Marsh White Award Report Template

Project Proposal Title	Spring Into Physics!
Name of School	Augustana College
SPS Chapter Number	0335
Project Lead (name then email address)	Cecilia Vogel, ceciliavogel@augustana.edu
Total Amount Received from SPS	$250.00
Total Amount Expended from SPS	$250.00

Summary of Award Activities

The Augustana Physics and Engineering Society of Augustana College recently collaborated with Bowlesburg Elementary School to launch an after school outreach program, *Spring Into Physics!* This program aimed to inspire 1st - 4th grade students to use their creativity and imagination through hands-on physics projects such as building boats, bridges and towers. Augustana hopes to continue this program to ignite a passion for physics among younger students.

Statement of Activity

Overview of Award Activity

- **Brief Description:** This program was broken up into two different sections: 1st and 2nd graders on Tuesdays and 3rd and 4th graders on Thursdays. Our club planned different activities for each section that would challenge the students but also keep them engaged and curious about the science behind the activity. Each session began with a short introduction to the activity we would be working on.
  To begin with, 1st and 2nd graders had a new activity each week. This included the following projects:
  - Paper tops- The purpose was to start them out with something they could take home that would be intriguing. It shows that they can do physics in their own home and also demonstrates the concept of rotation.
  - Spaghetti Towers- This is a common challenge proposed to students and is done at science olympiads. This specific project emphasized communication and teamwork skills in groups of 3 or 4 students.
    - This project helped students learn about how buildings are made and what concepts need to be considered in order to keep buildings from collapsing. This had a lot to do with forces and the distribution of forces. It also taught students about strength and durability.
  - Demo day- This day allowed our volunteers to perform common physics demos that are listed below. We made our demonstrations interactive by asking students questions and including hands on demos for them. We rotated the students between 4 stations so that students had the opportunity to engage in all the demonstrations.
    - Fabric of the universe
    - Wave demos
    - Electromagnetism demos with magnets, ring launcher, compasses, ammeter and wire, and the metal tube demo
  - Buoyancy and Clay boats- Students were given a variety of common objects such as rocks, paper, plastic and foam, as well as a bin of water. Students would place each object in the bin of water and see if that object would sink or float.
    - This activity allowed students to learn about different properties that cause objects to float or sink. They were able to “become” scientists by creating hypotheses about what materials would float or sink when placed in water.
    - The Clay boats were a demonstration of what goes into boat making because clay itself, as in a ball of clay, won't float; however, if you flatten it out and cup it, the clay “boat” will indeed float.

  For the 3rd and 4th section, we planned projects that could be worked on for a longer period of time. These activities included:
  - Bridges- The purpose of this activity was to help students understand the foundations of building a strong and sound structure. Our students were able to become engineers, and through collaboration with peers and the use of physics concepts such as forces, they were able to build bridges using popsicle sticks, glue, and tape.
    - We worked on this project for multiple sessions. The first session was primarily introducing the activity and creating a plan to build the bridges. The second and third sessions were spent building and refining the structures.
  - Clay boats/Demo Day- The students were split into two different groups, and like the 1st and 2nd grade demo day, we rotated these groups so that each had time to engage in all activities.
    - In the one room, we introduced the boat activity by testing materials the same way the 1st and 2nd graders did. We also had electromagnetism demos such as compasses and ammeters.
    - In the other room, we had demonstrations presented by the volunteers. These demos were the ring launcher as well as current, wave, and inertia demos.

- **Outcomes:** This program successfully promoted an interest in physics among the students we worked with. Students were able to work on collaboration skills through group projects, and they learned how to think like engineers and scientists. We were able to demonstrate to students the idea that physics is a part of their everyday lives and that they can do physics outside of the classroom and in their own homes.
- **Audience:** In total, 70 students (40 1st and 2nd graders and 30 3rd and 4th graders) were directly impacted by the program and were also the target audience of our program. Along with the students, the families were

indirectly impacted because their students were given an opportunity that would normally be a cost that they could not afford, considering they are primarily low-income families.

- **Context of the Project:** This program fits into SPS because it was an outreach program that allowed younger students to become physicists, or more so, engineers. It helped them learn basic physics concepts while working on skills that are important to physicists, such as creating hypothesis, collaborating with others, and building structures. This fit in with our chapter activities because we normally do outreach activities by participating in science nights or simply going to an elementary school to perform physics demonstrations. This took place of those "one night" activities and through this, we were able to build stronger relationships with the students. Overall, this program allowed our volunteers to reach an audience that would not normally attend our regular outreach activities.
- **Highlights and Stories:**
    - There was a large amount of student participation when we asked them questions, and students also asked us questions that showed that they were interested/invested in what they were learning.
    - We watched students helping their peers if they were struggling during an activity, not only in their groups but between multiple groups.
    - As volunteers, learning how to listen to the students needs and using that to adjust how an activity is presented, or figuring out how to give a particular student individualized attention.
    - We received positive feedback from faculty during the program. Specifically, teachers would stop us in the hallway to tell us how excited their students were about coming to the program.
    - At the very end of the program, we received thank you notes from some of the students. When we told them that it was our last day visiting, they kept saying how they "did not want *Spring Into Physics!* to end"!

