

Future Faces of Physics Award Proposal

Project Proposal Title	“Turn”ing up with Physics!
Name of School	University of the Sciences
SPS Chapter Number	5619
Total Amount Requested	\$499.98

Abstract

The University of the Sciences chapter of SPS will partner with Philadelphia’s Mighty Writers Afterschool Program to demonstrate engaging experiments about the physics of spinning and rotation to minority students to promote critical thinking in science.

Proposal Statement

Overview of Proposed Project/Activity/Event

In the past, the University of the Sciences SPS chapter has traveled to nearby high schools and middle schools to conduct outreach programs, with the goal of stimulating interest in physics and related fields among young people and under-represented groups. This year, we plan to conduct a physics outreach event with students of the afterschool academies of Mighty Writers, a Philadelphia-based volunteer organization dedicated to teaching students of all ages, races, how to think and write with clarity. As part of their “Second Friday” events, Mighty Writers hosts different speakers and presenters every second Friday. The USciences chapter of SPS will travel to Mighty Writers - West Philadelphia, and conduct physics demonstrations to promote critical thinking in science.

At the event, we will set-up six stations with different Physics demonstrations in the areas of rotation. The stations are, How Tops Work, Spinning Dumbbells, High Voltage Science, Gyroscopes Galore, Roll! Roll! Roll!, and Resonance. The students will spend approximately 20 minutes at each station, exploring the different properties of rotation in a hands-on way. The students will be asked to think about the physics behind each experiment before the experiment is actually conducted. After the experiment, the students will be asked to investigate their previous thoughts. We will promote participation with small prizes for those who answer questions.

- **Station 1. How Tops Work.** This station will have numerous different spinning tops. Students will examine how each top is unique and how they spin differently based on shape and construction.
- **Station 2: Spinning Dumbbells.** This station will demonstrate the effect of conserving angular momentum. Students sit on a spinning base while holding weights. As we bring the weights into our center of gravity our rotational speed increases.
- **Station 3: High-voltage Science.** This station features a Van Der Graaf generator with multiple accessories such as the Electrostatic Whirl. When electrons jump off the generator onto the whirl, the whirl will spin.
- **Station 4: Gyroscope Galore.** This station will explain gyroscopic precession with small and large gyroscopes such as a handheld gyroscope and bicycle wheel.
- **Station 5: Roll! Roll! Roll!** This station will include a ramp with several different rolling and sliding objects. The students will predict which object will make it to the bottom of the ramp first. The experiment leads to concepts of moment of inertia.

- **Station 6: Resonance and yo-yo's** A chinese spouting bowl shows how to transfer energy to the water. The energy produces waves in the water and even makes small splashes. Other demos of resonance including standing waves on a slinky and string, will be used. We will also have a chinese yo-yo that demonstrates that when the yo-yo is spinning it is stabilized.

How Proposed Activity Promotes Physics Across Cultures

Mighty Writers is a Philadelphia-based volunteer organization that teaches and mentors over 2000, mostly minority, kids annually and recognized by the White House as a top arts-and-humanities program in the US. Mighty Writers has invited our SPS chapter to perform outreach at their after-school academies to increase the interest for physics among minority kids by conducting hands-on physics experiments with them. Our goal is to excite minority students about science. Moreover, our activities in this partnership will provide students with material and inspiration for scientific writing, which is a skill being developed by *Mighty Writers*. We also plan to encourage students to consider pursuing physics-related careers. We believe this outreach has the potential to nurture a fruitful collaboration between SPS and Mighty Writers.

Plan for Carrying Out Proposed Project/Activity/Event

- SPS members Alyssa Petroski, Despina Nakos, Austin Vantrease and Karla Miletic will be in charge of the project. The group will be under the direction of Dr. Roberto Ramos, SPS advisor.
- Marketing of the project will be a collaboration between SPS and the site coordinators of Mighty Writers. SPS will develop flyers containing information about the demonstrations and Mighty Writers will disseminate these and discuss with their captive community audience. A minimum of 60 students, between ages 7-17, is estimated to attend the outreach.
- Approximately 5-8 members of SPS will participate and volunteer as mentors after discussing and practicing the experiments on the University of the Sciences campus.
- Our advisor, Dr. Ramos, will use his physics expertise to ensure safety of the experiments and effective communication of physics ideas.

- We will have six physics demonstrations. Every station will be manned by SPS members who will engage students using an inquiry-based approach to physics concepts.
- After giving the students a chance to ponder on how the demonstration works, they perform the experiment and the idea is discussed further.
- Progress will be monitored by surveys after the session and two weeks after the completion of the event.

Project/Activity/Event Timeline

- January 16, 2017: Order all materials, create a demonstration outline and flyers, and contact Mighty Writers site coordinator.
 - February 9, 2017: SPS members will receive training in performing demonstrations
 - February 16, 2017: Design and print handouts to be given to Mighty Writers students.
 - February 23, 2017: Last run through of how the final day will happen.
 - March 9, 2017 : Pack all demonstrations for transportation.
 - March 10, 2017 : SPS members will go to the Mighty Writers site to perform outreach.
 - March 24, 2017 : SPS will receive additional post-outreach feedback from site coordinators
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Activity Evaluation Plan

To evaluate the success of the activity, surveys will be handed out to each student after the session, asking how they feel about experiments, what they learned, and what they took away from the demonstrations. An additional evaluation will be sent to coordinators two weeks after the completion of the project to determine the lasting impact.

These surveys will help our chapter of SPS determine what future outreach events we can do.

Budget Justification

We request funding to purchase the designated demonstration equipment. Since our chapter is fairly new at performing outreach, we have limited demonstrations. With these physics demonstrations we can impact more K-12 students and encourage them to consider a physics or physics-related career. The budget will also cover transportation to/from the site. Using Septa will be the most efficient way of travel.

The bulk of the budget will go towards buying demonstrations. Each demonstration will be interactive and we will be able to teach the students hands on how each demonstration works. The different tops will be used at the “How Tops Work” station. The Gyroscopes will be at the station “Gyroscope Galore”. Using dumbbells with a spinning base will be in the “Spinning Dumbbells” station. A Van Der Graaf generator with an electrostatic whirl will be in station “High Voltage Science”. The ring and disc apparatus will be in the “Roll! Roll! Roll!” station. The last station will have the SpillNot, a chinese spouting bowl and also there will be yo-yo’s so that the students can have a little more fun and get more involved in general with physics.
