National Aeronautics and
Space Administration

2022 | NASA SCIENCE ACTIVATION

IMPACT REPORT

https://science.nasa.gov/learners

Image Credits

Front and back cover:

- These maps show locations where the Science Activation program conducted learning interactions for learners of all ages.
- Photos highlight some of the range of activities conducted.

Front cover photos:

- *Photo top right:* Mission Earth
- *Photo bottom right:* NESEC
- *Photo bottom left:* NASA's Neurodiversity Network

Back cover photos:

- *Photo top left:* Arctic SIGNs
- *Photo top right:* AREN
- *Photo bottom:* LENE

* *See pages 12–13 to learn more about each Science Activation Team.*

A group of happy young children holding up paper rockets and NASA stickers in their hands.

Reach Map Legend *(front and back cover)*

Science Activation Teams

- AAA—The Airborne Astronomy Ambassadors
- ACA—American Camp Association
- ACCP—ASTRO CAMP® Community Partners Program
- AMNH—American Museum of Natural History OpenSpace
- AREN—The AEROKATS and ROVER Education Network
- ASU Infiniscope
- Challenger Center
- ES:CSP—Eclipse Soundscapes: Citizen Science Project
- GME—GLOBE Mission EARTH
- GMRI—Gulf of Maine Research Institute
- N3—NASA's Neurodiversity Network
- NASA AstroMaterials
- NASA@ My Library
- NASA eClips
- NASA HEAT—NASA Heliophysics Education Activation Team
- NASA Solar System Treks
- NASA's Universe of Learning
- Native Earth Native Sky
- NCCN—NASA Community College Network
- NESEC—The NASA Earth Science Education Collaboration
- NESSP—Northwest Earth and Space Sciences Pipeline
- PLANETS—Planetary Learning that Advances the Nexus of Engineering, Technology, and Science
- Reaching for the Stars: NASA Science for Girl Scouts
- SaSa—Student Airborne Science Activation
- SciActSTEMecosystems
- SEES—STEM Enhancement in Earth Science
- SEISE NISE
- SIGNs—Arctic and Earth STEM Integrated GLOBE and NASA
- SMSC—The Smoky Mountains STEM Collaborative
- SSA—Solar System Ambassadors

DASHBOARD

WE COLLABORATE

48

TEAMS

A cooperative network of competitively selected teams and NASA infrastructure activities across the Nation connects NASA science experts, content, and experiences with communities to activate minds and deepen understanding of our world and beyond.

WE LEVERAGE

525

PARTNERS

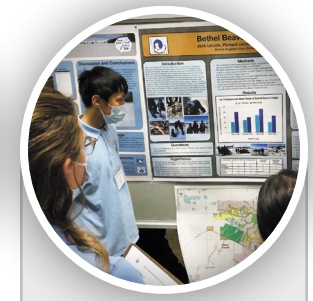
We extend our reach through strategic partnerships with community-based and audience-based organizations to support institutional, state, and local efforts. These partnerships have more than doubled since 2016.

WE CONNECT

745

SCIENTISTS INVOLVED

NASA and NASA-funded scientists work with Science Activation behind the scenes and directly with learners to share the story, the science, and the adventure of NASA science. The number of scientists involved has increased 50% since 2016.



WE INNOVATE

110

PAPERS PUBLISHED

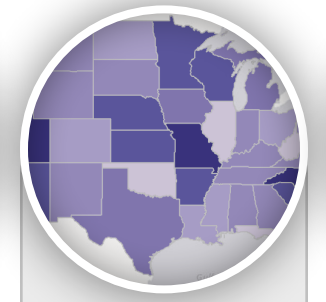
Our teams use evidence-based solutions to reach and motivate learners of all ages and document those solutions so that others can benefit. Our work has been cited more than 690 times to date.

WE ENGAGE

50+ M

LEARNER INTERACTIONS

In 2022, Science Activation teams facilitated more than 50 million learner interactions in the United States and 1/4 million across the globe. This more than doubles the level of interaction reported in 2021.

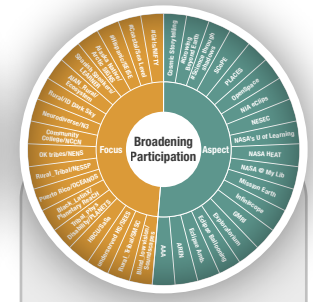


WE REACH

55

STATES & TERRITORIES

The SciAct program reached learners in all 50 states, DC, Puerto Rico, Guam, the Northern Marianas, the Virgin Islands, and 153 countries in 2022. Explore our network in our interactive Reach Map.



WE EMPOWER

100%

COMMUNITIES

More than half of SciAct teams focus on broadening participation of underserved communities. All competitively selected teams support underrepresented groups.

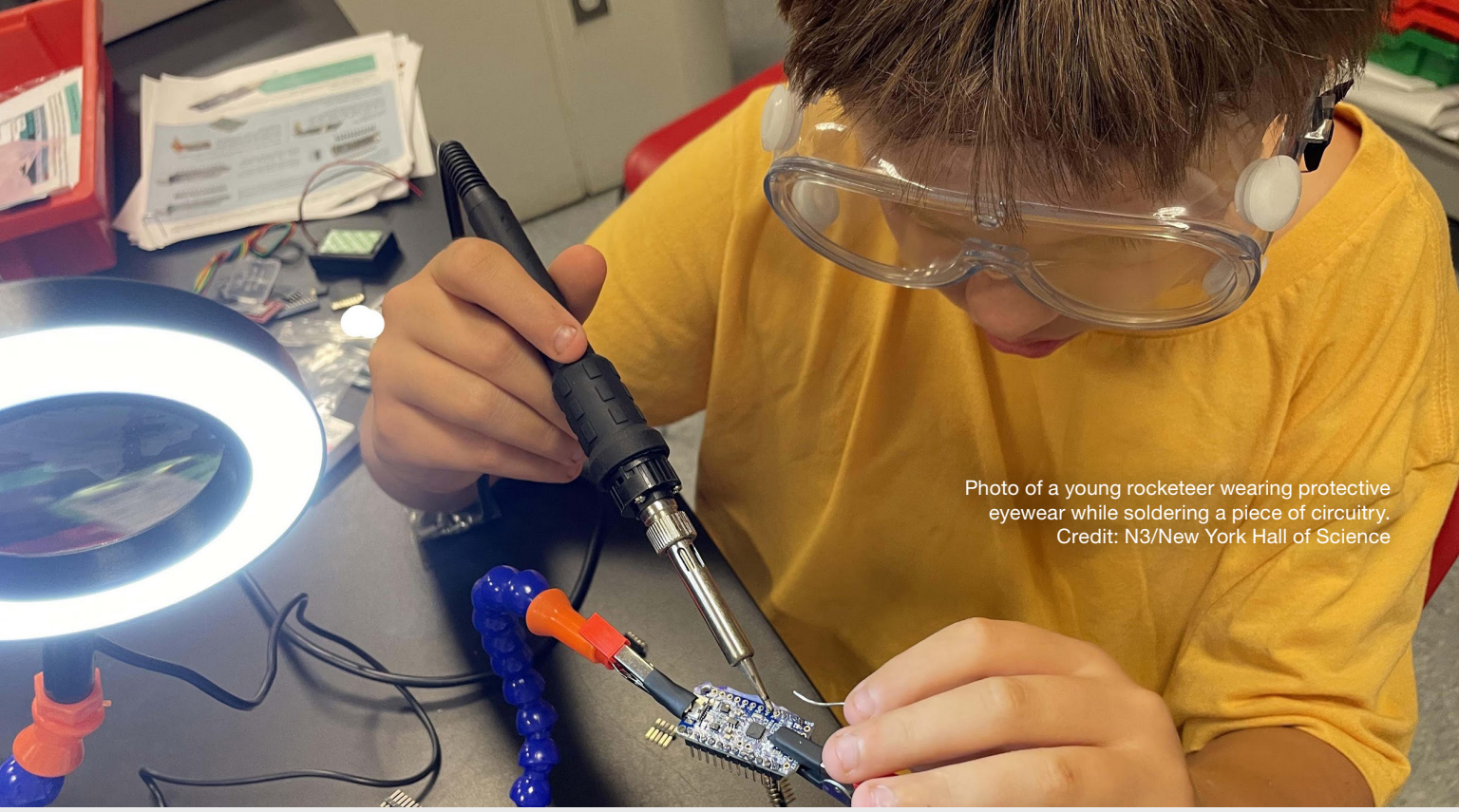


Photo of a young rocketeer wearing protective eyewear while soldering a piece of circuitry. Credit: N3/New York Hall of Science

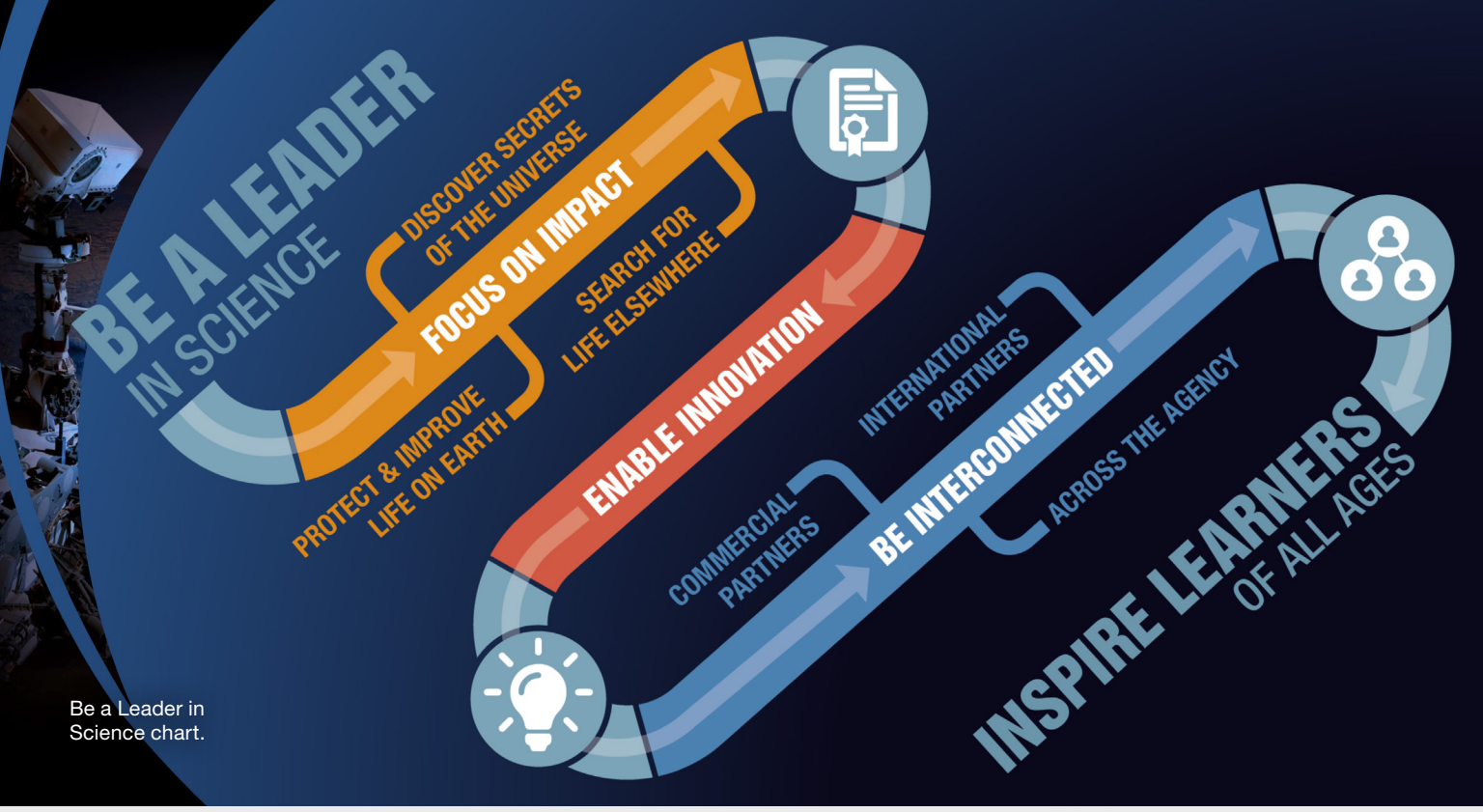
INTRODUCTION

The NASA Science Mission Directorate (SMD) Science Activation (SciAct) program connects NASA Science with diverse learners of all ages in ways that activate their minds and promote a deeper understanding of our world and beyond, with the ultimate Vision:

> To increase learners' active participation in the advancement of human knowledge.

