Eos

Mentorship During a Pandemic: Transitions from Lab and Sea to Virtual

With mentorship having gone virtual this past summer, three geosciences programs offer case studies about how to form meaningful connections during a time of social distancing.

By **Richard J. Sima**
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Research Experiences for Undergraduates (REU) programs, such as this one at the Incorporated Research Institutions for Seismology, provide opportunities for students to physically experience what it's like to conduct research. Credit: Michael Hubenthal of the Incorporated Research Institutions for Seismology

The summer of 2020 was supposed to be one of exploration, discovery, and mentorship for students in the geosciences.

But then the pandemic happened.

Laboratories shuttered their doors; research vessels stayed docked.

Many of the mentorship programs students applied to are now navigating the still-uncharted waters of the "new normal" and working to provide quality, albeit remote, mentorship.

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STEMSEAS—short for Science, Technology, Engineering and Math Student Experiences Aboard Ships—is one such program.

Run out of the Lamont-Doherty Earth Observatory at Columbia University, the National Science Foundation–funded initiative has been a gateway for more than 125 students to experience ocean science up close every summer since 2016. In a normal year, STEMSEAS gives undergraduates the opportunity to spend 6–10 days aboard a U.S. Academic Research Fleet research vessel with experienced faculty mentors as the ship makes transits between expeditions.

"Going to sea is really quite life changing the first time one goes, I think regardless of your stage in life," said **Jon Lewis**, a professor of geoscience at Indiana University of Pennsylvania and co–principal investigator of STEMSEAS. "It is very powerful."

Of course, 2020 has not been a normal year.

"It took us actually until a couple of weeks ago to finally admit defeat, that we weren't going to be able to do this," said **Sharon Cooper**, a senior staff associate at Lamont and STEMSEAS co–principal investigator, in July. "We want to go to sea! We're kicking and screaming."

"These are unique times, and we really should just step up and try to keep maintaining engagement and get people excited," said Lewis, who, with Cooper, originally **sketched out the concept of STEMSEAS over coffee**. "The irony is, the entire project is based on something that is truly a sui generis experience. It's really [such] a one-of-a-kind, transformative experience that you virtually can't do it virtually."

Though the onboard experience cannot be replicated, Lewis and Cooper are building out the mentorship aspect of STEMSEAS and working to connect their students to resources, opportunities, and mentors virtually.

> *These programs may serve as case studies for creating remote mentoring networks that can develop meaningful connections for students in a time of social distancing.*

Other programs are in a similar boat.

The **Nautilus Live science and engineering internship program** of the Ocean Exploration Trust also did not go to sea. Program leaders decided to defer all would-be participants for the ship-based program to next year and instead provide opportunities to participate virtually from shore.

"It's such a hard decision because we know how important and how timely these experiences can be in the career track of students," said **Megan Cook**, manager of Education Partnerships and Programs at the Ocean Exploration Trust. "That's the thing really in our hearts and minds."

Many of the **GEO Research Experiences for Undergraduates (REU)** programs, usually hosted by laboratories at different research institutes throughout the United States, were either canceled or moved to virtual research internships and professional development workshops in 2020. This pivot, forced by social distancing concerns, **affected student engagement in geoscience education and career preparation**. Regardless, it was apparent that "the students were very hungry for something," said **Valerie Sloan**, director of the GEO REU network and an internship specialist at the National Center for Atmospheric Research.

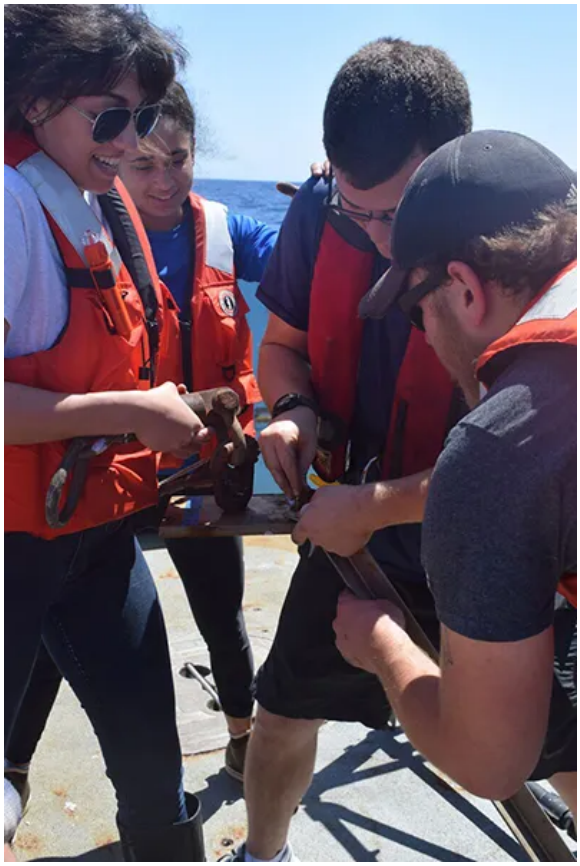
These three programs—STEMSEAS, Nautilus, and GEO REU—may serve as case studies for creating remote mentoring networks that can still develop meaningful connections and professional development for students in a time of social distancing.

