THEGLOBEPROGRAM

Annual Review

2019–2020

Sponsored by: NASA Supported by: NSF NOAA Implemented by: UCAR

THEGLOBEPROGRAM

GLOBE Milestones

1994: Earth Day, U.S. Government announces The GLOBE Program as a multi-agency effort.

1995: Earth Day, The GLOBE Program launches (with 11 protocols); 33 countries join the program.

1998: Finland hosts the first GLOBE Learning Expedition (GLE) in Helsinki.

2000: USA hosts second GLE in Fayetteville, Arkansas.

2003: Croatia hosts third GLE held in Sibenik.

2004: GLOBE receives the Goldman Sachs Award for being an "outstanding program that makes use of media/technology to educate students or teachers about other world regions and cultures, or international issues."

2005: Earth Day; GLOBE celebrates its 10th birthday, with 15,000 schools in 106 countries.

2008: South Africa hosts fourth GLE in Cape Town.

2009: GLOBE established Regional Offices in Africa, Asia and Pacific, Europe and Eurasia, Latin America and the Caribbean (LAC), Near East and North Africa (NENA), and North America to support professional development workshops, capacity building, and regional sustainability efforts; data in GLOBE database reaches 20 million.

2011: GLOBE launches concept of Student Research Campaigns.

2014: India hosts fifth GLE in New Delhi.

2015: Earth Day, GLOBE celebrates its 20th birthday! GLOBE launches new mobile data entry app; offers 51 protocols; data reaches 128 million measurements.

2016: GLOBE provides online eTraining; hosts International Virtual Science Fair and six regional U.S. science fairs and various student scientific campaigns.

2017: Data reaches over 140 million measurements; International Virtual Science Symposium increases in number of submitted projects and worldwide representation; new mosquito protocol launched.

2018: Ireland hosts the sixth GLE in Killarney; data reaches over 150 million measurements; U.S. Department of State initiative on mosquito education launched; all six GLOBE regions entered over one million measurements into the GLOBE database

2019: GLOBE (via the GLOBE Zika Education and Prevention Project) connects with Google Voyager to highlight GLOBE's story, "Stopping the Spread of Zika."

2020: The GLOBE Program celebrates its 25th Anniversary! The Covid-19 pandemic disrupts everything. For the first time, the GLOBE Annual Meeting goes "virtual."

About The GLOBE Program

The GLOBE Program (GLOBE) is an international science and education program sponsored by the National Aeronautics and Space Administration (NASA); supported by the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and the United States Department of State (DoS). GLOBE is implemented by the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, USA. For 25 years, GLOBE has connected students, teachers, and professional and citizen scientists from around the world to conduct hands-on science within their local environment to enhance their awareness of—and their scientific contribution to—the global environment.

ON THE COVER: Student participants of the 2019 GLOBE Annual Meeting; Detroit, Michigan, USA

Table of Contents

The GLOBE Implementation Office is supported under NASA Grant and Cooperative Agreement C19M0120, awarded to the University Corporation for Atmospheric Research.

A Message from Dr. Tony Murphy, GLOBE Implementation Office Director

Eight months ago, as the year 2020 was approaching, many of us imagined that 2020 would be special. We imbued it with symbolism, as in "20/20 Vision"—a year that might be a lens through which we could see our lives, and maybe the future, more clearly. Very few of us had any idea what was coming: a global pandemic that would up-end all sense of clarity and disrupt our entire world in a matter of months. In addition to the Covid-19 pandemic, demonstrations addressing racial inequality and social justice have ignited an international movement. It now seems that 2020 has become the year to reexamine every aspect of our daily lives and work, and the values in which our lives are rooted: our relationships with family and friends; our responsibility for the health and welfare of others and equality for all. It is a time of deep reflection. How could it be anything else?

2020 has given us a new vocabulary with which to describe our world. Even though we observe "social distancing," it has taught us that we need community more than ever. And although we are "staying at home," we have never appreciated more the freedom to roam, with our feet on the Earth; never longed more for our children and students everywhere to be able to play and learn in spaces that offer trees, rocks, soil, water, and grass. No indoor environment, toy, or technology rivals the joy of running, jumping or climbing or, in the quiet moments, turning over a rock that reveals a diverse, living ecosystem.

It has been remarkable to see the determination of so many in our community to continue the work of GLOBE throughout these difficult times. Working Groups continue to meet; the Regional Coordination Offices continue to network with our community; and students continued to contribute research to the International Virtual Science Symposium (IVSS) in record numbers. My staff pivoted from a focus on outdoor education to developing resources for learning-at-home, and from planning an in-person 2020 Annual Meeting in Washington D.C., to holding the event online.

Our community continues to remain strong and united; we continue to find ways to support each other in campaigns, research symposia; and continue to develop and create new ways to collaborate. Our community recognizes that our diversity is our strength, and that we can do more together than any one of us can do alone.

So, perhaps now would be a good time to reflect on some of our achievements during the past year:

✺ The IVSS received 265 reports from students in 29 countries, with eight countries submitting reports for the first time. From 42 countries, a record 135 judges volunteered to become involved, including many STEM professionals from the GLOBE International STEM Network (GISN). This was the first year that reports could be submitted in five languages (Arabic, Croatian, English, French, Spanish).

✺ Throughout the pandemic, the measurement campaign teams continued to engage the community through numerous and diverse webinars. The GIO and several regions developed their own pages of learning resources, in multiple languages, to serve their networks for at-home learning.

✺ While the ability of students to manually enter data from weather stations has been curtailed during the pandemic, data continue to come in from automated weather stations that schools have purchased and established, many with funds from agency grants, ministry funding, and private foundations such as Youth Learning As Citizen Environmental Scientists (YLACES).

✺ A Diversity, Equity, and Inclusion (DE&I) Task Force, with representation from across the community, was established in February. Its charge is to create DEI goals for GLOBE and to develop an implementation plan for operationalizing them in the program.

✺ In 2019, two new countries joined the GLOBE community: Georgia and the Slovak Republic; in 2020, Australia was welcomed back into The GLOBE Program.

✺ The Zika Education and Prevention Project continued to add measurements to the database and to train individuals (more than 4,300) to recognize mosquitoes responsible for carrying vector-borne disease. By mid-July 2020, more than 169,000 measurements had been contributed to the GLOBE database.

✺ GLOBE'S database is well on its way to reaching the monumental number of 200 million environmental measurements.

Together, we have achieved a great deal in 25 years. We see the connections of school, community, and environment as the starting place for strengthening community bonds and citizen engagement. In doing so, we build a society of informed students and citizen scientists empowered to protect the places and communities they have come to love.

I wish to celebrate all of you—our teachers, learners, partners, Country Coordinators, professional and citizen scientists, and STEM professionals—who have nurtured The GLOBE Program over 25 years. I would also like to express my sincere appreciation to our sponsors: the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), and the United States Department of State (DoS). Without your support, this program would not be possible. I wish to celebrate all of you—our teachers, learners, partners, Country Coordinators, professional and citizen scientists, and STEM professionals—who have nurtured The GLOBE Program over 25 years.

Thank you all, for being part of this extraordinary community.

Sincerely,

Dr. Tony Murphy

GLOBE: An International Collaborative Community

For 25 years, GLOBE has connected scientific sleuths —students, educators, and professional and citizen scientists from around the world—to conduct collaborative hands-on science. Expanding personal comprehension and increasing precise data measurements, the people of GLOBE investigate their backyards and schoolyards in order to deepen their comprehension of, and commitment to, our interconnected planet. GLOBE now consists of dedicated and engaged community members from 123 countries and 131 U.S. partnerships.

The GLOBE community is an international community of practice. The GLOBE Program has consistently offered a unique opportunity for community members to engage in authentic scientific exploration using the same language: science.

Participants at the 2019 Student Experience; 23rd GLOBE Annual Meeting; Detroit, Michigan, USA

GLOBE's international framework includes:

- **GLOBE Regions**—GLOBE administration is divided into six regions: Africa, Asia and Pacific, Europe and Eurasia, Latin America and Caribbean (LAC), Near East and North Africa (NENA), and North America (which consists of Canada and the United States). GLOBE partners (country coordinators and U.S. Partners) facilitate the implementation of GLOBE in their country or within their service area.

- **GLOBE Working Groups (WGs)**—GLOBE's four Working Groups (Education, Evaluation, Science, and Technology) are dedicated to enhancing the role of the program's diverse community members in shaping the future of GLOBE around these four themes—and in supporting the development and implementation of GLOBE worldwide.

- **U.S. Partner Forum (USPF)**—The U.S. Partner Forum (USPF), which represents six regions (Midwest, Northeast and Mid-Atlantic, Northwest, Pacific, Southeast, and Southwest) works to enhance the contribution of GLOBE toward improving STEM (Science, Technology, Engineering, Mathematics) education in the United States.

- **The GLOBE International STEM Network (GISN)**—The GISN is an international network of STEM professionals. These experts mentor teachers; explore national and international components of science and research; design and create unique field campaigns; and inspire students to engage in the hands-on exploration of cutting-edge STEM and research.

Whether in-person or virtual, GLOBE Annual Meetings, GLOBE Learning Expeditions (GLEs), and annual regional meetings bring the GLOBE community together to: share best practices and solutions to common issues; engage in collaborative data-collection adventures and horizon-expanding expeditions; consider challenges and opportunities; and work together to chart the course of The GLOBE Program. In 2019, GLOBE invited community members from around the world to come together in Detroit, Michigan, USA, and experience "Intersections of Diverse Environment." In 2020, GLOBE met the need of the times and expanded the collaborative environment by opening the "virtual" door to inclusive connections—energizing and expanding GLOBE's forward momentum.

GLOBE Implementation Office:
Dedicated to Service and Support

The primary goal of the GLOBE Implementation Office (GIO)—hosted by the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, USA—is to serve the immediate and long-term needs of all community members.

On a day-in and day-out basis, the people of GIO work to provide informed support for the common elements of science, communication, education and evaluation, technology/website, and overall community support. These common elements, and the NASA-hosted Data Information System (DIS)—which is focused on database and website infrastructure—are instrumental to enabling the worldwide implementation of GLOBE.

GIO staff provide targeted technical support services; initiate and sustain activities that encourage and energize community involvement and expansion; provide up-to-date training and mentoring; coordinate and facilitate campaigns, projects, and meetings; engage with other groups, such as the DIS team, GLOBE Observer team, and the NASA-funded Science Activation Projects managed by GLOBE Partners, and generate and update high-quality education and science materials and resources.

In accordance with "The GLOBE Program Strategic Plan 2018-2023," GIO's strategic priorities "are to improve student understanding of environmental and Earth system science across the curriculum; contribute to scientific understanding of Earth as a system; build and sustain a global community of students, teachers, scientists and citizens; and engage the next generation of scientists and global citizens in activities to benefit the environment (p.1)."

The GIO, today and every day, is dedicated to serving and supporting the community.

GIO staff plus U.S. Country Coordinator Jen Bourgeault. International Coordinator, Lyn Wigbels, not shown

GLOBE: Supported by Science; Driven by Data

The foundation of The GLOBE Program is based on science—from data collection and entry to analysis, research, and focused scientific interactions between community members. GLOBE's uniqueness stems from the field-focused opportunity it offers to collect and submit data that can be used in cutting-edge scientific research efforts. The table below shines a light on some of the critical results of the community's ongoing data measurement efforts during 2019.

By mid-2020, nearly 40,000 teachers from over 35,000 schools worked to contribute over 1.8 million measurements to the GLOBE database for use in their inquiry-based science projects. In addition, citizen scientists, called "GLOBE Observers" have contributed over 146,000 measurements using a mobile app.

REGION	Number of countries entering data from 1 May 2019 through 30 June 2020	Total number of measurements entered by 30 June 2020	Total number of measurements entered from 1 May 2019 through 30 June 2020	Total number of measurements entered by citizen scientists orgs from 1 May 2019 through 30 June 2020
Africa	18	1,098,818	73,059	1,169
Asia and Pacific	13	2,226,813	813,982	28,367
Europe and Eurasia	42	73,296,856	4,058,299	19,030
Latin America and Caribbean	20	1,328,395	103,546	6,468
Near East and North Africa	11	1,598,232	401,819	1,328
North America	2	130,0513,889	17,338,245	90,309
TOTAL	**107**	**210,063,003**	**22,788,950**	**146,671**

Participants at the 2020 DEI Task Force Meeting; Boulder, Colorado, USA

GLOBE: It's All About Diversity, Equity, and Inclusion

From its inception in 1995, The GLOBE Program has focused on embracing the exceptional diversity of its international community—working to braid the uniquely diverse voices into a collaborative consensus that moves the program to a higher level of scientific excellence. In 2019, GLOBE took this effort a step higher and invited anyone interested in diversity, equity, and inclusion (DEI) to apply to participate in a GLOBE DEI Task Force.

In February 2020, GIO hosted the first community DEI Task Force Meeting in Boulder, Colorado, USA. The purpose of the meeting was for community members to come together and work on a DEI Statement and Implementation Plan. As a world, we are in this together; as a community, we are GLOBE!

Event participants included GIO staff (Dr. Tony Murphy, Dr. Julie Malmberg, and Katie Chapman); facilitators from UCAR's Office of Diversity, Equity, and Inclusion and the American Geophysical Union (Dr. Carolyn Brinkworth and Dr. Jill Karsten); UCAR/National Center for Atmospheric Research (NCAR) Equity and InclusION (UNEION) Lead Learners (A.J. Lauer, Dr. Jeremiah Sjoberg, Josh Young, and Kristen Aponte); and DEI Task Force members from Argentina, Colombia, Croatia, Ghana, the Philippines, and the United States. The full list of current DEI Task Force members is shown here.