This report summarizes the SciAct program approach, provides a snapshot of the program's 2022 impacts, and illustrates how this $50 million program creates impact and value that far exceed its annual expenditures, improving coordination across NASA Science Mission activities and allowing for the increasingly efficient, effective, and sustainable use of SMD Science discoveries and experts for engaging learners.

CONTENTS



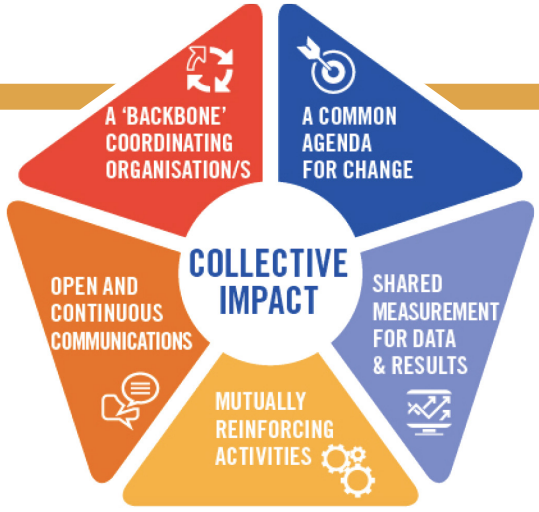
Be a Leader in Science chart.

THE SCIENCE ACTIVATION PROGRAM

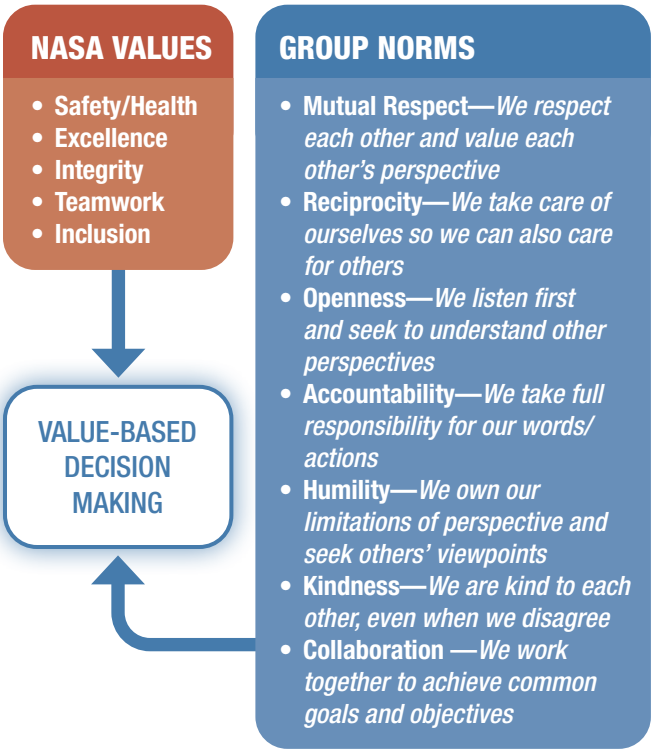
We Connect

A Collective Impact Approach

There are many organizations and programs that aim to inspire a passion for STEM in learners, with the hope that they will eventually pursue future careers in science and technology, but according to research conducted by Kania and Kramer (2011), a single institution is rarely capable of single-handedly facilitating the entire pathway from learning to career opportunities. However, coordinating across many organizations using a "collective impact" approach can help interlink individual programs in a way that is more likely to create pathways to opportunities for learners.



From "Using a Collective Impact Approach to Support Youth Pathways in Technology," A Case Example by Rafi Santo, New York University (2019). https://digitallearningpractices.org/resource/using-a-collective-impact-approach-to-support-youth-pathways-in-technology/



SciAct models value-based decision making. This has been critical to success in adapting to community needs during the 2017 Total Solar Eclipse, pandemic, and other events.

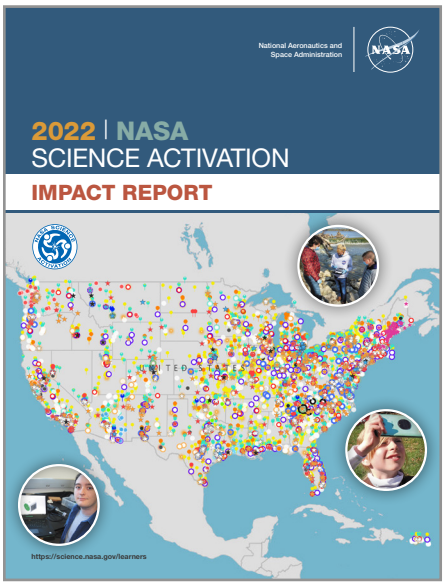
Since its inception in 2016, the SciAct program has adopted this kind of collective-impact, network-of-networks approach. SciAct serves as the "backbone organization" that supports, leads, and coordinates collaboration across a cooperative, nationwide network of competitively selected teams. These teams, made up of community-based learning providers, educators, and experts, uphold a shared set of NASA values and SciAct group norms as they work together to connect diverse learners of all ages with NASA Science experts, exciting NASA content, and authentic science experiences. It is through value-based decision making and community building, intentional and independent evaluation, efficient coordination of mutually reinforcing activities, and open and continuous communication that SciAct helps create learner pathways to STEM careers.

In 2022, the SciAct community was back in person for their Annual Meeting for the first time since 2019. It was a great blend of new faces and established relationships as over 200 team members gathered—both in person and virtually—for a week of renewing collaborations and deepening the portfolio-wide commitment to positively impacting learners through NASA science. See the Appendix for Key Findings from the Annual Meeting Evaluation.

The SciAct community gathered for the first in-person convening since the pandemic began.

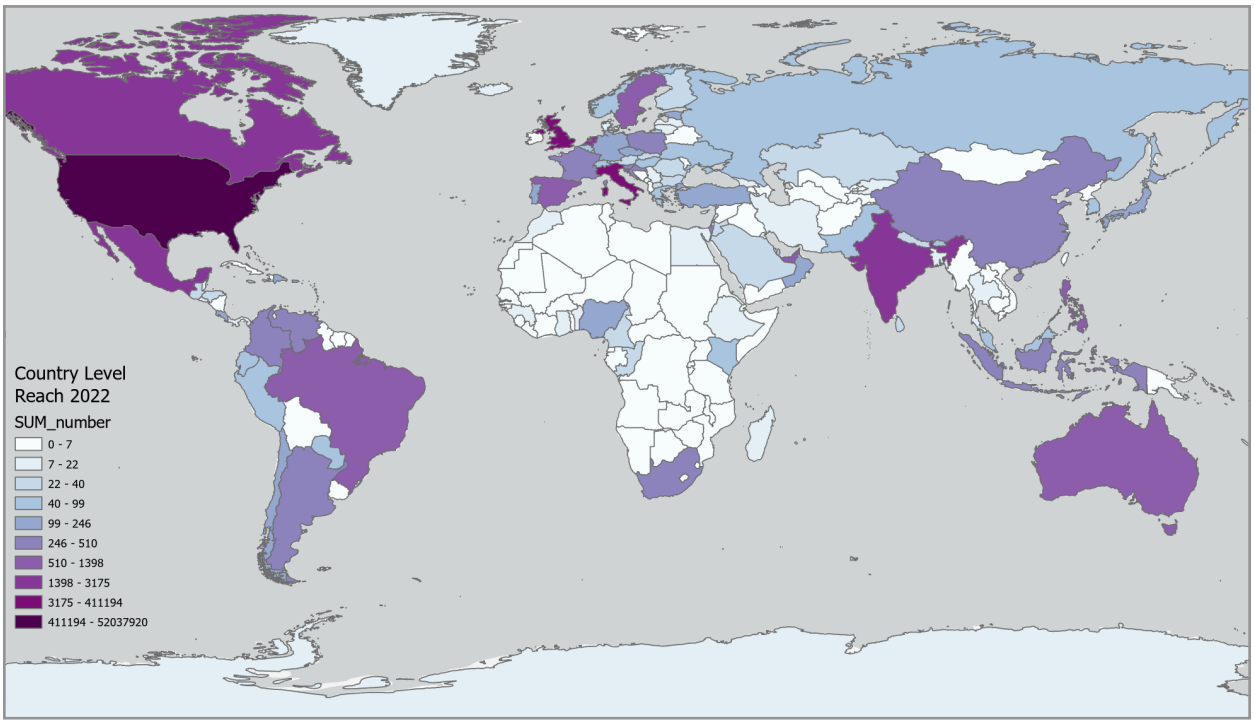
We Reach and Engage

Learners Across the Nation and Beyond



As shown in the reach map on the cover, the Science Activation project teams reach and engage learners in all 50 states; Washington, DC; Puerto Rico; Guam; the Northern Marianas; and the Virgin Islands. In 2022, SciAct facilitated more than 50 million learner interactions in the United States and ~1/4 million abroad.

The program is now working to bolster its already impressive reach and engagement successes through enhanced communications and social media strategies for leveraging NASA's extensive communications and outreach networks. As one example, the SciAct communications and project teams collaborated to compile and organize a wealth of back-to-school resources for teachers in August 2022. That single campaign reached over 1.6 million followers across multiple communications platforms.