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

Goals: Work on collaboration skills, spark interest in physics

- Work on collaboration skills
    - We were able to meet this goal by forming groups for the projects the students worked on
    - We saw evidence of these skills when students asked each other questions and built upon each other's ideas.
- Spark interest in physics
    - Our program aimed to spark students interest in physics by showing students that physics is used in their everyday lives, as well as showing them that it is possible to do physics experiments with accessible materials in their own homes.
    - We feel like we accomplished this goal based off of the response of the students and faculty. Students expressed excitement for the program, and were consistently engaged during the program. We cannot exactly know what the students did with the information given; however, based off of these positive reactions, we could gage that our program left a meaningful impact.

A description of the assessment plan:

- Part of our assessment plan included our club meeting on Thursdays with our advisor to review how the week went and to note what aspects we did well or what we could improve on going into the next week. This was super helpful for our volunteers because it was a way to get quick feedback from each group and be aware of our strengths and weaknesses as a whole. This also made us aware of certain students' needs and what to pay attention to next time we visited Bowlesburg. We reviewed these comments with our advisor, Cecilia Vogel, where she gave us words of advice and encouragement- she was a constant support for us when we needed help.
- Our assessment plan also included sending out a survey once the program wrapped up. Our questions could be answered by either a parent, guardian, or faculty member, and all of the questions aimed to help improve our program so that we can create the best experience for the student going forward.
- Results from the project assessments- Upon talking to the principal, we came to the agreement that the program should be directed toward an older audience going forward. We felt that the activities we hope to carry on in future programs are directed towards older students (3rd grade and older) who have a more composed and mature mindset. In terms of the surveys, we are waiting to receive results back from the

parents who filled them out. We intend to use the results and commentary included in the survey responses to improve upon our program for the future.

Key Metrics and Reflection	
Who was the target audience of your project?	**Elementary Students of Bowlesburg Elementary School that come from low income families**
How many attendees/participants were directly impacted by your project? Please describe them (for example “50 third grade students” or “25 families”).	**40 students- 1st and 2nd graders** **30 students- 3rd and 4th graders** **70 students total**
How many students from your SPS chapter were involved in the activity, and in what capacity?	**11 of our members were directly involved in the program. Most members during the program would help lead a group of students through an activity, promote them, and help them when they needed it. We had bi-weekly meetings for the planning of the program as well as during the program to see what members thought we could improve on week by week. 2 of our members kept in contact with the principal of the elementary school to ask questions and actually plan the program. In terms of planning the program itself, one of the members with an education background took the lead, but every one of the 11 club members, as well as faculty advisors of the physics department and the club, had a say in what was going on.**
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?	**The amount of money we received from SPS was sufficient (except to pay for the volunteer shirts which we weren’t sure if that was a proper use of the funds so we paid for a large part of the shirts ourselves). However, if we were to do this on a bigger scale, like with a larger group of students or for a longer period of time, we would probably have needed more funding. If we were to have extra funding for this year, it would have been for the shirts, which cost $227 total, of which the funding given to us paid for $128.29 of the shirts.**
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 plan on making this an annual program. We plan on returning to Bowlesburg to continue our outreach program, and we also hope to work with other schools in the Rock Island area. We could potentially expand the program by also hosting a science olympiad type of competition.**
What new relationships did you build through this project?	**Our volunteers built strong relationships with the students as well as the Bowlesburg faculty. Through these relationships, we believe that we can reach out to faculty members to do more outreach at their school, and potentially in their district.**
If you were to do your project again, what would you do differently?	**We would like to stick to working with an older audience in the future. We believe that these students are capable of taking on longer projects and exploring the physics concepts more in depth. Therefore, we could work on projects (such as building roller coasters), that allow students more time to design and build their structures while also learning the physics behind it.**