Diversity, Equity, and Inclusion (DEI) Task Force

DEI Task Force Members

Shadrack Agyiri (Ghana)	Jill Karsten (USA)
Jennifer Bourgeault (USA)	Julie Malmberg (USA)
Katie Chapman (USA)	Josette Neal-De-Stanton (USA)
Kimberly Davis (USA)	David Padgett (USA)
Mindi DePaola (USA)	Richard Parsons (USA)
Francis Emralino (Philippines)	Marina Pavlic (Croatia)
Wrayna Fairchild (USA)	Ana Prieto (Argentina)
Trena Ferrell (USA)	Nate Raynor (USA)
Rosalbla Giarratano (USA)	Juan Felipe Restrepo Mesa (Colombia)
Kate Goss (USA)	Elena Sparrow (USA)
Nikitah Imani (USA)	Josephine Joy Tolentino (Philippines)

From Earth to Sky:
NASA Satellite Missions and Field Measurement Campaigns

GIO staff, alongside GLOBE community members, support NASA's satellite missions through hands-on research and student research/field measurement campaigns. GLOBE campaigns are regional and worldwide projects that provide students with the opportunity to step out into the field and question, research, explore, measure, and collect data that NASA can then use to validate and "ground truth" its scientific data.

2019-2020 GLOBE campaigns:

✺ **The Trees Around the GLOBE Campaign:** This campaign, which began in 2018 and will run through 2021, works in conjunction with NASA's Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) mission, which uses lasers and a very precise detection instrument to measure the elevation of Earth's surface. The campaign is creating an organized community of people who take tree-height measurements (in association with land cover, greenings, and carbon cycle); research tree-height data from other GLOBE schools and countries; and take supplemental protocol measurements. By early 2020, data counts included: tree height (6,945 measurements from 4,238 sites); land cover (5,132 measurements from 4,109 sites); and green-up/green-down (3,137 measurements from 272 sites).

✺ **The GLOBE Mission Mosquito Campaign:** This campaign, which began in 2018, is creating an organized citizen science community who conduct and report local observations using the GLOBE Observer (GO) Mosquito Habitat Mapper (MHM) tool. Through this effort, citizen scientists identify potential breeding sites for mosquitoes, sample and count mosquito larvae, and (with optional equipment) examine and photograph specimens to identify genus.

In November 2019, 106 students from the Norfolk Academy in Richmond, Virginia, USA, participated in a Trees Around the GLOBE interactive talk about ICESat-2 and tree height. After the talk, participants took tree height measurements using hand-held clinometers.

✺ **Urban Heat Island Effect (UHIE)-Surface Temperature Student Research Campaign**: This ongoing campaign—which now takes place in October, December, and March—is focused on examining the impact urbanization has on the Earth's surface temperature and how the surface temperature changes the dynamics of the Earth's atmosphere. In increasing numbers, new schools have begun to take surface temperature observations, and many students have completed research projects based on the UHIE and presented them at the GLOBE International Virtual Science Symposium (IVSS) and the U.S. regional Student Research Symposia (SRS). The campaign finished up 2019-2020 with over 13,000 observations from over 200 schools around the world.

GLOBE Observer App: From Land Cover to Clouds

The GLOBE Observer (GO) app extends the reach of The GLOBE Program by providing a way for everyone to make—and submit—observations. These "citizen scientist" observations help professional scientists track changes in clouds, plants, and other life in support of Earth system science research.

As of early 2020, over 166,000 citizen scientists had downloaded the GO app, and over 373,000 data points were entered by citizen scientists. Observations through the GO app have contributed to significant data increases in the GLOBE database. GO "data challenges" during this period included:

- **Summer 2019 Land Cover Challenge (GO on a Trail):** This challenge generated 2,584 land cover observations. Everyone participating in this effort helped document the environment around them with the GO app, whether it was along the path of the Lewis and Clark National Historic Trail or in GLOBE countries around the world.
- **Cloud Challenge:** This challenge generated more than 45,300 observations from citizen scientists in more than 17,000 locations in 93 countries on every continent — including Antarctica. This influx of cloud observations is helping NASA scientists who work with geostationary satellites and the suite of satellite instruments known as the Clouds and the Earth's Energy Radiant System (CERES). By comparing geostationary and CERES observations from a particular area to data submitted by citizen scientists, scientists can differentiate between wispy cirrus clouds and cold, bright features on the ground, such as snow.

Antonio Viudez-Mora and Marilé Colón Robles; NASA Langley Research Center, Hampton, Virginia, USA

The AREN Project in action at the Bowie Red Sox STEM Day, held at Fenway Park in Boston, Massachusetts, USA, in 2019.

Doing Science: NASA-funded Earth Science Activation Projects

GIO provides support for four innovative NASA-funded Earth Science Activation (Sci-Act) projects (through STEM agreements with GLOBE U.S. Partners):

- **GLOBE Mission EARTH (GME):** GME is a collaborative of multiple institutions across the United States formed to increase involvement in The GLOBE Program with the goal of connecting students to scientists in the common pursuit of real-world science.
- **AEROKATS and ROVER Education Network (AREN):** The goal of AREN is to train the next generation of scientists, engineers, and other professionals to observe and understand Earth through experiential learning using NASA technology and data in real-world settings.
- **Impacts and Feedbacks of a Warming Arctic:** Engaging Learners in STEM using NASA and GLOBE Assets (Arctic and Earth SIGNs): This program connects youth and adults to climate issues and Earth science learning through inquiry-based GLOBE investigations and community stewardship projects.
- **NASA Earth Science Education Collaborative (NESEC):** NESEC is a partnership between four organizations that are GLOBE Partners: led by the Institute for Global Environmental Strategies (IGES), and the Earth sciences areas at three NASA Centers (Goddard Space Flight Center, Jet Propulsion Laboratory, and Langley Research Center). GLOBE is working with NESEC on enhancing STEM teaching and learning by creating engaging, meaningful, and authentic STEM experiences and resources.

In 2019-2020, these projects engaged in numerous hands-on and scientifically driven events, including in-person training, meetings, and events; as well as online training, webinars, and collaborative endeavors—all focused on engaging and energizing GLOBE community members!

GIO Director Dr. Tony Murphy at the Zika Action and Impact Meeting, which took place as part of the GLOBE Asia and Pacific Regional Meeting in Hyderabad, India, in January 2020.

Mapping and Measurements: GLOBE Zika Education and Prevention Project

As part of a two-year project, funded by (and in partnership with) the United States Department of State, GLOBE continued to expand its efforts to combat the spread of the Zika Virus. The GLOBE Zika Education and Prevention Project is taking place in three GLOBE regions: Africa, Asia and Pacific, and Latin American and Caribbean, and is enlisting thousands of students, teachers, and community members in the collection of larvae samples data in 30 participating countries. Currently, the project is in its third year, after a No-Cost Extension was granted at the end of the second year.

In order to be inclusive of all GLOBE regions, it was decided to create the Mission Mosquito Campaign, which is open to community members in all regions so that they can contribute mosquito data through the GLOBE Observer Mosquito Habitat Mapper app. The ultimate goal of the project is to connect public health officials and other relevant scientists to the data collected by citizen scientists around the world to better control mosquitoes and reduce mosquito-borne infectious diseases. Global data collection on this scale can help international public health officials and scientists predict new outbreaks—and will help to minimize the adverse impacts of mosquitoes.

Since the initial Regional Mosquito Trainings (RMTs), country coordinators have organized over 135 Country Mosquito Trainings (CMTs) and over 80 Local Mosquito Workshops (LMWs); trained over 4,300 individuals; and, collectively, added over 169,000 observations. Due to Covid-19, all workshops and training in all regions were delayed or canceled until they can safely proceed.

In addition, six student groups from the three focus regions (Africa, Asia and Pacific, Latin America and Caribbean) were selected to present their research at the GLOBE Annual Meeting Virtual Student Showcase in July 2020.

Training and Support: New Trainer/ Mentor Trainer Certification Process

For a number of years, in an effort to improve GLOBE's trainer certification process, the Education Working Group has collected feedback from the community through annual, regional, and Working Group meetings. In July 2019, the Working Group provided an update on the revised certification process to the GLOBE community at the Annual Meeting in Detroit, Michigan, USA. This included the need to: 1) enhance process flexibility; 2) move from "Master Trainers" to "Mentor Trainers;" and 3) develop guidelines for "Active Status" of trainers.

The Working Group created a revised training process, which was shared with GIO—who reached out to seek more in-depth community feedback. As part of this process, the proposed trainer/mentor trainer process documents were translated into Arabic, French, and Spanish. GIO staff also developed a survey to seek additional community input. The proposed process document/surveys were posted to the GLOBE website.

Following the reconciliation of community input and feedback with the proposed process, the final documents were forwarded to the GLOBE Program Office at NASA HeadQuarters for final approval. In January 2020, GIO ramped up the effort to communicate the new trainer/mentor trainer certification process by developing Frequently Asked Questions (FAQs); posting the new process to a specific section of the website; and communicating the new process to the Regional Coordination Offices (RCOs), who in turn will organize webinars for the Country Coordinators in their regions. In the next year, GIO staff will work with the DIS Team to develop automated processes to monitor and communicate the active status of GLOBE trainers and mentor trainers to GLOBE stakeholders.

GLOBE participants; 2019 GLOBE Annual Meeting; Detroit, Michigan, USA

GLOBE students performing hydrology protocol.

Protocol Precision: Updated GLOBE Teacher's Guide

The Teacher's Guide—an educational centerpiece of GLOBE—is constantly being updated and improved to account for changes in practices (such as new data collection equipment or improved methodology) and to reflect changes with campaigns and data entry.

In 2019-2020, the following updates, enhancements, and innovations were presented to the community:

- The old cloud identification section of the hydrosphere field guides and data sheets were updated with the newest S'COOL cloud identification chart.

- The Frost Tube Protocol was rewritten to require only two tubes (instead of three tubes). The associated protocol, field guides, data sheets, and eTraining were updated and uploaded to the GLOBE website. A training video was also created and added to the protocol pages.

- From January through May 2020, all eTraining slides were reviewed and updated.

Keep checking in with the Teacher's Guide—pertinent information is always being added and updated to meet the needs of the community.

Raising the Research Bar: GLOBE International Virtual Science Symposium

The GLOBE International Virtual Science Symposium (IVSS) is a way for GLOBE students (K-16) to show the world what they've learned through hands-on research. These focused research endeavors require students to collaborate with GLOBE International STEM Network (GISN) members—and to apply their work to a real-world problem.

In 2019, 235 projects from 26 countries were submitted. In addition, 114 judges provided feedback on more than three projects. In May 2019, seven projects were selected randomly from a group of projects that earned a four-star student research badge, and at least two other optional badges. The teams who submitted these projects received NSF stipends to help defray costs to attend the GLOBE Annual Meeting in Detroit, Michigan, USA. The seven projects were:

- **Africa Region (Zinder, Niger; IPF Kaoura-Matamèye):** "Typology and Evolution of the Number of Mosquito Habitats in Matamèye"
- **Asia and Pacific Region (Phatthalung, Thailand):** "Papayom Pittayakom School): "Effects of Heavy Metals on Plankton, Water Quality and Fish in Pak-pra Canal, Phatthalung Province, Thailand"
- **Europe and Eurasia Region (Langon, France; Collège Jules Ferry):** "Toujours le Vin Sent son Terroir/California and Bordeaux Vineyards Comparison"
- **Latin American and Caribbean Region (Canelones, Uruguay; Escuela No. 88 Alfredo B. Nobel):** "Water Quality in Nearby Areas to Canelones City through the Use of Macroinvertebrates as Bioindicators"
- **Near East and North Africa Region (Jeddah, Saudi Arabia; The 128 Intermediate Gifted Girls School at Jeddah):** "The Effect of Water Salinity Levels on Water Acidity (pH) and Water Conductivity in Jeddah"

- **North America Region (Norwalk, Ohio, USA; Main Street Intermediate School):** "How Does Elevation Affect Surface Temperature?"

- **North America Region (Gibraltar, Michigan, USA: Shumate Middle School)**: "Three Year Volumetric Soil Moisture Study"

In 2020, 263 projects from 29 countries were submitted. In addition, over 150 judges stepped up to provide feedback on these innovative projects. In April 2020, seven projects were selected randomly from a group of projects that earned a four-star student research badge and at least two other optional badges. The seven projects were:

- **Africa Region (Kenya, Shree Swaminnarayan Academy):** "Identification of Mosquito Larval Species at SSA Mombasa, Kenya—2"

- **Asia And Pacific Region (Thailand, Samsen Wittayalai):** "Faith-based Communities Affecting Breeding Sites of Mosquito Larvae at Samui Island, Thailand using Drone imagery and GLOBE Observer: Habitat Mapping App"

- **Europe and Eurasia Region (Croatia, Tehnicka Skola Daruvar):** "Representation of the Invasive Species of Trees Shrubs in Daruvar—2"

- **Latin American and Caribbean Region (Argentina, Escuela Primaria Particular Incorporada N°1345 Nuestra Señora del Carmen):** "El Comportamiento de las Palomas Durante el Eclipse Solar 2019"

- **Near East and North Africa Region (Oman, Um hany Basic School):** "The Effect of Irrigation with Sulfur Water on Soil, Land Cover, and Adaptation of Some Living Organisms"

- **North America Region (United States, Shumate Middle School):** "How Does Aerosol Optical Thickness (AOT) Vary Within 50 Kilometers of Lake Erie?"

