In the Trenches is a quarterly magazine of the National Association of Geoscience Teachers, a professional association that works to foster improvement in the teaching of the Earth sciences at all levels of instruction, to emphasize the cultural significance of the Earth sciences, and to disseminate knowledge in this field to the general public.

To learn more about ITT, visit: http://nagt.org/nagt/publications/trenches/index.htm

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FROM THE EDITOR

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In addition to recognizing this year’s award winners, who will be celebrated in person at the GSA meeting in Denver on October 9-12, 2022, this issue offers a look at an innovative avenue for outreach projects of the outreach officer’s own design. Typically, though not exclusively, this position is filled by formal and informal educators teaching elementary school through university-level classes, dedicated to coordinating all education and outreach activities for their assigned expedition. The duties for the International Ocean Discovery Program (IODP) include writing for the expedition blog (https://joidesresolution.org/expediti ons/), posting to the JOIDES Resolution (JR) social media channels, conducting live video broadcasts from the ship-to-shore-based audience, and additional education/outreach projects of the outreach officer’s own design.

The Integrated Ocean Drilling Program (IODP) started sailing Education Officers during Expedition 323 in the Bering Sea (5 July – 4 September 2009). Since then, on each expedition of the scientific ocean drilling vessel JOIDES Resolution (Deep Earth Academy, 2012) at least one person has filled this role, renamed Onboard Outreach Officer. Typically, though not exclusively, this position is filled by formal and informal educators teaching elementary school through university-level classes, dedicated to coordinating all education and outreach activities for their assigned expedition. The duties for the International Ocean Discovery Program (IODP) include writing for the expedition blog (https://joidesresolution.org/expediti ons/), posting to the JOIDES Resolution (JR) social media channels, conducting live video broadcasts from the ship-to-shore-based audience, and additional education/outreach projects of the outreach officer’s own design.

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Rediscovering Geography: New Relevance for Science and Society

Knowledge is required to understand systems and scales. Fostering geographic literacy includes broader perspectives, subject matter, techniques, and human connections. Almost a decade later, though, the National Geographic-Roper Public Affairs Survey showed that only 50% of Americans ages 18-24 could accurately locate New York on a map, and only 25% of those surveyed just months after the 2004 Indian Ocean earthquake and tsunami could find Indonesia on a map (GKJ NOP, 2006).

The two existing scientific ocean drilling vessels JOIDES Resolution and Okeanos, as well as IFP’s predecessor Glomar Challenger, have sailed in all the world’s ocean basins to collect sediment and oceanic crust from the deep sea. A live ship-to-shore session provides an opportunity for an instructor to show the location of the ship, as well as where it has been and where it is going on the current expedition. The expedition home page will show where the cores are being collected (see Expedition 390 — http://iodp.tamu.edu/sciencescoops/expeditions/south_atlantictransect.html), with the Daily Science Reports posting the latitude and longitude location of each drill site. Drill Site Maps, going back to the first expedition of Glomar Challenger in 1968, are available for download at http://iodp.tamu.edu/sciencescoops/maps.html. This page also links to instructions for putting the site locations in Google Earth.

In the context of “space and place” is important; geographic knowledge is required to understand systems and scales and is applied across disciplines. In 1997, the publication Rediscovering Geography: New Relevance for Science and Society addressed the “recent calls to ‘do something’ about geographic illiteracy” in the United States (National Research Council, 1997). Concerned that geography was narrowly being viewed as the ability to correctly identify a location of a place name on a map, the report presented ways geographic instruction should include broader perspectives, subject matter, techniques, and human connections. Almost a decade later, though, the National Geographic-Roper Public Affairs Survey showed that only 50% of Americans ages 18-24 could accurately locate New York on a map, and only 25% of those surveyed just months after the 2004 Indian Ocean earthquake and tsunami could find Indonesia on a map (GKJ NOP, 2006).

