



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Marsh White Award Report

*Instructions: Please complete each section after reading the purple text describing what should be in that section. Then delete the purple text.*

Project Proposal Title	The "Phun"-damentals of Physics
Name of School	The George Washington University
SPS Chapter Number	2319
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SPS Chapter Advisor	Professor Gary White
Total Amount Received from SPS	\$300.00
Total Amount Expended from SPS	\$300.00

## Summary of Award Activities

The George Washington University SPS chapter worked with Life Pieces to Masterpieces of Washington, DC to conduct six 45 minute physics workshops for elementary and middle school boys. These sessions allowed us to promote interest in physics among young students by allowing them to create, experiment with, and learn from popular physics demonstrations, such as lasers, LEDs, rockets, oobleck and liquid nitrogen ice cream. The students from GWU and the Life Pieces students all had a great time and look forward to continued partnership.

## Statement of Activity

### Overview of Award Activity

This outreach project worked to promote interest in physics for young men at the organization Life Pieces to Masterpieces of Washington, DC. Life Pieces to Masterpieces, which is a youth development non-profit that serves African American boys in Washington, DC, launched a new program called Innate Creativity Ability network (I CAN). Our outreach project offered science lessons as one of the workshops of I CAN. Members of our SPS chapter committed to conducting six consecutive weeks of two 45 minute sessions for two age groups (ages 7-10 and ages 10-14). Each group had 5-10 students, and we conducted sessions from February 20th, 2015 to April 10th, 2015. Our hope was to build these students' understanding of core physics topics through exciting, interactive demonstrations. In addition, we structured the lessons so that the students could make their own discoveries while we guided them through creating and experimenting with the demonstrations. We focused on four main topics, which included rockets and astronomy, velocity amplification/bouncing balls, lasers, and non-newtonian fluids. The students had an opportunity to build demonstrations and understand the core physics principles behind what they create; we hoped to span topics such as kinematics, astronomy, momentum and energy conservation, light and waves, and properties of fluids. Since we conducted sessions with two different age groups, we adapted each of our lessons for the age group we taught. Our project helped inspire interest and excitement in physics at a young age for these students. The project was a great asset to the new I CAN program at Life Pieces to Masterpieces, and allowed us to spark an interest in science and physics for young men in our city.

During the orbital motion lesson, we used spandex to demonstrate the concept of orbits: a heavy ball was placed in the middle and various sized balls, like marbles, golf balls and bouncey balls, were dropped in. These balls would orbit around a few times before falling to the middle. The children learned about the shapes of different orbits and had fun testing this out. During the light lesson, diffraction glasses were used to explore the different types of spectral lines from a variety of light sources. The young men went on a "Rainbow Scavenger Hunt" where they looked at the differences in spectral lines for natural sunlight, fluorescent light, LED lights, lasers, candle flames, everyday objects and even from a mercury lamp. The young men really enjoyed comparing the different rainbows they observed from the many light sources around them. During the astronomy and rockets lesson, the young men learned about the different planets and how propulsion causes rockets to move. The boys were particularly intrigued about how we are able to get information about the different planets without necessarily having traveled to them. We also introduced the concept of how people have left Earth with rockets, and did a rocket propulsion demonstration with a water pressurized rocket car. Each boy had the opportunity to use the air pump to launch the car themselves. The boys loved chasing after the car and trying to guess how far it would go. During the states of matter lesson, the students were introduced to the idea of solids, liquids, and gases, and how we can categorize the matter we find on Earth. We made root beer floats with the young men to demonstrate examples of a solid (ice cream), liquid (root beer), and gas (the fizzles), all in one tasty treat. We also made oobleck and had the students do experiments on the substance to make an assertion on whether it was a solid, liquid, or gas. The students came to the conclusion that this was a "sliquid" - somewhere between a solid and a liquid. Finally, during the velocity amplification lesson,

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the students were amazed by a supernova animation (they asked to watch in many times), and modeled supernovas using a bouncing balls experiment. They experimented with the common physics demonstration of dropping a tennis ball on a basketball and watching the tennis ball fly up at a high velocity. They also tried this experiment with many balls of different sizes and material, and observed the height of the rebound. On our final day, we had fun making liquid nitrogen ice cream for the students to enjoy!

