



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Proposal

Project Proposal Title	STEMMED: Science and Service
Name of School	John Carroll University
SPS Chapter Number	3329
Total Amount Requested	\$369.17

Abstract

STEMMED: Science and Service is a STEM focused teaching and mentorship program at John Carroll University. The program will educate students on physics and encourage them to pursue their own questions through supervised project development, ultimately preparing students to pursue and excel in physics at the collegiate level.

Proposal Statement

Overview of Proposed Project/Activity/Event

The program is structured to run in tandem with John Carroll's Center for Service and Social Action spring service schedule. The program will include ten three-hour sessions on Thursday afternoons from 5:30pm-8:30pm running from February 1 through April 24 (with no sessions during our spring and Easter breaks). The first five sessions will be used to introduce students to physics and other scientific disciplines through hands-on experiment based learning activities, many of which are still in development. These sessions will also include short discussions on career and research opportunities afforded to physics students and other STEM students after college graduation. For each of the first five sessions, a different STEM discipline will lead and activity. Once the students have been exposed to the five major STEM disciplines offered at John Carroll (Physics, Math and Computer Science, Biology, Chemistry, Psychology), the students will be able to choose which field they were most drawn to, to work through a series of projects with an assigned mentor from that field. The students will spend the remaining five sessions exploring their chosen fields of study through small group (2-3 students) experiment design and execution. The final week though, will be primarily used by the students to make poster presentations for a 'science fair' type event to be held at John Carroll in the late spring.

Ideally, students participating in the program will be exposed to different scientific disciplines that they might not otherwise be exposed to in school. By exciting the students' curiosity and exposing them to jobs in these fields, hopefully the students will choose a STEM discipline for study in college. Additionally, the program should introduce some basic research/lab skills that will prepare students for success in the STEM fields they choose to study.

All sessions will be held at the Northeast Ohio Boys Hope Girls Hope campus located in Garfield Heights, Ohio. The 5:30pm-8:30pm block will allow us to work with 40-50 at risk 11th and 8th grade students from around northeast Ohio. Boy Hope Girls Hope students fall within 200 percent of the federal poverty line and generally need a stable, supportive environment to succeed in school. Many of these students, without the support of Boys Hope Girls Hope, would never attend college. Even though the program sends its students to college, we hope to entice those students to study physics or some other STEM discipline if they do attend.

In the fall of 2018, our SPS chapter carried out a four-week coding class with 8th grade students at Boys Hope Girls Hope. The program was incredibly fun and rewarding, so we wanted to continue the tradition of service, but go bigger. Unfortunately, with a department and a chapter as small as ours, it was already difficult to carry out a four week service project, so to go bigger, we needed help. Out of that desire to serve and that need for help, STEMMED was born. Our SPS chapter reached out to every STEM student organization at our university to engage students in a more comprehensive program that was still promoting physics to underserved and underengaged student groups.

How Proposed Activity Promotes Physics Across Cultures

The students at Boys Hope Girls Hope are 'at risk.' Students in the program live at or near the federal poverty level, have difficult home lives, and many come from underfunded, underperforming school systems. Boys Hope Girls Hope even has a residential program for students that have exceptionally unstable home lives and require more structure and support to succeed in school.

A majority of the students at Boys Hope Girls Hope are black and Hispanic, demographic groups that have a much lower college enrollment rate than whites and Asians. Even if these students get to college, only 15 percent of the bachelor's degrees earned by Hispanic students are in STEM fields and the rate drops to 12 percent for black students according to the National Center for Education Statistics. Needless to say, if we break that down into the percentage of Hispanic and black students that study physics, the results look even more dismal.

78 percent of Boys Hope Girls Hope students who are first in their families to attend college eventually graduate, compared to 11 percent nationally. Boys Hope Girls Hope does an exceptional job getting students to and through college who otherwise might not attend or graduate. Our goal though STEMMED is to aid in that journey to college and to promote physics and other STEM fields as ideal majors for these students when they get there. Exposing students to physics in a fun, yet educational way will hopefully do this. Further, the project and experimental aspects of the program should also help students succeed in physics and STEM once they arrive at college pursue those majors.

Plan for Carrying Out Proposed Project/Activity/Event

- Overseen by Kyle Blasinsky (SPS Member, John Carroll Physics Student)
 - Each subject has a chair that oversees that subject's classroom activities
 - Progress monitored by Kyle and John Carroll's Center for Service and Social Action in conjunction with personnel at Boys Hope Girls Hope
- Boys Hope Girls Hope staff will ensure the program is incorporated into their students' usual afterschool schedules
- STEMMED is overseen by two SPS members and several others (likely 4-6) will be involved in teaching physics/mentoring students in the student experiments/projects throughout the 10-week program
 - Another 15-20 non-SPS members will be involved with planning lessons related to other STEM subjects
- Both STEMMED leaders (who are in SPS) are well acquainted with the Center for Service and Social Action at John Carroll and Boys Hope Girls Hope from previous service projects

The program is layered in its structure. Subcommittees in each STEM subject meet regularly to plan and acquire supplies for their lessons. The subcommittees all come together bimonthly to discuss their progress and the general structure of the program as details become more concrete. Additionally, the STEMMED leadership (two SPS students) meet regularly with the Center for Service and Social Action at John Carroll and the SPS and STEMMED faculty advisor. Several STEMMED leaders also recently conducted a site visit at Boys Hope Girls Hopes to continue the planning process and see the physical space the student volunteers would be using.

Project/Activity/Event Timeline

- April 25, 2020 - Students visit John Carroll to present on their experiments/projects ('Science Fair')
- March 19-April 23, 2020 - Students conduct small group projects in chosen subjects with mentors
- February 6-March 12, 2020 - Students rotate through subjects to learn about and experience STEM
- February 1, 2020 - Lesson plans completed and ready to present
- December 6, 2020 - STEMMED leadership finalizes logistics with Center for Service and Social Action and Boys Hope Girls Hope

Activity Evaluation Plan

Student volunteers will report on their perceived engagement of the students in their session after the session is completed. Additionally, keeping track of how many students choose projects/experiments in physics after their exposure to five unique STEM fields will also measure how effective our promotion of physics was. Finally, students will self-report their interest in physics and the other four STEM fields using pre and post program surveys.

Budget Justification

The Center for Service and Social Action will provide much of the logistical support for the program. The Center will be providing transportation to and from the service site (roughly thirty minutes from John Carroll's campus) during the ten-week program. Also, the Center is funding most of the costs associated with the 'Science Fair' on April 25, 2020 including food and set-up costs.

Many academic departments are offering up non-consumable equipment for use during the program including glassware, data interface technology, wave drivers, and the like. Also, departments are opening their labs to tours and activities on April 25 as well.

Boys Hope Girls Hope is providing the facility and many non-consumable supplies available at their facility (computers, tools, 3D printers, circuit kits, etc.). Also, Boys Hope Girls Hope will be transporting their students to John Carroll on April 25 for the 'Science Fair.'

Organization is key to success in the world of physics and science more generally. Ensuring students learn this skill early on in their academic careers will ensure success when they get to college. Since college success in physics and STEM is a stated goal of STEMMED, we must ensure these organizational skills are learned throughout the program. This will be achieved by having students keep well organized binders to house their informational and learning materials from throughout the program. Notebooks will also be utilized to keep record of significant observations or particular questions students have during their experimental work in their small groups, giving us the opportunity to teach students how to keep a proper scientific notebook. Finally, the trifolds will allow the students to experience the other major aspect of work in science, communication. Students will complete trifolds displaying all they've learned in their small groups for presentation during the 'science fair' at John Carroll on April 25.