



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	Science After Hours: Educating Young Students
Name of School	Towson University
SPS Chapter Number	7338
Total Amount Requested	\$500.00

Abstract

Towson University's SPS chapter will be running a program with community activist Andrea Loran to teach elementary school students science in a weekly after school program. The program will include four long-term projects lasting 3-4 weeks, and will excite, empower, and educate the students in the sciences.

Proposal Statement

Overview of Proposed Project/Activity/Event

Towson University student Andrea Loran takes several physics and astronomy courses at Towson University: not towards a degree, but out of interest in the sciences. Loran, a community activist, runs an after school program for 30 elementary school students. These students range from 2nd to 5th grade, and most are there because their parents are working. Every Friday, these young students meet with Loran at the Hampden Family Center in Baltimore from 4:00pm to 5:00pm, where she attempts to pass to them her interest in science.

A few weeks ago, Loran approached Towson University's chapter of the Society of Physics Students and asked for assistance in a program she runs. In response, Towson University's SPS chapter will create and implement a program that will excite, empower, and educate the students in the sciences. Inspired by an elementary school program run by students at Virginia Tech, the form of our program will be a series of long running projects, each project lasting 3-4 weeks. The projects will have multiple components (i.e., historical aspects, group work, making measurements, simple programming) designed to keep the young students engaged and interested while learning.

The main projects we will implement are

- Project 1: Projectile motion
 - **Project:** the class will split into groups for 4 weeks, preparing for a game of Battleship. In this game, each team will make distance measurements of targets, then look up on a chart the correct firing angle and power setting.
 - **They will learn:** how to make proper measurements, read graphs and charts, and create a team plan.
- Project 2: Circuitry
 - **Project:** The students will play with squishy circuits to create their own innovations.
 - **They will learn:** creativity and design, how to work independently, and how to ask questions.
- Project 3: 3D printing
 - **Project:** designing and creating a 3D printed object. We are not sure whether to make this an individual project, or a group project where each student will create a small part of a larger project.
 - **They will learn:** creativity and design, the basics of the 3D printing software, and how the 3D printer works.
- Project 4: Astronomy
 - **Project:** creating a scale model of the solar system. The students will get to work outside as a class to create a scale model of the Solar System. Other smaller astronomy projects will also be included. This was saved for last so it will be nice weather when we go outside.
 - **They will learn:** about numbers, fractions, and (if possible) orders of magnitude, and how to work in groups.

In addition to this program with Andrea Loran and her elementary school students, we have formed connections with leaders from Patterson Park Public Charter School, Tunbridge Public Charter School, and Moravia Park Primary school, and Immaculate Conception School. We plan to run similar programs at these schools in the near future.

How Proposed Activity Promotes Interest in Physics

As mentioned above, our program looks to excite, empower, and educate the young students in science. The excitement is the main objective because we want to instill an interest in science. Empowerment was agreed to be important because the students should leave with a demystified sense that they *can* do science, an idea inner-city students tend to never hear. Finally, we want to actually teach these students some science, as opposed to presenting cool demonstrations. By balancing these three themes, our program will be one in which kids come with an eagerness to begin, leave with a sense of accomplishment, and return to their classrooms to teach their peers.

Regularly working with Andrea Loran's program allows us to provide kids with a more intimate experience in science. We can keep the focus and interest of the students by choosing projects that engage the students. Continuing each project over multiple weeks will then give us the opportunity to really educate the students with time to mentor and support them. Ultimately, this program provides young students with one of their few opportunities to truly experience science.

Plan for Carrying Out Proposed Project/Activity/Event

The people mostly in charge of planning this program are Andre Loran, SPS President Nathan Prins, and SPS Outreach Coordinator Nicholas McKinley. All three have significant experience with promoting science and educating elementary school students. Andrea Loran has been running her Friday program for months as a community activist, Nathan Prins has been involved with numerous outreach programs for all ages, and is a volunteer reading teacher for an elementary school, and Nicholas McKinley is a physics major training to be a physics teacher through Towson University's UTeach program.

Along with our three project leaders, over a dozen SPS members from Towson University have expressed interest in joining the program. Many bring their own expertise; for example, Mathew Ridge works at the Digital Harbor Foundation, a non-profit organization that teaches young students about technology, specifically 3D printing.

Project/Activity/Event Timeline

- Fridays: Nov. 20th, 2015 – Dec. 4th, 2015
 - Attend Loran's Friday program
 - Familiarize ourselves with the students
 - Do a few fun, easy demonstrations
- Dec. 4th, 2015
 - Have a detailed lesson plans for Projects 1 and 2
- Fridays: Jan. 29th, 2016 – Feb. 19th, 2016
 - Dates for Project 1: Projectile motion
- Fridays: Feb. 26th, 2016 – Mar. 11th, 2016
 - Dates for Project 2: Circuitry
- Feb. 29th, 2016
 - Have detailed lesson plans for Projects 3 and 4
- Fridays: Mar. 25th, 2016 – Apr. 22nd, 2016
 - Dates for Project 3: 3D printing
- Fridays: Apr. 29th, 2016 – May 13th, 2016
 - Dates for Project 4: Astronomy
- May 16th, 2016
 - Complete all evaluations and debriefings for final report
- May 31st, 2016
 - Submit final report

Activity Evaluation Plan

Because our main goal is education students, we will create a “Science Wall.” This will be a large board on which students write down new and interesting science facts that they learn. Obviously, the more that the board gets filled, the better we have done as a group. We will also be in contact with their teachers throughout the semester. We hope to see the students find the value in education to some extent, helping them focus more in class. Finally, we will debrief every other week with the volunteers from Towson University’s SPS chapter. The volunteers should be able to gauge how the young students receive the material, as well as provide information on their own involvement.

Budget Justification

Thankfully, due to years of dedicated outreach activity, most of the supplies needed to create the projects described above can be found within Towson University’s physics department. In addition, Towson University’s SPS chapter can provide funds from past fundraisers, snack sales from our lounge, and funding from Towson University’s Student Government Association.

The main materials our program needs are the squishy circuit kits, the 3D printing filament, BuildTak 3D printing surface, and a poster board for our “Science Wall.” The squishy circuits kits come with the conductive dough and some small electrical components. We ask for 5 such kits, knowing we can provide more electrical components, wiring, and other materials from our department. The 3D printing filament and BuildTak 3D printing surface are essential to the 3D printing process. We are already in the process of buying a 3D printer, and will have one soon. The poster board is to create our “Science Wall.” This is just a 6-foot poster board, that we can design and decorate ourselves.

We also ask for funding for transportation to and from the site, and snacks and drinks for the students and volunteers. For transportation, we calculated that at \$0.50 per mile, with a 5.8-mile one-way distance, we ask for \$5.80 per day, adding up to \$81.20. We ask \$10.00 for snacks and drinks per day, adding up to \$140.00.

Finally, the miscellaneous items include other materials we do not account for. These extra funds will give us a relaxed budget in case we need more money. Any costs beyond this can be paid for by our chapter’s account, and funding from Towson University’s Student Government Association.