



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Marsh W. White Award Proposal

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Project Proposal Title	Quantum Kids: You Got This!
Name of School	University of Maryland
SPS Chapter Number	4155
Total Amount Requested	\$500.00

### Abstract

Early exposure to quantum physics can help students begin to navigate complex concepts and address misconceptions that can take shape at an early age. The University of Maryland SPS proposes to design a program of activities for elementary school students that introduces them to the world of quantum through diverse learning experiences.

## **Proposal Statement**

### **Overview of Proposed Project/Activity/Event**

Quantum is the future for elementary school students. Breakthroughs in quantum have propelled this area of physics research from academia into the public sphere. Elementary school students have the capacity to quickly absorb knowledge when it is presented in an engaging and accessible way. Our goal is to positively affect students' academic self-confidence and thoughts about their future career choices, while bringing awareness to the connection between real life and quantum concepts.

The University of Maryland (UMD) SPS Chapter has broad experience in outreach programs. From presentations to large audiences to running our signature liquid nitrogen ice cream booth at Maryland Day, we have consistently carried out meaningful physics events for the K-12 community. Our Chapter is lucky to have a professional outreach program and excellent leadership who will help guide this project. Also, UMD takes quantum research and education seriously as seen with the launch and success of the Joint Quantum Institute (JQI), an effort between UMD and the National Institute of Standards and Technology. SPS students and graduate students will share their expertise and time as the lessons and activities are developed and implemented.

We propose two 4-hour programs for elementary school students (grades 4-6) designed to introduce them to quantum. Each program will open for 24 students and parents will be invited to participate or observe. The program will include: superconducting demonstrations, 3 short labs, intro-programming activity, a one-act play. We will disseminate the program lessons to the broader community, present our results at the American Association of Physics Teachers (AAPT) summer meeting, and share our program at the zone meeting as an outreach program. In addition, we hope that by sharing our work to enhance and expand the existing outreach activities available to the broader physics community.

### **How Proposed Activity Promotes Interest in Physics**

We plan to present these concepts with enjoyable activities for the students to have them associate it with fun and positive attitudes. This event will expose students to quantum concepts at an early age prompting for an easier understanding of the topics at a higher level, and will also expand their knowledge in an area of physics most do not encounter unless they are in undergraduate physics. We hope that this program will encourage students to pursue physics or another field in STEM. Likewise, we hope to give the students a stronger appreciation for the quantum and physics in general.

### **Plan for Carrying Out Proposed Project/Activity/Event**

This effort will be lead by Tyler McDonnell, Sarah Weatherly, Orlando Romeo, and Stephanie Williams along with other UMD SPS members. Program planning support and expertise will be provided by UMD Physics Outreach and the Physics Demonstration Facility. Both groups run annual summer programs and physics outreach programs during the school year for students in elementary school through high school. To capitalize on these well attended programs, the UMD Physics Outreach mailing list will be used to advertize and promote the program. Flyers and reminders will be sent out in advance of each program along with a link to online registration. At least 6 volunteers from the UMD SPS Chapter and physics outreach are expected to lead the program and guide students through the demonstration, programing lab, and one-act play activities. Volunteers will also provide input for the report following the program.

### **Project/Activity/Event Timeline**

We propose to launch the program in April 2019 which would give us enough time to submit the report . Marketing will begin in February with an initial announcement of the program along with the physics outreach calendar of events for spring and summer. The flyer with registration information will be sent out in the month prior to the first program. Reminders will go out in the weeks leading up to the program: one to the mailing list and ones to those who registered. Materials and supplies will be purchased early on in the planning phase to be used for planning and volunteer practice.

### **Activity Evaluation Plan**

We propose to have participant surveys for the students as well as completed projects to evaluate the success of the program. Participant attendance information will be gathered through online registration. A pre-survey will be giving out at the beginning of the sessions to gauge prior understanding of their current quantum knowledge. At the beginning of both sessions, journals provided to each student to allow them to detail their experiences throughout the activities. Journals will be collected, reviewed for the students' understanding and attitudes, and returned before they leave. The one-act play will provide us with information on the students' grasp of the concepts and how well they can communicate them to others. The student completion of each activity will give us a good idea of how they perceived the program and how we taught it. A post survey will be given out at the end of each session to analyze the effectiveness of the program and the students' satisfaction. We will use the post survey to determine student understanding of concepts and changes in attitude towards quantum.

### **Budget Justification**

We propose a budget of \$500.00 to cover costs for activity materials and supplies. The funds will used to purchase lasers, slit slides, and microcontrollers for the labs to give students a hands on experience in understanding quantum. The cost for additional supplies will be provided by our SPS Chapter and the UMD Department of Physics. The department will also provide funds to support students' travel and presentation at the AAPT summer meeting in 2019.