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HUDSON RIVER PK
RIVER PROJECT

The City College of New York

INTREPID
SEA, AIR & SPACE MUSEUM COMPLEX

THE YOUNG WOMEN'S LEADERSHIP SCHOOL
EAST HARLEM
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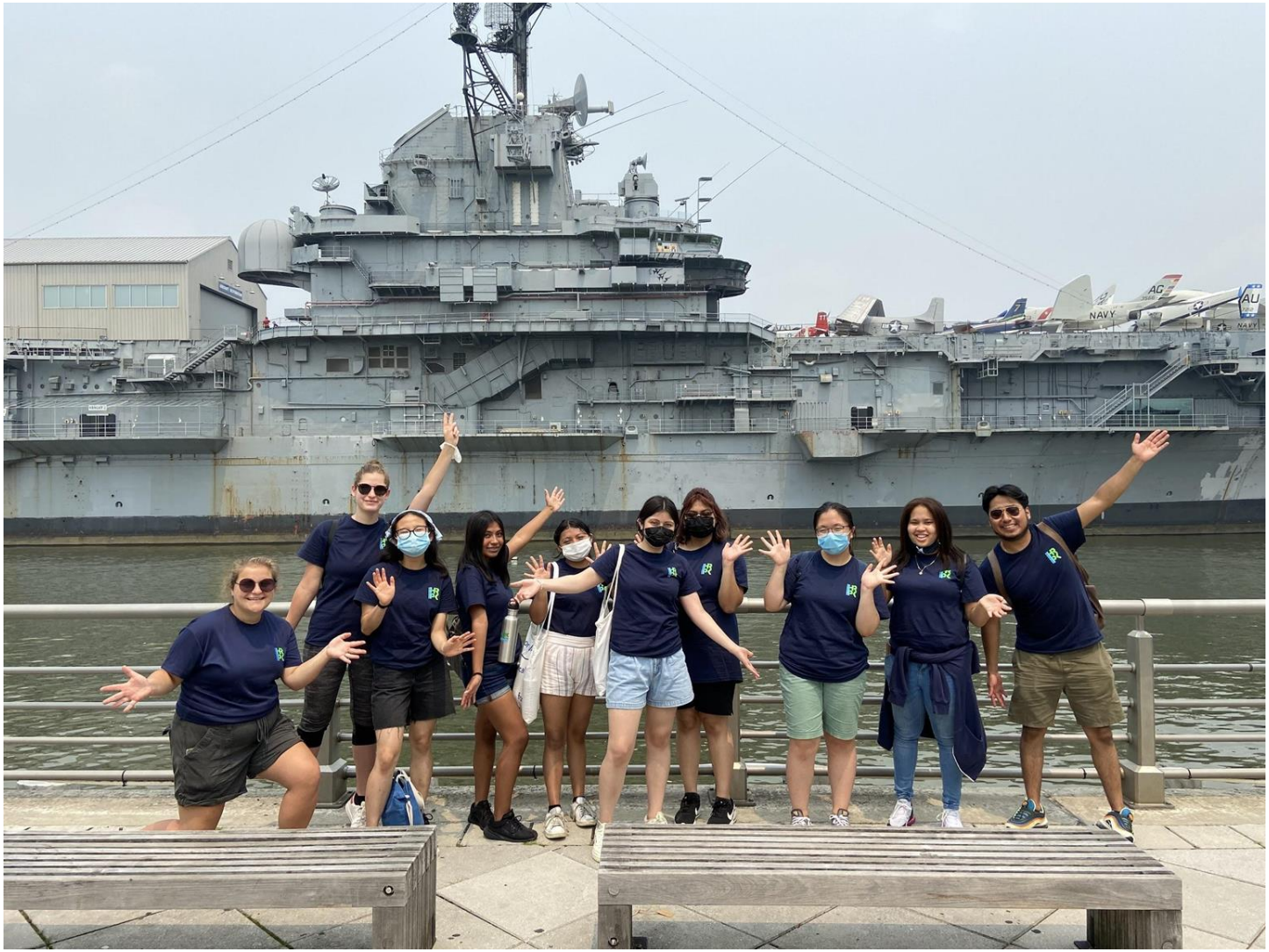
INCLUDES Research Internship Report 2021