Serendipity and Intentional Mentoring

As an undergraduate student at Iowa State University, **Chanel Vidal** took part in the 2018 STEMSEAS cruise on the R/V *Endeavor* as it sailed from Rhode Island to Barbados.

With Vidal hailing from landlocked Iowa, the program was life changing in more ways than one. "It was the best experience I had in college. The idea of being able to just go to sea for a week and only see ocean was mind-blowing," she said. "It's not something that I ever thought that I would be able to do."

Interacting with professors, graduate students, and other mentees while working on her research project shifted Vidal's academic trajectory by showing her how interdisciplinary ocean sciences research worked and that it was something she herself could do.



As part of an REU program, Chanel Vidal (left) helps build a flex cam aboard the R/V *Endeavor.* Credit: Chanel Vidal

"[STEMSEAS] definitely formed what I want to study for the rest of my life," Vidal said. "I had interest in it [before], but they helped me prove to myself that it's realistic and I can do it and it's possible."

The relationships she formed are still strong and influential years later; she still keeps in touch with her cohort and mentors. "The teamwork and the relationships and just the beauty of it all were so memorable and have resonated with me even though I've been in landlocked Iowa for 2 more years," said Vidal. "I still think about it every day."

One of her project mentors, **Joseph Montoya**, a professor of biological sciences at the Georgia Institute of Technology, recently helped with Vidal's application to the Nautilus internship program.

Montoya is an example of a chance mentor brought on board by the program: He was on the ship in preparation for a follow-on expedition and not originally part of STEMSEAS. Today he has become one the program's biggest contributors.

That happenstance is the beauty of the program, said Cooper. "We like to work with anybody else who might be on the transit," she said.

Rebecca Ju, an environmental studies major from Yale University, participates in the 2018 Bermuda Institute of Ocean Sciences (BIOS) REU program. Credit: Bermuda Institute of Ocean Sciences

These kinds of serendipitous connections may be one of the more challenging aspects to emulate in a remote program.

"The difference between mentoring and just supervision is that you're helping [students] to talk about their professional goals," said GEO REU's Sloan.

The goal of the GEO REU program is to give students experience doing geosciences research for 6–10 weeks during the summer, so they understand how science works and whether it appeals to them, said Sloan. "And the things that distinguish REU programs from let's just say being a student assistant in a lab would be that in an REU program, you have

intentional mentoring" and professional development, both of which are particularly important for students from historically underrepresented backgrounds.

This means, in part, nurturing an environment for informal mentoring stemming from spontaneous interactions in the cafeteria to introductions to faculty or invitations to lab meetings.

> *Moving programs online this year made introducing students to people more difficult by far.*

In a typical year, approximately 65 GEO REU sites would provide 800 students with hands-on research experiences and mentorship. Moving programs online this year made introducing students to people more difficult by far, Sloan said.

To help bridge the gap this summer, Sloan developed the 2020 NSF Ocean Sciences REU, a **virtual professional development workshop series**, to bring together 45 undergraduates hosted by different REU programs around the United States in weekly Zoom meetings with faculty facilitators on a variety of topics ranging from career exploration to research ethics to resumé building.

Before the workshops began, Sloan held more intimate sessions with four students at a time to get to know them. "It was small enough that I felt like I was connecting with them, and I hope they felt that as well," she said.

Pivoting and Finding the Silver Linings

There are physical limits to the number of people who can fit on a ship or in a research lab. But mentorship and programming this year are not subject to such physical constraints, which may be a silver lining: Though the virtual programs may have less depth of impact, they could have considerably more reach.

"A major challenge was the frameshift for us to recognize that if you can't go to sea, you shouldn't just assume we can't do anything," said Lewis of

STEMSEAS. "And I think once we got over that, [we] said what we really need to do is meet the moment and pivot and figure out a way to connect."

> *"We're going to reach more people in a very different way than we would have normally, so it's a little bit of a silver lining."*

Normally, STEMSEAS receives several hundred applicants each year, and only 40 students can sail. This year, those applicants who would not have had an opportunity to participate can stay engaged, Lewis said. "So that's kind of a plus. We're going to reach more people in a very different way than we would have normally, so it's a little bit of a silver lining."

In charting out its new remote programming, STEMSEAS will call upon its built-in network of 30-odd instructors and even more alumni who are eager to pitch in by connecting with a student or giving a lecture or webinar, things that could have happened almost as easily on a ship as on a computer. The STEMSEAS Facebook alumni page has fostered continued interaction and conversations, and alumni have made conscious efforts to connect their students with upcoming opportunities and internships.

STEMSEAS online programming will also try to bring some of the ship experiences to their students by connecting them to the ship operators, who may have more time now that there is not much sailing, Cooper said.

"We can arrange for them to talk to the students in a way that they probably wouldn't have been available for any other way," she said. "You know, when you haven't sailed on a ship yet, you think of the ship captain as some very intimidating, grizzled old guy, right? But most of the ship captains we've sailed with have been super hip and fun and crazy people with interesting stories. If we can have a captain talk to the students, I think that's really cool."