Professors within our department also became involved in our outreach activities. Professor van der Horst, Professor Qiu and our advisor, Professor White, all helped plan and run lessons. Professor van der Horst shared his knowledge of astronomy with the students and was happy to answer all of their questions. Professor White helped provide us with transportation to and from Life Pieces facilities. This has helped us increase cooperation between our SPS chapter and our department. The department has expressed interest in continued support of our activities, especially outreach.

### Impact Assessment: How the Project/Activity/Event Promoted Interest in Physics

The goals for our outreach activities were to promote an interest in science, introduce fundamental theories and start a partnership with Life Pieces. We feel that we were fairly successful in achieving our goals. The kids enjoyed our demonstrations and stayed engaged in our lessons, but our lessons were not perfect. There were times our plans had to change due to time constraints or a lack of response to our lessons. We learned to adjust on the fly, and make our lessons work as best as possible. Overall, we feel that our lessons were successful in promoting an interest in science. Leaders at Life Pieces told us that since we started our workshop series the children have started talking about science more and thinking about science more, even when we were not there. Life Pieces also expressed interest in a continued partnership and we would love to continue doing outreach there as well.

We assessed the extent to which we met our goals through surveys which we handed out to the students. We gave them surveys where they were asked to rate how much they enjoyed each lesson. We learned that the young men had a great experience during the last six weeks, and that each of them had a different favorite lesson, which was encouraging to us. We were glad that we were able to design and deliver lessons that were exciting and engaging for all of our students.

### Key Metrics and Reflection

Please answer the questions below. Please indicate if a question is not applicable to your project.

Who was the target audience of your project?	Elementary and middle school boys in the program Life Pieces to Masterpieces
How many attendees/participants were directly impacted by your project? Please describe them (for example "50 third grade students" or "25 families").	10 students aged 7-14
How many students from your SPS chapter were	We had ten students from our SPS chapter

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involved in the activity, and in what capacity?	and three physics professors involved in process.
Was the amount of money you received from SPS sufficient to carry out the activities outlined in your proposal? Could you have used additional funding? If yes, how much would you have liked and how would the additional funding have augmented your activity?	Yes; the amount of money we received was sufficient. We were able to cover additional expenditures with money provided by the GWU Department of Physics.
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	We plan to continue the lessons in future years with Life Pieces to Masterpieces and continually build upon and improve our lessons.
What new relationships did you build through this project?	Through the project, we were able to get to know the students really well and form strong relationships with them over the six weeks.
If you were to do your project again, what would you do differently?	During future lessons, we would make some of the lessons more hands-on and interactive. We realized that we needed to adapt how we taught the lessons between the younger group and the older group, and in future lessons, we'll take steps to better cater the lessons more to the age group. We also plan to zoom in more in certain topics that gained a lot of interest, such as astronomy, and carry the single topic over several lessons.

### Press Coverage (if applicable)

The George Washington University Physics Department blog <http://blog.phys.gwu.edu/?p=2638>  
The George Washington University Physics Department Alumni Newsletter, to be published

### Expenditures

Our expenses included both materials for our outreach activities as well as give-away prizes for the children at Life Pieces. A majority of the cost was covered by the Marsh White Award, but the George Washington University Physics Department provided the extra funding we needed.

<b>Expenditure Table</b>
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<b>Item</b>	<b>Cost</b>
LEDs and Diffraction Glasses	65.40
Table Cloth, Spoons, Cups	46.52
Amazon Rockets Type 1	36.72
Amazon Reimbursement for Shipping	-20.82
Amazon Reimbursement for Shipping	-35.97
Modell's Kick Balls	139.64
Modell's	-6.35
Amazon Reimbursement for Shipping	-23.48
Amazon Reimbursement for Shipping	-22.29
Amazon Rockets Type 2	44.30
Amazon Rockets Type 2	58.26
Walgreens – Tshirts	45.08
Laser pointer	74.00
Donation: Corn Starch	0.00
<b>Total of Expenses</b>	<b>401.01</b>

## Activity Photos

Please include captions and credits for each photo. By including photos below, you are giving SPS and the American Institute of Physics permission to use these photos in their online and printed publications.



Making liquid nitrogen ice cream and showing the students how cold it is.



Our SPS volunteers with Life Pieces students Kayon and Marlon.