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Purpose

The Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES) Summer Research Internship is a paid research opportunity for high-school aged girls in New York City. This project is a collaboration of NYC STEM institutions including Hudson River Park's River Project, City College of New York, Columbia University, The Young Women's Leadership School, and The Intrepid Sea, Air and Space Museum. The program is founded on a tiered mentorship model which utilizes near-peer mentoring as a strategy for community building and skill development. This research intensive is traditionally held in-person at Hudson River Park and involves hands-on science and STEM career skill building. In 2021, INCLUDES was hosted both in-person and remotely during the COVID-19 pandemic. Interns remotely studied how the release of microfibers in clothing varied based on different conditions and returning students built off their findings from 2020. This research project aligns with and supplements the Park's microplastic research to better understand the impacts of plastic pollution in local waterways. At the conclusion of the six-week program, all eight interns presented a scientific poster of their research, both virtually and in person, to the River Project staff.

Hybrid Internship

Due to the pandemic, the 2021 INCLUDES program did not meet in-person on a regular basis and was designed as a hybrid model running from Monday to Thursday. Each week, interns met with mentors virtually via Zoom for three days and in-person at Hudson River Park for one day to conduct field research. Throughout the program, interns participated in various professional development, networking, and leadership opportunities both virtually and in-person. Remote days were divided into a combination of open work time to develop their research, socializing time where mentors led informal conversations called "Lunch Talks," and workshops with guest speakers or team building activities.