Similarly, the Nautilus internship program is taking advantage of the resources it has already built to offer students opportunities to stay engaged. The program was designed to train undergraduate and graduate students working aboard the E/V *Nautilus,* which explores the deep sea with remote-controlled vehicles. For 2–5 weeks, interns would get hands-on experience

working as seafloor mappers, data loggers, remotely operated pilots, or video engineers.

"We try to target students who we really think will benefit from the opportunity of getting to sea," said **Nicole Raineault**, the chief scientist and vice president of exploration and science operations at Ocean Exploration Trust.

The entire internship program cohort has been deferred this year because of limitations on how many can safely crew the ship. As an alternative, the students are encouraged to participate in the **Scientists Ashore Program**, another Nautilus initiative that allows scientists to participate in expeditions via live video and data feeds with text dialogues with shipboard scientists.

"This is such a wild year," Cook said. "And I think it's forcing us all to be really willing to be on our toes. And I think that's a good lesson for students."

"For 10 years, we've pioneered telepresence and pushed that technology forward, and now we're kind of being asked to put our money where our mouth is and flex that telepresence at a new level," Cook said. "We've always said you can come to the seafloor using technology—now let's actually take you to the seafloor."

During its delayed expedition season from October to December, Nautilus also plans to host career panels and student background talks about their experiences in ocean science, drawing from some of the program's almost 140 intern alumni. "We really look to position everyone as role models," Cook said.

These events, available on the **Nautilus Live website**, will be open to students as well as the general public.

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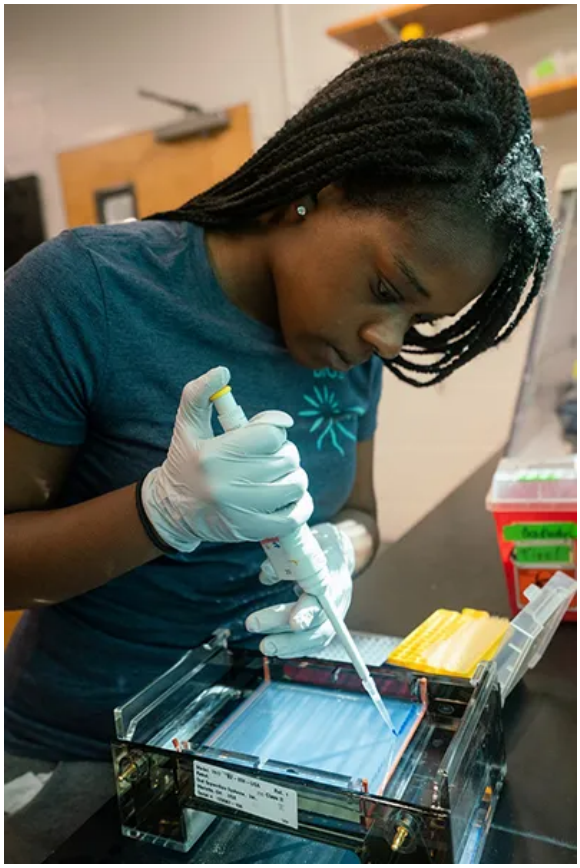
Lessons Learned for an Uncertain Future

This past summer may not be the last time these virtual programs are needed.

"Incidentally, two students that I know of got COVID," Sloan said. "They are recovering okay. If they had been on campus, it would have been complicated for everyone involved—the cohort, the lab staff, and so on. We had questions at the summer's outset about how would we deal with a sick student—who would provide care? How would they get home, if they had one to go to?"



Ashley Smith, a biology major from Rensselaer Polytechnic Institute, pipettes dye for gel electrophoresis during the 2019 BIOS REU program. Credit: Bermuda Institute of Ocean Sciences

"I bet you'll see a kind of mishmash next year" between in-person and virtual mentorship programs, Sloan continued. "It's wait and see [and] play by ear, but I would not be surprised to see a continuation of it."

Even after the pandemic, remote mentorship networks can be valuable for their wide reach, especially to **underrepresented groups** that might otherwise not find these programs accessible.

But remote programs come with their own, often technical, challenges. "Like every week, something would go wrong in a pretty big, frustrating way," so some trial and error was necessary, Sloan said.

"Keep things simple until you're more comfortable," she advised.

GEO REU also provided resources to mentors and program directors for **moving REUs online** with tips on engaging virtually to help ease the transition.

As with any successful mentorship program, communication and time were key. In the GEO REU mailing listserv, program directors and mentors from around the country shared their experiences and emphasized the importance of using different means of communication like texting, videoconferencing (e.g., Zoom), and online chatting (e.g., Slack) to maintain contact between students and mentors.

However, Sloan noted, giving time to students was doubly important when mentoring remotely. "We knew we don't want to have them on Zoom all the time," she said. "Because that's death."

Despite the challenges inherent in building connections in a new remote format, the experiment seems to have worked. In surveys she sent out after her virtual professional development workshop series ended, Sloan found that most of the students had had a positive experience and found the program valuable for their development.

"I think the takeaway for me was that it was successful, and I didn't know if it would be," Sloan said. "It was more successful than I expected."

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