- **North America Region (United States, St. Francis Xavier Catholic School):** "The Effects of Aerosols on Water Quality"

GLOBE would like to acknowledge the hard work and dedication of all students participating in the annual IVSS—and for continuing to raise the bar on GLOBE-related research endeavors.

Dr. David Padgett; 2019 GLOBE Weather training; Boulder, Colorado, USA

Weather Resource: New GLOBE Weather Short Course

In 2019, the UCAR Center for Science Education (UCAR SciEd) and GIO hosted several workshops to disseminate the new GLOBE Weather instructional unit. Developed to directly address the U.S.-based Next Generation Science Standards (NGSS), this five-week curriculum unit, posted online, is designed to help middle school students understand weather at local, regional, and global scales.

By using a storyline instructional approach, students can progressively move through the lessons while exploring questions and discovering answers that lead to more questions and opportunities to learn more.

The elements of GLOBE Weather include an "Anchor" (where students learn how extreme weather events can impact people and communities, as well as the science and engineering practices of data analysis and modeling) and three learning sequences. In these sequences, students can investigate the causes of an isolated storm, learn the ways in which storms form in a location, as well as how storms move on a global scale.

GLOBE Weather connects teachers and students with many GLOBE resources (including using atmospheric protocols), and school-based data from the GLOBE database. The unit is designed for 25 class periods of approximately 50-minutes each. It is available in French and Spanish, and can be downloaded from globeweathercurriculum.org.

Data in Action: Updated Publications Page

Thanks to the GLOBE Community Support Team (CST), a "new and improved" GLOBE publications page is up and running on the GLOBE website!

GLOBE has a long history of sharing impact and science findings through peer-reviewed publications. The peer-review process ensures that published articles represent the best scholarship currently available. Each article that is submitted to a peer-reviewed journal is sent to other scholars in the same field in order to get their opinion on the quality of research, the relevance to the field, and its appropriateness for inclusion in the journal.

The new GLOBE publications page allows users to search for publications via filters (such as searching by author, date, and content related to GLOBE spheres or protocols). Community members can now even suggest publications that they would like to see added to the page—by simply filling out an online form that, if approved after CST review, will get added to the library.

Participants at a virtual video conference

Dissolving Distance: New Virtual Exchange Program/Toolkit

In 2020, GLOBE worked with the Collaboratory of the Bureau of Educational and Cultural Affairs at the U.S. Department of State to finalize a toolkit for teachers connecting GLOBE schools involved in the Zika Education and Prevention Project. This toolkit, and the companion website, are now ready for use by the broader GLOBE community!

Virtual exchanges were organized to connect students collecting water samples and tracking mosquito habitats in Brazil, Kenya, Paraguay, and Thailand prior to the GLOBE Learning Expedition (which took place in Ireland in 2018). During these exchanges, students shared photos, videos, and stories and connected virtually to learn about mosquito-borne diseases and science communications. GIO staff incorporated the feedback from the participating teachers into a draft GLOBE Virtual Exchange Toolkit. A pilot was then conducted with this draft toolkit, where six pairs of schools (ranging from middle to secondary school-aged students) in Brazil, Estonia, Kenya, Thailand, and the United States field tested the toolkit. Teachers provided further comments and suggestions for the final toolkit and the companion website.

The GLOBE Virtual Exchange Toolkit, which can be found under "GLOBE Mosquito Project" on the GLOBE website, offers guidance and tools for GLOBE community members to engage with their counterparts over a sustained period of time. It outlines steps, program ideas, suggested criteria, and a sample timeline for creating a virtual exchange, and shares best practices and experiences. It also provides technical tips, including a technical troubleshooting "cheat sheet" and checklist.

Got Questions, Get Answers:
Focused FAQs and Training Tutorials

As GLOBE community members explore, learn more about, and dive deeper into The GLOBE Program, there are many answers available on the website designed to provide up-to-date assistance. On an ongoing basis, the GLOBE CST works to provide tips and tools to make using GLOBE, and GLOBE resources, as easy as possible.

Need to know "what" it's all about?
Check out the focused FAQs, including:

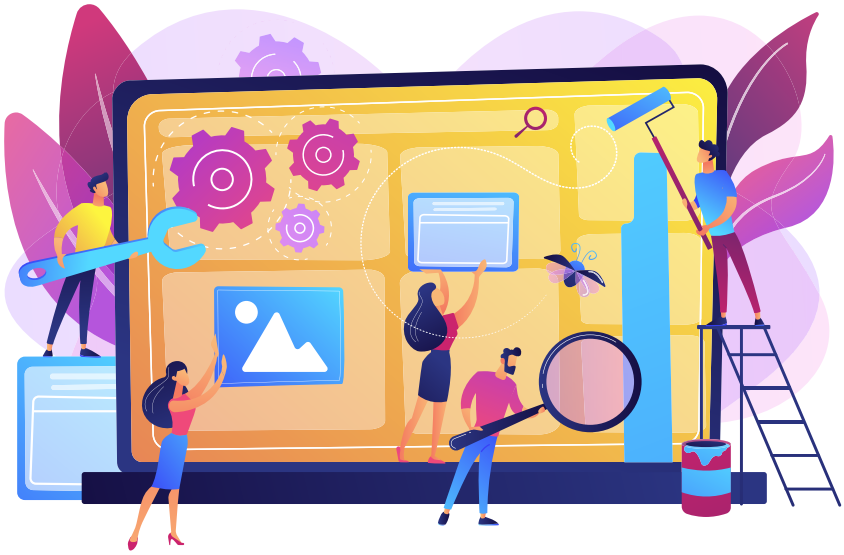
- GLOBE Program Overview
- GLOBE Accounts Information
- GLOBE Schools Information
- GLOBE Workshop Information
- GLOBE Website Tutorials
- GLOBE Protocols Information
- Instrument Information
- Data Entry Information

Need to know "how" to engage in the program?
Check out the training tutorials, including:

- Setting up Your Data Site
- Entering Measurement Data
- Retrieve and Visualize Your Data
- Setting up Your GLOBE Account
- Creating Student Accounts
- Collaboration

Community members can also reach out to the CST via email (globehelp@ucar.edu) or via telephone (1-800-858-9947), Monday-Friday, from 7:00 a.m. to 3:00 p.m. Mountain Standard Time.

NOTE: Are you in need of support as you journey through The GLOBE Program's website? Then please take note: GLOBE's Community Support (CST/Help Desk) contact email has changed from "help@globe.gov" to "globehelp@ucar.edu."



Use and Functionality:
Tech Updates and Website Upgrades

Many exciting changes and updates have been made to the GLOBE website—all with the goal of improving the level of ease and comfort in navigating through the variety of GLOBE-related options, including:

GLOBE Website:

- added ability for community members to create a GLOBE "Team" organization (private or public);
- added ability for community members to join a school (with a referral code);
- improved search capabilities (now using Google search);
- modified display of events (now filtered by upcoming or past events);
- added ability for community members to find a trainer in a country (including the creation of a searchable list page);
- added enhancements to the IVSS reporting tool (teachers, students, and collaborators can now edit their submitted reports before being approved; teachers can include report collaborators from other countries; reports can be filtered by report name and school name; and reports can be uploaded in other languages);
- created a GLOBE Data User Guide (a comprehensive user guide on how to use the website and apps to input and retrieve GLOBE data); and
- added a GLOBE Application Programming Interface (API) tool (which allows community members to query data by date, location, protocol type, and much more).

GLOBE Visualization (VIS) System:

- added tree height;
- added watershed boundary base map (U.S. only);
- added ability for community members to import vis layer as overlays into the ArcGIS system;
- added ability for community members to share their site's data on media apps (including Twitter and Facebook); and
- added ability for community members to embed their graphs directly on webpages.

GLOBE Advanced Data Access Tool (ADAT) System:

- improved interface for mobile viewing;
- added Tree Height protocol; and
- added Spanish and Dutch language with Google translate.

As community members return to the website to learn more, and do more, they can be sure that GLOBE remains dedicated to improving the overall "usability" of the components that make up the educational and scientific core of the program.

In an effort to inspire young students to pursue careers in STEM disciplines, NASA's Emily Schaller (second from left) travelled throughout the Philippines giving informational talks on the airborne science mission CAMP2Ex.

Getting the Word Out: News and Events

A daily goal of the GIO is to inform, educate, inspire, and engage GLOBE community members. To achieve this, GIO scours the globe for what's new, what's happening (and when, where, and why it's happening), as well as all other pertinent information about what other community members are up to—then works to announce this "news" to the community.

GIO also invites community members, sponsors, partners, and collaborating organizations and programs to provide the information necessary to ensure that the website is constantly being updated with vital information regarding GLOBE-related news and events. In 2019-2020, more than 1,000 GLOBE-related news and events were posted to the website!

In addition to "printed" news and events listings on the website (as well as those shared in the monthly News Brief and mass mailings), GIO created and produced a number of vital and informative video presentations. In 2019-2020, GIO Director Dr. Tony Murphy traveled the globe to meet with, and connect with, community members; however, there were times when he was not able to attend all of the important GLOBE events taking place—especially after the world, as one, took a break to ensure health and safety in the time of Covid-19. Continuing to craft personalized virtual video messages served as a key ingredient in ensuring that all community members realize that they are invaluable to the enduring and expanding success of The GLOBE Program.

Passion and Purpose:
Community Spotlight Feature

The power behind The GLOBE Program is our passion, our purpose, and our people! The GLOBE Program values the level of daily dedication to, and ongoing support of, the program, as well as the enduring quality of the educational, environmental, and scientific contributions of every single one of our community members.

In 2020, as a way of highlighting the invaluable dedication of our community members to the program, GLOBE updated the "Community Profiles" feature offered on the GLOBE website. In a different way than GLOBE "Star Stories" (which highlight group activities and events), the goal of the Community Profile feature is to place a "spotlight" on individual community members and their GLOBE endeavors. The idea is to offer a place where every single community member can share their story—how working with GLOBE has impacted learning endeavors, classroom activities, scientific research, environmental observations, STEM career, and the overall journey of research and education.

Inspiration and Innovation:
GLOBE Star Stories

As always, GLOBE Star Stories shine a light on extraordinary examples of community members engaged in vital projects, activities, and experiences taking place in connection to GLOBE. GLOBE Stars are the bright lights that spark our imagination and inspire us to commit on an ever-deeper level to the passion and the purpose of The GLOBE Program. The dedicated, inquiry-based and community-expanding work that GLOBE teachers, students, STEM professionals, and professional and citizen scientists do on a day-in and day-out basis is the foundation of The GLOBE Program—and the heart of every GLOBE Star Story.

Streamlining Messaging:
Social Media Merger

In 2019, the social media team at NASA Headquarters conducted an inventory of all associated social media accounts, of which The GLOBE Program and NASA GLOBE Observer (GO) are a part (as they are both sponsored by NASA). As a result of this inventory, and with representation and guidance from NASA officials, it was decided that the two social media presences become one.

The GLOBE and GO communications teams worked tirelessly to plan this merger. In February 2020, word went out to all social media followers to provide information regarding the coming changes—and how to follow along with the merger. In March 2020, the social media presences were merged into one platform in order to consolidate efforts, endeavors, and exciting events. Community members can now find both GLOBE and GO information shared via the following accounts: Facebook, Twitter, Instagram and YouTube.

Participants at the 23rd GLOBE Annual Meeting; Detroit, Michigan, USA

Intersections of Diverse Environments: 2019 Annual Meeting

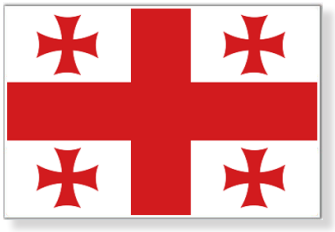
The 23rd GLOBE Annual Meeting, which was held in Detroit, Michigan, USA, from 14-18 July, was attended by almost 250 people from 35 countries. Participants took part in a variety of engaging and enlightening presentations, workshops, cultural presentations, and special interest and professional development sessions. They were also treated to focused addresses by GIO Director Dr. Tony Murphy and keynote speakers from around the regions.

The theme of the meeting, hosted by Dr. Kevin Czajkowski and David Bydlowski, was "Intersections of Diverse Environments," which sought to explore Detroit's diverse cultural, geographical, and economical environments in multiple strands: Finding Nature in Urban Landscapes; Exploring Changing Environments; GLOBE and Technology; and GLOBE Gives Back.

Nearly 60 students participated in the two-day "student experience," which was held at the Howell Nature Center from 16–18 July. (Howell Nature Center is an outdoor education and wildlife rehabilitation center located about an hour outside of Detroit.) Students engaged in hands-on activities centered around learning about the local environment; and also designed and worked on a project using GLOBE protocols to help them better understand their environment.

"It was awesome to see the students' energy and excitement about their GLOBE research, with topics from air pollution to incidence of mosquito populations. While the students left Detroit for a two-day field experience at Howell Nature Center, the adults learned lots of new information in sessions from their colleagues," Dr. Murphy said.

Warm Welcome: Georgia, Slovak Republic, and Australia



Georgia: In September 2019, NASA and the Ministry of Education, Science, Culture, and Sport of Georgia signed an agreement to implement The GLOBE Program in Georgia. The Caucasus Environmental NGO (non-governmental organization) will be serving as the Country Coordinator.

