



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	\$215.96

Abstract

Lab for Kids is an outreach program by Adelphi University's SPS Chapter, and is primarily run by student volunteers. It allows underrepresented students in physics from local high schools to have enjoyable hands on experiences with science experiments. These students also tour our Physics Department at Adelphi University.

Proposal Statement

Overview of Proposed Project/Activity/Event

Lab for Kids is an outreach program where we connect with students from local high schools. We will hold this year's event in the Adelphi University Physics Department. There will be several "stations" that groups of 5-8 students will alternate between with multiple volunteers providing guidance. We plan to have one station with LED circuits and DC motors, where students will build their own circuits and motors that they can take home. The second station will be explore optics. The third station will demonstrate gravity, angular momentum, electrostatics and sound. The fourth station will be a tour, where volunteers will show students the physics department labs and describe their research. This program is designed to get students excited about physics, especially those who are usually underrepresented in the field. Our department is very diverse, so we hope to show students that anybody can be successful in physics, and that seeking higher education in a STEM field can open new opportunities. We also want to show them that anybody can have fun with physics, especially when doing experiments. Generally, we hope to increase their passion for physics and STEM topics. This program will be open to high school students from the local area. Last year we had around 30 students attend our event, and this year we anticipate the same number or more. We will organize students into smaller groups in order to connect with them individually and give each opportunities to try hands-on experiments for themselves. Lab for Kids for several years now. Every year we get to see students leave the program with a newfound wonder for physics, and appreciation for how our world works. We hope to continue to foster a love for physics in students, especially those underrepresented in the field. Also, we want our SPS members to be able to explain physics in understandable ways (an important skill no matter what profession they may be pursuing), and Lab for Kids offers the opportunity for that. Overall, we love inspiring young science students to follow their passion for physics and one day turn it into a career.

How Proposed Activity Promotes Physics Across Cultures

Our current public education curriculum gravely overlooks the field of physics-- it is often not a requisite or focuses too heavily on standardized testing. Based on statistics from the American Institute of Physics, underrepresentation of certain groups in physics starts as early as high school. This does not encourage students to take physics in their high school years, let alone during their time in higher education. Thus we find it important to bring fun and accessible lessons in physics to young students so they may seek further education in the field. We also aim to grow a curiosity and drive to learn by providing them with the chance to have hands-on and active learning, which is crucial to encouraging them to enter challenging STEM fields such as physics. Through Lab for Kids we give back to the community and provide opportunities to underrepresented demographics so they can have the drive and freedom to pursue it in the future. According to data from the 2016-17 year from the New York State Education department (<https://data.nysed.gov/>), 97% of Westbury High School students are from underrepresented groups in physics (68% Hispanic/Latino and 29% black/African-American). 85% of Westbury HS students are categorized at "economically disadvantaged." Our goal is to reach out to these less involved and disadvantaged groups to give them opportunities they may not have, and serve as a stepping stone for these students to enter prospective STEM fields. Inspiring these students can create a snowball effect, where their activity in STEM can empower others in future generations. In this sense, we hope that our assistance to the community will extend beyond merely our chapter.

By giving these young students the chance to learn physics now, we can enrich the future scientific community with equality and diversity. We hope to do so by empowering students to take initiative in their own education, and encouraging them to venture into challenging subjects such as physics. Through our program, students may take more interest in STEM, or build analytical problem solving skills and logic that can help them in the future. Supplementing their education in this way will allow them to have a voice in the scientific community and beyond, thereby providing the potential for social and economic growth. We reach out to a unique variety of students, composed of various underrepresented groups. Giving such groups the opportunity to experience a field they may never consider gives them choices that everyone should have available. Those from different backgrounds may also seek to resolve issues that their background has led them to prioritize.

As we have held this event annually for several years, we can see the effect it has on students. They are more involved and invested in what they are learning, as we allow them to explore and test science themselves. This program is also an important experience for our diverse population of volunteers. Many of our student volunteers are women or from other underrepresented groups. We are always trying to bring constructive experiences to build upon the minds and characters of our own students. Volunteering for Lab for kids allows them to meet students and hone their teaching skills. This eye opening experience can give insight into future careers in education, as well as the chance to practice communication skills. Volunteers and students who have lose sight of the fundamental beauty of physics can refocus their passion by learning together. The beauty of our accessible and fun demonstrations is that they can remind the volunteers of what initially inspired them to pursue physics, so they'll have motivation to continue their education and career goals. For the high school students, Lab for Kids may be the igniting spark that creates their love for science.

Without the proper funds, we would provide students a subpar experience, and remove the potential for many of our lessons. They would not be able to keep some of their experiments, or even worse, we may have to remove some demonstrations altogether. Removing experiments due to lack of funding would drastically diminish the effectiveness of our program. Providing each student the tools needed to play an active role in the learning process helps give them the feeling that they can take part in STEM. What they take home serves as a reminder that they can choose to take part in physics regardless of whether or not they are from an underrepresented group. We must give the underrepresented the chance to take control of their education if we want to improve diversity in physics and STEM.

