



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Report

Project Proposal Title	G5: Girls are the 5 th FUNdamental Force
Name of School	Coe College
SPS Chapter Number	1255
Project Lead (name and email address)	Anne Ruckman afruckman@coe.edu
Total Amount Received from SPS	\$500
Total Amount Expended from SPS	\$500

Summary of Award Activity

The Coe College chapter of SPS used the Future Faces of Physics Award to implement a mentorship program for girls at Franklin Middle School and Harding Middle School in Cedar Rapids, IA. We matched half of our SPS members with each school to help cultivate relationships between mentors and students. At the close of the program, we invited participants to Coe College for our first Women in STEM @ Coe Day for interactive demonstrations, research laboratory tours, and hands-on experiments. As participants exchanged ideas about program sessions, girls from both schools engaged with each other and our SPS mentors.

Statement of Activity

Overview of Award Activity

Coe College's SPS chapter partnered with Franklin Middle School and Harding Middle School to increase STEM interest in girls ages eleven to fourteen in the Cedar Rapids, IA community. Mentors consisted of members of Coe College's SPS chapter, physics club, women in STEM organization, chemistry club, biology club, mathematics & computer science clubs. By uniting with men and women of diverse passions, we offered participants a greater range of engaging experiments and exposed the girls to more possibilities of a future in physics.

Within the dates specified on our award proposal, our mentors traveled to respective middle schools for one hour sessions directly following the students' school day. Ruckman led a group at Harding Middle School while Smith took the lead at Franklin Middle School. The project leaders prepared most of the lessons, and issued surveys at the first session to best prepare interesting activities for the participants and record attendance. In total, our SPS chapter impacted forty-six girls throughout the duration of the program. Smith and Ruckman taught the girls to program robots through MakerBot, analyzed the effectiveness of various sunscreen brands with UV beads, and explained light diffraction with balloons and lasers. We relied on SPS members to assist their small group at mentoring sessions and encourage the girls to discuss their goals and interests in STEM. Additionally, there were a few SPS members who led sessions on forces that cause soil erosion, explained animal cells, denatured proteins, and simulated the effects of electric charge on the human heart.

This project was an excellent addition to regularly scheduled events with our SPS chapter as our mentorship program targeted students needing academic and educational support. We eliminated the need for working parents to plan additional means of transportation by traveling to the schools directly following their school day. Our SPS chapter schedules annual community events with frequent visits to middle and high schools; however, this was the first program we offered with completely student-developed and student-executed sessions. Additionally, our SPS chapter grew closer to other campus organizations and gave us the opportunity to work with local middle school administration.

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

Our project promoted physics across cultures by matching middle school girls with enthusiastic SPS members to serve as role-models to decrease the gender gap in physics and applied science fields. Our first goal was to get our program approved and registered with Cedar Rapids district schools, and we were successful in gaining the support of necessary administration and community leaders. Our second goal was to create a program schedule of the session topics we wanted to cover based on students' interest through a pre-session email and during the first session. Throughout our program, we ensured that we could cover those topics. The third goal was impacting fifty middle school girls. While we were four students less than our goal, we were very close to our ideal number and are very satisfied that we impacted with so many girls. Our fourth goal was to have at least twenty SPS members be involved which was surpassed and an additional nineteen women joined our efforts to mentor and assist at Women in STEM at Coe Day.

Our program was primarily assessed through three surveys issued to participants. The first survey was issued at the beginning of the first session and asked the girls to list three goals they planned to achieve by the end of the program. The most common responses were: to gain a better understanding of what to do with STEM, learn more advanced laboratory skills, practice what they heard in class, and simply make more friends. The second survey asked them to rate our program goals listed above, and everyone indicated that they were more than satisfied. The final survey asked students if their confidence in the classroom increased such as asking more

questions, if they had led their lab groups since the beginning of the program, if their personal goals were met, and if they would participate again. The girls agreed that their confidence increased which allowed them to participate more, three-quarters met their personal goals, and eighty percent said they would participate again.

In addition to the written surveys, we also collected feedback individually from SPS members and volunteers. SPS members agreed that it was better for parents since we were able to drive to their child's school rather than relying on them to coordinate their daughter's transportation. Mentors also said that students were attentive and actively participated in sessions by asking questions, conducting experiments, and discussing the projects with their peers. The girl's excitement and smiling faces were also good indicators of their enjoyment.

Impact Assessment: How the Project/Activity/Event Influenced your Chapter

This mentorship program gave SPS members the opportunity to not only interact with future female physicists, but also develop personal relationships with participants. It was wonderful to witness mentors and mentees gain more confidence in themselves by conversing with their small group about their scientific journey, academic plans, and personal struggles. Additionally, the male SPS members acquired a greater understanding of the challenges women in physics face, discussed how to better support minorities, and served as examples of supportive peers for the young women.

This program also allowed our SPS chapter to plan and institute physics events with bi-weekly continuity unlike most of our community chapter events that are usually once a year. Since we chose to work with a couple of local schools instead of inviting all district schools, we were able to focus our strengths on providing the children with an impactful program. While we enjoy welcoming the most students that we can to our annual Playground of Science at Coe College, we are not able to converse with students and families easily due to the amount of visual demonstrations, venue space, and noise. This project enabled our SPS members to truly develop relationships with local youth and gave participants a chance to voice their opinion about STEM education in our community.

