and hobbies in all participants attending, especially in physics.

In order to more accurately measure these goals, we created a survey for participants to fill out, specifically parents and others in charge of students to get feedback on the students' engagement and learning. We also kept a running tally of who had visited and interacted with our exhibit throughout the event.

Our methods of measurement met some success, though not as much as we hoped. In all, we had about 50 surveys filled out through the course of the event. We found that many of the parents and other potential survey participants were in a rush to leave after spending a lot of time with our booth. This makes sense because there were many other exhibits and often time was a major factor for these participants and their corresponding students. Students would run to the next exhibit, and parents would feel compelled to follow because of the large crowds limiting view distance to their kids/students.

In the feedback we did receive, we learned that survey participants found our exhibit to be highly engaging, both because of our exhibitors and because of the interactivity of the different demonstrations. In terms of specific points learned, many expressed surprise in learning about molecule polarity and that its effects are noticeable in the real world. As for memorable experiences, we got a lot of anecdotal feedback that our exhibit was one of the more creative and fun of the event, but we only heard a few stories of students saying that they wanted to learn more about static and electromagnetism in the future. We were happy to see their excitement none-the-less as energy was always abounding in participants. I.e. We didn't work at all trying to attract people to our booth and many showed a genuine interest in why the physics phenomena were happening.

We did receive some critical feedback as well. Some felt that we rushed students through the different parts of our exhibit, especially the static wand water-bending and mylar levitation. At the time we did this out of fear for our equipment that if played with too much, that many of it would be broken by the end of the event. So we have taken note of this complaint and will work to make more robust solutions and to have more units available to allow students more time to experiment in the future.

Based on the feedback we formally and informally received, our first event with the new exhibits was a resounding success with over 1000 participants spending countless hours interacting with our exhibit. Every volunteer was proud and tired after such a whirlwind event.

Key Metrics and Reflection

Who was the target audience of your project?	**Elementary and middle school students and their parents**
How many attendees/participants were directly impacted by your project? Please describe them (for example "50 third grade students" or "25 families").	**~1000** **about 400 adults and 600 elementary and middle school students**
How many students from your SPS chapter were involved in the activity, and in what capacity?	**15-20 SPS members were involved in the planning, construction, transportation, and presentation of our activity**
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?	**Yes we had enough funding, as our local Physics department helps support our projects as well. (No additional funding necessary)**
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	**Our chapter often sends representatives to give presentations and local schools and science fairs and we vote on which demonstrations to take to each one, These activities will now be part of our repertoire and will certainly see future use.**
What new relationships did you build through this project?	**Because this activity involved so many SPS members, it turned out to be a relationship building activity for the entire chapter especially with the newer members getting to know and interact with everyone.**
If you were to do your project again, what would you do differently?	**We would do a better job of considering the logistics of transporting it, as its size ended up presenting some issues (We needed a pickup-truck). By planning better and building future exhibits just a few inches smaller we will mitigate this transportation issue we ran into, as well as having back-up transportation available.**

Press Coverage (if applicable)

We are unaware of any direct press coverage of our exhibit by local news or the TechFest organizers as this time (often marketing materials come out right before the next TechFest)

Expenditures

Our budget was composed of funding provided by the Marsh W. White award and the University of Dayton Physics Department. Some of our items used for our demonstrations were already in the chapter's possession, and the rest were bought using the award funds and the remaining costs covered by the Physics Department.

Expenditure Table

Item	Please explain how this expense relates to your project as outlined in your proposal.	Cost
Assorted Magnet Sets	Used for 1st & 3rd Electro-magnet Stations	$40.24
Iron Filling Display	Used for 1st. Electro-magnet Station	$16.99
Electromagnet Kit	Used for 2nd Electro-magnet Station Demo	$10.99
Hand Crank Generator	To show reverse phenomena as above.	Chapter Provided
2x4 Wood (multiple)	For final stations for both Demo tracks	$16.50
Wood Screws and Glue	Same as above.	$11.78
Various Static Demo Materials	For the first Electro-static Station	Chapter Provided
Electroscope	For measuring materials from above.	Chapter Provided
Fun Fly Sticks	For Static Generation for stations 2&3	$99.95
Water Tub	To catch falling water in static station 3	$37.70
Sump Pump	To create a continuous water stream for st. 3	$21.86
Plastic Water Tubing and Clamps	Same as above	$17.41
Acrylic Sheets	For walls in water case for static station 3	$67.75
Plywood	For top and bottom of Water Casing	$19.87
	Total of Expenses	361.04

Activity Photos

Early Brainstorming Session
Image Credit: Rachel Adams

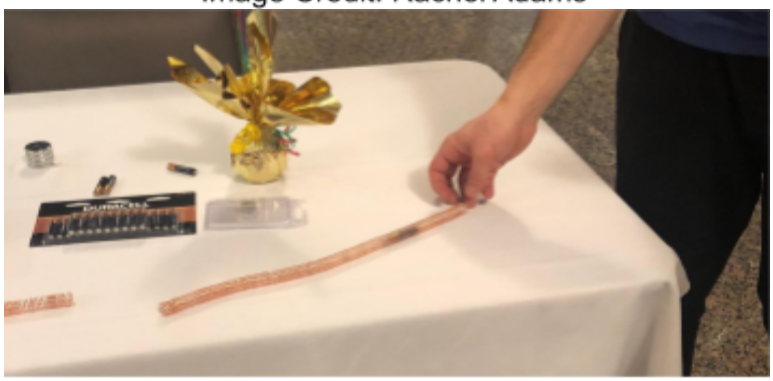
Electrostatic Station 2: Mylar Levitation
(with some help from the Empire)
Image Credit: Peter Hadchiti

TechFest 2019, Day 1 at Noon
Image Credit: TechFest 2019

Exhibit Setup: Electrostatic Water Bending
Image credit: Dani Smith

Curious Students needing slight adjustment
Image Credit: Rachel Adams

Morgan Adams and Dani Smith: A Dynamic Duo
Image Credit: Rachel Adams



World's Simplest Magnetic Train
Image credit: Rachel Adams

If you have any questions, please contact the SPS National Office Staff
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