



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	The Phun-damentals of Physics
Name of School	The George Washington University
SPS Chapter Number	2319
Total Amount Requested	486.25

Abstract

The George Washington University SPS chapter will work with Life Pieces to Masterpieces, a Washington, DC organization, to run five 45 minute physics workshops for elementary and middle school students. We also hope to begin the process of creating a permanent "Science Station" at Life Pieces with hands-on demonstrations and children's books related to physics.

Proposal Statement

Overview of Proposed Project/Activity/Event

Our project will further our outreach efforts that we began last year with the nonprofit organization Life Pieces to Masterpieces of Washington, DC, youth development non-profit that serves African American boys in Washington, DC. The project will help spark an interest in physics among the young men at Life Pieces to Masterpieces. Our outreach will be a part of their Innate Creative Ability network (I CAN) initiative, which seeks to bring out creativity in the young boys through art and science workshops. The members of our SPS chapter would participate in five consecutive weeks of workshops with two age groups (ages 7-10 and ages 10-14), and a final culminating celebration and showcase on the final week.

Building on last year's program, we plan to span topics such as light and lasers, astronomy, and properties of fluids in our hands-on science workshops. We received great feedback, including a Blake Lilly Award, from this outreach effort last year and had an amazing time working with the young men in the program. The director of the Life Pieces program, Tiffany Ross, remarked at one point that she never heard the boys talking about science in the halls until our group showed up, and now it seems like a regular occurrence. This year we hope to reach an even larger group of students with better honed demonstrations and activities, including a small permanent "Science Station" to house books and demonstrations on site.

How Proposed Activity Promotes Interest in Physics

The activity is designed to help the students relate to physics, so they can understand how physics is relevant both to their daily lives as well as to exotic things such as lasers and supernovas that they might hear about in the news or otherwise. We plan to change the focus somewhat from last year, and we are retooling all of the lessons to fit the new goal.

The topics from last year were: 1) light and lasers, 2) states of matter and non-Newtonian fluids, 3) astronomy and rockets, and 4) supernovas and velocity-amplification.

In the lesson about lights and lasers, we gave the students diffraction glasses and had them go between different stations, each with a light source and activity to go with it. The students were fascinated by the different spectra, but had difficulty grasping the relationship between the colors they were seeing and the light source they were looking at. This year we are going to start by talking about prisms and rainbows, which should help elucidate the link.

In the states of matter lesson, we introduced the students to the properties of fluids and solids before surprising them with oobleck. They readily comprehended solids and liquids, and understandably had difficulty comprehending gases. For this reason, we are going to focus more on giving them a tactile sense of what fluids are, as well as how liquids and gases are similar. We are considering adding a new activity with a feather for the students to explore how they can push objects around in air similarly to how they can in water.

In the astronomy lesson, we talked about the planets of our solar system and showed them a water-based 'rocket' that moves along the ground. We had planned to have two separate sessions, one on astronomy and one on rockets, but had to combine them due to scheduling issues. We noticed a significant split among the students in who liked each. The section on planets was not very hands-on and the rocket section was not very structured, so we are considering ways to adapt them. For the first, we are considering a spandex planetary demonstration for the students to try their hand at putting each planet into orbit. For the second, we are considering a rocket experiment to determine how to launch rockets the farthest.

In the final lesson, we introduced the students to the common physics demonstration of the basketball and tennis ball. When you drop a tennis ball sitting atop a basketball, the tennis ball rebounds at a much higher speed than the basketball does. We connected this to the idea of the supernova core bounce, and how all of the layers of the star crash in on each other and then explode outwards. This lesson was very successful in terms of engaging students last year, but nevertheless we are retooling it to be more hands-on. The new

lesson will be focused around tension and slinkys. One question we will focus on is “What happens when you drop a slinky?”, and we will show a slow motion clip for them to see it in action.

For each of the four topics we plan to include a small demonstration and set of resources to be located permanently at Life Pieces in the “Science Station”, including such items as rainbow glasses, LED lights, a prism kit, balloons, slinkies, bungee rockets, bouncy balls, and related resources. We also plan to purchase several recent award winning books from the American Institute of Physics Science Writing for Children contest (such as *Batman Science: The Real-world Science Behind Batman’s Gear*) and include them in the science station as well.

Plan for Carrying Out Proposed Project/Activity/Event

Our project will be conducted by members from the George Washington University SPS chapter. We will have at least four SPS members attend each Friday session to carry out the lessons. We will have planning sessions weekly where we will lay out the plan for the lesson. The SPS members will sign up for the workshops that they would like to teach and participate in based on their availability and their interest/expertise in that topic. We will market the project to the students at the first workshop date. During this session, the students will try out our workshop as well as others and decide on which series of workshops would like to pursue for the following five weeks. We will use this first workshop session to expose the students to different types of activities and physics lessons they will get to participate in throughout the five weeks. We expect at least 10-15 SPS members to get involved with the project. Since most of our SPS officers conducted lessons last year, we will have them take the leadership on lessons this year as well as get newer SPS members involved and engaged in the lessons.

Project/Activity/Event Timeline

Our program is one of multiple that Life Pieces will be running in the Spring, under the name Innate Creativity Ability Network (I CAN). Five sessions will take place over the next five weeks, each of which constitutes one lesson, followed by a showcase event. We will need to finalize our pitch by the week before the lessons start and develop complete lesson plans for each week during our practice sessions.

As begin our outreach, we will also begin organizing the new “Science Station” and Life Pieces and ensuring that we can have a supply of the physics books and demonstrations there for the Life Pieces students to read, experiment with, and enjoy.

Activity Evaluation Plan

At the conclusion of the workshops, we will hand out a survey to assess how effective our workshops were and which were most interesting to the students. We also plan to document the attendance of the students each week and the use of the Science Station. We will also get feedback from the administrators at Life Pieces. Last year, we noticed that the student evaluations and feedback from administrators were consistent with each other, so we are confident that our assessment will again be productive. Lastly, we got helpful informal feedback last year from the undergraduates, which we intend to do more systematically this year.

Budget Justification

The Marsh White award will be used to purchase supplies for the demonstrations and small take-aways for the students to bring home with them as a token from each lesson. We would like to give the students

these take away physics demonstrations as an incentive to participate in the activities, as well as a small reminder of what they learned so that they can share this with their classmates, friends, and family. The funding will also be used to purchase permanent demonstrations and books that can be given to the new "Science Station" we hope to establish at Life Pieces.

In addition to the funding requested from SPS, the GWU Physics Department will provide various financial and logistic support including:

1. assistance with transportation for the undergraduate presenters each week to the Life Pieces site (usually two vehicles about 10 miles one-way)
2. demonstration materials to be used on a recurring basis, such as laser pointers , non-Newtonian fluid supplies, balloons, liquid nitrogen, and various balls for bouncing demonstrations
3. occasional snacks for the students and undergraduates