"I am pleased to welcome Georgia into the family of GLOBE countries," GIO Director Dr. Tony Murphy said, "and to know that this partnership agreement was signed in Tbilisi, site of the first UNESCO intergovernmental conference on environmental education in October 1977 is gratifying. How fitting that The GLOBE Program takes root in Tbilisi, Georgia where environmental education first began!" GIO welcomes Georgia, the 122nd country to participate in The GLOBE Program.

The Slovak Republic: In December 2019, the Minister of Environment of the Slovak Republic, László Sólymos, and, on behalf of NASA, the Honorable Bridget Brink, U.S. Ambassador (U.S. Embassy Bratislava), signed an agreement to implement The GLOBE Program in the Slovak Republic. Špirála, Network of Environmental Education Non-governmental Organizations (NGOs), will serve as the Country Coordinator.

"The GLOBE community welcomes the Slovak Republic as its newest participating country," Dr. Tony Murphy said. "As we approach the 25th Anniversary of The GLOBE Program, it is wonderful to see countries still excited about becoming participants in this global science and education program." GIO welcomes the Slovak Republic, the 123rd country to participate in The GLOBE Program.

Australia: NASA and the Australian Space Agency signed an agreement to cooperate on The GLOBE Program. The new agreement enables the Australian Space Agency to re-launch GLOBE activities in Australia, building upon the foundation it created in 1995 when Australia first joined GLOBE.

"We're excited to see our partners in Australia re-engage in the GLOBE program," said NASA Administrator Jim Bridenstine. "Global observations are a critical component of this program and participation from observers across Australia will help ensure we have the best data possible to help students, teachers, scientists, and citizens promote science and learning about the environment. It also strengthens our partnership with a key international ally who will help us in our efforts to send the first woman and next man to the Moon in 2024 as part of the Artemis program."

Historic Connections: 2020 Virtual Meeting

The GIO would like to thank everyone participating in the 2020 GLOBE Virtual Annual Meeting. Your continued dedicated participation in the program is the key to GLOBE's enduring educational and scientific success.

"This was the first interactive virtual annual meeting that the GIO organized and hosted," GIO Director Dr. Tony Murphy said. "Over the four days, you all heard updates from GIO, the technology team at SSAI, and the program sponsors. There was also time for reports from the GLOBE Working Groups and the U.S. Partners and Country Coordinators to meet about possible collaboration. Students from the International Virtual Science Symposium also had the opportunity to present their research."

"This was not how we expected to host the annual meeting this year, especially for the 25th anniversary," Dr. Murphy said. "However, due to the pandemic, we had to pivot to a virtual meeting from our regular in person event. I want to thank you all for attending all or some of the virtual sessions, and I hope you found them useful. I heard that some of you were up either very early or very late, depending on your time zone, to view the live broadcasts of the sessions...this was quite dedicated of you. "

"Your level of interest and engagement as a community in the program was clearly visible in that this was the largest annual meeting, with 429 registrants from 72 countries. I commend you for your commitment to the program and, again, I want to thank you for being part of this virtual GLOBE annual meeting," Dr. Murphy said.

Diversity, Equity, and Inclusion: Taskforce Presents Initial Action Plan

During the 2020 GLOBE Virtual Meeting, the Diversity, Equity, and Inclusion (DEI) Task Force presented the proposed GLOBE definitions for Diversity, Equity, and Inclusion, the "Mission" and "Vision" of these efforts, as well as an initial Action Plan. A community-wide survey will be sent out soon to gather additional feedback on these statements and plans.

The 2020 GLOBE Virtual Meeting, which was held from 13–16 July, was attended by 429 community participants from 72 countries. The DEI presentation built upon previous efforts. In February 2020, the GIO hosted the first community Diversity, Equity, and Inclusion Task Force meeting in Boulder, Colorado, USA. Community members from Argentina, Columbia, Croatia, Ghana, the Philippines, and the United States attended the event.

Event participants included 18 community members, three GIO staff members (Dr. Tony Murphy, Dr. Julie Malmberg, and Katie Chapman), and two facilitators from the University Corporation for Atmosphere Research (UCAR) Office of Diversity, Equity, and Inclusion, and the American Geophysical Union (Dr. Carolyn Brinkworth and Dr. Jill Karsten). In addition, for part of the meeting, four UCAR/National Center for Atmospheric Research (NCAR) Equity and InclusION (UNEION) Lead Learners participated (A.J. Lauer, Dr. Jeremiah Sjoberg, Josh Young, and Kristen Aponte).

The goal of this ongoing effort is to ensure that the variety of voices of GLOBE community members are heard and valued.

Creative Collaboration

GLOBE's ongoing collaborative efforts continue to focus on expanding and enhancing the work of The GLOBE Program. In 2019-2020, collaborative efforts included:

- **Peace Corps:** GIO continued communications with the Peace Corps on ideas for future collaboration. GIO and Peace Corps facilitated communications between GLOBE country coordinators and Peace Corps Directors of Program and Training in GLOBE Zika Education and Prevention Project countries. GIO encouraged country coordinators to partner with the Peace Corps on Zika project activities that potentially could lead to collaboration with the Peace Corps on other GLOBE activities. GIO also invited the Peace Corps to send representatives to the Asia and Pacific and the Africa regional meetings, as well as to the Zika Action and Impact meetings (in January and March 2019, respectively).

- **United Nations Environmental Programme (UNEP):** GIO began working with UNEP to implement the NASA Memorandum of Understanding (MOU). GIO, UNEP, and GLOBE Kenya gave a presentation on UNEP's objectives and GLOBE collaboration. In addition, discussions were held to discuss priorities for the collaboration. The Water Bodies Intensive Observation Period (IOP), which took place in September 2019, was the first collaboration effort.

- **National Wildlife Federation Eco-Schools International:** GIO continued discussions with the National Wildlife Federation on several countries where there is no current GLOBE country coordinator. The Portuguese Eco-Schools National Operator agreed to become the GLOBE country coordinator, and GIO continued to work with the U.S. Embassy on Ministry approval and designation. Strategies were developed for Iceland, Norway, Slovenia, and the United Kingdom. Efforts continued to connect Eco-School Coordinators with country coordinators in Canada and in the Slovak Republic.

Africa

2020 Regional Meeting

In March, the 2020 Africa Regional Meeting and Zika Action and Impact Meeting took place online, via a Zoom conference. Participants from Benin, Botswana, Burkina Faso, Cameroon, Ghana, Kenya, Liberia, Madagascar, Namibia, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tanzania, Togo, and the United States attended the event. The objective of the meeting was to work towards greater participation, cooperation, collaboration, and innovation in order to strengthen The GLOBE Program in the Africa Region.

The topics of the meeting included the alignment of the country report template and the country survey to the GLOBE Strategic Plan. Cornell Lewis (SSAI) shared new website developments, and addressed some challenges from the community. In addition, country coordinators from the region provided feedback on how Covid-19 is impacting GLOBE activities and upcoming events, including Intensive Observation Periods (IOPs).

Participants at a 2019 GLOBE Sensitization and Advocacy Workshop; Nigeria

Topical Highlights from the Region

As always, the RCO encouraged, supported, and hosted numerous events (meetings, training, activities, field studies, and research efforts) during 2019–2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

The 2020 Water Bodies IOP was intended to encourage participation from within the region. It was designed to encourage the community to measure different hydrology parameters, as well as experience relevant GLOBE bundle protocols. The effort produced a definite increase in student presentation submissions to the GLOBE IVSS.

GLOBE student presents her research on zika education and prevention.

Education

Throughout the region, the use of all GLOBE protocols was encouraged. During 2019–2020, there was a spike in data submission, which indicated increased participation within the region. In addition, this concerted effort also resulted in an increase in IVSS presentation submissions.

In 2019, support was secured from NASA SERVIR for a Train-the-Trainer event in Ghana. Participants from Ghana, Niger, and Senegal worked with the following GLOBE protocols: Transparency, Temperature, Dissolved Oxygen Content, Electrical Conductivity, Salinity, pH, Alkalinity, Nitrate Content, Mosquitoes (and the use of NASA GLOBE Observer app to collect data), and (as an option) Freshwater Macro-invertebrates.

Community

A variety of community activities, meetings, and events occurred in various forms throughout the region, including:

✺ **Water Bodies IOP Webinars:** This event brought the community together for two webinars, which included participation from scientists from three regions and from UNEP. There was also a pre-IOP webinar for the anticipated 23 March-17 April 2020 IOP, which was postponed.

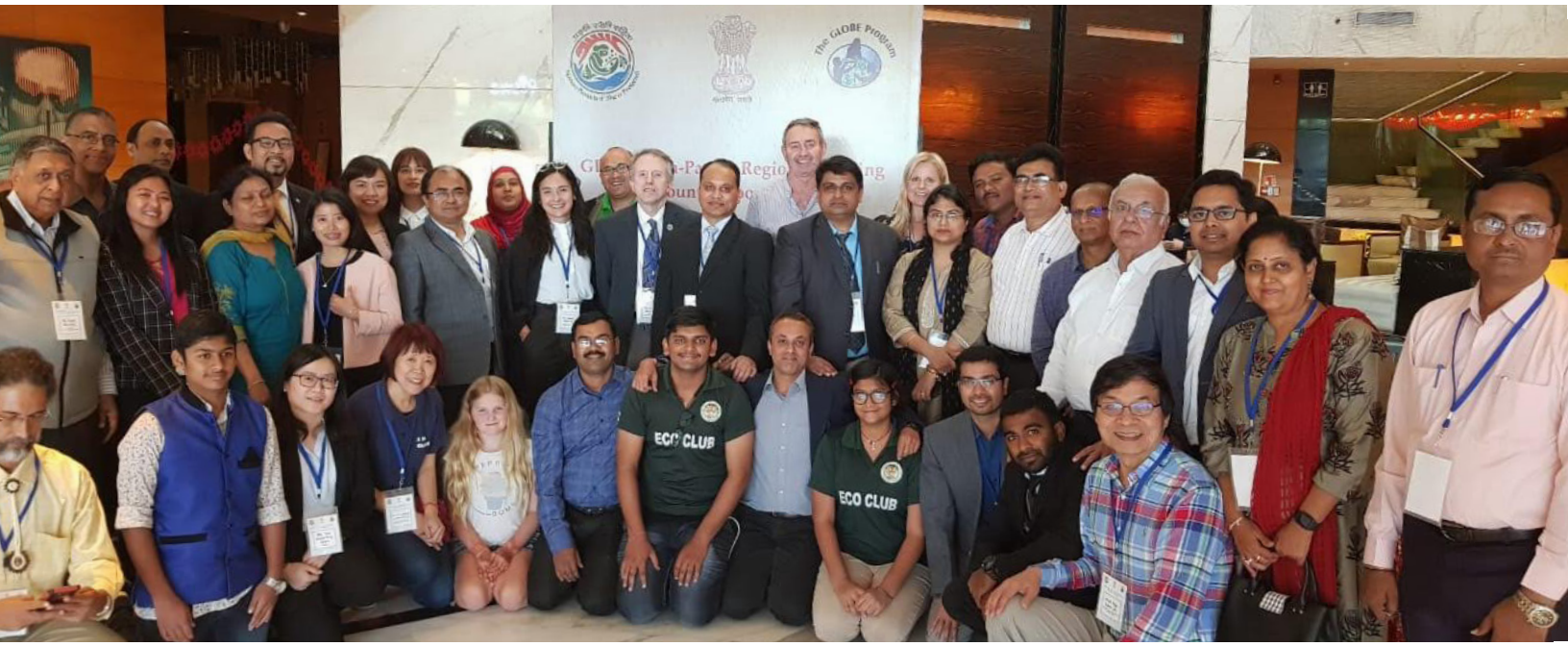
✺ **Advocacy Workshop, Nigeria:** Nigeria hosted a workshop on advocacy and sensitization, with participation from the State of Nigeria and the U.S. Embassy in Lagos. The Embassy continued to work diligently to promote and support the program.

✺ **Science Symposium**: In July 2019, Kenya students participated in a Science Symposium to promote the program, and also presented a poster at the Annual Meeting in Detroit, Michigan, USA.

✺ **Earth Day 2020:** In April, in celebration of Earth Day 2020 and GLOBE's 25th Anniversary celebration, two Zoom meetings were held. During the first meeting, held on 15 April, Cornell Lewis (SSAI) spoke about website navigation and workshop management. He also addressed individual questions regarding the website. On 22 April (Earth Day), the call focused on alumni and the success of the regional participation in the Zika and Education Prevention Project. During the meeting, Peter Falcon (NASA-JPL) spoke about NASA Satellite Missions, their relation to GLOBE protocols, and NASA's "Stay-at-Home" resources. Peggy Foletta, an Education Specialist from the Elkhorn Slough in Monterey Bay, California, USA, and former GLOBE Teacher, spoke about GLOBE hydrology protocols, collaboration efforts, and "sheltering" at home with GLOBE. There were 38 people from 15 countries participating in the Earth Day event.

✺ **IVSS Zoom Meeting:** In May, a Zoom session was held that focused on IVSS project submissions and collaborative opportunities. Fourteen people from nine countries participated. During the meeting, there was a "report-out" session on the effects of Covid-19 on education in Africa, and what country coordinators are doing to engage students.

Participants at a 2019 science symposium; Kenya



Participants at the 2020 Regional Meeting; Hyderabad, India

Asia and Pacific

2020 Regional Meeting

In January, the 2020 Regional Meeting took place in Hyderabad, India. Thirty-seven participants from India, Maldives, Marshall Island, Nepal, New Zealand, Philippines, Sri Lanka, Thailand, Taiwan Partner, Vietnam, and the United States attended the event.

