



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Future Faces of Physics Award Proposal

Project Proposal Title	The TLU SPS SYS-STEM Program
Name of School	Texas Lutheran University
SPS Chapter Number	7209
Total Amount Requested	500.00

Abstract

The Texas Lutheran Society of Physics Students (TLU SPS) will team up with a unique after school program, Seguin Youth Services (SYS). TLU SPS members will serve as mentors to a target group of 3rd – 5th grade SYS students. We will present monthly “STEM sessions” filled with fun lab experiences for the diverse group of students. For the first and last STEM sessions, we will go to the SYS facility so that we can interact with the larger group of students, which includes high school students. Our hope is that by meeting with students regularly, genuine mentoring relationships will form between SPS volunteers and the SYS students. The goal of this public engagement is to motivate these young students to learn more about physics through hands-on learning activities and to form relationships with strong role models.

Proposal Statement

TLU SPS volunteers will engage from 18-30 students from the Seguin Youth Services (SYS) after school program five “STEM sessions”. We recently met with the director of SYS, Sheryl Sachtleben, who supervises the daily afterschool program that was originally invented for the suppression of delinquency and to support academic success and citizenship. We have set a goal of at least 5 interactions, three on campus and two at the SYS facility. We thought it was important to have our SPS volunteers present at the SYS facility because only a subset of the full student group will be traveling to TLU to participate in the hands on science labs and think that many of the older students might benefit from interactions with college role models. Most of the students who participate in the all-voluntary SYS program are from low-income minority families. The services provided by SYS are important to those families and have, over the years, been a strong positive influence on the success and stability of the students. We believe that our chapter can be a positive influence as well by bringing the first ever dedicated science outreach program to SYS.

Overview of Proposed Project/Activity/Event

Basic Outline of the Program:

- We will open the program with a visit to SYS in late January to make introductions between TLU SPS volunteers and SYS student participants. During this opening visit, we will present multi-age group hands on activities that are centered on activities that they participate in regularly, but do not necessarily connect with science:
 - Pool (there is a pool table in the large gathering hall)
Here we will talk about the way that the balls bounce off the bumpers as a reason to discuss the idea of momentum. We will bring in other kinds of systems that illustrate these same concepts, including ramps with balls of various sizes. The discussion will culminate with a home-built version of the Rutherford scattering experiment developed as part of the 2010 SPS Sock kit.
 - Basketball (they regularly play basketball in the lot outside the gathering hall)
For this activity, we will use the idea of pressure to understand the effects of inflation pressure on the basketball. In this activity, students will work in teams to inflate the basketball, and then perform an experiment to see how the inflation pressure affects the bounce height.
- We will then host smaller groups of 3-5th grade students on campus in the TLU Physics labs for three STEM sessions. Students will be presented with their own SYS-STEM tshirt and wristband. The plan is to cover topics that the students will see in their schools so that we can have an impact not only on their interest in science in the future, but maybe on their present academic interest and success. We will pick the exact content after the first STEM session at SYS to see what the students are most interested in. Here we present a few options.
 - **Simple machines**
With this lab experience, students will use computer interfaced force sensors to understand the nature of forces in a variety of situations.
 - **Hot and Cold**
With this lab experience, students will build their own thermometer and test the functions with

liquid nitrogen, ice water, and boiling water. The extension will be to investigate material properties under the influence of liquid nitrogen and predict and determine how the material properties change.

- **Acoustics – understanding sound waves**

With this lab experience, students will explore the general idea of waves, especially applied to the field of acoustics and sound properties. By using a microphone and a sound recorder, students will be able to “see” the differences between many kinds of sound

- **Light and Matter**

With this lab experience, students will examine diffraction properties by analyzing the spectrum of Hydrogen, Helium, Neon, and Mercury. They will also explore the key properties of laser light and investigate why laser light is different from ordinary light.

- Each of the on-campus STEM sessions will be about an hour long, leaving plenty of time for informal interactions, help with homework and getting to know each other. All STEM sessions will be administered by SPS student volunteers.
- Most of the equipment and some of the materials and supplies for each lab are already available. Future Faces of Physics award money will be used for consumable supplies and items for the participants to take home, and t-shirts for all participants.
- Each student will be given a brief lab write up that will guide them in step by step procedures as well as outline the theory and mathematics behind the experiment for their understanding. The flexibility of these write ups is key, since we are dealing with a diverse group of students and a range of grade levels. Students will be encouraged to take the mini-lab home and discuss with their families. Older students will be engaged in more challenging questions during the lab experience.
- The final STEM session in the SYS-STEM program will have TLU SPS volunteers return to the SYS campus, for a final “Super STEM Session”. For this visit, we will do a full 45 minute demonstration program and treat the group to liquid nitrogen ice cream and a physics themed cake.

How Proposed Activity Promotes Physics Across Cultures

We are just beginning our outreach program at TLU SPS. The university is in a small south Texas town, populated by primarily low income, working-class families, making this a perfect opportunity to make a difference in the future faces of the Physics community. The students who make the SYS facility their afterschool home are typically those in the most need of strong role models that can influence their decisions to study and stay in school. It is our mission with the multiple visits to allow the student presenters to establish mentoring relationships with the afterschool students.

Plan for Carrying Out Proposed Project/Activity/Event

The detailed plans for the program are above. We have a solid group of SPS leaders committed to this project and have already made arrangements with director of Seguin youth students for carrying out our visits. Our advisor is an expert in carrying out these kinds of programs, so we feel sure that it would be successful.

Project/Activity/Event Timeline

As described above, our first STEM- session will be in late January. The next 3 on campus STEM sessions will be held in February, March, and April. The last STEM session will be held in May, so that we are finished before we face final exams!

Activity Evaluation Plan

We will monitor the number of student participants at each STEM session and will survey participant at the first and last STEM session as a way to assess impact of our efforts. We will also monitor the success of our program based on feedback from the SYS director.

Budget Justification

- The majority of our budget will go for T-shirts for the participants and presenters. We think this is a important and effective way to make the participants connected to their science role models.
- Since the students can't wear the t-shirts every day we plan to give them matching wristbands in the hopes that they generate interest among their peers.
- Other budgeted items include basketballs that we will donate to the facility, as we noticed that all basketballs were worn during our visit. The other budgeted items are consumables for liquid nitrogen ice cream.
- Other supplies and materials, including lab handouts, will be provided by the TLU department of physics with some support from the TLU SPS general budget.