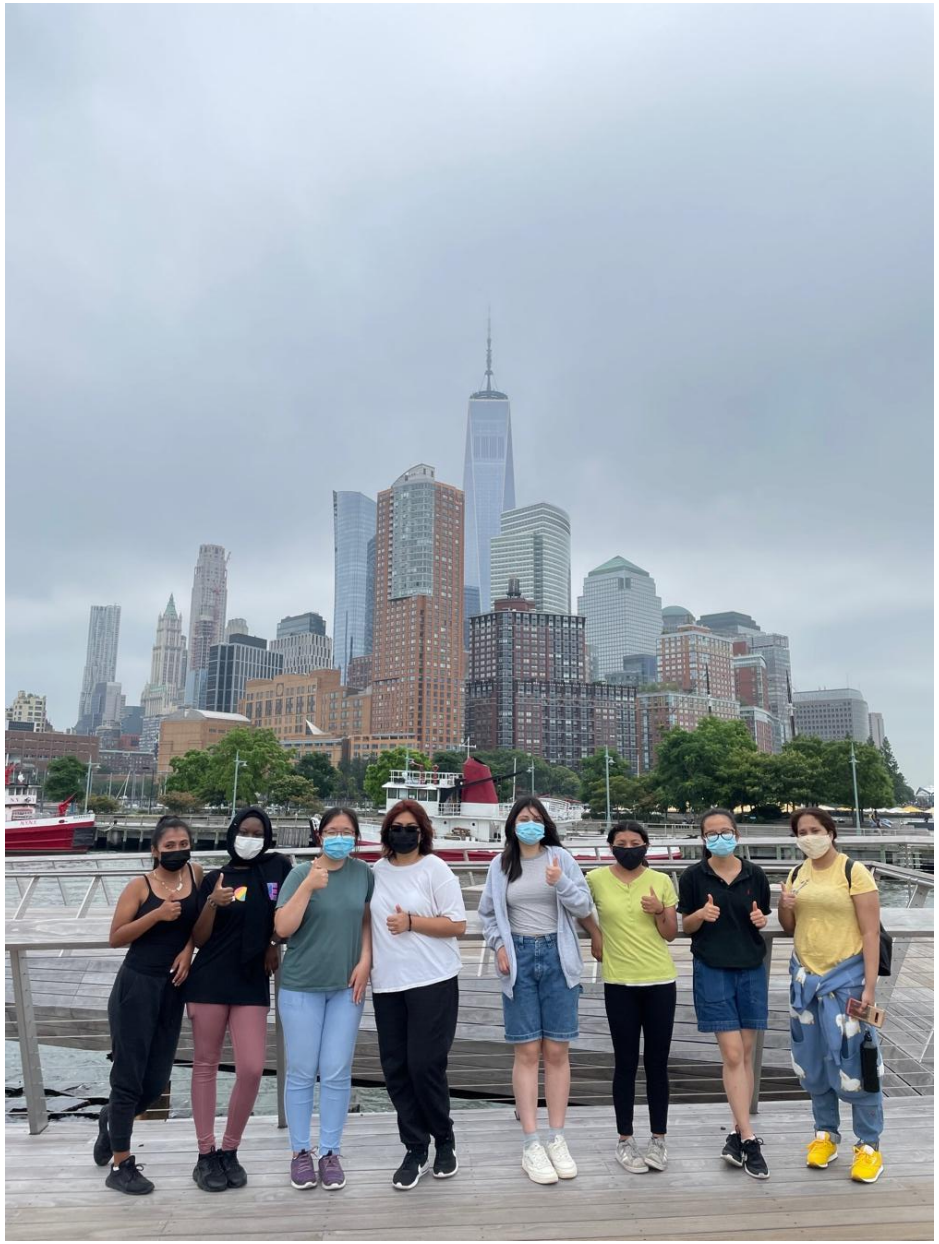

Fig. 1 | 2021 INCLUDES interns at Pier 26.

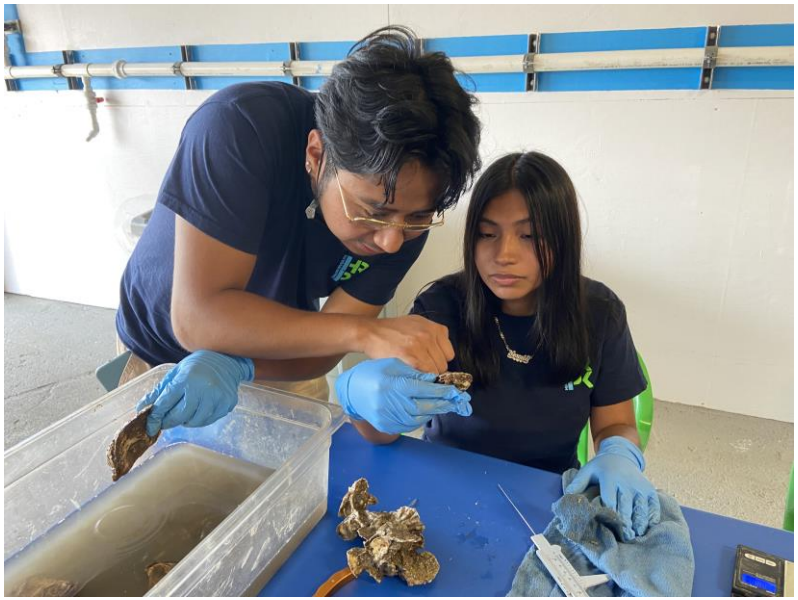

Fig. 2 | A college mentor with a high school intern measuring oysters for Hudson River Park's Community Oyster Project.

Key Questions

- Does the INCLUDES internship program help students feel more confident in their STEM skills and knowledge?
- How has participation in a STEM internship affect students' overall attitudes toward pursue a career in the STEM field?
- Does a tiered mentorship structure help support emerging STEM leaders?
- Can a hybrid internship model provide the same benefits as an in-person model?