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Working in Groups

Towards the end of one of my Zoom tours with a university class, the instructor asked me to share with their students the importance of working as a team on JOIDES Resolution. There was urgency in their voice as they made this request, and I was able to discuss the many circumstances when scientists needed to be in constant communication with each other, how the science team needed to speak with the drillers about the drilling activity to collect our cores, how the co-chief scientists needed to speak with the captain of the ship and bridge crew about our site locations, and more.

For example, everyone on the ship works 12-hour shifts. At the end/beginning of every shift, each day, the science discipline teams working on opposite shifts come together to discuss topics such as the work completed in the past twelve hours, work in progress, and unique core features and discoveries. Scientists across the teams would also use this crossover time to meet around recently acquired core sections to determine where samples would be collected for thin sections, paleomagnetic and physical property analyses, and micropaleontological determination. It did not matter the number of academic degrees the scientist had, their academic rank, or the nation they were from — everyone had a role and responsibility on the ship for listening, discussing, and carrying out the assigned tasks to reach our expedition objectives.

At the end of this specific tour, the instructor reminded stu-
dents of their own group projects that they were to be working on and submitting very soon. I then realized that the urgency in the instructor’s voice related to what many of us see in our own classes — the struggles with communication and productivity during group projects. But the JR’s teamwork happens without hesitation, as working in groups is required for the success of the expedition and is a valuable model for students to witness.

Introducing an International Community of Collaborators

JOIDES Resolution sails scientists, technicians, and crew from nations across the globe. During the ship-to-shore broadcasts, I emphasized how our research on the ocean was being carried out by a global community of individuals collaborating and working together. For myself, this was one of the highlights of being on the JR, living and working with others that shared my passion for learning more about our ocean.

One common question asked by K-12 students was how everyone on the ship communicated with one another, as we came from nations and spoke different languages. Myself and the other scientists were quick to explain that even though everyone spoke English on the ship, we also communicated with hand gestures and even drawing objects and concepts. Many instructors shared their students’ broader learning of science processes and the many additional benefits that a ship-to-shore broadcast provided for students as well as instructors. I share a summary here of some of these learning opportunities beyond the science to encourage instructors to provide this live engagement opportunity to benefit their students’ broader learning of science processes and the global scientific community.

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An Opportunity to Discover Careers Beyond Ocean Science

Although the ship-to-shore broadcasts will typically feature scientists discussing their work and showing the equipment and samples they are analyzing, there is an entire supporting group of technicians, drillers, and more that are necessary for the ship to function. During each of my ship-to-shore broadcasts, I made sure to mention how the JR has computer specialists and application developers, electricians, mechanics, a publications specialist, a medical doctor, cooks, and stewards. The bridge crew was available to show me and some of my Zoom sessions to describe their roles on the ship, from navigation to recording meteorological data. Although live interactions with the scientists allow students to break stereotypes and work towards developing their own science identity (Schinke et al., 2016; Shin et al., 2016), showcasing the additional career fields related to that support the scientific work allows students to possibly see themselves in these roles.

Showing the Human Side of Scientists

When students are taught science, they may only see the scientists/educator side of the individual presenting them discipline information. Yet scientists who teach and do research have full lives beyond these roles, which is especially true for scientists at sea.

For example, each expedition hosts a ship-wide contest to draw a logo for the expedition, separate from the expedition patch used by IODP. The entries are voted upon, and the winning logo is printed on T-shirts as well as placed on the wall in one of the ship stairwells. This particular stairwell has the contest-winning logos from most of the expeditions, including the expeditions going back to Glomar Challenger. I would always pause for a moment in this stairwell during tours and show the different logos drawn by scientists and others on the ship.

During one tour, one university student spoke up and said that they didn’t believe that any of the logos were drawn by scientists, because all of their friends majoring in STEM fields had no artistic talent. This provided an excellent opportunity to not only discuss the artistic talent of those on board, but also the fact that we also brought some of our hobbies on board with us, from knitting to playing musical instruments to mastering the yo-yo. We did not focus on science 100% of our time at sea, instead spending time with each other off our shift playing card games, watching movies, exercising in the gym, and even organizing a paper airplane flying contest for National Paper Airplane Day.