The meeting, which was attended by GIO Director Dr. Tony Murphy; Mindi DePaola, Zika Education and Prevention Project staff; a team from NORC; and staff from SSAI, included a presentation by Sri Rajeswar Tiwari, the Chief Secretary of Environment, Forests, Science and Technology, thanking participants for "doing outstanding work in their countries" and sharing the importance of GLOBE schools. In addition to training events and workshops, participants discussed the GLOBE Strategic Plan and shared achievements and goals. After the meeting, a two-day "GLOBE Zika Action and Impact" workshop took place, where achievements and goals were discussed. The NORC Team presented evaluation findings for this project as a whole and for the Asia and Pacific Region.

Topical Highlights from the Region

As always, the Regional Coordination Office (RCO) encouraged, supported, and hosted numerous events (meetings, trainings activities, field studies, and research efforts) during 2019–2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

A variety of science activities, meetings, and events occurred in various forms throughout the region, including:

- **GLOBE Student Research Competition 2019:** In March 2019, Thailand organized "GLOBESRC2019." During this event, students from primary school, lower secondary school, and higher secondary school categories presented 26 oral presentations and 55 poster presentations.

Participants at the 20th Anniversary of GLOBE Thailand celebration in 2019; Thailand

✺ **GLOBE Taiwan Science Festival:** In July 2019, Taiwan hosted the GLOBE Science Festival for the region. The event was held in Pingtung, Taiwan. Sixteen students, teachers from four schools, scientists, and 25 people from Taiwan participated in the event. The students shared research endeavors and experiences. The festival was part of the annual exhibition of the HIGHSCOPE Program and the FORESEEING Program, which focus on STEM education.

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

✺ **GLOBE Teacher Training, Seoul, Republic of Korea:** In May 2019, the Republic of Korea, in collaboration with the Asia and Pacific RCO, organized a teacher training workshop. The training was attended by 28 teachers from different schools in Seoul. All four GLOBE spheres (atmosphere, biosphere, hydrosphere, and pedosphere) were explored during the workshop. GIO Director Dr. Tony Murphy, Dr. R.K. Garg, and Dr. Desh Bandhu served as master trainers. Cornell Lewis (SSAI) presented a training session on the GLOBE website and the GO app.

✺ **GLOBE Teacher Training workshops, India:** In July 2019, India organized a workshop for new GLOBE schools. The training was attended by Education Department Officials and teachers from five different states ready to implement The GLOBE Program. Dr. Desh Bandhu and Dr. R.K. Garg attended the workshop, and gave presentations on GLOBE. They also explained the benefits GLOBE offers to students, as well as the importance of GLOBE data collection and usage for research projects. All the teachers who participated in the workshop were new GLOBE teachers. After the workshop, additional teacher training workshops were organized in each implementing state, including:

- ✺ Bhopal, Madhya Pradesh, India (September 2019); attended by 139 teachers;
- ✺ Siripur, Odisha, India (October 2019); attended by 150 teachers;
- ✺ Thiruvananthapuram, Kerala, India (October 2019); attended by 118 teachers;
- ✺ Udaipur, Rajasthan, India (October 2019); attended by 147 teachers; and
- ✺ Gandhinagar, Gujarat, India (November 2019); attended by 76 teachers.

✺ **GLOBE Train-the-Trainer Workshops, India:** From July through November 2019, India organized workshops for new GLOBE schools. In November 2019, a training was held at Indira Paryawaran Bhawan,

MOEFCC, which was attended by teachers from five states planning to implement The GLOBE Program. Dr. Desh Bandhu, Dr. R.K. Garg, and Dr. Avinash Tiwari served as master trainers. During the event, both theory and field work were covered.

✺ **GLOBE Teachers Conference, Tokyo, Japan:** In October 2019, Japan organized a GLOBE teachers conference at Tokyo Gakugei University. Teachers from 12 GLOBE schools participated in the event. GLOBE teachers presented on GLOBE protocols, and showed participants how to enter data into the GLOBE database.

✺ **GLOBE Teacher Training, Ho Chi Minh City, Vietnam**: In November 2019, the Ho Chi Minh City Space Technology Application Center, in collaboration with the Center for Education and Development, organized a teacher training workshop. This was the second time The GLOBE Program has been presented in Ho Chi Minh City, with the goal of expanding implementation of the program. The training course was conducted with the support of Dr. Desh Bandhu and Mr. Pulla Rao Gadde from the Indian Environmental Society. Participants included 80 teachers from junior high schools and high schools. The event included theory and field work.

✺ **NASA Airborne Science Team**: 2019 CAMPEx (Cloud, Aerosol and Monsoon Processing Philippine Experiment) Mission: In September 2019, the Philippines hosted a NASA CAMPEx visit at Paranaque Science High School, which served as a GLOBE program orientation meeting. The event attracted 1,500 teachers and students from 39 different schools from all over the Philippines.

✺ **Taiwan Special Event.** In December 2019, the GLOBE Taiwan Office hosted a special training, with the support of the Taiwan Ministry of Science and Technology and the American Institute in Taiwan. Two trainers, Peter Falcon and Dorian Janney, held a STEM education workshop for teachers. Over the course of the event, they also shared their knowledge about the application of NASA satellite data and GLOBE observation data on science teaching.

Participants at a cultural program during 2020 Regional Meeting; Hyderabad, India

Participants at a 2019 GLOBE Student Exchange Program; Bangkok, Thailand

Participants at a 2019 GLOBE teacher training program at Tokyo Gakugei University; Japan

Community

A variety of community activities, meetings, and events occurred in various forms throughout the region, including:

✺ **GLOBE Student Exchange Program:** In November 2019, Thailand organized a GLOBE Student Exchange Program in Bangkok. Eleven schools from Thailand, three schools from Taiwan, two schools from the Philippines and Nepal, and one school from Japan participated, along with two members from the RCO. The Exchange Program provided an opportunity for students and teachers to participate in "GLOBE Youth Camp." The program included a field visit, as well as discussions on future activities.

✺ **20th Anniversary of the GLOBE Program in Thailand:** In September 2019, the Institute for the Promotion of Teaching Science and Technology (IPST) hosted an event to celebrate GLOBE's 20th Anniversary in Thailand, with 184 distinguished guests. Dr. Khunying Kalaya Sophonpanich, Deputy Minister of Education, delivered the opening speech, and presented GLOBE Star Awards to teachers, scientists, schools, and university networks. Students presented their research to Dr. Khunying Kalaya Sophonpanich and Dr. Sukit Limpijumnong, the country coordinator of GLOBE Thailand and President of IPST. The event highlighted the progress of The GLOBE Program over the last 20 years in Thailand.

✺ **Local Mosquito Workshops (LMW):** In May 2019, a LMW was held, which focused on training local communities on the GO Mosquito Habitat Mapper tool, and engaging hard-to-reach and at-risk populations. Since beginning this local phase of the Zika Education and Prevention Project, Thailand had completed 43 LMWs; the Philippines had completed 11 LMWs; India had completed one LMW; Nepal had completed four LMWs; and Vietnam had completed one LMW. In all, by May 2019, the region had trained 5,209 community members.

Participants at the 2019 Europe and Eurasia Regional Meeting; Trieste, Italy

Europe and Eurasia

2019 Regional Meeting

In October, the 2019 Regional Meeting took place in Trieste, Italy. Participants from Croatia, Cyprus, Czech Republic, Estonia, France, Georgia, Germany, Greece, Hungary, Ireland, Israel, Italy, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Malta, Netherlands, Poland, Russia, Slovenia, Slovak Republic, Switzerland, and the United States attended the event. The meeting was organized in cooperation with GLOBE Italy, the GLOBE Europe and Eurasia Board, and the RCO.

The two-day meeting, which was attended by GIO Director Dr. Tony Murphy and staff from SSAI, included a citizen science conference and two days of training/workshops. Participants had opportunities to interact during the GLOBE Strategic Plan Workshop and the School Collaboration Workshop, as well as to learn about the most recent developments of the program, including technology innovations. The RCO also awarded schools in the region for special achievements, such as joining the observation campaigns or representing the program to the public.
The conference "The GLOBE Program, Citizen Science and Climate Change connections" opened the second part of the week. During this time, scientists showed how they involved the general public in contributions to research (for example through the use of smartphone apps), be it tracking down invasive species or observing clouds or changes in vegetation.

Topical Highlights from the Region

As always, the Regional Coordination Office (RCO) encouraged, supported, and hosted numerous events (meetings, training, activities, field studies, and research efforts) during 2019-2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

A variety of science activities, meetings, and events occurred in various forms throughout the region, including:

✺ **2019-2020 European Phenology Campaign:** Teachers and students crossed borders and language barriers to collaborate during the campaign. They exchanged observations of trees changing color (in autumn) and greening-up (in spring), and planned research efforts as well as face-to-face meetings. The campaign encourages students to share their results and compare these with schools from other parts of Europe. In all, 156 schools from 14 countries (Croatia, Cyprus, Czech Republic, Estonia, Finland, Germany, Israel, Latvia, Lithuania, Macedonia, Malta, Netherlands, Poland and Ukraine) tracked the date when buds opened and measured the growth of young leaves. They also took pictures of the greening-up of trees and shared their results on the website's discussion forum. During the autumn part of the campaign, 160 posts with photos and results were shared on the discussion forum, and more than 2,500 observations were uploaded to the GLOBE database.

✺ **Air Quality Event, Ireland**: In 2019, students from 30 schools across Ireland measured nitrogen dioxide (NO2)—a principal pollutant from car exhaust emissions. Students researched and analyzed their data and produced reports for the GLOBE Air Quality event in Dublin. At the event, they exchanged information and ideas on how to further investigate their local air quality and how to come up with solutions for reducing air pollution. Students were invited to take key aspects of their research project and practice sharing them with a non-expert audience. Everyone also took part in hands-on activities centered on soil, water, biodiversity and waste. The purpose of the event was to highlight the fact that GLOBE enables schools to study various aspects of their local environment in a practical way. The event was attended by 60 students and teachers from nine schools.

Participants at the Estonia Learning Expedition; Estonia

Participants at the GLOBE Switzerland 10th Anniversary Field Day; Switzerland

✺ **GLOBE Switzerland Connects to Educational and Environmental Research:** During 2019-2020, GLOBE Switzerland strengthened cooperation with partners from environmental research and administration organizations in the country. The GLOBE Program model is regarded as the baseline on which the collaboration is built. Wassernetz ("Water Network") is the result of cooperation between three environmental education organizations (Naturama, Pro Natura, and GLOBE Switzerland). This aim is to bring schools with learning opportunities to rivers and still waters so that they can explore and research water rights in the field.

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

✺ **Student Research Experiences:** Between May 2019 and April 2020, several expeditions, science conferences, and camps were organized, including: Annual Meeting, Germany (May 2019); Student Conference and Workshop, France (May 2019); GLOBE Games Czech Republic (June 2019); National Science Fair, Netherlands (June 2019); Annual Meeting, Israel (June 2019); Estonia Learning Expedition (August 2019); Annual Students Conference in Lithuania (November 2019); GLOBE Day at the Dutch National Institute for Public Health and the Environment, Netherlands (April 2020); Croatia National Student Conference (May 2020), and School on River Learning Expedition in Italy (May 2020).

✺ **GLOBE Student Conference and Competition in Croatia:** In 2019, The GLOBE Program community of Croatia celebrated science with hundreds of students coming together to show their research skills at the national GLOBE Games. This annual event is supported by the Ministry of Education. In Croatia, the event is organized at two levels (regional and national). GLOBE schools are grouped in seven regions, led by a local coordinator experienced in GLOBE. As always, GLOBE students from all of the regions participated in presenting their GLOBE research. From the regional level, projects were selected (based on common criteria) to go up to the national-level competition.

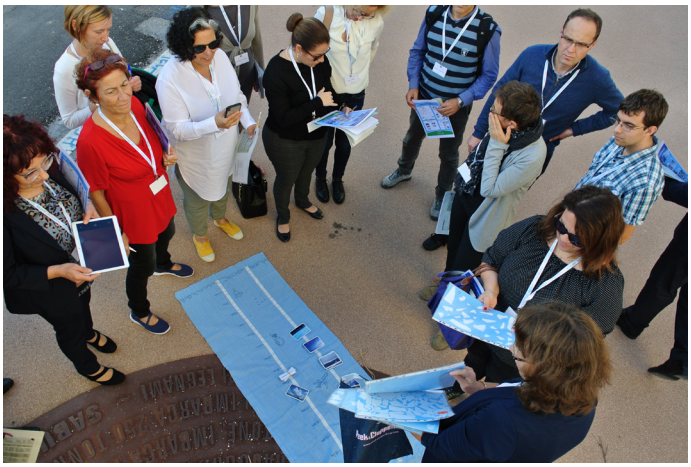
✺ **Urban Heat Island Effect (UHIE) Study, Malta:** In 2019, GLOBE students in Gozo, Malta, focused on studying the effects of trees on urban temperatures in their surrounding communities. In order to accomplish this, students recorded the surface temperature from two different areas: built-up areas, and grassy patches with trees planted nearby. The students were successful in: involving the local community through the Climate Action Fun Walk; introducing the community, students, and teachers to The GLOBE Program (the Walk was featured on a popular local television program); and linking their investigation to environmental issues in order to provide solutions.

Community

A variety of community activities, meetings, and events occurred in various forms throughout the region, including:

✺ **GLOBE Games, Czech Republic:** More than 200 students and 50 teachers from five countries met for the GLOBE Games in Czech Republic. The GLOBE Student Conference is a highlight of the school year for many of the area schools. In 2019, there was a great emphasis on Sustainable Development Goals. More than 40 projects were presented by courageous student teams. There was also a "networking and mentoring" evening for teachers. Participants enjoyed field games in the nearby Nature Reserve Uhost. At the end of the event, the traditional "rolling of the GLOBE" (a large ball painted like the Earth) through the town was done by all the participants.

