



**SOCIETY OF PHYSICS STUDENTS**  
An organization of the American Institute of Physics

# **“Physics Outreach to A Low Income Middle School”**

**Future Faces of Physics Award  
Indiana Wesleyan University Society of Physics Students  
Chapter: 3116  
Robert Burchell: IWU-SPS President  
Joshua Ostrander: IWU-SPS Vice President  
Dr. Roberto Ramos: IWU-SPS Faculty Advisor  
Amount Requested: \$300**

**Abstract:** The Indiana Wesleyan University Society of Physics Students (IWU-SPS) proposes to “make waves” in the underrepresentation of minorities in physics careers through an outreach event to McCulloch Middle School. This activity will cater to middle school students to teach about the physics of waves of all kinds.

## **Overview of Project:**

McCulloch Middle School in Marion, Indiana is considered a low-income school by the Department of Education and has a large percentage of racial minorities. Through an outreach event co-sponsored with the Marion Community Schools, Indiana Wesleyan University will lead a physics day that focuses on the physics of waves. Waves are ubiquitous in physics education and often one of the more challenging concepts to beginning students of physics. Because of the foundational nature of waves in all areas of science, we propose that engaging students through interactive demonstrations will encourage students to pursue physics in school.

This event will target the Junior High school (7<sup>th</sup> and 8<sup>th</sup> grade) students in the Grant County community: specifically, the many underrepresented groups in the school. McCulloch Middle School is 52% girls and is composed of over 35% underrepresented minorities. In addition to this, it is considered a low-income school by the state of Indiana. Because of its diverse population, McCulloch middle school will be the perfect location for IWU-SPS to help develop the diverse science, technology, engineering, and math (STEM) work force of the future. We will custom design activities that are culturally relevant to the middle school students. They will then be able to learn about the magic of science in an environment that first captivated every scientist to pursue his or her field.

We propose to spend two hours in the middle school gym putting on a physics open house that will allow teachers to come and go as they please. Alternatively, we will collaborate with one of the science teachers to bring our demonstrations and activities to their classrooms. Our hope is that the entirety of the 7<sup>th</sup> and 8<sup>th</sup> grade students will be able to participate in our event. We will show many of the well known phenomena of electromagnetic and sound waves. In last year's Future Faces of Physics event, we collaborated with the Boys and Girls Club of Grant County, which has similar demographics. Indeed, many McCulloch students are involved in the club on a daily basis. We hope that by building on our experience with a smaller audience last year, we will be able to reach a wider variety of diverse students in a more structured environment.

To most effectively serve students in a small group setting, we will set up four different stations to have multiple interactive demonstrations on the physics of waves. Students will be free to move about as they wish. Some stations we plan to include are the Doppler effect, a process oriented guided inquiry lesson on standing waves with a jump rope, and demonstration on the wave properties of light. We also hope to incorporate an activity involving the physics of music. By drawing connections to familiar activities and things, students will understand the importance of science in their daily lives. We hope to satisfy their desire to know "why?"

## **Physics Across Cultures**

This event will intentionally reach out to the diverse cultural and socioeconomic populations of Grant County, Indiana. In this event, we will be sure to be inclusive of all races, socioeconomic statuses, genders, and cultures. We will emphasize the importance of diversity and science because of the unique perspectives diversity brings to the field. We hope that through this event we can see several different people come together with the common goal of learning more about the magic of our universe. McCulloch Middle School is unique in that it has such a wide variety of cultures represented. We want to seize this opportunity with a Future Faces of Physics Award to encourage this diverse populace to pursue STEM careers.

## **Planned Logistics**

This event will be planned and organized by IWU-SPS President Robert Burchell and Vice President Joshua Ostrander. They will serve as the liaison between the University and McCulloch Middle School. Through efforts to communicate and collaborate with the school, we will ensure that students are made aware of our event through school announcements and flyers produced by IWU-SPS leadership.

We expect that about a dozen SPS members will play an active role in planning and executing the event. In addition to this, we are in the process of involving the Science Club in our outreach efforts. The president of IWU's Science Club has expressed interest in combining efforts to engage the community in science. We plan to host a combined event with them to introduce students to the chemical and biological sciences, as well. This will be the first of many outreach collaborations in the future.

IWU-SPS President Robert Burchell attended McCulloch Middle School and will utilize his professional contacts to arrange our visit to the school. His field of science education will also prove useful as we organize and plan to reach students most effectively. In addition to him, IWU-SPS has many men and women who have proven records of successful volunteer work and outreach to middle school age students.

## **Timeline:**

2/1/13- IWU-SPS will begin preliminary planning with McCulloch Middle School Administration

3/1/13- IWU-SPS will finalize a date for the event.

3/15/14- An informational meeting will be held for volunteers.

03/31/14- Participating volunteers in the Science Club and in IWU-SPS will be trained in the demonstrations and activities.

04/14/14- The tentative date for the physics day at McCulloch Middle School.

## **Activity Evaluation:**

To evaluate the success of the activity, IWU-SPS will survey participating teachers one week after the event regarding the successes and possible improvements. We will also ask for representative student feedback, as well. This will pave the way for future events in which we can involve McCulloch Middle School Faculty and students. In addition to this, we will ask for specific instances in which students from underrepresented groups responded positively to the event. This may be a girl showing interest in STEM careers or a student from low socioeconomic status verbalizing a desire to pursue science. We will also have a sign in sheet to keep track of the number of students their demographics. This will allow us to ensure that we are encouraging students from all cultural backgrounds to pursue STEM careers.

## **Budget Justification**

The Items listed provide positive reinforcement to the ideas presented. The items are necessary to the understanding about waves and their nature. There will be four stations with two activities at each individual station. The stations would demonstrate the waves of lights, motion, sound and radio electromagnetic. The items in the budget are key resources required for the understanding of general waves. The activities are easy to understand and can be manned by experts and amateur physicists alike.