Expenditure Table		
Item	**Please explain how this expense relates to your project as outlined in your proposal.**	**Cost**
Wooden Popsicle sticks	The popsicle sticks were used for our 3rd and 4th graders during our bridge project. Each group used popsicle sticks to make a sturdy bridge.	18.34
Spaghetti	The Spaghetti was used by the 1st and 2nd graders to make towers. There is a physics based challenge to do this, given a specific amount of spaghetti strands and masking tape. The goal is to be able to place a marshmallow on top of it without the tower falling.	1.43
Rulers	Rulers were mainly used by the 3rd and 4th graders for their bridges to measure the constraints of the bridge area.	3.29
Foam Board	We got several foam boards, and we used these for the 3rd and 4th grade group for the bridge project. We used them to outline the dimensions of their bridges (they shouldn't be bigger than the board), while also giving us a way to store and display bridges.	7.96
Paper	We used the paper a lot throughout the program. We specifically used it for a craft for the 1st and 2nd graders, where we showed them how to make paper tops to demonstrate rotation. We also used it for demonstrating bridge strength, printing out coloring pages (for the time after groups finished a project), and using it for the certificates that we gave to the students after they finished the program.	7.44
Rubber bands	The rubber bands were mainly used as an organizational tool to help keep supplies together, such as the spaghetti for the groups, the popsicle sticks, and the markers.	2.01
Marshmallows	The marshmallows were used for the spaghetti tower project for the 1st and 2nd graders.	0.92
Tape	The masking tape was used for the spaghetti tower project for the 1st and 2nd graders, as well as the bridge project for the 3rd and 4th graders.	10.38

Elmer's Glue	The glue was mainly used for the bridge project for the 3rd and 4th graders.	13.02
Markers	The markers were used for the top project that the 1st and 2nd graders did (so the students could decorate their tops) and for the coloring pages students did after they were done with a project. We also used markers for demonstrations (like demonstrating how bridges worked), as well as labeling projects so students didn't get mixed up.	8.00
Plastic Containers	We came up with a buoyancy demonstration/experiment that we did with both groups. We used the containers to separate materials for different groups, but for the experiment, we filled the containers with water, and the students got to experiment with different materials, hypothesizing which materials would float and why.	8.62
Clay	The clay was used for our buoyancy demonstration as one of the materials, but we also made boats with the students. There was a specific shape of the clay that we were able to make float, and we were able to use this to describe density, as well as buoyancy concept used in boat making.	21.13
T-shirts	We got volunteer T-shirts so that students would know who to go to to ask questions. These were worn by our group leaders every session. These T-shirts were mainly funded by the volunteers themselves and our personal club funding; however, we budgeted leftover funds from what was granted to us from Marsh White to make this purchase.	128.49
Slinkies	These were given to the students at the end of the program as a way to remember the program. It was kind of a token students could keep and play with. The slinkies also went really well with our theme of "Spring Into Physics!," which made it perfect to give the students to end the program.	18.97
	*The $150 given to us initially was used in the purchase of materials. However, especially with the T-shirts, this came out of our club funds and out of pocket of individual members.	
	Total of Expenses	$250

Activity Photos

Bowlesburg Elementary students (grades 3rd-4th) on the last day of *Spring Into Physics!*
Photo Credits: Katie Syer of the Augustana Physics and Engineering Society

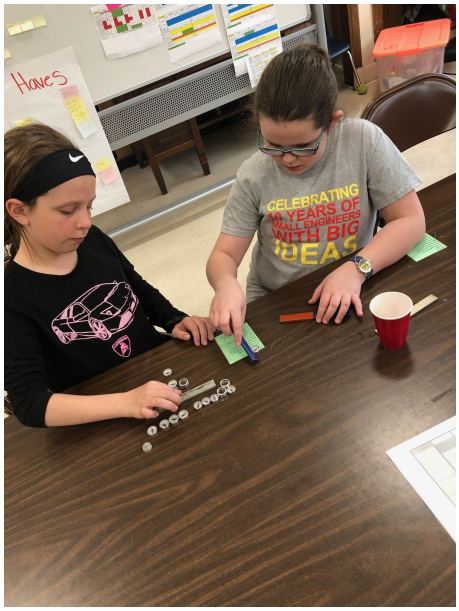
Bowlesburg 1st and 2nd grade students constructed towers out of spaghetti strands and tape. The pictures above show students balancing a marshmallow on top once built.
Photo Credits: Emmalee Pentek of the Augustana Physics and Engineering Society

One of our volunteers, Katie Syer, leading one of our sessions and introducing an activity.
Photo Credits: Emmalee Pentek of Augustana Physics and Engineering Society

Two of our students testing materials before they build their own boat out of modeling clay.
Photo Credits: Emmalee Pentek of Augustana Physics and Engineering Society

Students building bridges with the guidance of one of the volunteers.

Photo Credits: Emmalee Pentek



Students exploring magnetic fields with compasses.

Photo Credits: Emmalee Pentek

A group of students completed their bridge using popsicle sticks and glue.
Photo Credits: Emmalee Pentek

Students constructed boats and then tested them to see how many pennies it could hold before sinking. Photo Credits: Emmalee Pentek

Spring Into Physics! volunteers on the last day of the program.
Photo Credits: Emmalee Pentek