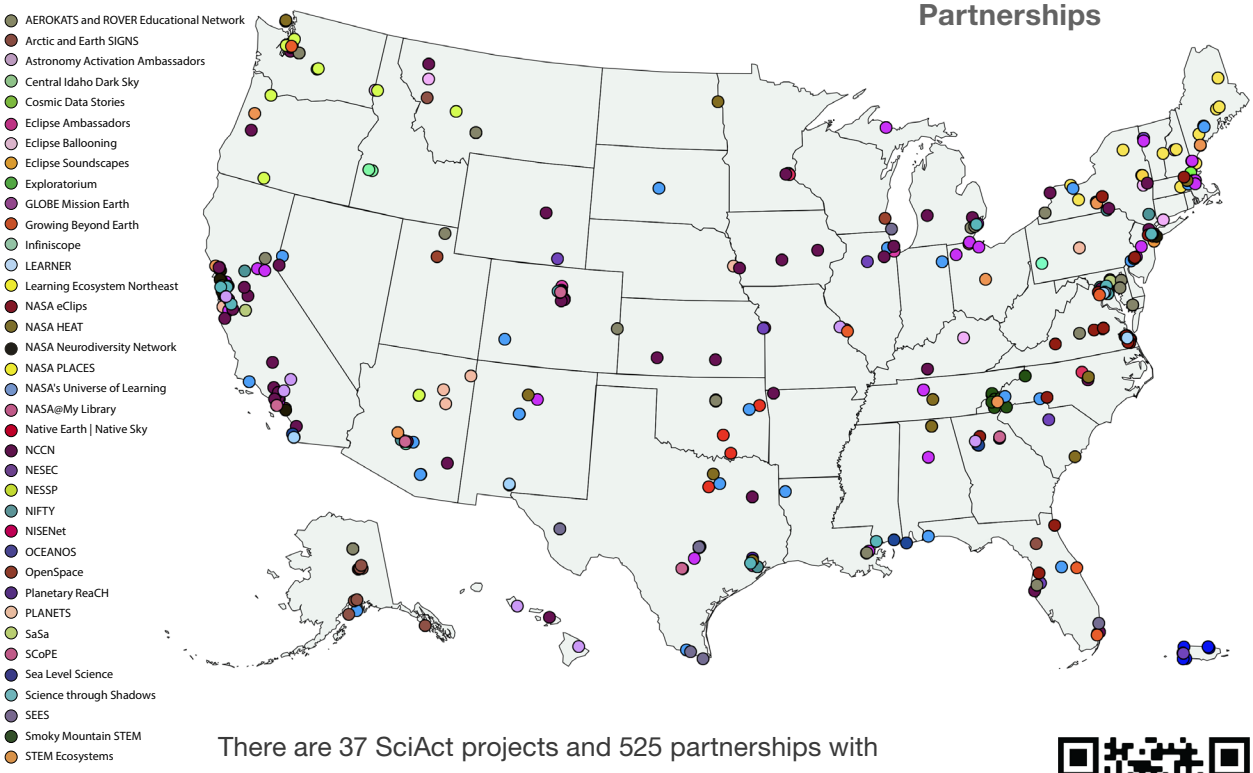
2022 Reach Map by Country.

We Leverage
525 Partners

SciAct achieves its impressive reach and engagement goals in two primary ways. First, project teams engage in strategic partnerships with community-based and audience-based organizations outside the SciAct program to support existing institutional, state, and local efforts. Leveraging partnerships and collaborating both internally and externally amplifies SciAct's impact for learners across the Nation and allows connections in all 50 states, as shown in the partner map below. Each awardee selects and develops those relationships that help them best achieve their objectives and meet the needs of diverse learners. Since the beginning of the SciAct program in 2016, these partnerships have more than doubled, with the teams having worked with 525 active external partners in 2022.

Leverage Through Partnerships

SciAct Leverages
525
Partnerships



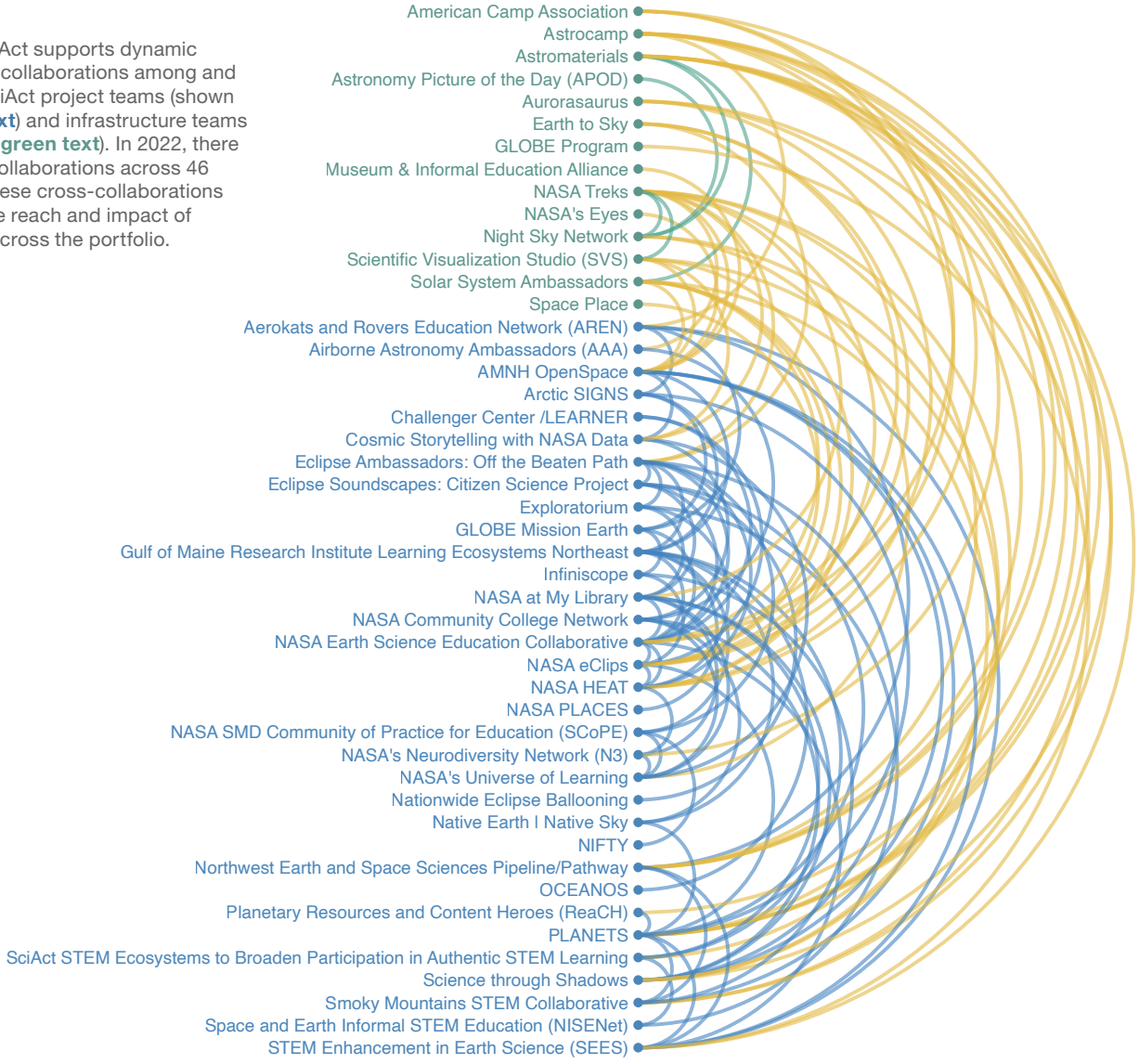
There are 37 SciAct projects and 525 partnerships with organizations represented on this map. Each project and its partners share a color.

Explore our Interactive Partner Map.

The SciAct program efficiently extends its reach through strategic partnerships with community-based and audience-focused organizations that support institutional, state, and local efforts.

In addition, the program leverages partnerships and cross-collaborations within the program to ensure project teams benefit from each other's assets and expertise as well as those of existing NASA infrastructure teams. This reduces any duplication of effort and promotes efficiency while putting great minds together to accomplish shared goals.

NASA SciAct supports dynamic and deep collaborations among and across SciAct project teams (shown in **blue text**) and infrastructure teams (shown in **green text**). In 2022, there were 99 collaborations across 46 teams. These cross-collaborations extend the reach and impact of projects across the portfolio.



https://science.nasa.gov/learners/leverage

We Inspire
Learners and Scientists

NASA and NASA-funded scientists work with Science Activation, both behind the scenes and interacting directly with learners, to share the story and adventure behind NASA Science. Throughout 2022, more than 745 subject matter experts participated in and helped produce accurate, compelling, and innovative Science Activation events and products—giving learners the opportunity to learn from and work hand-in-hand with real scientists in inspiring and engaging ways.

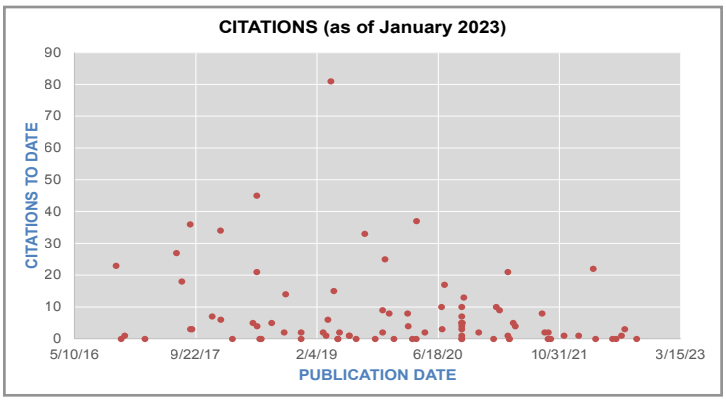
SciAct leverages major NASA Science events such as the first images from the James Webb Space Telescope, as well as key discipline priorities. For example, SciAct's citizen science efforts increased in 2022, and a number of teams also focused on climate-related topics of interest to their local and regional communities. In 2023, we plan to leverage the OSIRIS-REx sample return on September 24, the annular solar eclipse on October 14, and the launch of the TEMPO air-quality mission, among other inspiring NASA content that can engage learners of all ages in the advancement of science.

Participants work on the concept of stellar spectra.

We Innovate

Evidence-Based Learning Solutions

Since SciAct began, our teams have reported 110 peer-reviewed publications documenting evidence-based solutions for reaching and motivating learners of all ages so that others can benefit from our lessons learned. To date, these publications have been cited at least 690 times, and the portfolio has an h-index of 15.



To explore the range of SciAct peer-reviewed publications, visit *https://science.nasa.gov/learners/publications*.

In 2022, the portfolio evaluation team began working with the project independent evaluators, who conduct ongoing evidence collection to confirm evidence-based practices, to converge on some common measures of impact that could be used consistently across multiple projects.