Plan for Carrying Out Proposed Project/Activity/Event

- Personnel – Each station will have several lab demonstrations. We typically have our Adelphi student volunteers separated into teams of two or more in order to ensure that the students will have quick access to help. In case volunteers have classes for some of the event, we make a schedule in advance so they can take shifts. Two of Adelphi's physics professors help with "Lab for Kids", as they monitor the demonstrations and make sure they run smoothly.
- Marketing – We speak to the teachers of local high schools such as Westbury High School. By contacting them, we know their curriculum and what students are struggling with. From this, we work with teachers to determine the type of instruction that will assist them the most. We also decide the date of Lab for Kids with their teachers so the timing works with their school schedule. We make it clear that this program is intended to give them fun hands on experience to encourage students to come.
- SPS member participation – Most of the student volunteers are SPS members. We typically have around 12 volunteers from our own SPS chapter. However, this event interests many non-SPS members, and encourages them to join SPS.
- Expertise – The two student volunteers are usually SPS members. To help keep the demonstrations consistent, we try to pair experienced members with new ones. We also meet prior to the event to not only create a volunteer schedule, but to also inform volunteers of their roles. This time allows us to run through some of the experiments to make sure we understand how to teach it, and fix any issues prior to the program. Volunteers are also given the chance to choose the demonstration they teach, that way they can work with the field they are most comfortable in or have had the most experience. The two Adelphi Physics professors also help if further instruction needs to be improved.

We have attendees divided into groups that move through each station. Depending on the space we have, we will have either 6 thirty minute labs or 4 forty five minute lab stations. The experiments at each station will be decided based off of what their teachers request. In the past we have provided a range of experiences, from LED Circuits to DC motors, spectroscopy, the optics sock, the speed of light, the gravity sock, angular momentum, simple sound, the Van de Graaf generator, and lab tours. As we have procured the 2018-2019 sock kit, we will likely add this to to the simple sound or circuit labs if time allows. For optics, we will focus on the use of lasers, diffraction gratings, optical fibers and polarizers, as their understanding would be strengthened by seeing the principles they've learned in class practiced in front of them. Bohr's model and discrete energy levels will be explained during the spectroscopy demonstration, and they can later see these principles in action using discharge tubes of 6 different compositions. We also teach electrostatics with the Van de Graaff generator. They are provided several materials so they can examine the effects of electric fields themselves. To teach circuitry we have a brief explanation of circuit theory, and demonstrate how to build a circuit different kinds of circuits. Typically, students can make a parallel circuit, a series circuit, and a

combination of the two in order to light up an LED. Another activity students can make themselves has them build D.C. motors. The DC motor is created from: rubber bands, coils, magnets, and pins. We have found that students find that - while challenging - this is a very rewarding experiment when completed. They can see electromagnetism in action, and they see simple materials as an opportunity to enjoy science. The 2016 SPS SOCK kit for sound is also used to teach acoustical physics; with the 2018-2019 SOCK kit, we may supplement this section. Our angular momentum demonstration uses a spinning platform and bike wheel. Students learn how these items affect each other, and come to understand how to change their angular velocity through the extension of their arms, as well as by spinning the wheel to change their angular velocity and direction.

Project/Activity/Event Timeline

Our goal is to have the outreach program in mid-April. By February 15th we will start contacting local high schools, such as Westbury High School in order to determine the date and labs. The finalized plan will be set by March 14th in the form of a specific lab schedule, and list of volunteers.

Activity Evaluation Plan

The most important feedback is from the students we teach and interact with. We will initially monitor their behavior, and the way they respond to questions. Having them articulate ideas will help us know what experiences were both engaging and educational. Near the end, we will speak to the students' teacher in order to receive some feedback or recommendations about the experience. To ensure that we've reached out to underrepresented groups, there will be attendance taken of those participating; which includes the high school students and our own volunteers.

Budget Justification

We are requesting \$215.96 to buy: seven laser pointers, three packs of clear shrink film, two metal slinkies, two packs of soap bubbles, three packs of forty curved safety pins, and two packs of twelve safety goggles. Laser pointers and metal slinkies will be used to replace parts of the optics and acoustics experiments that will be performed. The soap bubbles will be used in demonstrations with the Van de Graaff generator. The safety pins and modelling clay are used in the DC Motors experiment that the students are able to take home. The safety goggles will be used to provide eye protection for students and volunteers during the experiments. The equipment will help accomplish our primary goal of "Lab for Kids", which is to serve as a stepping stone into the fields of math and science for high school students. "Lab for Kids" allows students to take their experiences home with them to share with their family and peers.