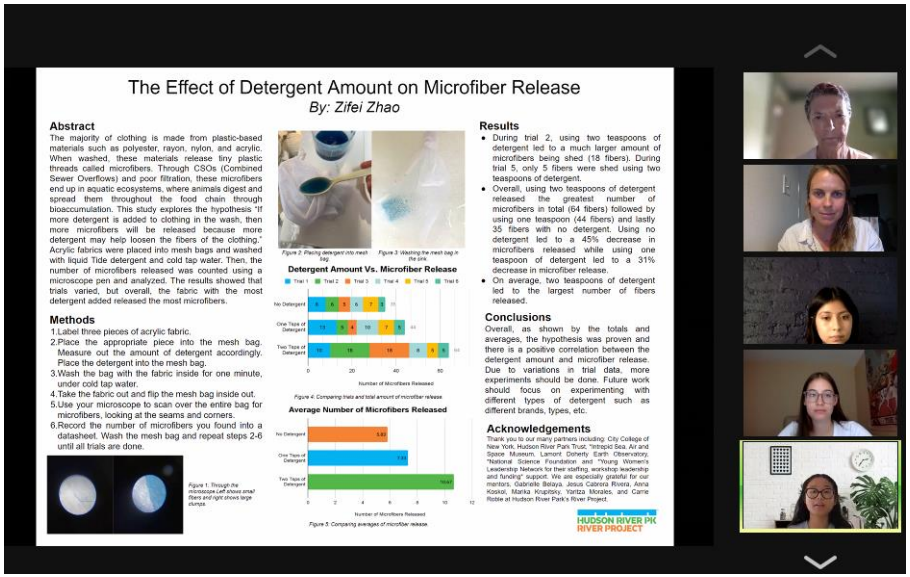

Fig. 3 | A high school student's final poster presentation.

Methods

- Interns and mentors completed a pre- and post-program survey about attitudes toward their peers, their mentors, their STEM skills and other career-based topics.
- Interns met virtually and in-person for six weeks with the regular support and guidance of mentors, Park staff, and partners (Fig. 2).
- Interns designed individual research projects focused on microfibers and presented a scientific poster on their findings (Fig. 3).

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Field Science Opportunities

One of the program's goals is to provide students with the tools and skills to grow professionally and transition into STEM careers. Thus, including hands-on field work projects in the program creates key opportunities for interns to develop meaningful field science skills. For instance, learning how to collect data, use field and laboratory equipment, take measurements, and communicate with the public are all skills interns can carry on to college and future jobs. Furthermore, all students can use this opportunity to explore a variety of scientific fields, create meaningful relationships with their peers, and network with professionals at Hudson River Park and their partner organizations. At the Park, students participated in projects including oyster restoration, habitat enhancement, marine debris research, and more. Through in-person research experience, interns participate in authentic field work and contribute to HRPK's scientific research.

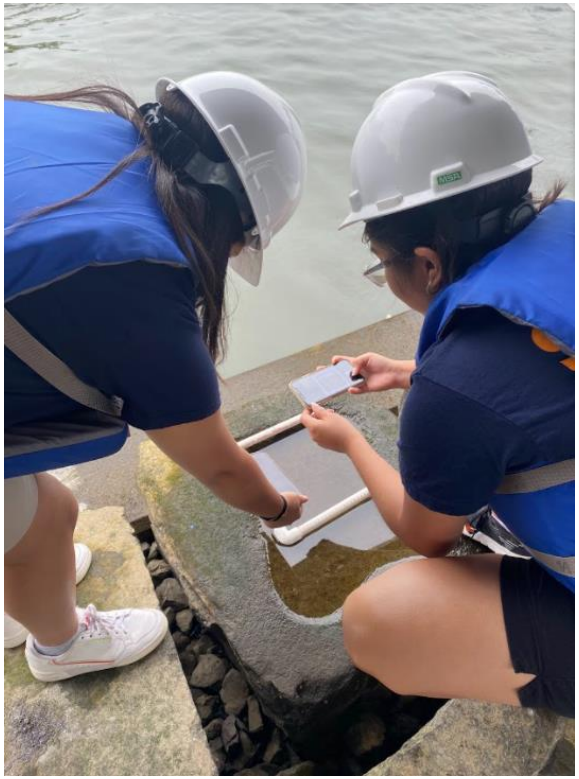

Fig. 4 | Interns monitoring a tide pool at the Pier 26 tide deck.