Students (Gozo College Rabat Primary School) during online call with the students from Israel



Participants at a protocol training; Trieste, Italy

✺ **International Collaboration—Schools in Israel and Malta:** In February 2020, GLOBE Israel and GLOBE Malta coordinated a collaborative project between four schools, culminating in a "learning experience" conference call. Students from Gozo College Rabat Primary School, (Victoria, Gozo, Malta) and Begin Elementary School (Dimona, Israel) sang songs about trees and nature in their own language. Students from Gozo College Middle School (Victoria, Gozo, Malta) and Mosenson Youth Village High School (Hod Hasharon, Israel) read a tree blessing. The collaboration provided a unique learning experience where students and teachers were able to contribute to scientific discovery (exchanging data and results between the schools) and be exposed to different cultures, languages, and traditions.

✺ **Estonian GLOBE Learning Expedition:** GLOBE Estonia conducted a learning expedition for GLOBE students and teachers to the northern coast of Lake Peipsi. The expedition focused on measurements in different science areas. Groups of students, under the guidance of scientists, took measurements and prepared presentations on their research associated with atmosphere, biosphere, hydrosphere, and pedosphere. There were 130 participants: 95 students from 28 schools and 35 guests, trainers, teachers and alumni.

✺ **Earth Day 2020:** Numerous events celebrating Earth Day took place (virtually) around the region.

- ✺ **GLOBE Italy organized a festival** for schools and the public—calling the GLOBE community together to join a live webinar: "Humans, the Earth, and Covid-19." They prepared a mix of celebration, teaching, and supportive messages. They also invited scientists to talk about Earth science research topics associated with the pandemic. More than 500 people joined the live event.

- ✺ **GLOBE Malta launched a "Cloud Observation Challenge"** as part of a collaborative effort between the U.S. Embassy in Malta and the Embassy of the Republic of Malta. The effort supported the international collaboration of students, teachers, and citizen scientists with the goal of better understanding the environment. Students celebrated the diversity and beauty of the sky by observing, drawing, and writing poems on clouds through the month of May.

- ✺ **GLOBE Israel held a virtual conference** for students and teachers to commemorate GLOBE's 25th Anniversary. Students submitted creative art for the National Photo Competition on The GLOBE Program. The winners were announced during the conference on 23 April.

- ✺ **The RCO prepared a showcase** "25 Years of GLOBE" in photos. The final video version was made available to the entire community.

Participants at the Estonia Learning Expedition; Estonia

Participants at the 2019 Regional Meeting; Atal, Brazil

Latin America and Caribbean

2019 Regional Meeting

In August, the 2019 Regional Meeting took place in Natal, Brazil. Participants from Argentina, Brazil, Bahamas, Bermuda, Chile, Colombia, Dominican Republic, Ecuador, Mexico, Panama, Paraguay, Surinam, Trinidad and Tobago, Uruguay, and the United States attended the event.

The meeting, which was attended by GIO Director Dr. Tony Murphy, and staff from SSAI, was divided into a number of themes. The first theme was a one-day Zika Education and Prevention regional meeting, in which participating country coordinators shared project updates, challenges, and solutions.

The next day comprised the regular regional meeting and included sessions about the GLOBE Strategic Plan, the GLOBE website, the partnership between GLOBE and the United Nations Environmental Program (UNEP), and alignment between GLOBE and the Sustainable Development Goals (SDGs).

Following the regional meeting, a two-day workshop focusing on the GLOBE mosquito bundle was facilitated by Kristin Wegner, Zika Project Coordinator; Dr. Tony Murphy, GIO Director; and Mariana Savino, Latin America and Caribbean Regional Coordination Office (RCO). In addition, new rubrics for the trainer and mentor trainer certification process were used to evaluate the two training candidates present at the meeting. During the training, four country coordinators became trainers; 10 became mentorr trainers; and two people applied to become mentor trainers. New requirements for attending regional meetings were also discussed.

July 2019 Solar Eclipse; Latin America and Caribbean Region

Topical Highlights from the Region

As always, the RCO encouraged, supported, and hosted numerous events (meetings, training, activities, field studies, and research efforts) during 2019-2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

A variety of science activities, meetings, and events occurred in various forms throughout the region, including:

✺ **2019 Eclipse:** On 02 July, at Junín de los Andes and San Martín de los Andes, Argentina, participants gathered to observe the total eclipse. Students in Junin met with their teachers to take measurements. (For example, the Huechulafquen Science Club with Professor Ana Prieto met with students and professors to see the eclipse from the institution; and in San Martín de los Andes, participants met with Professor Sebastián Livón on the coast of Lake Lácar to observe the eclipse.) Students and teachers took measurements of temperature, clouds, and light intensity before, during, and after the eclipse. An event was also held in the city of Córdoba, which gathered more than 500 people.

✺ **Online Research Webinars**: "How to Do a Research Project:" Between August and November, the LAC RCO organized a series of webinars to help teachers within the region develop research projects, provide guidelines on the scientific method, and inspire ideas. The webinars were conducted by Claudia Caro (Science Working Group) and Ana Prieto (Technology Working Group). Sixty teachers from the seven Spanish speaking countries joined the training. A video of each session was uploaded to the RCO's YouTube Channel and shared with the entire GLOBE community.

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

✺ **Teacher Training:** In May 2019, a two-day workshop was held in the city of Medellín, Colombia. The training was conducted by Master Trainer Ana Prieto, with the support of Mariana Savino and the Colombia Country Coordinator Carlos Acuña Caldera. The workshop focused on hydrosphere protocols. In May 2019, a teacher training workshop was also held in Asunción, Paraguay. Master trainer Ana Prieto conducted the two-day workshop, covering GLOBE protocols.

✺ **Online Hydrosphere Protocol Training Course**: From 20 April through 14 May 2020, participants from Peru and Uruguay attended an online course focusing on hydrosphere protocols. The course was provided to primary and secondary school teachers in Uruguay who specialize in Chemistry, Biology, and Geography. The course was conducted by Master Trainer Andrea Ventoso and Patricia Píriz. Alejandra Gualco conducted a field class, at a water source in Montevideo.

✺ **Online Atmosphere Protocol Training Course:** From 08 May through 08 June 2019, participants from Peru and Uruguay attended an online course focusing on atmosphere protocols. The course was conducted by Peru Country Coordinator José Martín Cárdenas and Uruguay Country Coordinator Andrea Ventoso—both of whom are Master Trainers. Thirty-two secondary school teachers from Peru participated in the training.

✺ **Training Workshop:** In May 2019, the RCO hosted a workshop at the Universidad Austral, Pilar in Buenos Aires. The workshop was provided to educational institutions directors and teachers, and was conducted by Mariana Savino and Master Trainer Ana Prieto. Fifteen teachers were trained in biosphere and pedosphere protocols.

Participants at a GLOBE training; Latin America and Caribbean Region

Participants at a GLOBE workshop; Santiago, Chile

✺ **Training Workshop:** In May 2019, in Junin de los Andes and San Martín de los Andes, Argentina, the RCO hosted a workshop at Comahue University, Neuquen. The workshop was provided to educational institution directors and teachers, and was conducted by Master Trainer Ana Prieto, from Argentina. Protocols in atmosphere, biosphere, hydrosphere, and pedosphere were covered. Teachers were also able to practice using the website and uploading field data.

✺ **Teacher Training:** In August 2019, a two-day training workshop for teachers was held in Río Cuarto, Córdoba Province. Those who completed, and presented, research projects were certified.

✺ **Online Biosphere Protocol Training Course**: In November 2019, participants from Peru and Uruguay attended an online course focusing on biosphere protocols. The course was hosted by Master Trainer Andrea Ventoso and Master Trainer Claudia Caro. Online/Field Biosphere Protocol Training Course: In December 2019, participants from Peru and Uruguay attended an online training covering biosphere protocols conducted by Master Trainer Claudia Caro. After the online training, a field activity was held in Prado Park in Montevideo, Uruguay. Twenty-two teachers who had completed the online biosphere course attended the field practice.

✺ **Webinar—How to Organize a Virtual Science Fair:** In April 2020, 142 people from Argentina, Bahamas, Bermuda, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Peru, Paraguay, Puerto Rico, and Uruguay participated in a webinar hosted by the Dominican Republic Country Coordinator María Lorraine del Ruiz-Alma, Dr. Henry Clarke, Dr. Audry Belén, and Jessica Weird.

✺ **Webinar—How to Use GLOBE Data:** In May 2020, 132 people from Argentina, Chile, Colombia, Costa Rica, Ecuador, Paraguay, and Uruguay participated in a webinar hosted by Ana Prieto, Claudia Caro, and Marilé Colón Robles.

✺ **Webinar—How Do We Use GLOBE Protocols to Measure Air Pollution:** In May 2020, 72 people from Argentina, Bahamas, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Panama, Paraguay, Peru, Suriname, and Uruguay participated in a webinar hosted by María Lorraine del Ruiz-Alma.

✺ **Mosquito Workshops**: In May 2019 (Santa Fe, Argentina), October 2019 (Mendoza, Argentina and Santa Fe, Argentina), and November 2019 (La Plata, Colombia) Local Mosquito Workshops (LMWs) were conducted. During the workshop, participants learned about the GLOBE Zika Education and Prevention Project and then were trained on the use of the GO Mosquito Habitat Mapper app.

Community

A variety of community activities, meetings, and events occurred in various forms throughout the region, including:

✺ **Triple Frontier Country Mosquito Training (CMT):** In May 2019, the CMT was held in Leticia Amazonas, with students, teachers, community leaders, and public health officials from Brazil, Colombia, and Peru in attendance. Participants learned about the GLOBE Zika Education and Prevention Project and then were trained on the use of the GO Mosquito Habitat Mapper app.

✺ **Huechulafquen Science Club/Student Awards:** In July 2019, Argentine students were recognized with awards for their work on mosquitoes. During the event, three students presented their research paper on the GLOBE Zika Education and Prevention Project: "Distribution and Abundance of Mosquitoes in the World." This research received an award from The GLOBE Program and the U.S. State Department; and the students were able to travel to the 23rd Annual Meeting in Detroit, Michigan, USA.

Participants at a GLOBE workshop: Envigado, Columbia

✺ **Water Bodies IOP:** In September 2019, people from Argentina, Colombia, Paraguay, Peru, and Uruguay participated in the IOP, collecting data using GLOBE hydrosphere protocols.

✺ **Earth Day 2020:** In celebration of Earth Day 2020 and GLOBE's 25th Anniversary, the RCO engaged in various activities, including: inviting community members to join GIO´s live streaming IVSS drawing; inviting country coordinators and community members to upload greetings in the Padlet; sharing the GIO's video retrospective via email and social media; sharing ideas on how to celebrate Earth Day from home; promoting observations on clouds and trees; and hosting three webinars covering different topics related to GLOBE. All activities were also promoted on social media and through email and WhatsApp.

In addition:

- ✺ Brazil created a video (which was uploaded to Padlet);
- ✺ Chile created a video (which the RCO shared on social media and via WhatsApp);
- ✺ Dominican Republic held a virtual science fair throughout the week with Notre Dame schools students;
- ✺ Ecuador put together a PowToon (a video);
- ✺ Paraguay hosted a videoconference on "Earth as a System;" and
- ✺ Suriname organized "Grammy Winners: The Online Concert for a Healthy Planet" (which was streamed to community members).

NENA Regional Meeting 2019; Kuwait

Near East and North Africa

2019 Regional Meeting

In November, the 2019 Regional Meeting took place in Kuwait City, Kuwait. Participants from Bahrain, Jordan, Kuwait, Oman, Mauritania, and the United States attended the event. The meeting began at the dinner table, with a focus on training.

The meeting, which was attended by GIO Director Dr. Tony Murphy and staff from SSAI, included a workshop focusing on educational and environmental issues of significance to GLOBE partners in the region. The meeting also included a Train-the-Trainer workshop, which resulted in 12 people (from across the region) becoming certified trainers.

During the meeting, country coordinators presented on achievements in their countries during the previous year, as well as on goals for increasing the numbers of students and schools participating in the program. Training was conducted on atmosphere, hydrosphere, and pedosphere protocols.

School visit during the NENA Regional Meeting 2019; Kuwait

Topical Highlights from the Region

As always, the Regional Coordination Office (RCO) encouraged, supported, and hosted numerous events (meetings, trainings, activities, field studies, and research efforts) during 2019-2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

In October 2019, the Kingdom of Saudi Arabia hosted the GLOBE Environmental Program Applications and Research Project in the department of Al-Jouf Educational Zone; 120 middle school students participated, with learning focused on weather, temperature, and humidity, as well as theoretical and field work covering GLOBE hydrology and pedosphere protocols.

Education

For the 2019-2020 school year, Bahrain launched the "GLOBE Green March Campaign. In September 2019, 120 students participated in the associated "GLOBE Future Scientists Competition," learning how to collect data, prepare research, and participate in a "green" future. In December 2019, 135 high school students participated in a "GLOBE Green Walk," during which they focused on hydrology protocols. In February 2020, 110 middle and high school students participated in a science research workshop.

In 2019-2020, students from around the region were encouraged to participate in the 2020 GLOBE IVSS. With the support of teachers and scientists, students from Bahrain, Jordan, Kuwait, Oman, and Saudi Arabia submitted research reports. Students from Oman won at the regional level.