By learning of the interests, hobbies, and talents of those on board the JR, students may not only expand their perception and definition of a scientist, but these live conversations have the potential to create a more equitable and inclusive science community for those studying STEM fields (Jarus, 2020; Vincent-Ruz & Schuman, 2018).

Earth Systems Science and Ocean Literacy

Certainly, a live ship-to-shore broadcast offers students a unique opportunity to learn science content about the ocean, from the ocean. Each expedition has a different set of primary and secondary objectives, and these objectives allow the Onboard Outreach Officer, as well as the onboard classroom instructor, to assist students in seeing the connections across and beyond the hydrosphere and lithosphere. For example, for Expedition 390, one of our primary objectives is to investigate the microbes living in the sediment and basement and how they have varied in abundance over time and location from the Mid-Atlantic Ridge (Coggon et al., 2020). The expedition patch was an excellent visual for me to begin each tour and share with students the interactions across and spatial/temporal relationships with multiple Earth systems. Although knowledge from all ocean expeditions advances Ocean Literacy Principles #1 (Earth has one big ocean with many features) and #7 (The ocean is a largely unexplored), Expedition 390 also provided the foundation for classrooms to discuss #5 (The ocean supports a great diversity of life and ecosystems) (see Guertin, 2022a; NOAA, 2020).

Benefits for the Scientists Onboard

This paper highlights the benefits for students and instructors participating in a live ship-to-shore session, yet there are benefits to the scientists on board JOIDES Resolution as well. Scientists that participated in these live events had the opportunity to improve their science communication skills, especially as they needed to adjust their content and presentation style, depending upon the education level of the audience. Krebs et al. (2020) found that live classroom/scientist interactions are effective in helping scientists realize the importance of their roles as science communicators. At the same time, the live interaction with a scientist can provide an experience that a learner can draw on for some time following the expedition, leading to student achievement and a deeper understanding of science as a process of inquiry (Niemitz et al., 2008).

Conclusions

Although computer simulations and direct experiences at sea have each their advantages for teaching students oceanographic concepts (see Winn et al., 2005), conducting ship-to-shore sessions through telepresence expands the sharing of the process of science as well as the science during expeditions at sea. This access democratizes the science and removes barriers for students that may never be able to see a live view of ocean while learning about oceanography or have an opportunity to speak with an oceanographer (Marlow et al., 2017). Students, as well as instructors, expand their learning beyond the expedition science objectives by being introduced to the how science is conducted at sea, career opportunities, and the lives and identities of scientists.

An excellent overview on the history and impacts of scientific ocean drilling is presented in Becker et al. (2019). To schedule a free, live ship-to-shore broadcast for your classroom or community group, visit: https://joidesresolution.org/about-the-ijr/live-video-events-with-the-ijresolution/. The current Onboard Outreach Officer will be more than happy to discuss with you the content you are interested in highlighting during your live session.

REFERENCES


FOR  detailed biographies, visit https://nagt.org/nagt/awards/index.html.
KUSALI GAMAGE
Austin Community College,
Austin, Texas

Soon after Kusali Gamage started adjunct teaching at Austin Community College in 2011, she explored ways to expose her students to the work of scientists, as well as possible career fields. In 2014, she developed classroom materials based on an ongoing International Coastal Drilling Program expedition (studying the Izu Bonin Mariana Forearc). Her students read an overview of the drilling cruise, followed the expedition’s blog for two weeks, and then composed questions which they asked to project scientists during a live video conference.

Inspired by positive student feedback and a desire to expose her students to more geoscience research, Gamage applied for an NSF REU (Research Experiences for Undergraduates) grant with two collaborators at UT Austin. The team was awarded the grant in 2016, and thus developed their Summer Undergraduate Research Experience Course (SUREC). In addition to summer research opportunities, the grant funds field trips to the Gulf Coast repository at Texas AM & University to expose ACC students to sediment and rock core analysis. These field trips happen each semester. According to Gamage, “During the 3-year program a total of 158 students have participated in the field activity and 24 students have participated in the summer research program. Twenty students from the summer program have successfully transferred to a four-year institution (UT or Texas A&M) to study geosciences or related STEM field.”