“How do you know about a planet if you can’t get to the planet?” –Jaylen

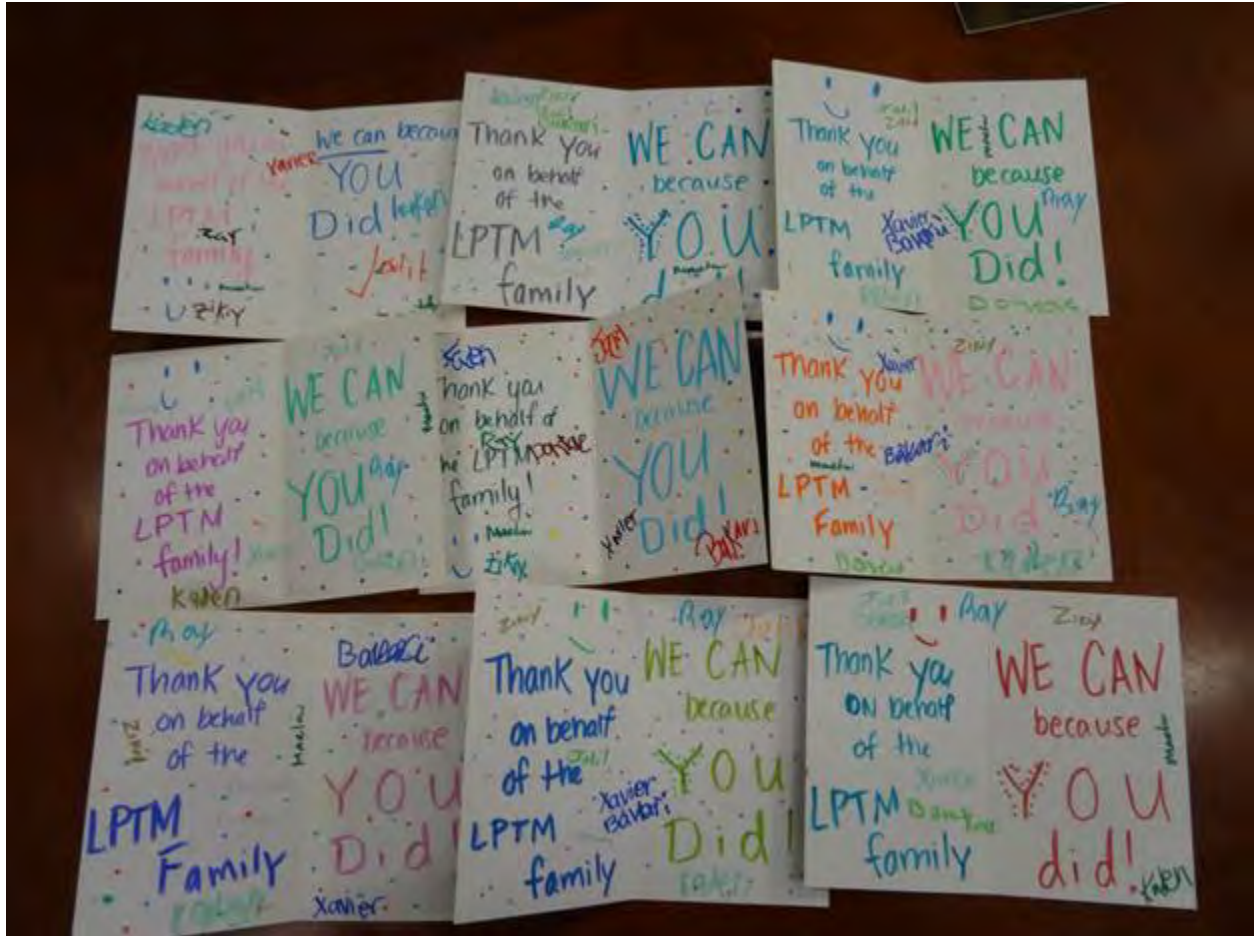


Xavier: "I want to be a scientist!" Brian: "What kind of scientist?" Xavier: "Your kind of scientist!"





Apprentices learn about rockets with a pressurized water rocket demonstration.



Thank you letters from Life Pieces to Masterpieces to GW SPS.



If you have any questions, please contact the SPS National Office Staff  
Tel: (301) 209-3007; Fax: (301) 209-0839; E-mail: [sps-programs@aip.org](mailto:sps-programs@aip.org)