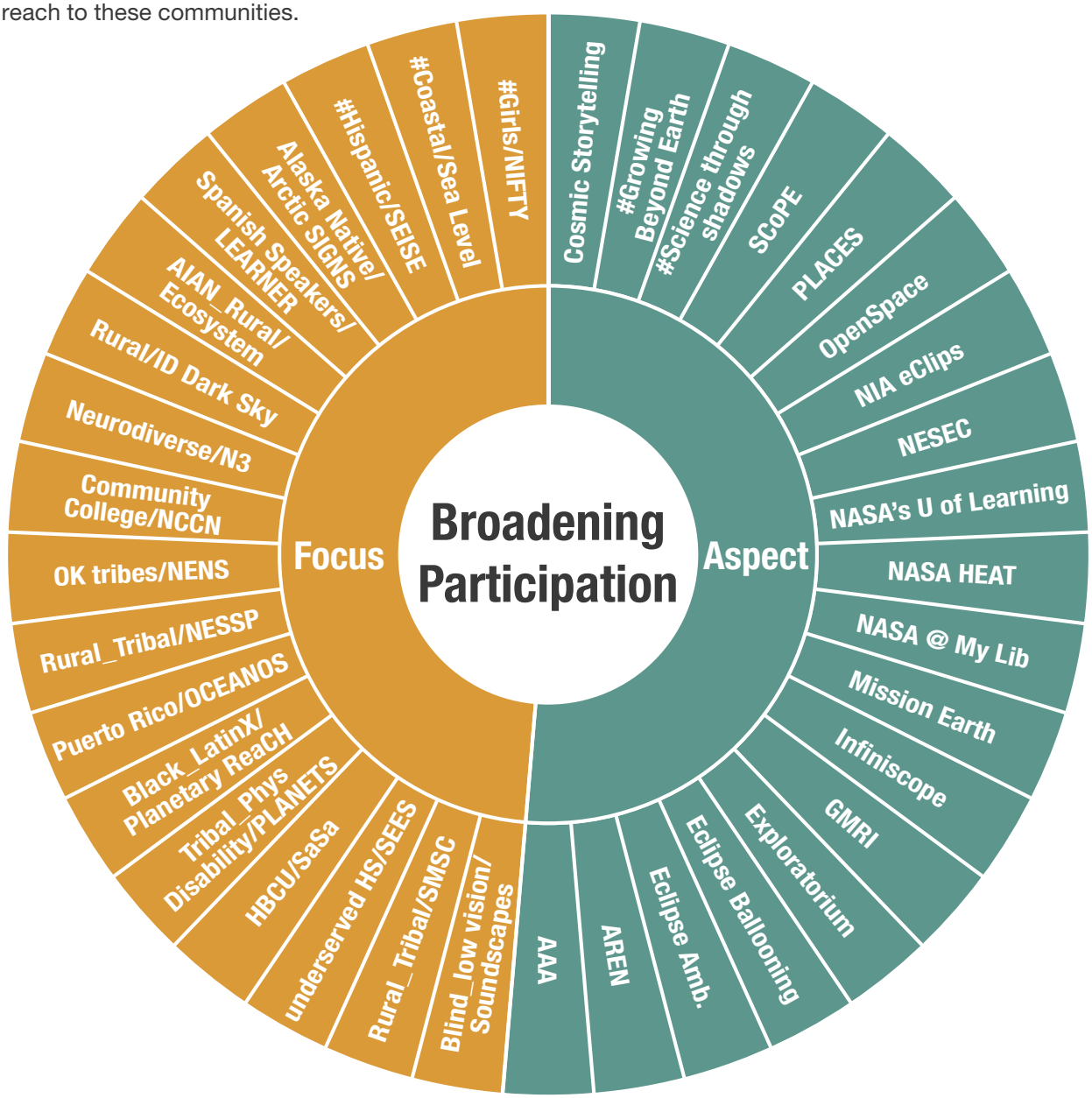
We Empower

Broadening Participation

Diversity, equity, inclusion, and accessibility (DEIA) are critical values that underscore SciAct's commitment to broadening participation. With over half of its portfolio focused directly on broadening participation as its primary goal (and the other projects attending to aspects of Broadening Participation), SciAct supports NASA's 2020–24 Vision for Scientific Excellence Priority 4 Strategy to "increase the diversity of thought and backgrounds represented across the entire Science Mission Directorate portfolio through a more inclusive environment."

The entire SciAct portfolio aims to better serve groups historically underrepresented in STEM fields by delivering activities and experiences to learners of many backgrounds and leveraging scientist-educator partnerships that demonstrate diverse, broad, and deep national education and communications impacts. SciAct is bringing new learners into the process of science via projects and activities specifically designed to support multilingual, indigenous, rural, immigrant, disabled, and other disadvantaged, underserved, and underrepresented communities, which also closely aligns with our national agenda for STEM education in its priority to increase diversity, equity, and inclusion in STEM.

We also leverage the SMD attendance at targeted meetings and conferences to further enhance our reach to these communities.



Since the start of 2021, more than half of SciAct teams have focused their efforts on broadening participation by underserved communities. The rest of the SciAct portfolio incorporates broadening participation in some aspects of their work while otherwise focusing on science content or broader audience segments. Projects marked with # were new in mid-2022.

THANK YOU

We hope you have enjoyed this brief snapshot of the Science Activation program and its 2022 Impacts. It is our hope to provide every lifelong learner, student, and educator with the opportunity to not only experience the excitement of scientific discovery, but to become active participants in the advancement of knowledge well into the future. Keep up with our ongoing activities and explore Science Activation resources on our website. *https://science.nasa.gov/learners*

Leadership Team

Kristen Erickson
DIRECTOR

Dr. Lin Chambers
DEPUTY DIRECTOR

Dr. Selene Willis
EINSTEIN EDUCATOR FELLOW

Dr. Rachel Connolly
SYSTEMS INTEGRATION AND ANALYSIS LEAD

Kim Holloway
PROJECT COORDINATOR

Luke Henke
EINSTEIN EDUCATOR FELLOW

Matt Pearce
OSTEM DETAILEE

Michael Guarraia
EINSTEIN EDUCATOR FELLOW

Tahira Allen
COMMUNICATIONS LEAD

Bea Underwood
ADMINISTRATIVE OFFICER

Science Division Leads

Dr. Hashima Hasan
ASTROPHYSICS

Dr. Lisa Carnell
BIOLOGICAL AND PHYSICAL SCIENCES

Dr. Tahani Amer
EARTH SCIENCE FLIGHT

Dr. Trena Ferrell
EARTH SCIENCE SCIACT

Dr. Barry Lefer
EARTH SCIENCE RESEARCH AND ANALYSIS

Dr. Allison Leidner
EARTH SCIENCE GLOBE

Dr. Nancy Searby
EARTH SCIENCE APPLIED SCIENCES

Dr. Kelly Korreck
HELIOPHYSICS

Dr. Michael Kelley
PLANETARY SCIENCE

THE SCIENCE ACTIVATION PROJECT TEAMS

In 2022, 10 new projects were added through competition in the ROSES-21 solicitation, denoted with an asterisk in the table below. Learn more about each Science Activation Project Team via the following compilation of recent 2022 two-page snapshots.

PROJECT NAME	NASA SCIENCE MISSION DIRECTORATE DIVISION SUPPORTED	PAGE
NASA's Universe of Learning	Astrophysics	54
NASA's Neurodiversity Network (N3)	Cross-cutting	56
NASA@ My Library	Cross-cutting	58
*Nationwide Eclipse Ballooning Project (NEBP)	Cross-cutting	60
Native Earth | Native Sky (NENS)	Cross-cutting	62
Navigating the Path of Totality	Heliophysics	64
Northwest Earth & Space Sciences Pathway (NESSP)	Cross-cutting	66
*Ocean Community Engagement and Awareness Using NASA Observations and Science for Hispanic/Latino Students (OCEANOS)	Earth Science	68
*Place-Based Learning to Advance Connections, Education, and Stewardship (PLACES)	Earth Science	70
Planetary Learning that Advances the Nexus of Engineering, Technology, and Science (PLANETS)	Planetary Science	72
Planetary Resources And Content Heroes (ReaCH)	Planetary Science	74
SciAct STEM Ecosystems	Cross-cutting	76
*Science Through Shadows	Heliophysics	78
*Sea Level Education, Awareness, and Literacy	Earth Science	80
Smoky Mountains STEM Collaborative (SMSC)	Cross-cutting	82
STEM Enhancement in Earth Science (SEES)	Earth Science	84
Student Airborne Science Activation (SaSa)	Earth Science	86

* Indicates new Science Activation Project Team

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

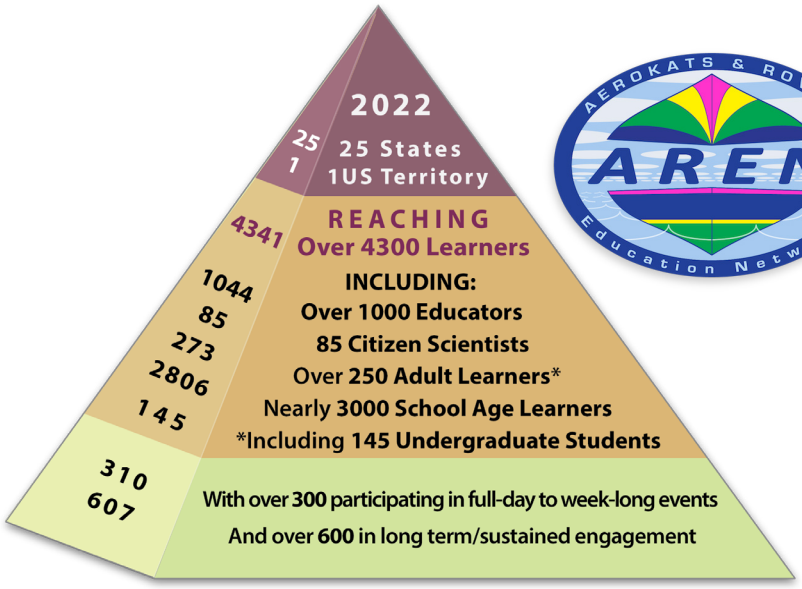
AEROKATS and ROVER Education Network (AREN)

PI: Paul "Andy" Henry
INSTITUTION: Wayne RESA

AUDIENCE AGES
3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

AREN introduces learners to novel NASA technologies, science, and operations concepts. Kite-borne Aeropods are used to gather local-scale remote sensing and in situ atmospheric measurements. Instrumented remote-controlled AquaROVERs and TerraROVERs are used to investigate water quality and terrestrial surfaces.



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quotes

"Feedback at the end of the year was, 'Keep doing it. It was the most fun out of all the activities that we did.' They really enjoyed the hands-on feature of it. Where a lot of time in astronomy you're looking at stars, you're looking at phenomena you can't really touch or experience other than just looking at a model, this was actually getting real data from our own planet." —Teacher

"It is awesome. It is a good program, and I wish more teachers had the opportunity to participate...and I think it is very beneficial to the students to participate." —Teacher

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://sites.resa.net/aerokats

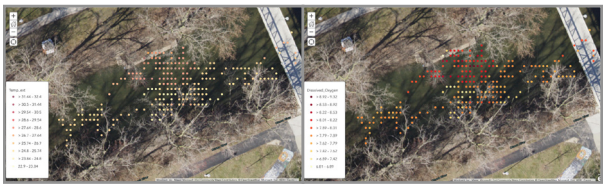
Key 2022 Accomplishments

- Summer Institute for Remote Sensing and TerraROVER Workshop—virtual, hands-on training for middle/high school educators.
- Several events by team members ranging from a multi-week high school summer program, to deliberately inclusive community activities, to formal infusion in undergraduate institutions.
- Enhanced trainings within the GLOBE community, as well deeper collaboration with other SciAct teams such as GLOBE Mission Earth.
- Significant production and dissemination of Aeropods and TerraROVERs and introduction of new MiniCams.

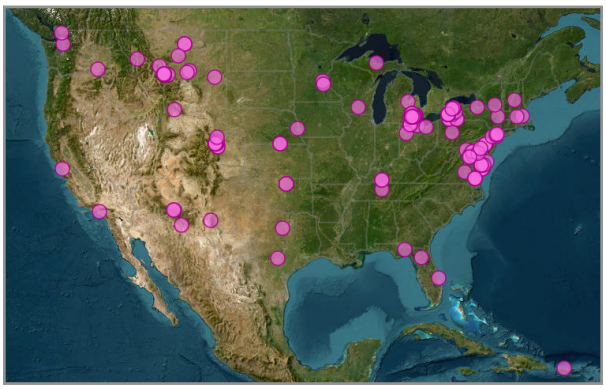
Key Partners Active in 2022

SciAct Collaborations Active in 2022

- GLOBE
- Mission Earth
- NW Earth and Space Sciences Pipeline (NESSP)



AquaROVER Water Temperature & Dissolved Oxygen.

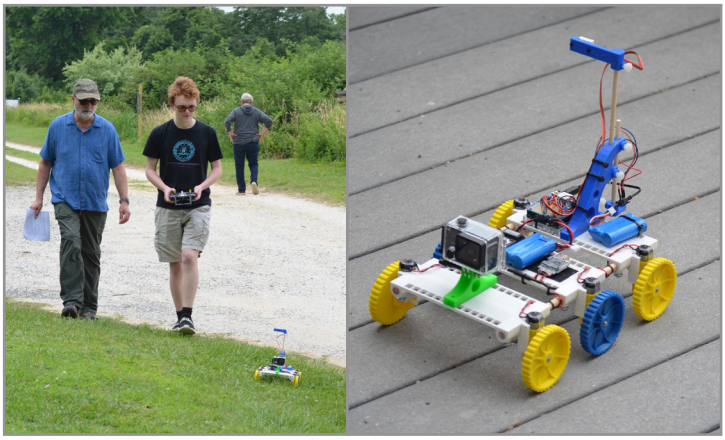


AREN 2022 Project Reach Map.

