

EDUCATIONAL STEM OUTREACH AT STONY BROOK UNIVERSITY: BUILDING THE PIPELINE FROM KINDERGARTEN THROUGH COLLEGE. L. B. Breitenfeld¹, T. D. Glotch¹, T. Grandfield¹, B. Peritore¹, and W. Shen¹, ¹Department of Geosciences, Stony Brook University, Stony Brook, NY 11794, laura.breitenfeld@stonybrook.edu.

Introduction: In the last several years, we have worked on the expansion of educational outreach efforts within the Department of Geosciences at Stony Brook University, located on Long Island, New York. In order to accomplish this work, previous graduate students established the organization “Graduates for Education and Outreach” also known as “GEO”. Although GEO leadership has changed as previous leaders graduated, we continue to work towards providing educational science technology engineering and math (STEM) outreach through a variety of activities. Here, we present our educational philosophy, current efforts, and future goals for our organization.

GEO: Historically and currently our organization is led by graduate students who coordinate all efforts and events. Our education outreach work is primarily performed by graduate students across several STEM departments in the Stony Brook College of Arts and Sciences and College of Engineering and Applied Science, as well as by faculty within the Department of Geosciences. The primary goal of our organization is to provide educational instruction to students spanning a range of ages (kindergarten through college), informing and inspiring students within STEM disciplines.

Our two primary efforts include teaching traditionally underserved students at Nathaniel Woodhull Elementary School and Suffolk County Community College. We are also working to establish an effort at Brentwood High School, a majority minority school district. In addition to these efforts, we work with local science fairs and schools upon request. Aside from our efforts on Long Island, here we also highlight our participation at the NASA Red Sox STEM Day.

Philosophy: GEO prioritizes efforts towards engaging with students in school districts composed primarily of economically challenged and traditionally underrepresented minority students. Diversity, equity,

and inclusion are important pillars of our organization. In an attempt to contribute to improving diversity, equity, and inclusion in our field, we are working to provide early and consistent support in our local community. We know that local schools understand their educational needs better than we do and therefore we provide educational opportunities that are based on what educators request from us (**Figure 1**).

Another component of education that we consider is student availability, food, and financial insecurity. When possible, we are working towards providing students with free nutritious food at our events. Looking forward, we are investigating paid study time for older students.

Nathaniel Woodhull Elementary School: We work with five fifth grade classes to provide hands-on STEM lessons. We prioritize topics that students are currently studying and introduce new topics of interest (often planetary science lessons). A few examples of topics include water pollution, ecosystems, states of matter, and the Perseverance Rover. Our current yearly goal is to provide ten hands-on STEM lessons.

At Nathaniel Woodhull Elementary School, we particularly emphasize the use of art (STEAM) in our lessons. This focus inspired students and teachers to create hallway “museum galleries” where students display their art/creations (**Figure 2**).

Suffolk County Community College: We provide hands-on STEM workshops that focus on skill-based activities led by faculty from Stony Brook’s Department of Geosciences. A few examples of topics include remote sensing of planetary surfaces, lunar mission design, carbonate depositional environments/sequence stratigraphy, seismology/geodynamics and using python tools to visualize seismic waves. The workshops are usually three hours in length and are advertised to students in all

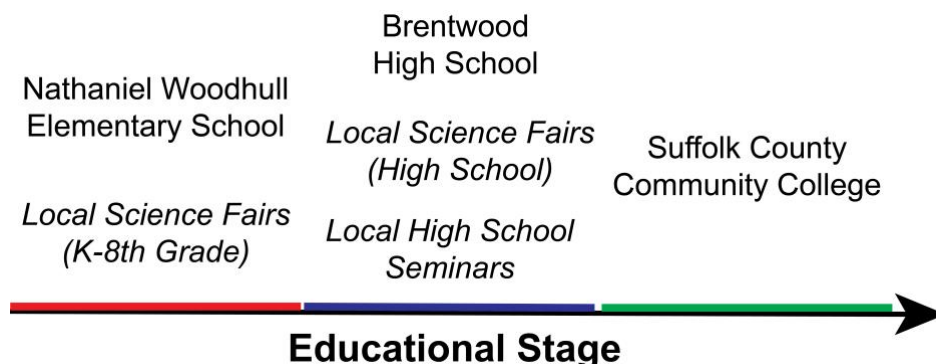


Figure 1. Diagram depicting educational outreach efforts by stage of education or age.



Figure 2. Examples of posters for invasive species created by Nathaniel Woodhull Elementary School students.

STEM departments. Using event advertisements through the community college system, students at other community colleges (e.g., California and Hawai'i) have attended our virtual workshops.

In addition to workshops, we organize and lead panel discussions that are focused on future career paths for students. The panels have included Stony Brook undergraduates, graduate students, and faculty members. Our current yearly goal is to provide six workshops and several panel discussions.

Brentwood High School: We are actively working towards expanding our outreach to Brentwood High School this spring. We plan to assist students who are studying for the Physical Setting/Earth Science Regents Examination (a required exam in the State of New York). This specific exam is held in January, June, and August every year. In preparation for the exam, we will hold study sessions and provide free tutoring to students. We are working to recruit bilingual graduate students to teach students at Brentwood High School where English as a second language is common. This



Figure 3. GEO volunteer showing students what a wax “volcano” looks like through a Forward Looking InfraRed (FLIR) camera at the NASA Red Sox STEM Day in May 2022.

outreach effort will have a direct impact on student outcomes as this exam poses a barrier for many students. Our yearly goal is to provide at least four study session prior to each of the three exams.

NASA Red Sox STEM Day: Every year GEO contributes to the NASA Red Sox STEM Day at Fenway Park in Boston, Massachusetts. At this event, we provide planetary science specific demonstrations and activities such as building a “shield volcano” out of wax, highlighting the capabilities of an infrared camera (**Figure 3**), creating impact processes, touching meteorites/lunar samples, and building “asteroids” out of clay (**Figure 4**).

Future Goals: In the upcoming years, our goal is to ensure the longevity of our organization through leadership transitions. We would also like to increase our organization’s reach and effectiveness by collaborating and working with others in the STEM educational outreach space.

We hope to contribute positively to our field by increasing diversity, equity, and inclusion through these activities. Lastly, we would like to collect data and track the outcomes of our efforts in collaboration with school educators. These efforts will help us move into furthering the research of STEM educational outreach.

Acknowledgements: We are grateful for NASA SSERVI funding from the RIS⁴E and RISE2 nodes for support of our current educational outreach program.



Figure 4. GEO volunteers teaching students about planetary bodies at the NASA Red Sox STEM Day. Students were encouraged to touch meteorite and lunar samples and build their own “asteroid” out of modeling clay.