



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Future Faces of Physics Award Proposal

<b>Project Proposal Title</b>	Physics HALO (High-School Advanced Learning Opportunity)
<b>Name of School</b>	The University of Texas at Dallas
<b>SPS Chapter Number</b>	7258
<b>Total Amount Requested</b>	\$435.98

### Abstract

Most modern physics studies require computer programming skills. We propose a two-part physics bootcamp to inspire high school women to pursue physics, understand what such studies would entail, and give them foundational programming tools necessary to succeed in a modern physics environment.

# Proposal Statement

## Overview of Proposed Project/Activity/Event

**Brief description:** This will be a two-day event. The first day will be dedicated to learning Python 3 programming skills, and the second day will involve a competition where participants apply their skills to astrophysical data. Both days will feature talks from women in physics (including undergraduate students, graduate students, faculty, and industry physicists).

**Goals of the Project:** The goal of this project is to inspire high school women to pursue physics in college and give them a foundation to be successful in such an endeavor. We hope to ameliorate the trepidation many students experience regarding programming, which is usually necessary for success in a modern physics environment. Doing so for this group of women should help close the gender gap in physics.

**Intended Audience:** We plan to accept approximately 20 high school students into this mini conference. Ideally, we would want our attendees to be junior or senior women in high school. Juniors will be in the middle of their college search and applying for colleges in the Fall, so our event could inspire them to look for a good physics school. Similarly, we hope that our event will inspire senior women to declare a physics major when they enter college. However, these will not be firm requirements, as we will be open to any high-school women who are interested! Although our focus will be on women in physics, all high school students will be welcome to apply and considered equally.

**Background and Motivation:** According to the National Science Foundation (NSF), approximately 20% of undergraduate physics students identify as women. We aim to increase that number slightly by giving high school women some tools they need to be successful as a physicist. If this weekend is successful, Dr. King may use some of her grant funds to expand the effort and host similar events throughout the school year for various underrepresented groups.

## How Proposed Activity Promotes Physics Across Cultures

True equality in physics will occur when participation in physics reflects the country's demographic distribution. Unfortunately, this is not the case in the United States, as women represent only one-fifth of the country's professional physicists despite representing half of the population. The variety of viewpoints and experiences present in a diverse team promotes success, so fostering diversity in physics by closing this gender gap will improve the field as a whole.

Anecdotally, our members have noticed that many young women are not aware of female role models in their field of interest. Since our event will feature several women in physics as mentors, many of whom come from additional underrepresented backgrounds, we will demonstrate to our attendees that women can and do become successful in physics. Additionally, this event will give the attendees a foundation to be successful in physics, which will directly impact (albeit in a minute way) the gender gap in physics by adding more potential students to the field. Finally, we will encourage the attendees to

connect with the mentors via LinkedIn or other means to maintain contact throughout their careers, which will help them feel like members of the physics community.

We will target our recruitment to students in the Dallas area. Many Dallas-area schools feature high percentages of minority (~70%) and economically-disadvantaged students (~40%). Although our only requirements will be that our participants be high school students, targeting our recruitment efforts in these areas will inadvertently have our event inspire students in other underrepresented areas.

## Plan for Carrying Out Proposed Project/Activity/Event

**Personnel:** SPS UTD President Victoria Catlett will oversee planning of this event, including the delegation of tasks and completion of paperwork. SPS member Evan Meade will co-lead the project by determining the schedule. Dr. Lindsay King, who currently teaches the “Numerical Methods and Computational Techniques” course in the UTD Physics department, will determine an appropriate curriculum, and Evan will assist her in turning the ideas into lessons. The other SPS UTD officers will have roles according to their officer positions.

