



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Report

Instructions: Please complete each section after reading the purple text describing what should be in that section. Then delete the purple text.

Project Proposal Title	Strange Science: Unmasking the Weirdness of the Quantum Realm
Name of School	University of the Sciences
SPS Chapter Number	5619
Project Lead (name and email address)	Brett Conti (bconti@mail.usciences.edu)
Total Amount Received from SPS	\$500.00
Total Amount Expended from SPS	\$500.00

Summary of Award Activity

The USciences chapter of SPS travelled to an all girls high school, showing demonstrations with the hopes of generating interest in quantum physics. The goal was to promote physics to girls specifically, as they are traditionally underrepresented in physics and other STEM fields as well. We received very positive feedback from the students and teacher, and quite a few girls are interested in visiting USciences in the future for physics.

Statement of Activity

Overview of Award Activity

- Brief description

Our USciences physics team consisting of five physics majors arrived at the Baldwin School at around 8:30 am to begin setup in the physics classroom. Our event consisted of two sessions, 9:15 – 10:45 am and 1:00 – 2:30 pm. Dr. Ramos, our SPS advisor, joined us for the first session.

We set up all of our demos around the classroom in different stations. There were three stations, each containing multiple demonstrations that fell in the overarching category of the station, and the big themes were focused around particles, light, and superconductivity. The girls from each class broke up into small groups of about 4-6 students and cycled around from station to station every 30 minutes for the class period. A few of the demos we brought were: quantum dot suspensions of varying sizes (colors), the double slit experiment, helium/hydrogen spectrometer discharge tube, and the superconducting Meissner effect. The students showed a lot of interest in the demos, and asked quite a lot of questions while we were explaining everything, which was encouraging for us and what we had hoped for. Before going through all the demos, we had a short presentation prepared in order to explain the background of quantum physics and why it is important and useful, since when people hear quantum physics they typically get turned off due to its complexity. Along with the demos and presentation, we prepared a short questionnaire for the girls to fill out about the event and what they liked/didn't like. We felt it was important to get feedback from them on how we did, since demonstrating and explaining the quantum effects to freshman who haven't had much experience in physics in general can be difficult.

- Outcomes

After our outreach, our team felt successful and excited. Going in, we were a little skeptical due to the fact that our audience was going to be freshman, who only had one class in introductory physics at the time. When we talk about physics to other college students they don't want to hear about it, so there was a background feeling of worry as to how the students would perceive it and feel about our demos. However, once we got started and interacted with the girls, that feeling went away. The girls were *eager to understand* what was really going on with the demos, more so than just our basic run through of the demo itself. A few times, we even had to cut off the questions because they were getting too advanced for even their teacher to help explain in an understandable way. This was a great feeling because we had tangible evidence that we were providing a useful source of learning for these students, and making physics more enjoyable. Our overall goal of the project was to make physics fun and enjoyable, and hopefully pique at least one student's interest in the subject. Reading the questionnaires that were filled out, we saw that we definitely accomplished our goal, as quite a few of the girls said they were interested in physics and even a possible future tour of our university's physics program. Along with making a good impression on the girls, their teacher was excited to have us and interact with us as well. Throughout the day we discussed how physics is taught in schools and what it means to be a good physics teacher, and at the end he expressed interest in coming to our university to give talks on teaching physics and his experiences as a teacher.

- Audience

The target audience was the 30 freshman girls in the honors physics classes at the Baldwin School, a private all-girls high school. We reached out to around 4 all-girls schools in the Philadelphia area, but only the Baldwin School responded positively to our outreach event. The focus on an all-girl audience was motivated by the well-known fact that only 19-20% of the STEM workforce are women, and our intention was to help make a small impact in opening the eyes of high school girls as a discipline and a career. We had two classes of freshman, with about 15 students in each, so around 30 students in total were there for our event.

- Context of the Project

Both our SPS chapter and physics department are very active and involved in outreach and hosting/going to events. This encourages us to continue to get more involved and apply for grants and funding to do our own events, such as this one. Along with this grant, we also received the Marsh White award, and hosted our SPS zone 3 meeting this semester, which shows how eager we are to promote physics and share our interests with others. This was my first year at the university, and right when I came I got caught up in the outreach hungry environment, and this project fit right in with what we wanted to do.

- Highlights and stories

All in all, the project was very successful and I am glad I had the opportunity to be the project leader and share my knowledge with others. One moment of the day in particular stood out to me, when one girl in the second class got so absorbed in asking questions, we stayed for an extra 15 minutes as she bombarded us with question after question. Each time we answered, she would dig deeper and deeper, she truly wanted to learn and understand what was happening. It is this curiosity and interest that we are fueled by and hope to inspire in every student.

Impact Assessment: How the Project/Activity/Event Promoted Physics across Cultures

The main goals of our project were to promote not only physics but science in general to women, and also to generate more interest and a friendlier, more welcoming, less intimidating environment in physics for this under-represented group. After visiting the school and completing the project I would say we met both of our goals comfortably. We chose an all-girls high school to ensure that we were focusing entirely on our targeted audience, we wanted that to be the main goal. High importance was placed on finding an all-girls school near us so we could base our entire project on trying to inspire confidence and interest in science in the girls for the future. We actually got to show our demos to two classes instead of just one, which was even better, and their teacher was so pleased that he invited us back in the future, so if possible we want to go back again to have another event for the girls.

