



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Proposal

Project Proposal Title	A Continued Effort to Patch the Pipeline
Name of School	Drexel University
SPS Chapter Number	1619
Total Amount Requested	\$221.09

Abstract

The Drexel University Chapter of the Society of Physics Students focuses on public outreach. With the current underrepresentation of women in physics, we propose to engage young women at a local all-girls high school with a variety of hands-on demonstrations that the school typically cannot access.



Proposal Statement

Overview of Proposed Project/Activity/Event

The American Institute of Physics found that in 2010, approximately 20% of recipients of Bachelor's Degrees in Physics were female. One contributing factor that has been proposed as an explanation for this underrepresentation is that girls who are drawn to science as young children lose interest as they get older, especially in middle school and high school. This has colloquially been referred to as a "leak in the pipeline", or in other words, one of the major places in the education system where future scientists are lost. Drexel SPS believes that one way we can help combat this issue by providing access to hands-on physics demonstrations that are engaging in a way that is sometimes lacking in a typical classroom setting.

Our primary project is to return to a local all-girls Catholic high school. Over the last two years, we used two different Future Faces of Physics grants to build a fantastic relationship with their physics teacher. Drexel SPS visits one day each year and teaches all five sections of physics classes (4 freshmen sections, 1 junior/senior section). We present different demonstrations each year and our goal is for these demos to be either beyond the scope of their curriculum (so that they can be exposed to it) or a demonstration that the high school simply does not have access to (like liquid nitrogen). In addition to presenting demonstrations, we reserve part of the class time in order to discuss college -- how the application process works, what studying science is like in college, what living in a dorm is like, etc.

This year, we plan on presenting an array of electromagnetic and thermodynamic demos. The teacher previously expressed an interest in magnetic levitation demos and the Meissner effect, so we are going to purchase the appropriate materials in order to present this demo. Additionally, we will bring our entropy fan, which converts differences in thermal energy to kinetic energy, as well as some liquid nitrogen for some classic carnation shattering. We hope that this event will show the girls how amazing physics can be -- a subject whose beauty is often lost amid stale high school kinematics.

As a secondary project, we hope to again partner with the Drexel Graduate Women in Science and Engineering (DGWISE) organization which founded a weekly after-school science club at a local predominantly African American middle school. Our goal is to plan and lead the club activities for at least two different weeks. The magnetic levitation kit we propose to purchase will be absolutely perfect for this setting! We will also bring liquid nitrogen to present thermodynamics demonstrations and make ice cream.

How Proposed Activity Promotes Physics Across Cultures

Our proposed events -- one at an all-girls high school and one at a predominantly African American middle school -- will bring physics to two groups that are currently underrepresented in physics. We hope that our hands-on demonstrations will be more engaging than the typical classroom and that the students' experience will encourage their curiosity and stay with them when faced with more challenging science courses in the future. SPS is aware that our position as a university sponsored organization provides us with access to materials that middle and high school simply do not have the means to acquire, especially in Philadelphia. We view this proposal as a way to give back to our immediate community and share the resources that are shared with us.



Plan for Carrying Out Proposed Project/Activity/Event

The president and vice-president of this chapter will lead the planning and execution of this event, ensuring that it is delivered as intended. Due to our preexisting relationship with the teacher at the all-girls school, an audience of approximately 80 students is guaranteed. We may reach as many as 125 students if, like last year, the adjoining chemistry class joins us for part of the demonstrations. As planned, the event will require the involvement of at least five SPS chapter members, with the opportunity for both graduate students in physics and undergraduate members of the American Chemical Society to collaborate. The current officers and senior students of this chapter have experience handling liquid nitrogen and are thus equipped to deliver these demonstrations successfully. Communication channels are always open, per our previous involvement with this school, to ensure both availability of our volunteers and attendance of students to the event.

Similarly, our past partnership with DGWISE and participation in their program will aid in coordinating this year's activities. Attendance is again guaranteed since it is a program supported by the middle school and coordinated by Drexel's student organizations. Presenting similar demonstrations in a variety of settings (the all-girls school and the after-school club) will provide more opportunities for SPS member involvement and be more accommodating for our members' schedules.

Project/Activity/Event Timeline

Our day at the all-girls high school typically occurs in April. Official planning for the event will commence once proposal decisions have been made. First, we will reach out to the teacher (who we already know) to confirm the event and begin discussing potential dates. Immediately following confirmation from the teacher, we will order the supplies for the magnetic levitation demo. We are determined to place this order as soon as possible since the shipping time is longer than our chapter is used to for ordering demos. Approximately one month before the event, we will begin working on our assessment materials and confirm the day and time of the event with the school. Once we've finalized the event with the school, we will begin coordinating our volunteers and provide training on how to present the demos, especially the magnetic levitation demo which is new for our chapter. We will give the assessment materials to the teacher a few days before the actual event.

Similarly, we will contact DGWISE as soon as proposal decisions have been made. We will aim to help lead after-school club activities in April and May. From our experience last year, we have found DGWISE's schedule planning to be far more flexible and informal, and so we are not as concerned with adhering to a strict schedule.

Activity Evaluation Plan



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The success of this event will be measured against three scales: attendance of students, verbal feedback from the school instructors, and the results of a before and after worksheet assessment. Attendance will be assessed numerically, with one volunteer recording the number of students present during the discussion, and this will be referenced against attendance at past events and average attendance to school classes. After the event, a formal letter will be written to the instructors present at the event, asking for their feedback and evaluation. We will again utilize GoogleForms to prepare worksheets for the students to complete both before and after our presentation. These worksheets will address conceptual understanding, perceptions of science, and the student's feedback on the presentation.

The discussion following the demonstrations will include an open-floor session where students can lead the conversation and address whatever topics they would like. We will also have more structured questions prepared like what their favorite demo was and whether the presentation as a whole challenged their perceptions of STEM fields.

For the after-school science club, attendance will be used a measure of success as well as more qualitative assessment feedback from students. We also plan to include hard-copy worksheets for the students to complete throughout the activity. While the worksheet will include some questions about their perceptions of science, they will be less thorough than those used at the high school due to the age difference in the students and the more relaxed setting of the after-school club.

Budget Justification

Our largest expense will be the magnetic levitation kits which we intend to purchase from Colorado Superconductor, Inc (<http://www.users.qwest.net/~csconductor/>). These kits will be used for the event at the all-girls high school and after-school science club in addition to becoming a permanent part of Drexel SPS's demo closet for future use. We have free access to LN, dewars, and safety equipment for outreach purposes, so we do not allocate any of our budget to these things. We are budgeting significantly more for carnations than usual, but this will allow us to bring carnations to both events instead of only one. Carnations are the typical flower of choice for LN demos because they effectively show how the moisture in the flowers freezes which causes them to shatter. We intend to purchase styrofoam cups which we normally use to hold small amounts of LN which we submerge the flowers in since we don't want to get flower petals and other residue in the real dewar. Finally, we budget for SEPTA tokens that will allow our volunteers to travel to the outreach events. For our location in Philadelphia, this is by far the most cost effective travel option.