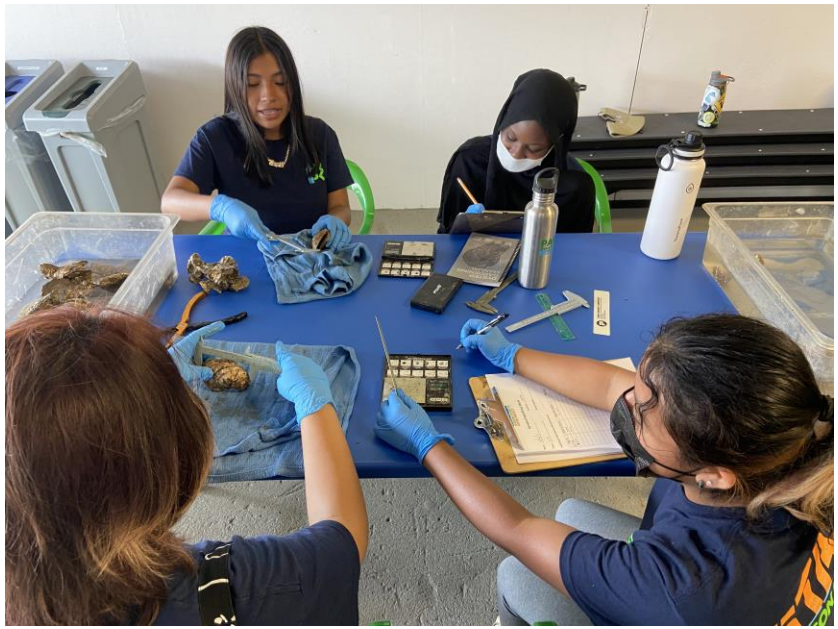

Fig. 5 | Interns measuring size and weight of live oysters to support Park oyster restoration efforts.

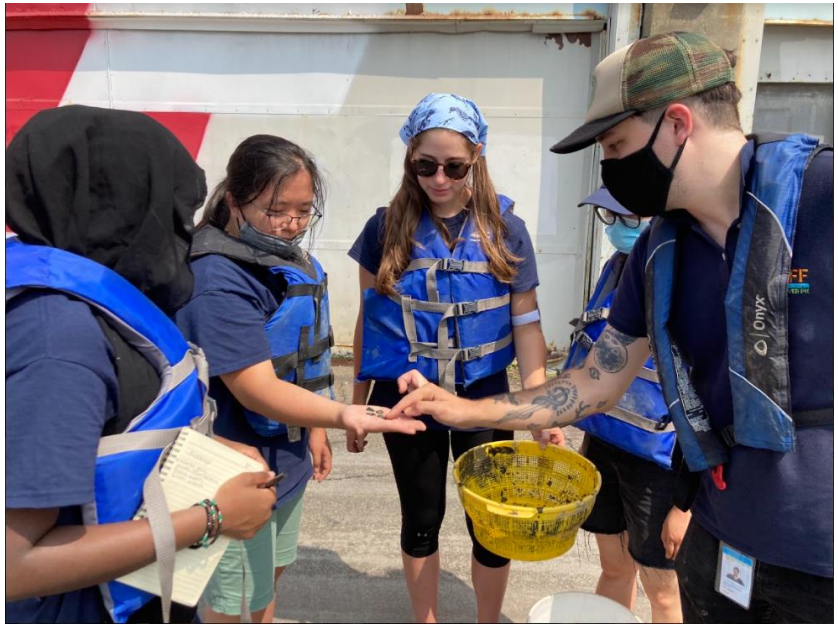

Fig. 6 | Interns observe organisms found in a sample of River sediment that they collected using an Ekman dredge.

Major Findings

Pre-Program Survey Results:
On the first day of the program, when asked to rate their confidence level in various science tasks such as reading scientific papers, forming hypotheses, and designing & conducting research, interns' responses were dispersed; some reported being "minimally" or "somewhat" confident. Interns were mostly confident in their ability to work in a team and learning to do research in a virtual setting. All of the interns agreed that it is important to engage the local community and increase diversity in sciences.

Post-Program Survey Restults:
On the last day of the program, all but one intern submitted responses to the Post-Program Survey. The majority of the interns said that they were either "moderately" or "extremely" confident in completing various science tasks, and no one responded with "minimally" or lower. All interns agreed that their mentors gave them confidence and that the mentors allowed them to feel heard, engaged, encouraged, and like they were part of a team. Most interns were interested in pursuing or were inspired by various science subjects and felt that these subjects would involve skills related to their summer research project. One students shared that they now have an interest in pursuing language because they want to communicate with more people. Since completeing the program students expressed that they were likely to pursue a career involving STEM such as environmental science, computer science, science education, pediatrics, and sustainability.

"STEM is important to me because it has always been a big part of my everyday life… I started getting more curious about our planet and how everything works at the start of high school. I enjoy going more in-depth about what I learn, and I feel proud when I discover something and solve something new."

