



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Future Faces of Physics Award Report

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

<b>Project Proposal Title</b>	Program for the Inspiration of Physics Students
<b>Name of School</b>	Colorado School of Mines
<b>SPS Chapter Number</b>	1287
<b>Project Lead (name and email address)</b>	Jordan Diemer Jdiemer@mines.edu
<b>Total Amount Received from SPS</b>	\$300.00
<b>Total Amount Expended from SPS</b>	\$300.00

### Summary of Award Activity

Colorado School of Mines' SPS Chapter presented an enrichment program that promoted the merits of staying in school, the beauties of math and science, the value of a college education, and STEM careers to a rural middle school that serves predominantly underrepresented students.

# Statement of Activity

## Overview of Award Activity

It is first worthy of note that in our original proposal for the Future Faces of Physics Award, we proposed to do two separate events – one at Berry Creek Middle School, and one at Gateway High School. Unfortunately, due to logistical difficulties in scheduling with the Gateway High School administration, we were unable to hold an event on their campus, and thus only held one event. While unfortunate, this allowed us to devote more resources to Berry Creek, allowing us to make our event there span their entire school day, and an after-school seminar, as described below.

On 07 April of this year, the Colorado School of Mines (CSM) chapter of the Society of Physics Students held a day long event at Berry Creek Middle School (BCMS) in Edwards Colorado. Our group of 23 student volunteers put together a program to promote engineering science education and the value of college studies to all 376 6th-8th grade students at BCMS.

Berry Creek serves underprivileged and underrepresented students that typically do not have the family support structure or history of pursuing a college education. For this reason, our chapter first started working with BCMS, and specifically Shannon Grant, their dean of students, in the Fall of 2013 as part of SPS's Future Faces of Physics program. Our chapter received its first FFoP award in December of 2013 to work with BCMS in April of 2014, and at the request of a multitude of BCMS students, parents, and faculty, we reapplied for the award last fall in order to repeat our successes, expanding and improving on our previous efforts.

This spring semester was one of extensive planning, gathering 23 student volunteers from the physics department at CSM to organize, plan and build, for a huge addition to last year's event. Through many long weekends and sleepless nights, we wrote lesson plans, drafted worksheets, built demonstrations, and rehearsed presentations for the big day to ensure it became the outstanding success we knew it could be. When 07 April came at last, we were prepared and pumped to be able to reach out to a group of kids we already knew first hand would be able to benefit tremendously from our efforts. We loaded a bus with our 21 available volunteers, and around 40 demos, and made the two hour trip to Berry Creek.

Throughout the entire school day at BCMS, our members staffed 10 STEM museum stations (featuring kinematics, momentum, fluid dynamics, pressure, robotics, circuits, electricity, magnetism, optics, and waves) in the BCMS gymnasium. These stations were intended to illustrate core principles of some of the most interesting and accessible topics in physics, and featured hands-on demonstrations designed and built by our members.

During each 50-minute period, approximately 60 BCMS students visited the STEM Museum during their normal science classes. By splitting the classes into small groups of about six students per station, we ensured close interactions between the students and our volunteers, who, having been an integral part in the planning of the event, were intimately familiar with the material they were exploring with the students. This synthesized to provide not only an informative presentation, but a cohesive and engaging experience. Students were able to ask questions, and actively participate in the discussion of the topics, meaning they were able to be involved and enveloped in the curriculum in a way not often possible in the classroom.

After the BCMS school day was over, our group hosted an after school seminar in the school's cafeteria with 30 specially-selected BCMS students. We started by building small monopolar motors and making a homemade

silly-putty that the students were able to take home. With this small group of students, we were able to have a nearly one-to-one ratio of students to volunteers, meaning each student was able to talk in detail with volunteers about the principles involved.

Over the course of this activity, volunteers actively engaged the students about their interests, encouraged their continued educational pursuits, and offered advice for their future endeavors. The ability to have this interaction was the primary benefit of our incredible student to volunteer ratio; it allowed students to talk with and get to know our volunteers in an entirely unique way, which we believe helps the students to relate with the field, and to be excited about their opportunities. In addition to the make-and-take workshop, we gave a presentation to the students in the seminar, in which we both showed off some of our larger, more exciting demos, and talked about the importance of higher education, reasons for pursuing that education in STEM fields, and what steps can best prepare these students to pursue their goals. By interlacing the talk with our demos, we were able to hold the attention of the students, and prevent them from tuning out from the talk. We also made sure to actively engage the students, seeking questions, hypotheses and other input from them as we went through the presentation.

