



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Proposal

Project Proposal Title	Lab for Kids
Name of School	Adelphi University
SPS Chapter Number	SPS Chapter #2 Sigma Pi Sigma Chapter #124
Total Amount Requested	\$205.59

Abstract

“Lab for Kids” is an outreach program by Adelphi University’s Physics Club and student volunteers. It brings enjoyable science experiences to children from typically underrepresented groups in physics from local high schools. For example, in previous years, Rocky Point High School students had made visits to our campus and they, alongside other schools, will be visiting this year.

Proposal Statement

Overview of Proposed Project/Activity/Event

“Lab for Kids”, is an outreach program that allows us to meet with local high school students from diverse backgrounds at the Cradle of Aviation, where we prepare several experiments led by our own college student volunteers. In the past, we have created a variety of lessons, including demonstrations of: Van de Graaff generator use, conservation of momentum, optics, spectroscopy, and the construction of simple circuits and motors. In order to accommodate for different learning styles, we make sure to have a combination of hands on participation and verbal lessons.

This outreach program was designed with the intent to make science – especially physics – accessible to underrepresented students. In doing so, we hope to inspire them to pursue physics in the future. One of our major goals is to allow them to enjoy learning about the world around them by separating theory from the potentially intimidating mathematics of physics. We also hope to create a casual atmosphere that allows students to learn while enjoying the experience!

We aim to show these students that, although mathematics is a challenging and important component to physics, they can still use physics to understand our fascinating world. As a result of this, we hope that they learn ways they can have fun experiments to obtain a physical understanding. Our main short term goal is primarily to teach students while allowing them to have fun. By keeping the tone of this program casual, we aim to allow students to focus on the rewarding experience of learning science through lab experiments.

Adelphi’s Physics Club has endeavored to increase the participation and passion of young students in physics. This has resulted in “Lab for Kids” becoming a sort of tradition for our SPS chapter, as we have been able to perform with success for several years. Hence, many of our volunteers feel very passionate in maintaining this tradition and continuously improving it each year. We would like to think that we have a very diverse physics department, and as such we offer a voice in physics education through peer instruction that is uniquely valuable

How Proposed Activity Promotes Physics Across Cultures

The students we meet with come from underrepresented groups in physics. We primarily hope that this outreach program can inspire students to pursue a career or education in physics, by showing them the beauty of science through demonstrations. As a secondary goal, we aim to spark their curiosity and drive to learn by making the learning process fun and accessible. The thought of pursuing a challenging field such as physics is only made more daunting by lack of exposure and representation in the field for underrepresented students. “Lab for Kids” is our way of giving opportunities to the demographics that need extra encouragement to pursue physics.

These young students are our future. If we are to strive for a future of equality and strength within the scientific community, then it is imperative that we give opportunities to women and racial minorities in physics. By empowering these students to begin a journey through the world of physics, their aspirations and strides in the field will inspire others in turn, thereby creating a ripple effect that will potentially last beyond the individual members of our chapter. We hope to encourage the students of the future to take more interest in the STEM fields or simply to build analytical problems solving skills. Strengthening minorities in this way will give them a voice in the science community and beyond, which will bring the potential for social and economic growth.

The future faces of physics award is amazing in its acknowledgment of all cultures. We reach out to a unique variety of students, composed of various underrepresented groups. Giving such groups the opportunity to enter it experience a field they would otherwise neglect provides them with a choice that all people should have available to them. In diversifying the practitioners of science, we diversify the perspectives with which humanity can tackle modern issues. Those from different backgrounds may also seek to resolve issues that their background has led them to prioritize. This will lead to improved standards of life for the groups whose issues are otherwise ignored.

When we meet with these young minds full of potential, it is clear that this outreach program is appreciated. The glint in the eye of an inspired student may be rare in the average class, but it is a common sight when we allow

them to explore and test science for themselves. In the past, some have even inquired as to how they may be able to pursue the sciences during the program.

This program is not only rewarding for the students that are taught, it is also an important experience for our diverse population of volunteers. Our student volunteers are still essentially learners themselves-- many of which are women or other underrepresented minorities of differing backgrounds. As physics majors we are eternally seeking a new constructive experience that can build upon our minds and character. For many, working with these students provides insight on future careers in education. This process can also refocus both volunteers and students who have lost sight of the fundamental beauty of physics. Going through a basic and enjoyable science education experience can remind them of what initially inspired them to pursue physics despite racial or gender barriers, and consequently rekindle their passion and motivation to discover their purpose in the sciences.

To lack funding would mean we would be unable to service as many students and prevent us from providing as many lessons to them. A huge disservice to these students would be that they would no longer be able to take home some of the experiments that they create, or even prevent them from creating in the first place. This disassociates the student from the subject, thus making it less enjoyable. Furthermore, the students will not be able to feel that they have the ability to create or have an impact in the field of physics. Although it costs more to allow them to keep some of the lab experiments, it pays off in how it serves as a reminder that they can choose to create and contribute to science, regardless of their background. If we are to begin bringing in underrepresented groups into physics, then we must give them the chance to take their education into their own hands. Whether they are teaching or learning, those involved in this outreach program are able to be part of a larger community that can create a positive impact on the world.