YVONNE GARRISON
Mason County High School,
Maysville, Kentucky

Before beginning her teaching career in 2012 at Mason County High School, Yvonne Garrison worked as a field biologist for the Ohio EPA and the Ohio River Sanitation Commission, conducting water tests and sampling fish populations in the Ohio River and basin tributaries. She now teaches biology, AP Environmental Science, and general college biology and coaches the Mason County Envirothon Team, which regularly competes at the state level.

Garrison takes a project-based learning approach in her biology classes, having her students tackle small, phenomena-based questions and large real-world problems and design and implement real solutions to them. A recent project required students to study businesses with green roofs, permeable surface parking lots, rain gardens, and rain barrels. Later, selected student teams implemented their projects to improve water quality (and quantity) in the stream, planting more than 100 trees on school grounds to improve the riparian zone around the stream and installing a large rain garden below a parking lot to manage water before it enters into the storm-water drain system and flows from there into the stream.

WENDY GRIMSHAW
Green Valley Middle School,
Salem, Virginia

Wendy Grimshaw has engaged students in inquiry-based learning that fosters interpretation of the world through a geosciences lens. She promotes content literacy through experiential learning, interdisciplinary problem solving, and engineering design activities and employs a CER-modeled IT Field Book routine that develops her students’ ability to reflect on scientific observations, express ideas, generate drawings, and demonstrate learning. Her students apply geoscience learning when connecting with community partners like Trout Unlimited, the Appalachian Trail Conservancy, the U.S. Forest Service, and the Roanoke Valley Astronomical Society during service learning, citizen science, and grant-funded outdoor education experiences.

Grimshaw has served on advisory boards, as a mentor teacher, on curriculum writing teams, and as the proprietor of The Learning Barn LLC, a sustainability-focused STEM school she opened on her farm in 2015. Since 2012, she has served as a KidWind coach and judge for hundreds of middle and high school students as they’ve researched, designed, built, and tested small-scale wind turbines. Teams of her students have twice advanced to the national level, winning the national challenge in 2017. She has regularly participated in professional development opportunities including NASA Space Camp for Educators, the TSSG/NASA Lift Off! Program, and other state, national, and international STEM conferences. Since 2009, she has attended Eastern Section meetings, bringing many innovative ideas and resources back to her classroom.

LORRAINE CATHEY
St. Thomas the Apostle School,
San Francisco, California

Lorraine Cathey has served as a KidWind coach and judge for twenty-eight years in the San Francisco Bay Area, teaching in public, charter, and Catholic schools. She began her...
career as the director of the San Francisco Title V American Indian Education Project, which focuses on local California Native Tribes and their cultures. Since then, she has built a science curriculum around sustainability, stewardship, and inquiry. Collaborations with the Marine Mammal Project, GLOBE, and now NAGT, as well as the Exploratorium Teacher Institute have broadened the scope and depth of learning for her students.

While project director of Title V, Cathey was also school secretary and head volunteer at New Traditions Creative Arts Elementary in San Francisco. There she was able to work with teachers on cross-curriculum development, integrating social studies with art and literature, math with mathematics, and science with Poets in the Schools.

Since earning her Multiple Subject CLAD Credential in 2000, Cathey continues to expand her teaching interests. She has brought math and science together with art through San Francisco Youth Arts Festival entries, starting a string orchestra at KIPP Bayview Academy, helped to pilot the Marine Mammals Ocean Ambassadors program at Visititation Valley Middle School, and is currently developing thematic units on the San Francisco Bay area at St. Thomas the Apostle School. Hands-on learning augmented reality sandbox, Lab-Aids, Nature journals, and modeling stewardship and a sense of place are foremost in her teaching practices.