Overall, the students at Berry Creek seemed thrilled with the event. In the one week since, we have received emails and letters from BCMS students, parents, and faculty thanking us for the event, and requesting we return again next year. We hope to further refine our process next year, and turn the Colorado School of Mines Society of Physics Students Future Faces of Physics event at Berry Creek Middle School into a traditional, annual event.

### **Impact Assessment: How the Project/Activity/Event Promoted Physics across Cultures**

The aim of this event was to encourage a passionate pursuit of scientific knowledge and learning in the underrepresented students of Berry Creek Middle School. In order to gauge our success, we asked the students, faculty, and parents of BCMS to write to us with their thoughts on the event.

Judging by their reactions, from their interest at the event itself, to the letters and other feedback we have received from them since, this event was very successful. Those students who had already considered the idea of a future in STEM seem inspired and motivated to pursue those dreams, and many who had never considered those possibilities, have opened their minds to a new-found field of interest.

It feels amazing, as a person who has had great fortune in my own life, to know that a group of students who may not have had such opportunities before and whose odds were statistically against them, have been inspired, encouraged, and enabled to pursue not only our dreams as current physicists, but hopefully theirs as well. We believe that this event opened up possibilities, and revealed the potential for great new minds to further the field of physics, both with the research and work they may do in the future, and by the unique personalities and perspectives they will bring with them.

## Key Metrics and Reflection

The Future Faces of Physics Award is designed to promote projects that cross cultures. What cultures did your project attempt to bring together?	<b>Hispanic/Rural community of Edwards CO and Physics students from CSM</b>
How many attendees/participants were directly impacted by your project? Please describe them (for example “50 third grade students” or “10 high school volunteers”).	376 6 <sup>th</sup> -8 <sup>th</sup> grade students and 23 Undergraduate and Graduate student volunteers
How many students from your SPS chapter were involved in the activity, and in what capacity?	23 as volunteers, explaining demonstrations
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? How would the additional funding have augmented your activity?	The funding received was sufficient as a supplement to other funding sources for the event.
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 repeat this event next year, with some logistic variations, and extend it to more schools if possible.
What new relationships did you build through this project?	We established a repertoire with a new class of students at BCMS
If you were to do your project again, what would you do differently?	Re-formalize the after-school show to a stage demonstration

## Press Coverage (if applicable)

N/A

## Expenditures

Please provide a brief explanation of your expenses. Include a written description of your expenditures below, those covered by your SPS funding and by other funding sources, and then fill in the table with the name and cost of each item purchased with your SPS funding. Add rows as needed.

Due to poor road conditions on the mountain roads needed to get to BCMS from our campus, and the long day we had ahead of us, we decided that it would not be safe to allow our student volunteers to drive. We therefore chartered a bus for transportation, which was by far our largest point of expenditure, at \$1200. This was covered primarily by a generous donation from Mines' President Scoggins, funding from our Physics Department, and profits from specific fund raising events. This was supplemented by funds from the Future Faces of Physics Award in order to afford the full price of the charter.

In the 2014-2015 school year, our chapter spent nearly \$300 on supplies to build and maintain demonstrations which were used at our event. This too, was made possible, in part, by the Future Faces of Physics Award. Funds from the award were also used to buy the consumed supplies used in some demonstrations at the event, and supplies for our make-and-take activities.

### **Expenditure Table**

<b>Item</b>	<b>Cost</b>
Make & Take Supplies	\$171
Laminar Flow Demo Supplies	\$56
Bed of Nails Construction Materials	\$7
Optical Cloaking Construction Materials	\$29
Bus Charter (in small part)	\$37
<b>Total of Expenses</b>	<b>\$300</b>

## Activity Photos



SPS Demonstrations Librarian Zach Simons explains series/parallel circuits to a group of students at the museum



SPS members Allie Nilles and Eric Jones talk about the our chapter's homemade Jacob's Ladder at the museum



SPS President Logan Hillberry and member Alex Briggs explain our chapter's homemade diamagnetic levitation demonstration



BCMS students work to create silly putty during the make-and-take event



The full group of CSM SPS volunteers poses at a bench outside BCMS