External Collaborations Active in 2022

- Wayne Westland School District (MI)
- Wayne RESA Maker/STEM collaboration with Community Television Network (CTN), and MiSTEM Regional Network (MI)
- Eastern Michigan University, Geospatial Technology Talent Consortium (MI
- Gibraltar Public Schools (MI)
- MAVEN Group/Westwood Schools (MI)
- BOREALIS, Montana Space Grant Consortium (MT)
- American Kitefliers Assoc. (AKA)
- AmericaView
- Rouge Education Project (MI)
- Great Winds Kites (WA)
- Into The Wind (CO)
- Brave Hearts (VA)
- Prince George's County Public Schools (MD)
- Aeronautics Engineering Aviation Technology Program (MA)
- National Baltimore Aquarium Conservation Education Program (MD)
- SABENS Group (NH)

MiniCam Aeropod.



TerraROVER.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Airborne Astronomy Ambassadors (AAA)

PI: Dr. Dana E. Backman

INSTITUTION: SETI Institute, Mountain View, CA

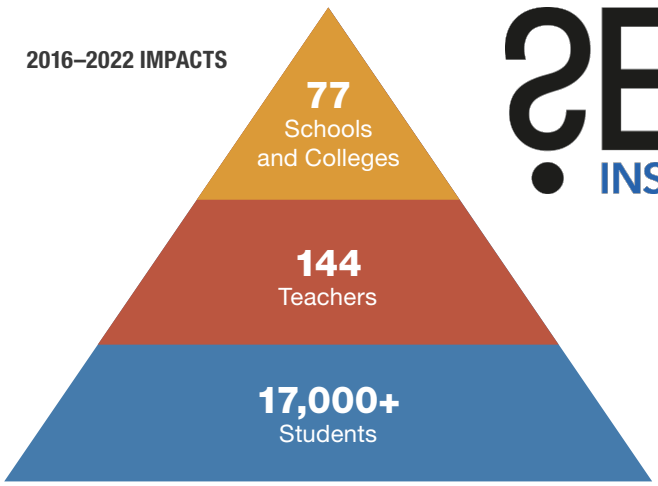
AUDIENCE AGES

10-75

10–12
13–15
16–17
18–22
23–29
30–75

The Airborne Astronomy Ambassadors (AAA) project aims to measurably enhance student STEM learning and engagement in selected schools and districts via professional development for middle school, high school, and community college science teachers, including (1) training in astrophysics and planetary science content and pedagogy and (2) week-long STEM immersion experiences at NASA astronomy research facilities such as SOFIA or the Infrared Telescope Facility (IRTF).

2016–2022 IMPACTS



SETI INSTITUTE

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Audience Quote

"My AAA experience has completely changed how I teach the EM spectrum, and my students are directly & positively impacted by the hands-on learning in the AAA curriculum". —Teresa Cobble, Georgia middle school teacher

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://www.seti.org/aaa

Key 2022 Accomplishments

- The C10 (2022) cohort of 24 educators (6 MS, 12 HS, and 6 CC teachers) from 13 states was selected in December 2021 via peer-panel review of applications.
- Delayed because of COVID-19, most of the C8 cohort plus all of the C9 cohort finally flew on SOFIA during December 2021 through June 2022.
- Documents composing the AAA Electromagnetic Spectrum/Infrared Astronomy curriculum module were publicly available on the SETI Institute website at https://www.seti.org/curricula.
- WestEd evaluation of student STEM engagement after C9 (AY21–22) teachers' delivery of the AAA EMS/IRA curriculum indicated positive student gains of similar significance to the baseline 2017–18 Randomized Controlled Trial (RCT).
- NASA decided to complete the SOFIA mission at the end of FY22. AAA staff determined via a recon trip to Hawaii in August that the IRTF plus nearby astronomical research and outreach facilities would be excellent new venues for AAA teacher STEM immersion. Six of the C10 teachers completed their professional development sequences in Hawaii during October 2022.

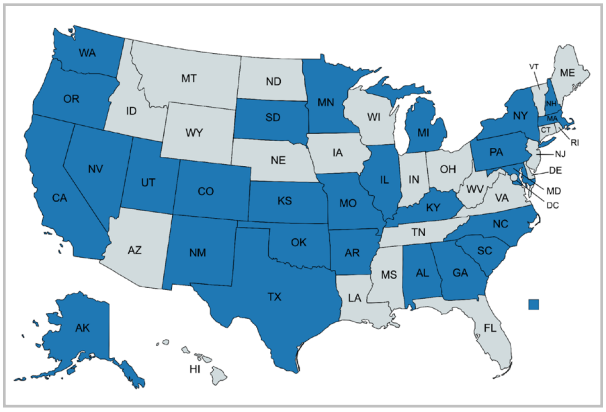
Key Partners Active in 2022

- 77 schools and districts
- SOFIA
- IRTF

AAAs and SOFIA team after final EXES flight, May 2022.

AAAs teachers and staff at IRTF, October 2022.

Two AAA groups in Gemini-N control room, October 2022.



AAA 2016–22 Project Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

American Museum of Natural History (OpenSpace)

PI: Dr. Rosamond Kinzler

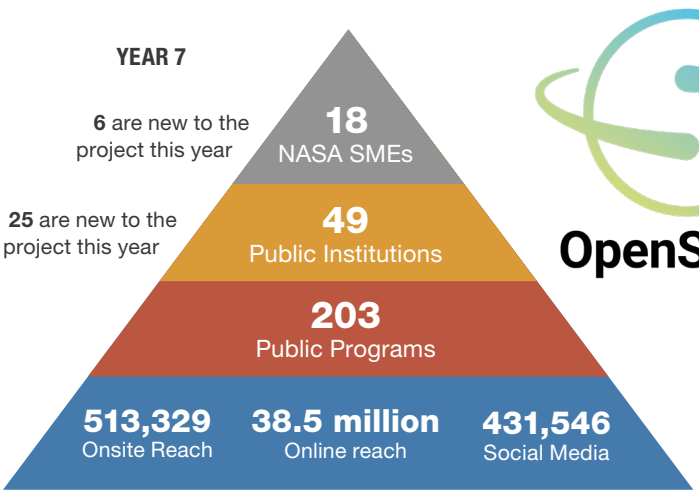
INSTITUTION: American Museum of Natural History

AUDIENCE AGES

6+

- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

OpenSpace is an open-source interactive data visualization software that enables exploration of the known universe and portrays our ongoing efforts to investigate the cosmos.



OpenSpace

TOTAL ACTIVITY, YEARS 1–7

NASA SMEs	Public Institutions	Public Programs	Onsite Reach	Online Reach	Other Online Reach
88	63	587	1,620,229	50,504,011	5,475,546

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"OpenSpace is a phenomenal tool and keeps getting more impressive as new versions are released. It is the center piece to my planetarium outreach efforts."

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/openspace-project

Key 2022 Accomplishments

- We released a major update of OpenSpace software (version 0.18.0).
- We engaged 18 NASA subject matter experts (SMEs) in Informal Science Institution (ISI) programming, formal education settings, and collaboration on content and software development.
- 25 new users were successfully installed and/or are using OpenSpace.
- 203 public programs and 4 exhibits reached 513,329 onsite.

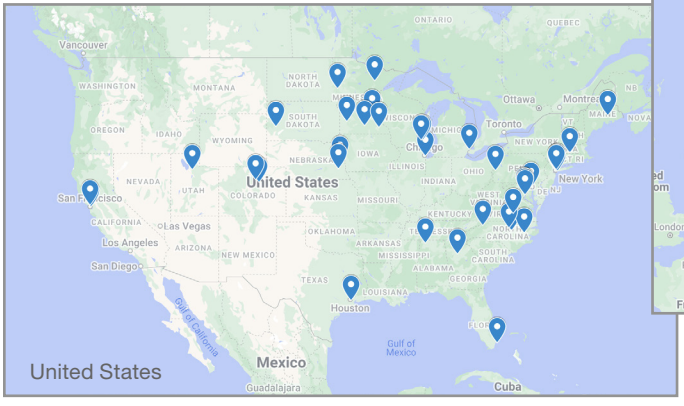
"Astronomy Live: Insights from the James Webb Space Telescope" program with Dr. Jackie Faherty in AMNH's Hayden Planetarium.

The OpenSpace Lab at the Houston Museum of Natural Science.

Key Partners Active in 2022

- Adler Planetarium
- American Museum of Natural History
- California Academy of Sciences
- Denver Museum of Nature and Science
- Houston Museum of Natural Science
- New York University
- North Carolina Museum of Natural Sciences
- University of Utah

Teaching students with OpenSpace in the Astronomy and Astrophysics Lab at the North Carolina Museum of Natural Sciences.



OpenSpace Project Reach Maps.

Europe.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Arctic and Earth STEM Integrating GLOBE & NASA

PI: Dr. Elena B. Sparrow

INSTITUTION: University of Alaska Fairbanks

AUDIENCE AGES

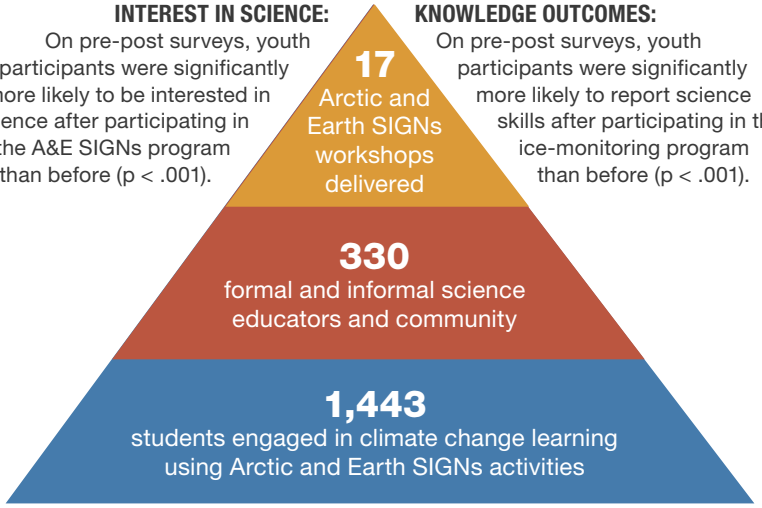
3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

AE SIGNs engages mostly rural educators, community members, and youth in STEM, climate change learning, and action through culturally sustaining, interdisciplinary, and place-based methods, as well as braiding of multiple knowledge systems: Indigenous and NASA science.

INTEREST IN SCIENCE: On pre-post surveys, youth participants were significantly more likely to be interested in science after participating in the A&E SIGNs program than before ($p < .001$).

KNOWLEDGE OUTCOMES: On pre-post surveys, youth participants were significantly more likely to report science skills after participating in the ice-monitoring program than before ($p < .001$).



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"This project meets my needs: 'It gets us outside for meaningful work. Like they're doing science for a real purpose. It's not like they're getting it out of a textbook and they're following the instructions. It's like they're actually doing real protocols.'"

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/arctic-earth-signs

Key 2022 Accomplishments

- Ornelas, a student in our first-generation college student research-intensive program, now a grad student, is coauthor of a research publication in *Science*.
- AE SIGNs team gave 31 presentations at conferences, and AE SIGNs students gave 43 poster presentations at research symposiums.
- An Alaska Native youth who participated as a middle schooler in AE SIGNs gave a presentation as a Youth Leader (college student) at a National Indigenous Climate Conference.
- We organized and hosted the first-ever Alaska GLOBE Student Symposium.
- Dr. Katie Spellman, AE SIGNs Co-Investigator, was named a Kavli Frontiers of Science Fellow by the National Academies of Science.