Community

On 07 April, the region held an online meeting for country coordinators. Dr. Budour Bouhji (Bahrain), Manal Alsah (Kuwait), Siham Salman (Lebanon), Nadira Alharthi and Ahmad Musa (Oman), Dr. Abdullah Althubaiti (Saudi Arabia), and Bahiah Alshihabi (United Arab Emirates) participated in the meeting, as well as Salma Alzubi, from the Regional Coordinator Office. Discussion points for the meeting included: achievements in the region during 2019-2020, the continuation of GLOBE during the pandemic, and activities to celebrate Earth Day 2020 and GLOBE's 25th Anniversary.

Specifically,

- **Bahrain:** Dr. Budour Bouhji reported that the Covid-19 challenge allowed the country to transform and improve in their online learning process in relation to The GLOBE Program. Forty-five teachers around Bahrain collaborated to provide online GLOBE protocol training for students in different schools. This step was taken to ensure the continuity of The GLOBE program in Bahrain. In addition, a collaboration with the University of Bahrain was established to help with the research projects. An initiative was launched to educate the public about the Coronavirus and The GLOBE program. A video was also produced in order to celebrate Earth Day (which was posted on the region's YouTube Channel).

Earth Day. Poster from Kuwait

NENA Regional Meeting 2019; Kuwait

✺ **Kuwait:** Manal Alsaleh reported on the impact of Covid-19 on the mental health of both students and parents. She assured everyone that the biggest concern is the health of students and teachers, and assistance is being offered virtually through home education platforms. Students are being directed to use The GLOBE Program in ways that help their communities—including the use of informational posters and videos. Students also used posters to celebrate Earth Day, for example the poster From Areej Jassim (p. 40).

✺ **Lebanon:** Siham Salman reported that the country is integrating The GLOBE Program with online activities. Attempts to find funding are taking place to increase these efforts, including discussions with the U.S. Embassy in Beirut.

✺ **Oman:** Nadira Alharthi and Ahmad Musa reported that all school activities had been brought to a halt due to concerns with Covid-19, and that there was no plan to have students return to school.

✺ **Saudi Arabia:** Dr. Abdullah Althubaiti reported that the pandemic has allowed for a major grant from the Saudi Government to transform traditional classroom education to an online endeavor. The Ministry of Education launched a Virtual Science Club, which hosted a competition covering artificial intelligence. The GLOBE Program website and GLOBE activities were added to the competition's website to encourage students to relate their projects to The GLOBE program.

✺ **United Arab Emirates (UAE):** Bahiah Alshihabi reported that the UAE educational process is being carried via online learning platforms. This was considered an opportunity to launch a Virtual Science Club. This platform has helped in teaching and distributing GLOBE activities to students in their homes. The program includes four stages: 1) informing new students and teachers about The GLOBE Program; 2) providing training on GLOBE protocols via the use of the website and mobile apps; 3) collaborating on GLOBE activities with other educational institutions in different countries; and 4) transforming small projects done by students into research papers and finding sponsors to fund their research. In addition, the Ministry of Education distributed more than 13,000 computers and internet routers to students to ensure that they had access to online learning.

To help celebrate Earth Day 2020 and The GLOBE Program's 25th Anniversary, students, teachers, and country coordinators from around the region entered messages, supportive comments, words of appreciation, photos, and GLOBE-related information to the Earth Day 2020 Padlet—viewed by GLOBE community members around the world.

Participants at the March 2019 NARM; Hampton, Virginia, USA.

North America

March 2019 North America Regional Meeting

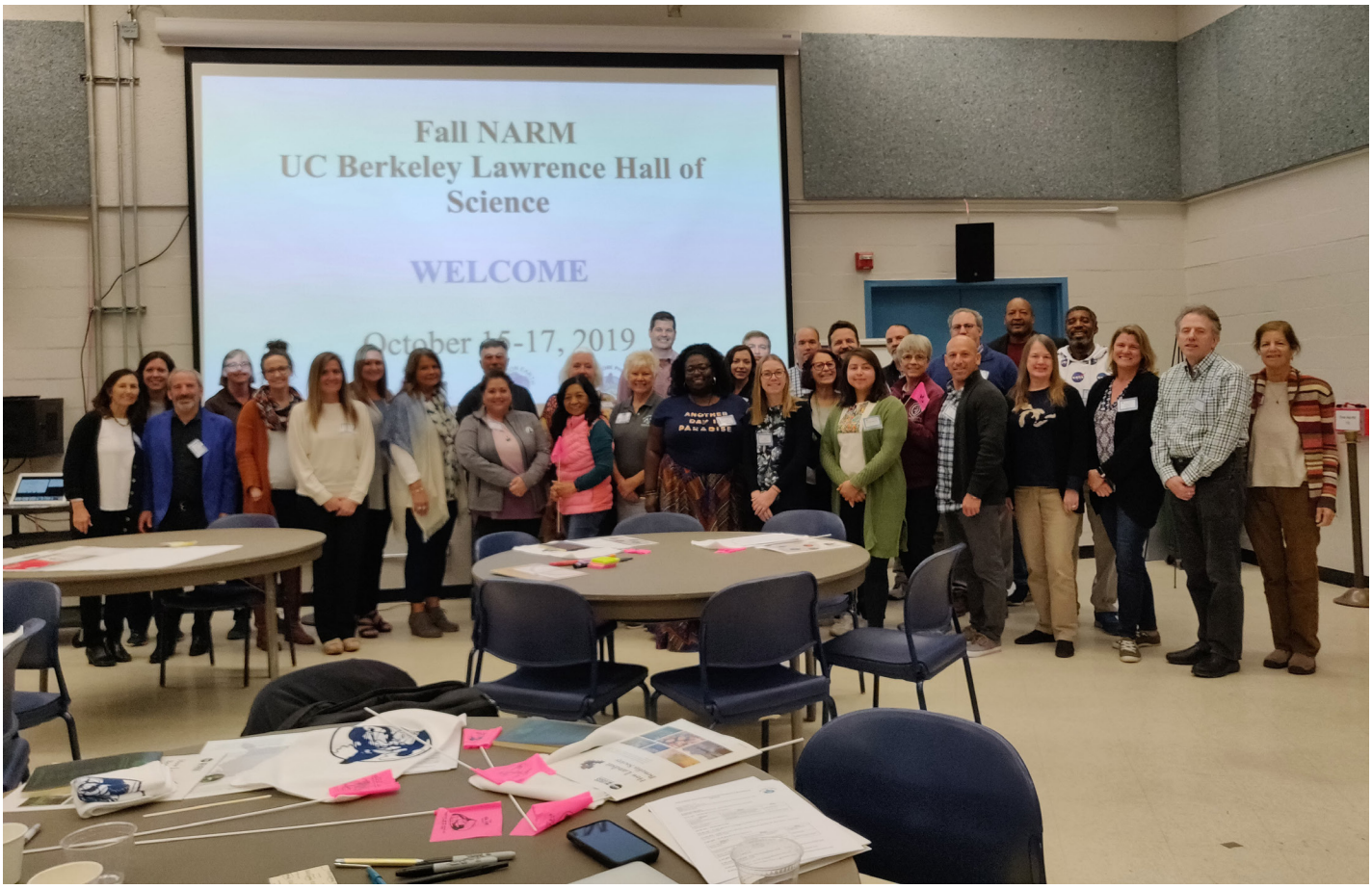
In March 2019, the NASA Langley Research Center Partnership hosted the North America Regional Meeting (NARM) and an Atmosphere Professional Learning Workshop in Hampton, Virginia, USA. The atmosphere workshop provided introductory information, as well as in-depth understanding of atmosphere concepts; specifically focusing on clouds and aerosols, and the relation to NASA's active Satellite Missions.

The NARM began with a welcome by Dave Young (Langley Director of Science), Allison Leidner (NASA Program Manager), and GIO Director Dr. Tony Murphy. The meeting was attended by approximately 59 people representing 23 partnerships, as well as the Canada Country Coordinator Kevin O'Connor, Jennifer Bourgeault (U.S. Country Coordinator), Dr. Tony Murphy, Jessica Taylor, and Cornell Lewis shared program updates.

October 2019 North America Regional Meeting

In October 2019, the WestEd/UC Berkeley GLOBE Partnership hosted the annual NARM at the University of California Berkeley's Lawrence Hall of Science. A total of 42 participants from over 30 U.S. GLOBE partnerships. GIO Director Dr. Tony Murphy, Canada Country Coordinator Kevin O'Connor, and the U.S. Country Coordinator Jen Bourgeault, also attended this three-day event.

The NARM opened with a welcome from the NASA Program Manager, Dr. Allison Leidner. The meeting included presentations, lightning talks, and keynote speakers. GLOBE partners presented on their GLOBE work, and the U.S. Partner Forum updated the community regarding upcoming goals for the year. Kevin O'Connor shared the great strides that have been made to expand the GLOBE network throughout Canada. Dr. Emily Schaller presented on a collaborative project with GLOBE students in the Philippines. Dr. Tony Murphy concluded the event with a "sneak peek" into 2020 regarding GLOBE's 25th Anniversary, new program initiatives, and planned Earth Day events.



Particpants at the October 2019 NARM; Berkeley, California, USA

Participants at the Midwest Student Research Symposium

Topical Highlights from the United States

As always, the United States GLOBE Office encouraged, supported, and hosted numerous events (meetings, training, activities, field studies, and research efforts) during 2019-2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Science

U.S. GLOBE joined an international Water Bodies IOP that took place 23-27 September 2019 in several GLOBE countries around the world. Thirteen schools participated in the event. The measurements collected at local water bodies included: Conductivity, Turbidity, Water Temperature, pH, Salinity, Nitrates, Alkalinity, Freshwater Macroinvertebrates, Dissolved Oxygen and Mosquitos.

Students participate in "GLOBEcaching" at the Northeast/Mid-Atlantic Student Research Symposium

The University of New Hampshire completed the final eTraining module of the GLOBE Carbon Cycle. The "Modeling" module was published to the GLOBE website, and the full set of protocols, including the data entry and visualization pieces, are ready for student input.

Education

During the spring of 2019, with support from a grant from NASA and Youth Learning As Citizen Environmental Scientists (YLACES), GLOBE students from across the United States participated in six face-to-face regional Student Research Symposia (SRS) to share the results of field investigations using GLOBE protocols.

At the 2019 SRS, 261 students presented a total of 114 GLOBE research projects to their peers and local scientists. These students, along with 66 GLOBE teachers, represented 26 different U.S. states/territories. States new to the SRS this year included Maine, Rhode Island, Virginia, and Washington. Forty-four schools uploaded their data to the GLOBE website (up from 13 last year!), and 33 SRS projects have been uploaded to Student Research Reports, under the new SRS tag. The 2020 SRS did not take place as scheduled due to Covid-19.

Community

PROFESSIONAL LEARNING COMMUNITY—PARTNERS

U.S. GLOBE partnerships formed a Professional Learning Community (PLC), and regularly present to one another virtually. The Zoom meetings, called "Watercoolers," are casual meet-ups where one or two presenters split the time. The Watercoolers are recorded for those who could not attend in person. Topics included:

Students present at the Southeast Student Research Symposium

- GLOBE Mission EARTH: Sharing Our Best Practices
- My NASA Data 2020
- IVSS 2020
- STEM Workforce Preparation within a GLOBE Context

PROFESSIONAL LEARNING COMMUNITY—TEACHERS

The U.S. GLOBE teacher network continued the Teacher Watercoolers to share how teachers use GLOBE with their students—and to provide support and encouragement for teachers. These Watercoolers were held once a month, with five meetings held during the 2019-2020 school year. The Watercoolers were recorded for those who could not attend in person. Watercooler presenters included:

- Elodie Bourbon (New York, USA) on preparing students for the SRS;
- Cornell Lewis (SSAI) on GLOBE data retrieval;
- Sesilynn Schleusner (Alaska, USA) on using GLOBE in the Alaska Boys & Girls Club;
- Jayme Margolin (Colorado, USA) on assisting students in the poster creation process; and
- David Overoye (SSAI) on using the GLOBE Visualization System.

Participants at the Pacific Student Research Symposium

YEARBOOK

The U.S. GLOBE Office created an annual Yearbook, with one page for each partnership, to share their annual GLOBE accomplishments. The final products are available as flip books on the United States webpage, and hard copies can be ordered for distribution at recruitment events and to interested organizations.

UNITED STATES REGIONAL NEWSLETTERS

The United States Partner Forum (USPF) members continued to work with the U.S. GLOBE Office to create seven versions of a regional newsletter (one for each region), plus a NASA-focused version by the NASA representative. This continued to be emailed quarterly to the GLOBE Partnerships in each of the geographic regions of the United States. Each newsletter featured one or more regional highlights and a "Partner of the Month" item. There was also a list of all upcoming regional workshops, as well as rotating sections (such as regional SRS news, GLOBE North America, GLOBE Worldwide or Tech Tips).

Topical Highlights from Canada

As always, the Canada GLOBE Office encouraged, supported, and hosted numerous events (meetings, training, activities, field studies, and research efforts) during 2019-2020. The items listed below are only to serve as "highlights" of the region's ongoing, dedicated, work!

