My student population includes high school sophomores through seniors that are embarking upon independent research projects. I would like them to be involved with citizen science projects as an entry point to the scientific community. I located a NASA citizen science project, Planet Hunters, TESS, which I will support my students to participate in. The project will use data from the Transiting Exoplanet Survey Satellite (TESS) to look for planets outside our solar system. The satellite will be surveying two-hundred-thousand bright nearby stars, measuring and recording their brightness every two minutes. The goal of this project is to potentially discover other planetary systems, and their development over time.

The need for citizen scientists arises because the computer based algorithms created to interpret satellite data may get confused by conflicting information. Humans can identify patterns that the computer may miss. Students will be partnered up to review lightcurves to identify drops in light due a potential transiting a planet. Leading up to their participation, students will learn about exoplanets and how to detect planets using the transit method. They will then be trained on how to interpret and identify different types of light curves, eventually training how to search for exoplanets in observations from NASA's TESS mission.

Engage: Can life exist outside of planet Earth?

- Students will line up along the classroom: Yes/No signs will be on opposite sides of the room and they will place themselves along the continuum. Teacher will ask for 2 volunteers from each student cluster to provide their reasoning.

- Working with a partner, students will use the QFT strategy to generate a list of scientific questions that they need answered in order to be able to answer the question more fully. Questions will be shared as a class. Students will look for patterns in the questions and sort class questions into groups based on these patterns

Explore:

- Students will act as “NOVA-nauts” through an online simulation to determine if exoplanets are habitable. They will analyze simulated data to support whether an exoplanet might be habitable for certain life-forms.

https://cptv.pbslearningmedia.org/resource/nvexl-sci-exoplanetlab-lessonplan/nova-exoplanet-lab-lesson-plan/
https://view.officeapps.live.com/op/view.aspx?src=https://static.pbslearningmedia.org/media/media_files/2c840887-e708-4c28-a0fc-4838f12dc9da/d66fb896-841a-4e20-b6a7-ae84be0c0cf7.docx

Explain:

- Students will revisit the class questions, and indicate which questions have now been answered and which still remain.

- Teacher will address any misconceptions with students and highlight the use of data to support claims, making the connection between simulated data and real data to transition to the Planet Hunters Citizen Science Project

Elaborate:

- Students will go to the following site to learn about exoplanets and use the training tools to learn how to interpret and identify different types of light curves, eventually training how to search for exoplanets in observations from NASA's TESS mission:

https://www.zooniverse.org/projects/nora-dot-eisner/planet-hunters-tess/about/research

- Once training is complete, students will participate in the citizen science project, analyzing real data to classify exoplanets using the transit method.

Evaluate:

- Students will compare the transit data used in the simulation to the transit data in the citizen science project. Using the citizen science data transit data, they will calculate the volume of 3 planets using the methodology from the simulated lab data. Students will make a claim if they think the exoplanets they measured could support life given the patterns they observed in the simulated lab.