



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 cover 5-6 science related topics, integrating projects, demonstrations, and lessons, to excite and educate students in the sciences.

Proposal Statement

Overview of Proposed Project/Activity/Event

Towson University's SPS chapter has coordinated in past semesters with community activist and science educator, Andrea Loran, to bring the Science After Hours program to the Hampden Family Center. This year Towson SPS is looking to bring this program to the Wolfe Street Charter School in Baltimore Maryland. The Science After Hours program plans to run an after school program every Friday from 4:00 to 5:00 pm, that educates and empowers 10-15, 4th-5th grade students in all aspects of science.

In conjunction with Loran and in the spirit of continuing the success of the Science After Hours program, Towson University's chapter of the Society of Physics Students will improve on the existing program and spread the reach of the program to more students. Initially inspired by an elementary school run by students at Virginia tech, the form of our program will be a series of long running topic themed projects, each lasting 2-4 weeks. The topics will encompass basic concepts in physics, math, robotics, biology and geology and have many subcomponents (i.e., historical aspects, group work, making measurements, simple programming) designed to keep the young students engaged and interested while learning important concepts.

The main projects/topics we will implement are

- Topic 1: Projectile Motion/Kinematics
 - Proposed Activities:
 - Battleship: The class will split into groups for the length of the activity, preparing for a game of Battleship. In this game, each team will make distance power settings.
 - Catapult Construction: The class will work in groups for the length of the activity to design, test, and construct a small catapult/trebuche. The teams will learn engineering principles and kinematics principles.
- Topic 2: Optics
 - Proposed Activities:
 - Total Internal Reflection: Students will learn through demonstrations the principle of TIR and other principles related to optics. Students will then construct their own source of TIR using 2 Litre bottles and laser pointers.
 - Polarization: Students will work in groups to understand the concept of polarization of light. Demonstrations will be conducted with 3-D glasses to show the principles of polarization. Then students will use blank overhead sheets to construct polarization "art".
- Topic 3: Electromagnetism and Circuitry
 - Proposed Activities:
 - Squishy Circuits: Students will work in groups learning on their own the mechanics of squishy circuits. Then when basic proficiency has been achieved by the students they will be guided in the construction of basic circuits.
 - Ferrofluids: Students will be able to play and explore the mechanics of ferrofluids.
- Topic 4: Astronomy
 - Proposed Activities:

- Scale Model of the Universe: Students with instruction from guides will construct a to scale model of the universe. This activity will be coupled with demonstrations and other small lessons.
- Portable Planetarium: Students will be guided through a tour of the universe using Towson University's portable planetarium
- Rocket Science: Students will construct basic rockets and learn the mechanics of rocketry.
- Topic 5: Biology/Geology
 - Proposed Activities:
 - Rain Garden: Students will construct and nurture a small rain garden in order to learn the processes of plant growth and ecosystem science
 - Tiny Archeology: Students will explore the concepts of geological processes during their exploration of a small archeological dig.

In addition to this program at Wolfe Street Charter School, Andrea Loran and Towson SPS is looking to expand into other after school programs. We have formed connections with leaders from Patterson Park Public Charter School, Tunbridge Public Charter School, Morvia 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. Exciting students in science is the main objective of this program. Due to our limited time frame for lessons each week the main focus of our program is to excite and get students interested in science. Our second and third goals of the program is to empower and educate students. As science educators we want to *demystify* science and make students believe that they have the ability to do AND enjoy science, an idea that historically not prevalent in inner-city schools. Finally, we want to educate these young students instead of just presenting cool presentations. By balancing these three themes, our program will be one in which kids come with an eagerness to begin science, and leave with a sense of accomplishment.

Regularly working this 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 the few opportunities to truly experience science.

Plan for Carrying Out Proposed Project/Activity/Event

The primary coordinators for this program will be Andrea Loran, SPS President Emileigh Shoemaker, and SPS Outreach Coordinator Sean Spencer. All three have significant experience with promoting science and educating elementary school students, and all have worked in this program in lesser roles before. Andrea Loran has been running her Friday program for years as a community activist, Emileigh Shoemaker has extensive experience working in the Science after Hours program, and Sean Spencer is a physics tutor at Towson University and has worked in the Science After Hours program before.

Along with our three project leaders, over a dozen SPS members, as well as members of the Towson UTeach program, from Towson University have expressed interest in joining our program. Many bring their own unique expertise; for example, Matthew Ridge works at the Digital Harbor Foundation, a non-profit organization that teaches young students about technology, specifically 3D printing. Students from other chapters of SPS are also being contacted about potentially working in our program. Goucher College's chapter of Society of Physics Students has also expressed interest in joining our program.

Project/Activity/Event Timeline

- Wednesday: October 5th, 2016
 - Have detailed lesson plans and materials for all 4 topics
- Fridays: October 7th-14th, 2016
 - Dates for Topic 1: Projectile Motion/Kinematics
- Fridays: October 21st-28th, 2016
 - Dates for Topic 2: Optics
- Fridays: November 4th-18th, 2016
 - Dates for Topic 3: Electromagnetism and Circuits
- Fridays: November 25th-December 2nd, 2016
 - Dates for Topic 4: Astronomy
- Friday: December 9th, 2016
 - Date for Topic 5: Geology and Biology

Activity Evaluation Plan

Because our main goal is to educate students, we will create a “Science Wall”. This will be a large 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 the their teachers throughout the semester. We hope to see the students find the value in education to some extent, helping them focus more in a class. Finally, we will debreif 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 projectes described above can be found within Towson University’s physics department. However we are asking for \$50.00 to make any necessary updates or repairs to already existing demonstration pieces and lesson activities. 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 squishy ciruit kits, poster board for our “Science Wall”, ferrofluid kits, and simple “crafts” materials for projects the students will be doing. These crafts materials include small things like 2 litre bottles, popsicle sticks, rubber bands, projector slides and tape. These materials are going to be purchased ahead of time but could also be purchased on the fly as lessons adjust. We are requesting \$50.00 to purchase these materials with the intention on using the funds “on the fly” as lessons adapt and change. The squishy cicuits 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 materials from our department. 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 an 11.7 mile one-way distance, we ask for \$11.70 per day, adding up to \$105.30. We ask \$10.00 for snacks and drinks per day, adding up to \$90.00

Finally, the miscellaneous items include other materials we cannot account for. These extra funds will give us a relaxed budget and allow SPS to be flexible in its presentation and structuring of its lessons and activities, for this we are requesting \$37.00. Any costs beyond this can be paid for by our chapters, account, and funding from Towson University’s Student Government Association.