A small five question survey was given to all of the students as they went around to the stations for them to fill out and return. Included were questions such as “Which demo was your favorite and what concept of physics did you learn from it?”, “After today, what is your interest in physics from 1-10?”, “What do you think we could do better for next time?” and some other similar questions. These easy to answer questions were intended to keep the girls engaged and thinking about what we were teaching

them and to see if we did a good job of conveying our knowledge to them. We got a lot of positive comments and feedback from the girls, more than I expected actually. One girl commented, "I have a very high interest in pursuing physics, and I thought it was interesting to see people who are and about what they do." Another girl wrote, "Today showed me that physics is a lot more fun than I had thought!" In total, we received 29 surveys from the girls, and 15 (52%) of them said they would be interested in visiting our university in the future to learn about our physics program and maybe shadow one of us to see what it's like, which was a great feeling.

Impact Assessment: How the Project/Activity/Event Influenced your Chapter

There were five of our SPS members that participated in the project, myself included. Being that our university is small, we are all close friends which I believe helped influence not only the girls at the school, but ourselves positively. Prior to the event, we met two times for two hours for training and were all very excited for the opportunity to share our interests with the students and see how we can affect younger people in an important way. Throughout the day we were talking about how we can explain the concepts to the students and make it more fun, and making sure we made it a memorable experience that we could use to encourage further future participation from our other SPS members. After completing the event, I would say our relationships were definitely strengthened and made deeper as well. Throughout the rest of the semester at school we talked about the event and how empowering it was for us as well as the girls at the school. Also, very useful skills were developed and honed prior and during the event: public speaking skills, our physics knowledge, ability to explain very difficult concepts in an understandable way, organizational skills, and other outreach skills. I personally feel much more comfortable participating in future outreach events and projects after being the leader of this one, which is invaluable to me.

Key Metrics and Reflection

The Future Faces of Physics Award is designed to promote projects that cross cultures. What cultures did your project attempt to bring together? (Please be as specific as possible.)	We attempted to promote an interest in science to women, specifically freshman girls in high school.
How many attendees/participants were directly impacted by your project? Please describe them (for example "50 third grade students" or "10 high school volunteers").	30 high school freshman girls distributed in two physics classes.
How many students from your SPS chapter were involved in the activity, and in what capacity?	7 SPS members were involved in total, 5 went to the school for the actual event.
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? How would the additional funding have augmented your activity?	Yes, the funding from SPS was sufficient to put on our demos.
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	Yes, we plan to do more outreach in the future, as well as re-visit the all-girls school again.
What new relationships did you build through this project?	We strengthened relationships within our chapter, as well as built one with the teacher at the school.
If you were to do your project again, what would you do differently?	Leave more time for questions and interactions after we are finished with the demos. The time during the presentations ran longer than planned due to questions during.

Press Coverage (if applicable)

This is a link to the picture gallery dedicated to our event that the Baldwin School uploaded on their website:

<https://baldwinschool.smugmug.com/Upper-School/Honors-Physics-Hosts-Univ-of-the-Sciences-Physics-Depart/>

Also, pictures of the outreach were posted on the SPS Zone 3 Facebook by our SPS advisor:

<https://www.facebook.com/groups/2209794329/>

Expenditures

Please provide a brief explanation of your expenses. Include a written description of your expenditures below, those covered by your SPS funding and by other funding sources, and then fill in the table with the name and cost of each item purchased with your SPS funding. Add rows as needed.

Our Chapter of SPS and Physics Department covered the \$4.60 overture in budget

Expenditure Table

Item	Please explain how this expense relates to your project as outlined in your proposal.	Cost
Meissner Effect kit	Superconductivity Station	\$58.65
Quantum Dots	Particles Station	\$210
UV Light	For Photoelectric Effect and Quantum Dots	\$9.98
Photoelectric Effect	Particles Station	\$10
Quantum Movement	Particles Station	\$36.67
Polarizers	Light Station	\$38.55
Diffraction Grating	Double Slit Experiment	\$16
Safety Goggles	Eye protection for us and the girls	\$13.85
Hydrogen Spectral Tube	Spectral lines demonstration	\$49
500 MW Laser Pointer	Double Slit Experiment	\$38.99
Laser Pointer Holder	Double Slit Experiment	\$22.90
Total of Expenses		\$504.60

Activity Photos

Please include captions and credits for each photo. By including photos below, you are giving SPS and the American Institute of Physics permission to use these photos in their online and printed publications.

Note that you will be encouraged to upload high resolution copies of your best photos directly to SPS via the FluidReview site when you submit your report.

All picture credits go to the Baldwin School



SPS Marsh White project leader Brett Conti explains the Meissner Effect to Baldwin School Freshman girls.



SPS president Alyssa Petroski and SPS member Stefan Hofmeister demonstrating how sizes of quantum dots made of the same material produce different colors when illuminated.



SPS secretary Austin Vantrease explains how the quantum nature of the light emitted by a helium discharge tube gives a window to the structure of the atom.



SPS member Jocelyn Fanti utilizes giant polarization filters to explain distinctive features of waves to four high school girls.



Baldwin high school physics teacher Dr. Jeff Goldader (left) poses with the SPS Future Faces Team (left to right: Stefan Hofmeister, Jocelyn Fanti, SPS President Alyssa Petroski,

Project Leader Brett Conti, SPS Secretary Austin Vantrease, and SPS Faculty Advisor Dr. Roberto Ramos.



If you have any questions, please contact the SPS National Office Staff
Tel: (301) 209-3007; Fax: (301) 209-0839; E-mail: sps-programs@aip.org