- A personal reflection on STEM by a returning student

Mentors:
During the program, a 1:4 mentor-to-mentee ratio was set to ensure that students could receive equal support. The two undergraduate mentors led interns through their daily schedule, conducted workshops, and offered guidance as they navigated their research. Each week, mentors provided constructive feedback on the interns' research projects and shared their advice and encouragement. In the Pre-Program Survey, they shared that personal growth, seeing mentees present their research, and mentees going beyond their comfort zone would be the most rewarding aspect of the program. They were moderately and/or extremely confident in their ability to be successful mentors and executing various scientific tasks. At the close of the program, the mentors reflected that seeing interns improve on their speaking skills and complete their posters were the most rewarding aspects. They found that keeping interns engaged on Zoom and balancing constructive feedback were some of the more challenging aspects of the program. Mentors also shared in a verbal reflection that having other tasks while students worked on their experiment trials would be helpful. They also shared that they learned how to give constructive feedback to students in a productive manner.

Fig. 7 | STEM Identity Panel co-hosted annually with the New York Academy of Sciences.

Take Aways

Summer 2021 marks the second year of virtual INCLUDES programming, a hybrid model that has both pros and cons. Students started the program with interest in STEM careers, but were hesitant about their confidence in designing and conducting a research project. Students left the experience with not only more confidence and continued interest in STEM careers, but also feeling supported and encouraged by their peers and mentors. Both interns and mentors perferred to have more in-person field days and expressed that they had the most meaningful experience at the Park conducting field science research with their peers. Remote days offered less oppportunity for students to authentically connect and bond with one another. Thanks to the partners, scientists, and science communicators who participated in the program, students were able to continue building their professional networks both virtually and in-person.

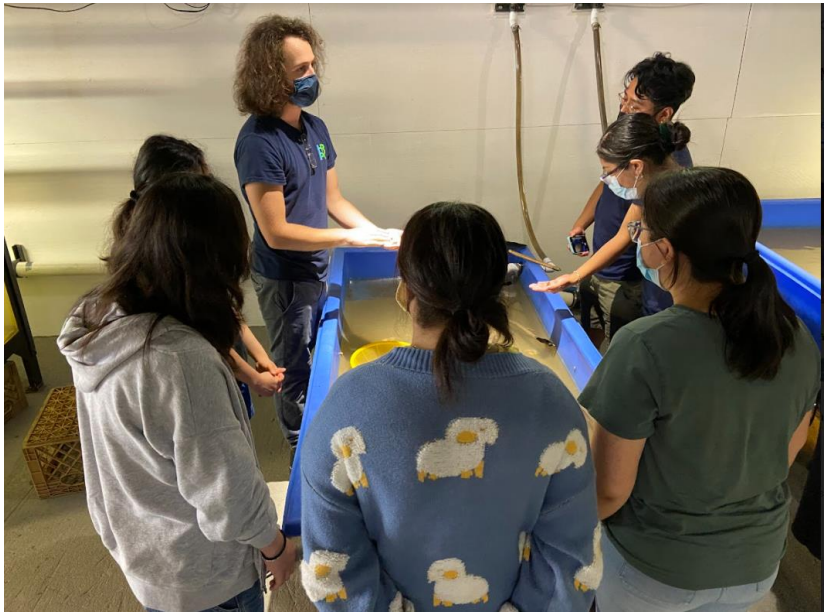

Fig. 8 | Interns touring the Wetlab at Hudson River Park's Pier 40.

Future Directions

With the uncertainty of the ongoing pandemic, there is possibility for the hybrid model to continue. If the program were to be held with remote days, carving out more time for students to connect through discussions and teambuilding exercises may be beneficial in their communication skills. Mentors reflected that the professional development and leadership workshops were educational and that adding new topics such as completing college applications, deciding on a major, or navigating the STEM field as a woman/POC may be of interest to future students. Mentors also suggested hosting an alumni event where previous participants return to talk about their experience in the INCLUDES program and how it benefited them in their academic or professional career. Students enjoyed developing their microfiber research at home and it may be of interest in the future to expand this research to address other emerging microplastics topics such as impacts on wildlife, water quality, toxicology, etc. Overall, the in-person, hands-on science experiences were the most effective way to teach students. Looking to 2022, integrating even one additional in-person day may further provide a productive and impactful experience for students and mentors.

Fig. 9 | Interns and mentors on a field trip to the Intrepid Sea, Air & Space Museum.