Arctic and Earth SIGNs Video

https://youtu.be/u0a0n6WILMI

Alaska GLOBE Student Research Symposium.

Gwichin Youth presenting at a National Climate Conference.

Climate research-intensive field work.

Alaskan educator learns GLOBE Hydrosphere Protocols.

Key Partners Active in 2022

- Association of Interior Native Educators
- NASA Langley Research Center
- NASA Snowex
- Santa Ana College MESA program
- University of Alaska Fairbanks Climate Scholars
- University of Alaska Fairbanks 4-H program
- University of Florida Institute of Food and Agricultural Sciences and 4-H

Reach map—adults reached through online and in-person programs in 2021.
https://bit.ly/AESIGNsMAP

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Central Idaho Dark Sky Reserve STEM Network (CIDSRSN)

PI: Prof. Brian Jackson
INSTITUTION: Boise State University

AUDIENCE AGES

3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

The Central Idaho Dark Sky Reserve STEM Network supports STEM engagement efforts throughout the state of Idaho, including student training, curriculum development, teacher support, and light pollution science.

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"I absolutely loved the resources you provided. Hearing about all the current activity in the area with Astronomy is absolutely amazing. I felt so incredibly disconnected before. Thank you. Thank you. Thank you. =^.^="

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://boi.st/NASA_CIDSRSN

Key 2022 Accomplishments

- Thousands of attendees at outreach events.
- Dozens of teachers at training workshops.
- Detailed lesson plans tailored to state curriculum.
- New light pollution data collected.

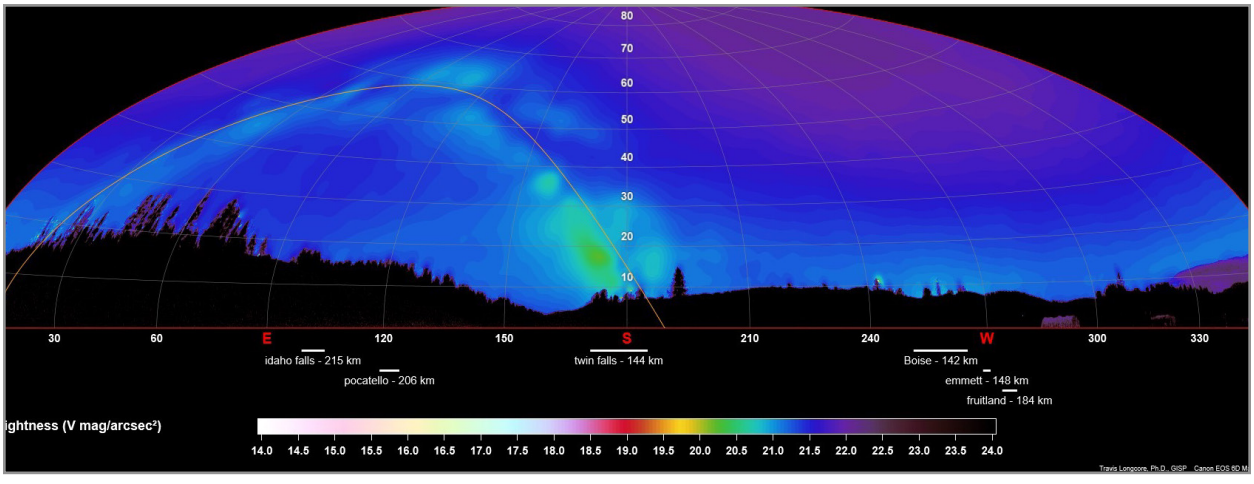
Key Partners Active in 2022

- UCLA
- Children's Museum of Idaho
- Central Washington University

iSTEM Teacher-Training Workshop at the College of Western Idaho, summer 2022.

iSTEM Teacher-Training Workshop at the College of Western Idaho, summer 2022.

JWST outreach event at Castleford Elementary, summer 2022.



Light pollution data collected in the Central Idaho Dark Sky Reserve, summer 2022.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

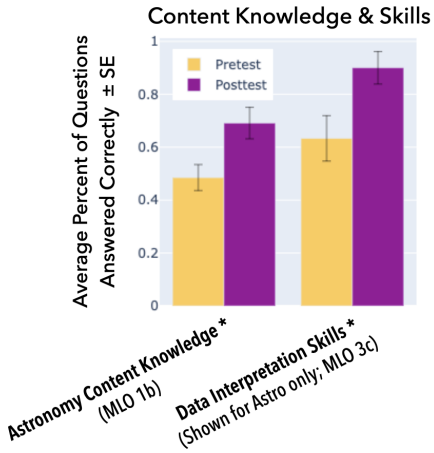
Cosmic Storytelling with NASA Data (CosmicDS)

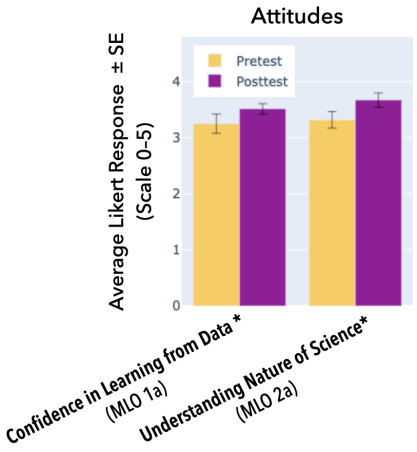

PI: Dr. Alyssa Goodman
SCIENCE PI: Dr. Patricia Udomprasert
INSTITUTION: Harvard University

AUDIENCE AGES
13+
13–15
16–17
18–22
23–29
30–75
76–99

Cosmic Data Stories (CosmicDS) are online resources co-created with subject matter experts that teach people how to interact with and learn from data. CosmicDS provides a web-based, learner-friendly environment for engaging with data, powered by research-grade software. Different Cosmic Data Stories will be targeted to a range of learners: middle school, high school, 2- and 4-year college, out-of-school STEM audiences, and the general public.

The graphs below show pre-post evaluation data from the Hubble Data Story pilot in two high school classrooms. In all measures shown, the gains are significant, with $p < 0.05$.





EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Educator Feedback

"I liked the discussion of how confident the students are of their result. This meta-analysis is often missing and gets to the heart of the matter. Instead of saying, 'I've proved Hubble's Law' students are saying, 'here is the data that supports this interpretation and here is how confident I am'. This project easily fits in with an astronomy class or physics class, and I will certainly use it again." —High school educator

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/cosmic-storytelling-with-nasa-data

Key 2022 Accomplishments

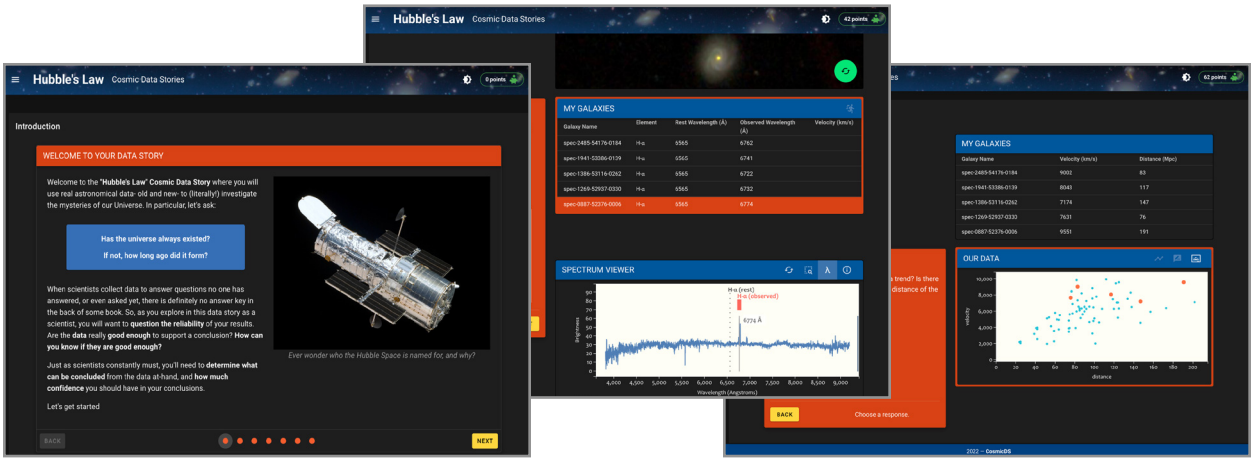
- Continued development of software infrastructure for Cosmic Data Stories, including deployment of the prototype app on a JupyterHub hosted on Amazon Web Services Elastic Cloud Computing platform.
- Collaborated with subject matter experts (SMEs) at UCLA to assemble appropriate galaxy image and spectra data for Hubble Data Story.
- Completed development of prototype Hubble Data Story and pilot-tested beta version in local high school classrooms.
- Recruited subject matter expert Catherine Zucker (Space Telescope Science Institute Hubble Fellow) to begin development of a data story on her Radcliffe Wave result.

Key Partners Active in 2022

- Smithsonian Astrophysical Observatory
- SMEs in UCLA Department of Astronomy and Space Telescope Science Institute
- NASA Community College Network
- Local high school teachers in the Greater Boston Area

High school astronomy students discuss how to estimate the distance to a galaxy by measuring its angular size.

High school physics and astronomy teacher answers student questions as they explore the Hubble Data Story.



Screenshots from the prototype Hubble Data Story, including the Hubble Space Telescope, galaxy spectra from the Sloan Digital Sky Survey, and a graph of the students' galaxy measurements in glue.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | **HELIOPHYSICS** | PLANETARY SCIENCE

Science Activation

Eclipse Ambassadors Off the Paths

PI: Vivian White

INSTITUTION: Astronomical Society of the Pacific

ASP ASTRONOMICAL SOCIETY of the PACIFIC

ECLIPSE AMBASSADORS

AUDIENCE AGES

18+

18–22

23–29

30–75

76–99

Eclipse Ambassadors partners undergraduates with amateur astronomers and trains them to offer eclipse engagement in 500 communities.

Virtual courses teach partners the safety, science, and social connections necessary to create culturally responsive eclipse engagement opportunities reaching new underserved audiences.

6	**Community Partners connecting with underserved communities**	• Land Grant Colleges • Libraries • First Generation (MESA) • Community Colleges
30	**Partners trained at the Pilot Workshop**	• Held pilot workshop in October • 3-weeks, 12 hours work • Covered safety, science, and awe • Changes in the works!
258	**Ambassadors ready to partner**	• Incredible applicants are waiting for partners near them • See map!

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Participant Quote

"Astronomy has changed my life and has granted me opportunities that I never thought would be possible…. I am usually the only person of color in most of these opportunities, and that is the reason why outreach in general is so important for me. Astronomy has started to feel like a privilege, and it shouldn't be that way. I want my people to experience the same joy and wonder I feel."

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | **FACILITATED LEARNING** | **GUIDED BY INFORMAL EDUCATORS** | DELIVERED BY FORMAL EDUCATORS | **PEER PROFESSIONAL LEARNING**

https://astrosociety.org/education-outreach/amateur-astronomers/eclipse-ambassadors/program.html

Key 2022 Accomplishments

- Built a functioning partner training program from scratch!
- Recruited 250+ Ambassadors in 3 months.
- Trained 30 Ambassadors in Pilot Workshop in October.
- Coordinated resource sharing among national programs.
- Presented at SACNAS,* AAS Eclipse, ALCon, and others.