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? (Please be as specific as possible.)	Middle school girls, parents and community members with undergraduate men and women
How many attendees/participants were directly impacted by your project? Please describe them (for example “50 third grade students” or “10 high school volunteers”).	46 girls between ages eleven through fourteen throughout the duration of the program
How many students from your SPS chapter were involved in the activity, and in what capacity?	14 SPS members served as mentors/tutors and another 8 SPS members led sessions for their visit to Coe College in addition to the mentors.
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?	Yes, the funding was sufficient.
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	Yes, we would like to implement this youth mentorship program annually each spring.
What new relationships did you build through this project?	We created new relationships with teachers and administrators of the Cedar Rapids public school district, the president of the Iowa PTA, STEM clubs on our campus, as well as parents and children in our community.
If you were to do your project again, what would you do differently?	We would ask for volunteers to be responsible for a program session rather than the coordinators and a couple of mentors preparing each lesson. We believe it would offer more diverse concepts to the girls as well as allow the students that are instructing to be more one-on-one with the group by rotating each week.

Expenditures

We reimbursed four vehicles to transport our mentors to the middle schools at the \$0.545 rate for each mentoring session. We also purchased a tie-dye kit, rubber bands, and printed shirts for mentors and participants to commemorate their dedication to our program and celebrate their last session with their mentors. Additional supplies such as pens, notebooks, and construction materials were donated by mentors. The physics, biology, chemistry, and computer science clubs donated materials for experiments and laboratory space. The Coe College Student Senate contributed \$800 for new demonstration materials and food for participants and mentors at WinSTEM @ Coe Day.

Expenditure Table

Item	Please explain how this expense relates to your project as outlined in your proposal.	Cost
Car 1	Mentor Transportation	21.80
Car 2	Mentor Transportation	21.80
Car 3	Mentor Transportation	21.80
Car 4	Mentor Transportation	21.80
XL Tie-Dye Kit	Diffusivity Activity with T-Shirts	42.80
Rubber Bands	Diffusivity Activity with T-Shirts	10.00
Printed T-shirts	Diffusivity Activity with T-Shirts	360.00
Total of Expenses		500.00

Activity Photos



Mentors Sam Collins, Amy Houle, and Megan Houle talk to participants about careers in STEM as they pass out UV beads

Mentor Rebecca Welch explains how to code in loops and use conditions while the girls program robots





Mentors Christiana Carroll and Emma Gooding-Lord prepare the strawberry DNA extraction for WinSTEM @ Coe Day



Mentors Amy Houle and Megan Houle demonstrate soil erosion



Mentor Ella White teaches mathematical properties with a deck of cards



Participants test their program functionality with a remote-controlled robot



Mentor Ariel Crego explains diffusivity and color perception while mentor Anne Ruckman demonstrates how to blend pigments



Participants write their hypothesis and roll their UV beads in varied sunscreen ratings to test the effectiveness of higher SPFs



Mentor Anne Ruckman makes UV detecting bracelets with the girls



The girls get to know each other as they share their program goals and STEM interests



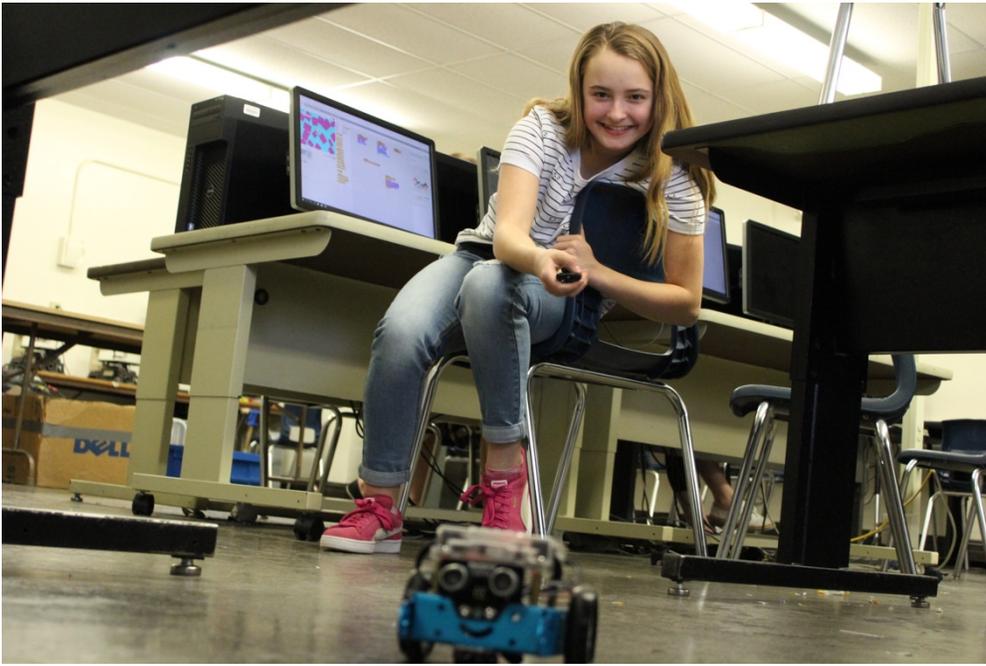
Mentor Brigette Smith demonstrates light diffraction



Mentors Collin Wilkinson, Martha Jesuit, Rebecca Welch, and Reilly Mathieu test their UV bracelets with the girls



Mentors Brigette Smith and SaCora Fisher talk to a student interested in astrophysics



Program trouble-shooting is successful!



If you have any questions, please contact the SPS National Office Staff
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