



Marsh W. White Award Proposal

Project Proposal Title	Promoting the Fun of Physics
Name of School	The George Washington University
\SPS Chapter Number	2319
Total Amount Requested	[\$500]

Abstract

The George Washington University SPS chapter aspires to expand a continuing outreach program with Drew Elementary School and Life Pieces to Masterpieces. The program involves ten 45 minute lessons given to elementary and middle schoolers. The chapter hopes to enhance the program by improving teaching materials using the Marsh White Grant.

Proposal Statement

Overview of Proposed Project

The chapter will expand a continuing outreach program organized by past GW SPS members through Life Pieces to Masterpieces at Drew Elementary School in Washington DC. Life Pieces to Masterpieces is a youth development non-profit organization serving boys in the DC area. The elementary and middle school aged boys qualify into the program by demonstrating high socio-economic need. The organization sponsors a project called ICAN which partners with GW SPS, where 5-10 sessions are held during the months of March-May on Fridays for program youth. During these sessions GW SPS volunteers provide 45 minutes of lessons and activities demonstrating physics concepts to youth. The goal of our project is to provide the youth members with tangible ways to explore physics concepts through demonstrations and lessons, sparking interest within students to learn more about physics in and outside of the classroom. We also hope to influence the educators we encounter through the program, showing them fun and interactive alternatives in teaching STEM concepts. In previous years, our SPS chapter has been able to put together lesson plans and demonstrations using the few resources available to us through the physics department budget. As a chapter, we recognize that we've been limited by this lack of resources which has had an impact on the amount of concepts we are able to demonstrate to the students and the quality of our teaching material.

How Proposed Activity Promotes Interest in Physics

The proposed project's impact is clear - increasing the budget for our outreach program at Drew Elementary School will provide students with little experience with physics the opportunity to interact and explore with the projects and lessons we provide them. More specifically, each of the proposed budget items we request will serve a purpose in demonstrating a new set of physics concepts in an engaging manner. The lessons we hope to add are listed below in our preferred session order.

Gravity and Air Resistance - We will demonstrate gravity and air resistance principles using a parachute making activity which will be created using materials provided by the physics department, and with the well-known feather and coin demonstration provided by investing in a vacuum pump and tube.

Air Pressure - Air pressure will be demonstrated using a vacuum tube and marshmallows, showing how they expand when you reduce air pressure. We will also provide a demonstration that requires students to use "stomp rockets". In essence, stomp rockets utilize the air pressure in a tube which, when the students stomp on the tube, generates a force shooting the rocket into the air.

Buoyancy - We will demonstrate the principles of buoyancy using an activity where students create their own boats with aluminum foil using information from a lesson taught prior to the activity. The students will then place the boats in a small plastic pool filled with water and have weights placed in them to see which of the boats can hold the most weight.

Electricity and Circuits - We will be demonstrating circuitry and electricity concepts. We will do so using snap circuits, which allow students to experiment safely with current carrying snap-on wires connected to a voltage. We will also be giving the students "energy sticks" which convert the heat of the students hands into electricity, activating the noise-making stick.

Light - Our light lesson plan will involve several different stations. One of the stations will involve students making bracelets using beads that change color when exposed to ultraviolet light, and another where they will make slime that changes color in response to UV light using photochromic pigment. The last station will utilize rainbow diffraction glasses that each student can wear to demonstrate the color spectrum of light.

Each of these lessons will be supplemented by a lesson on light and spectroscopy given at the beginning of the session.

Plan for Carrying Out Proposed Project/Activity/Event

- **Personnel** - SPS member Amy Georgescu in partnership with advisor Professor Gary White will be overseeing the preparation and outcomes of this project. We will attend and plan meetings in preparation for the lessons and attend these lessons along with providing transportation for our volunteers to Drew Elementary School.
- **Marketing** - Contact with the ICAN team will be made before the end of the fall semester in December to confirm the number of students to account for during the spring session and to confirm the dates and times for sessions.
- **SPS member participation** - Our chapter will have 5-10 members volunteering to assist with executing the in person lesson plans depending on the number of prospective students. During the fall and spring semester, all SPS members will be encouraged to collaborate on project preparation during weekly chapter meetings.
- **Expertise** - Almost every SPS member is an alumni of the Drew Elementary outreach program, giving them experience carrying out lesson plans and interacting with the students. Our SPS volunteers all have experience tutoring physics with several age groups as well. On top of this, Amy Georgescu, a member of SPS has nearly 7 years of experience teaching youth in large and small group settings with educational and sports related activities. This level of experience and expertise provided by our chapter will ensure a successful carryout of planned lessons and demonstrations.

Project/Activity/Event Timeline

- Develop preliminary list of demonstrations and lesson plans(October 20-November 17)
- Communicate with SPS board regarding availability to volunteer, confirm at least 10 Fridays during the period of March-May 2024 (November 17-December 8)
- Send these dates to ICAN team at Drew Elementary School to confirm their availability (December 1-17)
- Confirm and purchase lesson plan materials (January 15-31)
- Organize delivered lesson plan materials in preparation for first lesson (February)
- Three practice lesson sessions with SPS volunteers (February)
- First lesson! (undecided date in early March, aiming for March 1)

Activity Evaluation Plan

In order to calculate the success of our project, we will be conducting a survey to various groups impacted by our project. More specifically, we will survey the students being taught during sessions, the program leaders from ICAN involved in lessons, and program volunteers from our SPS chapter. The survey for each of these groups will vary - when we survey the students, it will be an informal way of gauging their enjoyment and interest in the lessons. For the program leaders and SPS volunteers we will survey their perception of what they believe the successes and pitfalls of our lesson plans were. With this information, we will be able to evaluate the effectiveness of our new lesson plan additions and improve them for the next program cycle.

Budget Justification

Our goal as a chapter is to enhance our old lesson plans by adding new ones to better our outreach program with Life Pieces to Masterpieces. These new lesson plans require new materials. The lesson plans include topics focused on buoyancy, air pressure, light and spectroscopy, circuits and electricity, gravity and air resistance. These new materials are critical in achieving our goals as an SPS chapter and will support the continued success of our outreach program and allow us to strengthen our relationship with Life Pieces to Masterpieces. As you can see in the budget, we are approximately \$2 over the maximum of \$500. This excess, and approximately \$100 in supplies will be covered by the George Washington University's Physics department. Below is a breakdown of how each of the items in the budget will be used.

- Small Plastic Pool (Buoyancy) - boat-floating activity
- Stomp Rockets-Pack of 4 (Air Pressure) - interactive air pressure demonstration
- UV Sensitive Beads (Light) - bracelet making station
- Photochromic Pigment (Light) - color changing slime craft station
- Diffraction Glasses-Pack of 12(Light) - light diffraction demonstration
- Thermochromic Pigment (Light) - color changing slime craft station
- Vacuum Pump (Gravity) - feather and coin demonstration, marshmallow demonstration
- Vacuum Tube (Gravity) - feather and coin demonstration, marshmallow demonstration
- Tubing for Vacuum Pump (Gravity) - feather and coin demonstration, marshmallow demonstration
- Snap Circuits (Electricity) - interactive circuitry demonstration