* SACNAS = Society of the Advancement of Chicanos and Native Americans in Science
AAS = American Astronomical Society
ALCon = Astronomical League Convention

First cohort of Eclipse Ambassadors.

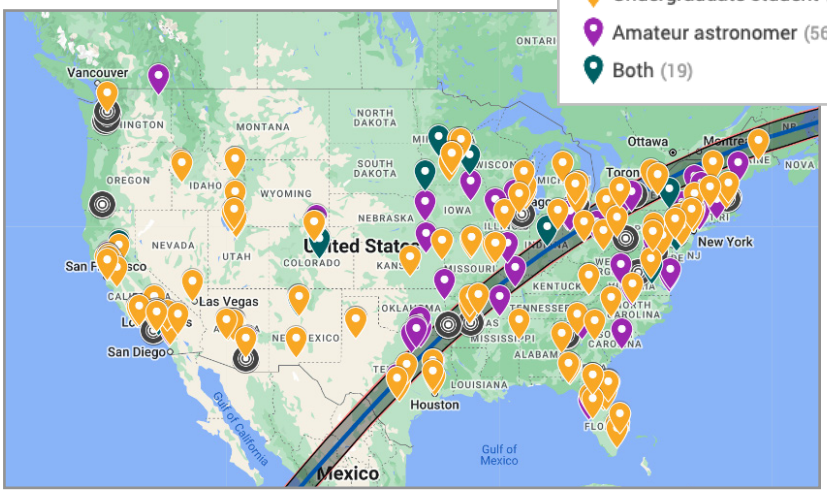
Key Partners Active in 2022

- SETI Institute
- Space Science Institute
- Exploratorium
- NASA Community College Network
- NASA HEAT
- Heliophysics Big Year
- Astronomical League
- American Astronomical Society

AAS Eclipse Workshop, Rochester, NY.

Request viewers!
bit.ly/eaviewers

Christine at the SciAct SACNAS booth in Puerto Rico.



Reach Map:
258 Ambassadors across the United States.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Eclipse Soundscapes: Citizen Science Project


SCIENCE PI: Dr. Henry "Trae" Winter
EDUCATION PI: MaryKay Severino
INSTITUTION: ARISA Lab, LLC

AUDIENCE AGES
14+

- 14–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

Eclipse Soundscapes provides learning experiences that utilize SMEs and best practices to increase scientific process understanding and address accessibility challenges, specifically those experienced by people who are Blind or Low-Vision (BLV). ES:CSP will answer scientific questions about the impact of solar eclipses on ecosystems using soundscapes. For more information, visit https://EclipseSoundscapes.org.

Advancing National Educational Goals

Promoting accessibility skill development for STEM careers

Diversity of Thought Discussion: Making STEM More Accessible	"Real World" Client NYU Student Collaboration
Male (55%); White, non-Hispanic (73%); BA Degree (38%); Educators (28%) (n=99)	Female (78%); Asian (61%); MA Degree (58%); < 1 year of academic UX/UI (44%) & professional UX/UI (50%) (n=18)
↑31% Increased interest in applying accessibility best practices	↑32% Increased understanding of accessible UX/UI best practices
Learned about alternative text, accessibility resources, and using new technology.	↑42% Increased knowledge & understanding of accessibility compliance requirements.
American Astronomical Society Eclipse Workshop, Univ of N. TX Series, & MSU Physics Colloquium	New York University, Spring 2022 Course

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"I really enjoyed the talk. It has me thinking about how I can better design my astronomy course using the principles of universal design for learning." —Dr. S. Willoughby, MSU Physics

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

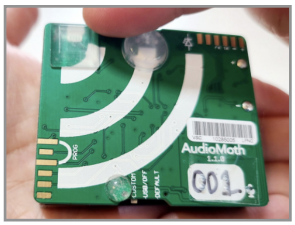
https://eclipsesoundscapes.org/citizen-science-project/

Key 2022 Accomplishments

- ES:CSP promoted project management and SciAct community involvement.
- ES:CSP increased accessibility awareness/knowledge in future STEM workforce and collaborated with NYU UX/UI design students as a “Real World Client.”
- SME-supported ES:CSP Science Investigation White Paper was drafted.
- Citizen Scientist (CS) Experience Development and Education Review: Eclipse and scientific process–related STEM Learning online resources and materials were developed and educator-reviewed.
- Accessibility Testing and Review: These supported updates to the CS experience and data analysis.
- CS Kit’s instructions were developed to make accessibility more inclusive (see below). CS Kit technology was made accessible in a way that invites the BLV community to learn alongside sighted peers via a “Bump Dots Tour,” which makes the use of tactile cues beneficial for everyone.
- Increased SME involvement: Collaboration and funding were established through SCoPE to collaborate with SME Dr. Lindsay Fuller at UTSA.
- Citizen Scientist Experience Opportunities Inclusion Plan: The plan considers various time commitment levels and various levels of supports needed by learners based on different abilities.
- Inclusive Science Data Analysis Elements: (see below) The Research & Science Investigation Plan was updated after testing 2021 data analysis protocols with 2017 eclipse audio data and determining that audio analyses, via spectrograms, are not easily accessible or inclusive for communities that have less scientific background knowledge due to being left out of science exploration.

Advancing National Educational Goals

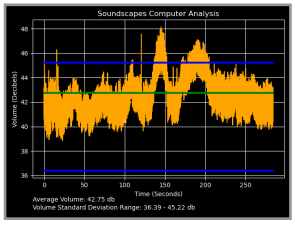
Through Intentional, Inclusive Design & Programming



DEIA Educational Opportunity: “Bump Dots Tour”

ES:CSP is utilizing bump dots and a tactile/audio “Bump Dots Tour” to make the CS Kit recording device more accessible while also creating an opportunity to make an accessibility support more well known and beneficial for everyone.

Audio: https://bit.ly/BumpDotsTour



More Inclusive Custom Data Plots

ES:CSP is developing less complex but equally scientifically relevant sound data outputs to make data analysis more accessible and inclusive.

Example: Plot of a soundscape’s volume as a function of time during the 2017 eclipse with the average and standard deviation overplotted.

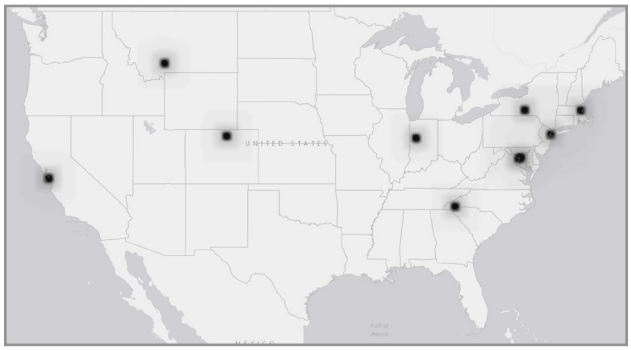
SCAN ME

Key Partners Active in 2022

- Regine Gilbert, New York University
- National Federation of the Blind
- Dr. Lindsay Fuller at UTSA via SCoPE Seed Grant

ES:CSP Video

https://bit.ly/ESCSP_info



2021 Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

GLOBE Mission EARTH (GME)

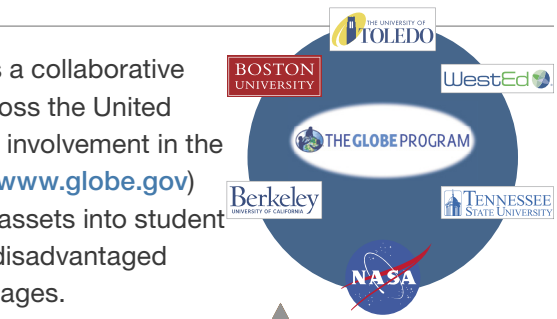
PI: Dr. Kevin Czajkowski
INSTITUTION: University of Toledo, OH
INDEPENDENT EVALUATOR: Dr. Nektaria Adaktylou, West Virginia University

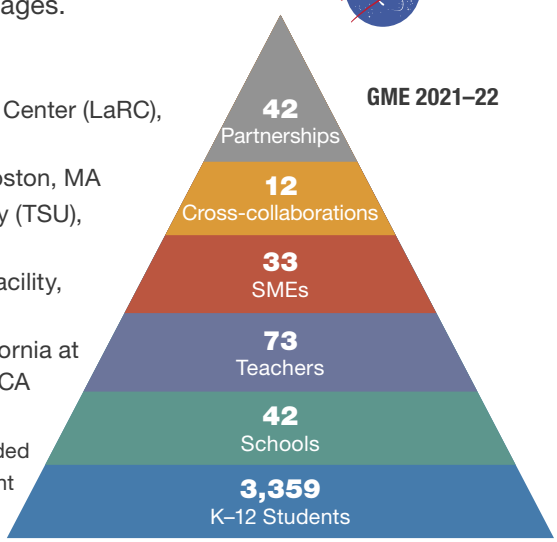
AUDIENCE AGES
3+
- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

GLOBE Mission EARTH is a collaborative of multiple institutions across the United States formed to increase involvement in the GLOBE Program (https://www.globe.gov) and to incorporate NASA assets into student learning. Our focus is on disadvantaged student populations of all ages.

Partners include:
- NASA's Langley Research Center (LaRC), Hampton, VA
- Boston University (BU), Boston, MA
- Tennessee State University (TSU), Nashville, TN
- Palmyra Cove Research Facility, Palmyra, NJ
- WestEd/University of California at Berkeley (UCB), Berkeley, CA

GLOBE Mission EARTH is funded by NASA Cooperative Agreement Notice (CAN)# NNX16AC54A.





EDUCATIONAL SETTINGS
- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"This project meets my needs by [helping me with] 'data collection, sharing data with other places, understanding that kids, people all over the world, are doing similar science.'" —Marcy Burns, 5th-/6th-grade teacher, Norwalk, OH

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://www.globe.gov/web/mission-earth

Key 2022 Accomplishments

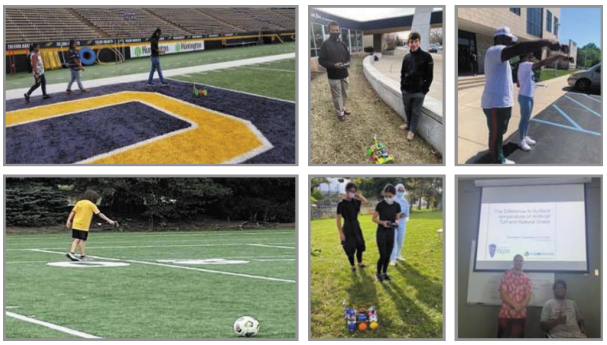
- 3,359 K–12 students from 42 schools were involved.
- 73 teachers attended UT/BU/WestEd and NASA LaRC Professional Development (PD).
- Students completed 67 projects for UT/BU/WestEd. For NASA LaRC, elementary students attended 8 showcase sessions where they shared their projects.
- 33 subject matter experts (SMEs) connected to classrooms.
- 12 cross-collaborations occurred within the SciAct.
- 42 partnerships formed at the local and regional levels.

Earth Heart Farms, Oak Harbor, OH.

Key Partners Active in 2022

- American River Conservancy
- Birmingham Southern College
- Chabot Space and Science Center
- Dataspire
- Deep South Center for Environmental Justice
- Detroit Green Door Initiative
- Earth Team
- Elkhorn Slough National Estuarian Research
- Lawrence Hall of Science
- Los Angeles Unified School District Office of Outdoor Environmental Education
- New Mexico Public Education Department
- Xavier University of Louisiana

GME Project Video
https://youtu.be/iwAaqV6_xII



Students collecting surface temperature data.

WestEd/UC Berkeley.

Boston University.

Reach Map.