Plan for Carrying Out Proposed Project/Activity/Event

- Personnel – Club members and other student volunteers from Adelphi University will be leading the high school students through their respective activities. Typically, we separate our volunteers in teams of two in order to ensure that the students will have enough assistance for each lab. Two physics professors from Adelphi also come to “Lab for Kids” to ensure that content is being taught properly.
- Marketing – We usually reach out to the teachers of local high schools. In the past, we have collaborated well with Westbury High school. Direct contact allows us to get a clear understanding of what the students are learning, and consequently what kind of instruction will be beneficial to them. Reaching out to the teachers also lets us determine a date that will be most accessible to students so that we can assist as many of them as possible. In order to capture the attention of local high school students, we promote this outreach program as a fun way to learn about science. In order to make this an attractive program, we emphasize the amount of unique and entertaining hands on learning and experimentation that will be present throughout their experience.
- SPS member participation – Most – if not all – of the volunteers from Adelphi University are SPS members. We typically have around 12 volunteers from our own SPS chapter. Each experiment station would optimally have two volunteers guiding the students through the learning process.
- Expertise – Each station has two volunteers, who are usually SPS members. In addition to this, we try to organize volunteers such that a more experienced member is paired with a new member. This ensures that the experiment and instruction flow smoothly, and that a new generation of SPS volunteers are trained to maintain the outreach program for future generations. Furthermore, volunteers are informed of their roles weeks prior to the event, thereby allowing them to have enough time to ensure that they are well informed enough to teach their respective subjects. As further precaution, we also make sure to assign volunteers with fields that they have already had formal instruction on. The presence of two Adelphi Physics professors also ensures proper instruction.

We have typically plan 6 thirty minute lab experiments tailored to entertain and enrich the education of the students. The attendees are split into smaller groups, which cycle through each of the stations. Depending on the feedback we obtain from their teachers, we select stations that we think will be most beneficial to their education and enjoyment. As each group of students is unique, we always have additional lab experiments prepared in case we need to switch up the curriculum. In order to educate them in optics, we will be using the SPS 2014-15 SOCK. We will focus on the use of lasers, diffraction gratings, optical fibers and polarizers in order to build upon lessons that they have previously learned. In addition to this optics lesson, students will later have a station in which they are allowed to make their own “holograms”. For this experiment, students will be cutting transparent sheets to form a structure that will reflect light when placed on top of a phone playing a compatible hologram video on YouTube.

The spectroscopy station will include a short lecture on Bohr’s model and discrete energy levels. To accompany this, we will be demonstrating the principles using discharge tubes of 6 different compositions. Since we want to show these students the diverse fields within physics, we also extend our lessons into static electricity through the use of the Van de Graaff generator. We allow them to have a lot of fun with this experiment, as we provide several materials – such as fur and bubbles - with which they can examine the effects of electric fields. We also encourage students to feel the static electricity themselves by “shocking” themselves individually and in human chains.

Another station teaches students about circuits; we start off with a brief explanation of circuit theory, and demonstrate how to build a circuit to turn on a light emitting diode. After this, students are given the materials to build their own. Another “build your own” activity we provide allows students to create D.C. motors. The requirement of patience and caution makes this the most challenging station, but upon construction, the simple motor created from: rubber bands, coils, magnets, pins, and batteries can be greatly rewarding. Not only does it allow them to see electromagnetism in action as the coils spin, it also shows them that the use of simple materials can bring them the opportunity to enjoy science. The 2016 SPS SOCK kit for sound is also a potential station, as we are able to use it to teach students acoustical physics, and how music can be made from various tubes. There is also an angular momentum demonstration using a spinning platform and bike wheel. We discuss this topic briefly, as they typically learn this subject in class prior to this event. As a result, we are able to quickly get to the fun of having students experiencing the power of angular momentum for themselves. We do this by having them change their angular velocity through the extension of their arms, as well as by having them spin the bicycle when to change their angular velocity and direction.

Project/Activity/Event Timeline

The outreach program will be executed in mid-April. We will have adequately planned and finalized the plan for each station by March 14th by creating an exact and detailed schedule of labs, which will be based on availability of supplies/volunteers and teacher feedback. The Cradle of Aviation Museum will be reserved by 2/28 as our space to hold the event. We will begin planning on 2/10 by contacting local high schools, such as Westbury High School in order to determine the date and their preferred selection of labs. Although it is usually in April, the exact date is determined by the high school teachers we work with, and the times they are able to obtain busses to transport them to the Cradle of Aviation.

Activity Evaluation Plan

The most important feedback is from the students we teach. First and foremost we will monitor their behavior and responses to questions to see whether or not they find the experience enjoyable and educational. We will also be speaking to their teachers afterwards in order to get any feedback or recommendations. To ensure that we have achieved our goal in reaching out to underrepresented groups, we will make sure to take accurate attendance of those participating; this includes the high school students and our own volunteers.

Budget Justification

The D batteries are used to run the DC motors. The attending students will use the DC motors when they perform the experiments. The students are given the batteries to take home so they may continue experimenting at home as well. The sandpaper is used to strip the enameled wire that we provide to perform the experiments. The safety pins are used heavily in the experiments and they are also taken home with the students projects. Laser pointers and metal slinkies will be used to replace parts of the Optics and Acoustics SOCK which have worn down through use. The clear shrink film will be used to create the hologram surfaces which the students will take home. The magnets are used to create the D.C. motors which are also taken home by the students. The soap bubbles will aid in demonstrations in the Van de Graaff generator experiment. This equipment helps to accomplish our primary goal of “Lab for Kids”, which is to serve as a stepping stone into the fields of math and science. Allowing students to take their projects and fun experiences home with them to share with their parents, siblings, and friends is an advantageous side-effect which aids in accomplishing our aforementioned objectives.