Amanda Savrda is an Earth science and rock enthusiast with 32 years of experience educating students ranging from kindergarten through grade 12. She currently teaches chemistry, Earth science, and general science. A major influence on her teaching career came 13 years into her career with a decision to switch from being a high school teacher to being an elementary teacher-librarian. Her passion for science became quickly known there, and her treats became rocks and sand collected and shared by students and families.

Lockwood is active in multiple projects that support teachers to further science education in their own classrooms. Since 1996, she has been Fishers and Oceans Canada Salmons in the Classroom program coordinator for the Qoqimil School district. She delivers salmon eggs to classrooms and supports teachers as they create educated stews. She has received the Canada 150 Community Leader award for her work in preventing the program from being defend- ed. She is the lead writer and creative developer of MineralsEd's teacher professional development.

As Lockwood continues her work in science education, she strives to create an environment that inspires students to be confident in their authentic selves and their abilities and aspire to help them find their joy in learning as they discover themselves as individuals and an essential part of a whole and new world.

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Since earning her Multiple Subject CLAD Credential in 2000, Cathey continues to expand her teaching interests. She has brought math and science together with art through San Francisco Youth Arts Festival entries, starting a string orchestra at KIPP Bayview Academy, helped to pilot the Marine Mammals Ocean Ambassadors program at Visititation Valley Middle School, and is currently developing thematic units on the San Francisco Bay area at St. Thomas the Apostle School. Hands-on learning augmented reality sandbox, Lab-Aids, Nature journals, and modeling stewardship and a sense of place are foremost in her teaching practices.

Amanda Savrda is an Earth science and rock enthusiast with 32 years of experience educating students ranging from kindergarten through grade 12. She currently teaches chemistry, Earth science, and general science. A major influence on her teaching career came 13 years into her career with a decision to switch from being a high school teacher to being an elementary teacher-librarian. Her passion for science became quickly known there, and her treats became rocks and sand collected and shared by students and families.

Lockwood is active in multiple projects that support teachers to further science education in their own classrooms. Since 1996, she has been Fishers and Oceans Canada Salmons in the Classroom program coordinator for the Qoqimil School district. She delivers salmon eggs to classrooms and supports teachers as they create educated stews. She has received the Canada 150 Community Leader award for her work in preventing the program from being defend- ed. She is the lead writer and creative developer of MineralsEd's teacher professional development.

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Michele Laverty

Harvard University.

Wylie served as a 2021 FFT fellow and was able to learn to scuba dive. She is in the process of introducing community youth to the world of SCUBA. During her spare time, Veronica runs STEMSouth, a small nonprofit that aims to develop success, tenacity, excellence, and merit through science, technology, engineering, and math. “She is a lifelong learner.”

NEVADA

Michele Laverty

Kathrin Izzo

Children in the agricultural field she returned to school, attending Grand Canyon University, and receiving a MA in secondary education.

Prior to becoming a teacher, Laverty created and operated a mobile science lab providing hands-on agricultural science education to thousands of middle school students each year. This experience helped hone her belief that hands-on exploration and connecting to the local environment are key to helping students understand and want to learn about the Earth and their local environment.

Her educational philosophy is to connect lessons to what the students see around them, providing scientific terms to things they have already experienced. She has found that key to student engagement is through projects where the students work in groups and explore topics on their own.

Laverty has been a facilitator for the development of the pacing guide for Earth science for her district and has presented workshops for fellow educators. A professional development opportunity she enjoys is participating in the Nevada Mining Association’s annual teacher training.

Zach Miller

John Jay Middle School, Cross River, New York

Zach Miller, an Earth science teacher, has been teaching for more than 15 years at both the middle school and high school levels. He earned both geology and hydrology undergraduate degrees from SUNY Oneonta and a teaching graduate degree from SUNY Purchase. Miller credits this strong foundation in geosciences for his passion for the subject, along with having taken an undergraduate-level geology course while in high school from Steve Klakovich (a past NSTA award recipient).

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Christopher Willis

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