



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	Science Fridays
Name of School	Towson University
SPS Chapter Number	7338
Total Amount Requested	\$500.00

Abstract

Towson University's SPS chapter is running a program with Wolfe Street Academy, a public charter school in Baltimore City, 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.

Proposal Statement

Overview of Proposed Project/Activity/Event

Towson University's SPS chapter has coordinated in past semesters with Wolfe Street Academy to bring the Science Friday program (formerly known as Science After Hours) to the Hampden Family Center. This year we will be continuing this program in Wolfe Street Academy. We will be running Science Fridays every available Friday from 3:00 to 4:30 pm.

Each week consists of a short lesson taught by our outreach coordinator. The lesson is followed by a hands on experiment lead by the coordinator and fellow general members. The lessons are designed to outline basic concepts while allowing the students further to investigate the subjects. Our goal is to introduce science in a fun and exciting way. We conclude Science Friday with a few wrap up questions asked to the students. This is done so that the students have an overall sense of the lesson and how it might relate to the world outside of school. It also allows for an observation of how receptive the lessons are to the students; and where there is room for improvements in the lesson plans. Throughout the entirety of the lesson, students are encouraged to ask questions and suggest topics they want to learn more for future Fridays.

The program is considered an extracurricular activity, so all students and members of SPS who attended do so voluntarily.

Some examples of topics/experiments taught are:

- Projectile Motion/Kinematics
 - Proposed Activities:
 - Battleship: The class will split into two teams, each team is given a spring loaded ball launcher. The teams take turn setting the angles and launching at each other's boats. This lesson teaches about parabolic projectile motion. Students learn the relationship between angles and range.
 - Catapult Construction: The class will work in groups to design, construct, and test a small catapult/trebuchet. The students will learn engineering and kinematics principles.
- Optics
 - Proposed Activities:
 - Laser Waterfall: Students will construct "laser waterfalls". This contraption uses total internal reflection to send a laser through a falling stream of water. This experiment demonstrates how light is transported for things like fiber optics.
 - Polarization: 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". This experiment will teach students about polarization.
 - Laser Race: Students are split into two teams. Each team is given a set of mirrors. Each team will take turns either directing their own light source to its target or reflecting the opposing teams light away from the target. Whichever team hits the target first wins. Students will learn about reflection
- Electromagnetism and Circuitry
 - Proposed Activities:
 - Squishy Circuits: Student are split into groups and given an assortment of materials such as paper clips and rubber bands. They are also given a power

- source and a light bulb. Students then discover what materials are conductive through experimentation. Students will learn about conductivity and circuit design
- Ferrofluids: Students will be able to play with and explore the mechanics of ferrofluids.
 - Compasses: Students build their own compasses by magnetizing a paperclip and floating it in water. Students will learn about magnetism
- 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.

How Proposed Activity Promotes Interest in Physics

Students are introduced to scientific concepts in an exploratory and educational way. The structure of the lessons allow students to see the dominant presence of physics in every lesson taught. Science Fridays emphasize this overlapping behavior of sciences in a simple and fluid manner by relating previous lessons to the current one being taught. Having positive experiences with science at a young age not only encourages appreciation for the roles of science, but peaks interest at an early age that may bloom into something greater with time. This is further emphasized by positive and diverse role models from the STEM community teaching the lessons, since all Science Fridays are taught by SPS general members and other undergraduate students from Towson University.

Plan for Carrying Out Proposed Project/Activity/Event

The primary coordinators for this program are Towson SPS President Bailey Spalding and Outreach Coordinator Azriel Weinreb. This program has already been well established as we do it every year. We are in contact with Wolfe Street Academy and coordinate the schedule together with them.

The lessons are written by the outreach coordinator. We have 2-3 undergraduate student volunteers every week from the physics or geology majors at Towson University.

Project/Activity/Event Timeline

The program will run this year on the following Fridays, and operate with a similar schedule every year:

- October 26, 2018 (10/26)
- November 2, 2018 (11/2)
- November 9, 2018 (11/9)
- November 16, 2018 (11/16)
- November 30, 2018 (11/30)
- December 14, 2018 (12/14)
- January 11, 2019 (1/11)
- February 1, 2019 (2/1)
- February 8, 2019 (2/8)
- February 15, 2019 (2/15)
- February 22, 2019 (2/22)
- March 1, 2019 (3/1)
- March 8, 2019 (3/8)
- March 22, 2019 (3/22)
- March 29, 2019 (3/29)
- April 5, 2019 (4/5)
- April 12, 2019 (4/12)
- April 26, 2019 (4/26)
- May 3, 2019 (5/3)
- May 10, 2019 (5/10)
- May 17, 2019 (5/17)

Activity Evaluation Plan

Because our main goal is to educate students, we will create a “Science Wall”. This will be a large area on which students write down new and interesting science facts that they have learned. The more filled the board gets, 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, which could potentially help them focus more in a 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 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. However, we are asking for \$50.00 to make any necessary updates or repairs to already existing demonstrations. In addition, Towson University’s SPS chapter can provide funds from past fundraisers, snack sales, and funding from Towson University’s Student Government Association.

The main materials our program needs this year are mirrors, magnets, poster board for our “Science Wall”, and “crafts” materials for projects the students will be doing. These crafts materials include small things such as 2 liter 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 may adapt and/or change. We also need to purchase mirrors as this is the first year we are doing the laser race experiment described above. We want to purchase 10 for \$7 each. Our compass experiment is also relatively new. We cannot use the magnets from Towson as they are neodymium magnets which are too strong (and therefore dangerous) to be

used by elementary school students. The magnets will cost us \$6.80 each and we wish to purchase 6. The poster board is to create our “Science Wall.” This is a 6-foot poster board that we can design and decorate ourselves, it will cost \$14.90.

We also ask for funding for transportation to and from the site as well as snacks and drinks for the students and volunteers. For transportation; we estimate \$0.25 per mile and travel 10.6 miles each way. This adds up to \$111.30. We are budgeting \$8 per-session for snacks and drinks.