**Marketing:** As mentioned above, the SPS UTD Media Chair Ian Schreiber will be in charge of marketing. He will advertise the event on the SPS UTD accounts, which include Instagram, Twitter, LinkedIn, and Facebook. Additionally, he should be able to access an email list of incoming Physics freshmen in early May, so he can invite them to participate. Victoria Catlett is also a member of the Student Outreach team for STEP UP Physics, and APS-sponsored initiative to increase women participation in physics, so they will try to advertise the event via STEP UP channels.

**SPS Member Participation:** SPS UTD members with sufficient programming experience will run breakout rooms with participants. We would need five volunteers to run breakout rooms (four participants in each and 20 participants total). Additionally, we will ask some of the many SPS UTD members who have done undergraduate research to talk about their experiences.

**Expertise:** Victoria Catlett and Evan Meade have significant Python experience. Their combined expertise with Dr. King will ensure that the Python material is appropriate and correct.

## Project/Activity/Event Timeline

- **February 12th, 2021:** Test-run the material by hosting a Python programming workshop for UTD Physics students
- **March 26, 2021:** Finalize and post event schedule, including speakers and volunteers
- **May 1st, 2021:** Purchase 1-month Zoom license
- **May 15th, 2021:** Day 1 of the Event (Programming Tutorials and Talks)
- **May 16th, 2021:** Day 2 of the Event (Competition and Talks)
- **May 17th, 2021:** Cancel 1-month Zoom license
- **May 21st, 2021:** Evaluate survey responses from attendees

Now, why are we proposing an event which would take place so close to the FFOP report deadline? Well, we want to host the event late enough in the semester for us to know who the incoming UTD freshmen are. Secondly, we do not want the event to interfere with high school AP exams (which end on May 14th) so as not to discourage participation.

## Activity Evaluation Plan

The first metric of our success will be the number of sign ups we receive. We plan to only accept 20 participants, but if we receive a smaller number of applications, then we will know that our marketing was not effective. Conversely, if we receive much more than 20 applications, we will know that our marketing was effective and that there is a large demand, so we will evaluate the feasibility of expanding the event.

We will send out a pre-survey to gauge the attendees' knowledge about Python programming, awareness of practices in physics, and appreciation of women in physics. After the event, we will send out the same survey, then compare the results to see how much the attendees learned. We will likely model this survey after the Student Assessment of Learning Gains, which is a proven, effective study of student learning developed as part of an NSF-funded endeavor.

Brandon Sike, the SPS UTD secretary, will draft free-response questions to attach to the post-survey which allow the attendees to assess the event itself. We will leave the form open for approximately a week. Then, the event team will read through the responses and evaluate the effectiveness of the event in time to include the conclusions on the final report.

## Budget Justification

We would like to host the event on Zoom given its breakout room capability. We request the shortest-duration, cheapest license, which is a one-month Pro license (\$15.98 after taxes).

Part of the requested budget will go towards volunteer food. This is a long event, and this will provide an incentive for volunteers to stay the full time and help them remain engaged throughout the event. We plan to provide food in the form of delivery gift cards that could cover approximately one meal and delivery costs. If the committee would prefer, we could also account for this by asking volunteers to provide food receipts (up to \$20), then reimbursing the volunteers.

The second day of the event will feature a competition. We want to have a prize for the winners that relates to our theme of inspiring women to pursue physics. Since the competition will involve the use of astronomical data, we believe that an appropriate prize would be the biography of Vera Rubin.\* This book is currently listed as \$29.95, so in the budget, we listed \$40 per prize to account for potential tax and shipping costs.

Finally, we want to send participants buttons so that they can show off their skills and dreams to their peers. The buttons themselves will be very cheap (\$0.05-\$0.50, depending on the vendor), but we have also factored in potential USPS shipping costs (up to \$3.00 each) to provide an upper bound on what this could cost.

We do not anticipate any costs for the programming materials, as we will use Google Colab as the programming environment, and we will use publicly-available data for examples and the competition.

\*Link to Vera Rubin biography:

<https://www.barnesandnoble.com/w/vera-rubin-jacqueline-mitton/1137695124?ean=9780674919198>