Mount Royal University, Bachelor of Education Program (MRU-B.Ed), STEAM Semester

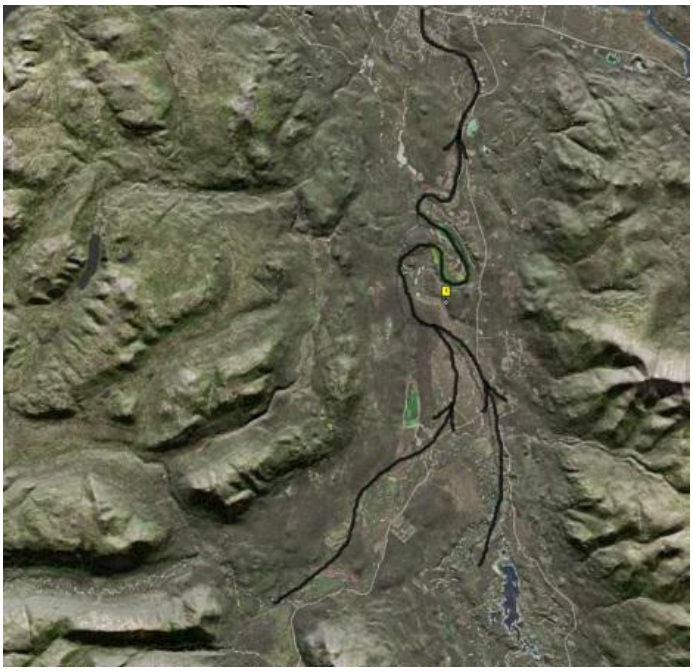
In 2019, focusing on theory and practice links, the MRU-B.Ed third year program continued to integrate STEAM (Science, Technology, Visual Arts, and Mathematics) field studies and training and inquiry-based projects using a place-based approach. This approach puts considerable onus on ecological field studies and longitudinal environmental assessments. Through a social-constructivist lens, in-school seminars (integrated weekly within a five-week practicum) involving cohorts of 8-12 teacher candidates from four partner schools were facilitated by teacher educators. The goal was to develop a sense of community and to support teacher candidates to reflect upon their teaching and develop responsive educational practices and adaptive expertise.

Through their relationships with Indigenous communities, the team of educators had a deeply held conviction that sustained deliberations on the connections between Indigenous knowledge systems and place-based thinking can provide significant opportunities for reframing education. The team partnered with Kainai and Siksika First Nations, Stoney-Nakoda First Nation, Ann and Sandy Cross Conservation Area (ASCCA), Tim Horton Children's Foundation (THCF), and Telus Spark Science Centre. All of these entities are engaged in common interests in education and hold an intent to enhance and deepen relationships by fostering new research-related integrated partnership activities. The community partners served as a key to the success of the third-year place-based STEAM semester.

Experiential Science

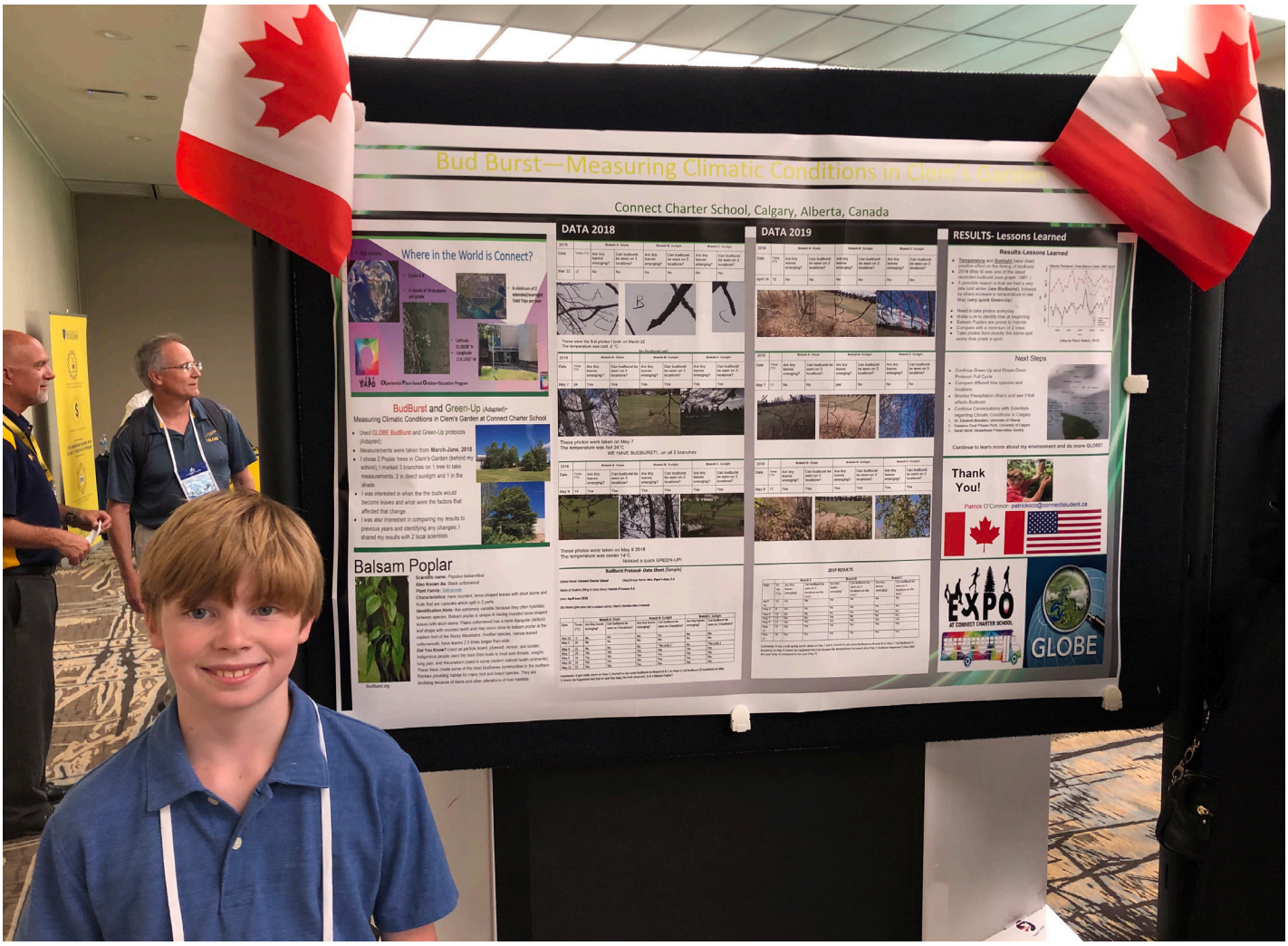
The Experiential Science (ES) Grades 9-11 programs were created as a pilot in 1994, and robustly continued in 2019-2020 as a territorial education model. The ES programs are Yukon Territory public school programs open to grade 9-11 students. Rural and Indigenous students from a wide range of schools choose to take part in the program. Students spend 35-45 days of a 93-day semester conducting field studies related to community issues and strategically connected to integrated curriculum science-related studies, such as the Cowley Lake Field Study.

Cowley Lake Field Study: This ES field study continued to focus on Cowley Lake in the Yukon Territory. The project began as a response to a community request and, over time, morphed into many different educational field studies. Initially, the Hamlet of Mount Lorne Local Advisory Council approached the ES-11 class with a local concern and a request for the class to undertake a series of studies that would help the community understand what was happening to Cowley Lake. The class began with discussions with community members, then turned to discussions with geologists, ecologists, and historians. This project represented a collaboration between ES11, the Cowley Lake neighborhood, the Mount Lorne Hamlet Council community, University of Alberta, and Yukon College. The university participants provided training and extension education to groups of northern high school students who were, in turn, addressing issues of community concern. Project funding came from the International Polar Year and has involved about 400 students over the course of the studies.



Deglaciation drainage pattern Photo courtesy of Bob Sharp

Students who participated in the project used a variety of research methods. These included discussions with community members and a review of records related to human impacts on the lake over the past 120 years. Following that, paleolimnology studies provided insights into past environments and historical lake levels. Studies related to the water balance of Cowley Lake involved four aspects: 1) mapping and measuring of the inflows and outflows of Cowley Lake; 2) conducting a bathymetric mapping of the lake; 3) taking systematic measurements of lake levels on both sides of the rail line; and 4) mapping possible changes to the inflow and outflow streams. Studies related to the water quality of Cowley Lake involved four-season sampling related to water chemistry, including pH, DO, conductivity and turbidity, and summer and winter analysis of aquatic invertebrate populations. Many of these studies involved the use of GPS to identify specific locations and to map many of the field studies. Currently, Cowley Lake studies carry on, building on the work of former students. An understanding of spatial and social contexts of place are central to this study. Three groups of ES11 students have made presentations to



Canadian student, Patrick O'Connor, at the 2019 GLOBE Annual Meeting; Detroit, Michigan, USA

community members and to residents who live along Cowley Lake. These case studies speak to how students value their understanding of this place from both a spatial and societal perspective and how these educational studies actively contribute to community understanding of place and space. Both GPS and GIS have contributed to the understanding of place. Many features of the students' studies have remained with them as general principles that have been applied to other situations. This capacity to reapply principles they have internalized describes the resilience educators seek and ultimately which rural community members can benefit from due to an increased participation in the research project and sharing of data and results back with the community.

Website Creation and Design

GLOBE Canada has begun work on a new national website designed to help schools become increasingly involved in their community by participating in experiential activities that support GLOBE-related community interests. GLOBE Canada has begun including a number of examples to inspire and help teachers and students undertake their own activities. Currently, the website provides numerous resources, and over 180 examples of place-based activities to help teachers and students develop their own GLOBE-related activities.

Student Research Projects at GLOBE Annual Meeting in Detroit, Michigan, USA

Canadian students attended GLOBE's 23rd Annual Meeting, which was held in Detroit, Michigan, USA, in July 2019. The students participated in the Student Experience, along with students from across the world and they all stayed at Howell Nature Center during the event.

Thanks to our GLOBE partners around the world.

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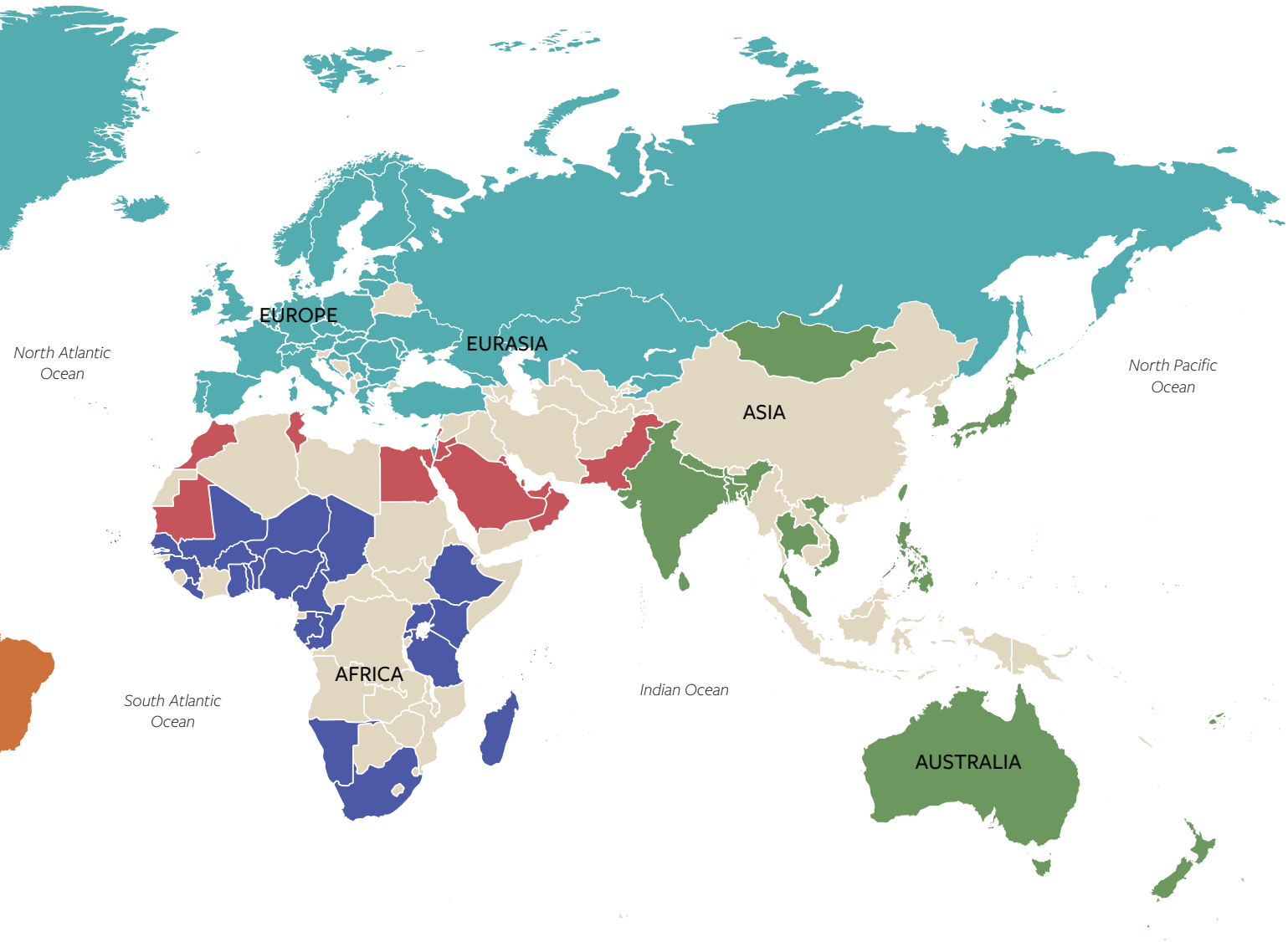

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