ASTROPHYSICS | **BIOL/PHYS SCIENCES** | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Growing Beyond Earth

PI: Dr. Carl Lewis

INSTITUTION: Fairchild Tropical Botanic Garden

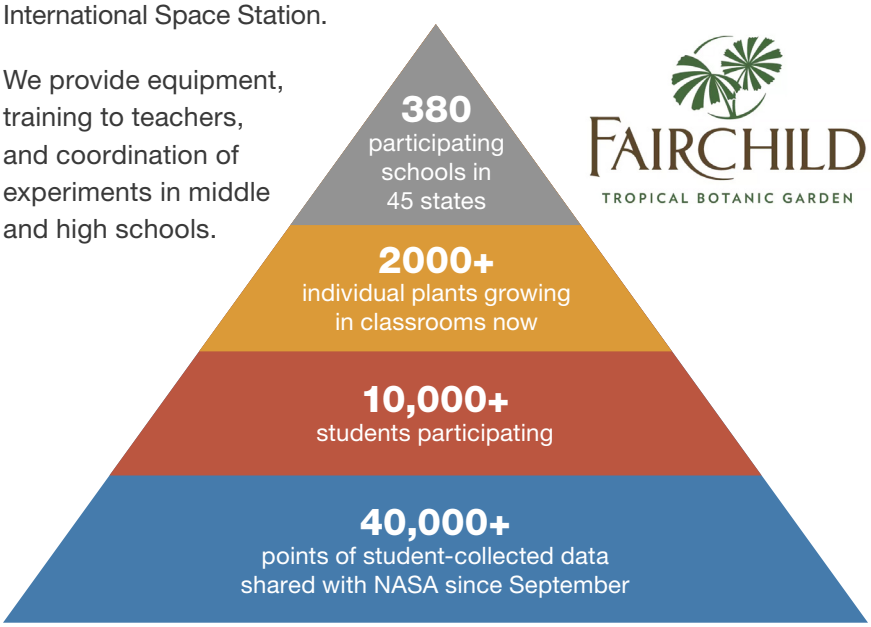
AUDIENCE AGES

10+

- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

This effort is a classroom-based citizen science project designed to advance NASA research on growing plants in space. It includes a series of plant experiments conducted by students in a Fairchild-designed plant habitat similar to the Vegetable Production System (Veggie) on the International Space Station.

We provide equipment, training to teachers, and coordination of experiments in middle and high schools.



FAIRCHILD TROPICAL BOTANIC GARDEN

EDUCATIONAL SETTINGS

- **INFORMAL/ OUT OF SCHOOL**
- **FORMAL EDUCATION**
- **CITIZEN SCIENCE**
- PROFESSIONAL

Audience Quote

"My students learn best when they have a real connection to the lesson. My students understand NASA is using and values the data they collect."

DELIVERY MODELS

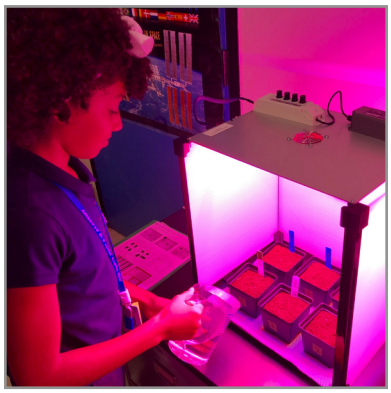
INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/growing-beyond-earth

Key 2022 Accomplishments

- Recruited 108 new schools.
- Coordinated two experiments across 380 participating schools to address NASA food production priorities: (1) analysis of resource use with the goal of minimizing the use of water and electricity, and (2) trials of new herb varieties for potential growth in space.
- Provided a virtual tour of NASA KSC plant research facilities for GBE students and teachers.
- Tested new technology that allows students to use computer coding to control and measure environmental factors within the plant habitat.
- Began developing an online portal for students to share data and see results of current and past NASA experiments.

Plant science team at NASA KSC while conducting a live online tour of research facilities at KSC.



Student setting up a new experiment in a GBE system.

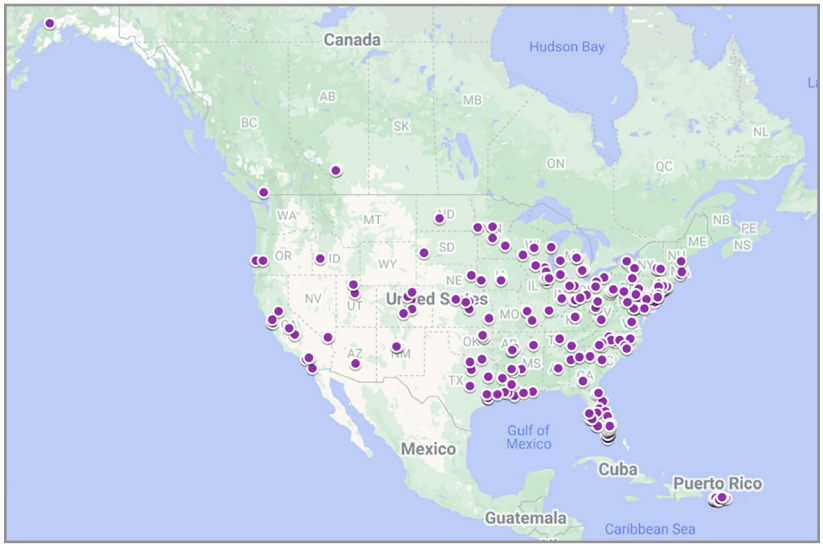
Student recording weekly plant measurements.

GBE Video

https://youtu.be/4TzQKqOKdJY

Key Partners Active in 2022

- National FFA
- SALAD (Space Agriculture Lab Analysis Database)
- SMEs at NASA KSC
- MARSFarm (manufacturing and distribution partner)



Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | **HELIOPHYSICS** | PLANETARY SCIENCE

Science Activation

NASA Heliophysics Education Activation Team (NASA HEAT)

PI: Dr. Michael S. Kirk

INSTITUTION: NASA Goddard Space Flight Center

AUDIENCE AGES

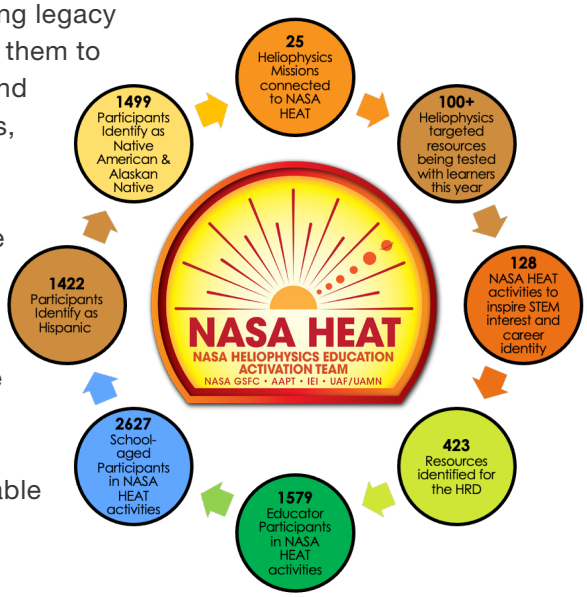
10+

- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

NASA HEAT provides educational guidance and resources for educators, communicators, and learners of all ages to deepen their understanding of our Sun and its effects on Earth and the solar system.

NASA HEAT is collecting legacy resources, connecting them to classroom concepts and current NASA missions, and deploying them in a dynamic searchable Heliophysics Resource Database (HRD).

NASA HEAT is advancing NASA's role in the 2023 and 2024 solar eclipses to make heliophysics recognizable across the nation.



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"During the NASA HEAT/4-H Mission Sun Club we asked kids: Why is it so challenging to study the Sun? One participant responded, 'Just the Sun being the Sun, makes it hard to observe. And because of Earth's orbit, it is hard to launch something from Earth to the Sun directly.'"

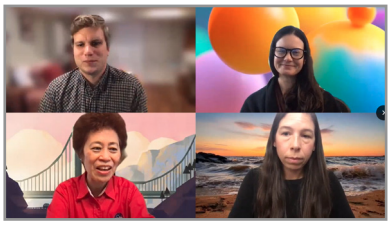
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

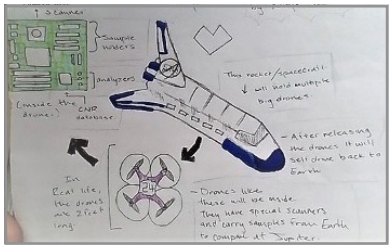
https://solarsystem.nasa.gov/heat

Key 2022 Accomplishments

- To show how heliophysics concepts can be an effective way to teach physical, Earth, and life science core concepts, NASA HEAT developed a Framework for Heliophysics Education (FHE) and a Heliophysics Resource Database (HRD). Currently with 423 resources, the HRD will become a searchable collection of vetted resources. A gap analysis will also guide the development of additional resources.
- NASA HEAT worked with a group of educators to develop inquiry-based lesson plans that incorporate heliophysics concepts into science curricula, with the intention of creating an integrative approach to teaching heliophysics that supports national standards.
- Based on a gap analysis NASA HEAT conducted, there is a need for cultural knowledge about basic helio concepts. IEI and UAF are working with Indigenous communities and elders to translate the identified concepts into Navajo and Iñupiaq languages.
- AAPT carried out a series of virtual workshops for 340 teachers throughout the year, including a 2.5-day workshop for eight educational leaders across the United States and Puerto Rico. These educators can impact thousands of students in their classrooms using the materials and training they received.
- NASA HEAT worked with NASA Headquarters/Communications to launch the NASA Eclipse Website phases 0.5 and 1.0, laying the foundation for a sustainable eclipse website. NASA HEAT also developed draft versions of eclipse training materials for NASA communities for the 2023 and 2024 eclipses.



NASA HEAT works collaboratively with different agencies and programs to support eclipse planning and develop educational products, e.g., a virtual panel at the American Geophysical Union (AGU) about NASA eclipse coordination.



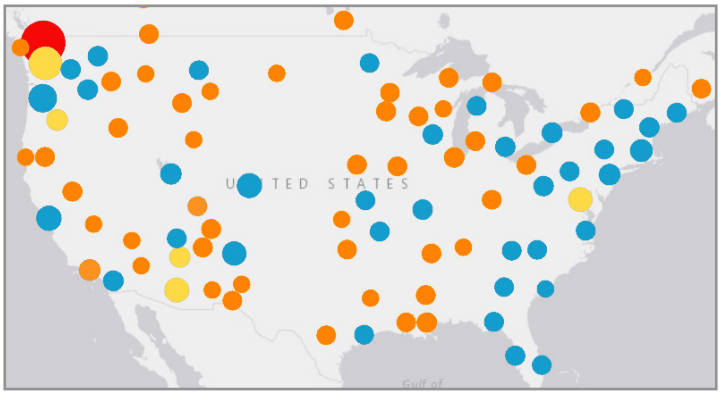
4-H Helio-Club participants designed their own missions using what they learned during the club from a NASA HEAT educator and the Maryland 4-H STEM coordinator. This image is from one of those projects.

Participants in an AAPT workshop sort colored buttons during a stellar spectra activity to extend a discussion of instrument sensitivity and resolution.

Key Partners Active in 2022

- NASA Goddard Space Flight Center (GSFC)
- American Association of Physics Teachers (AAPT)
- University of Alaska Fairbanks (UAF)/University of Alaska Museum of the North (UAMN)
- Indigenous Education Institute (IEI)

This webinar series brings together Indigenous perspectives on Earth and space sciences. This map shows the webinars' reach; the larger and warmer-colored dots indicate a larger number of attendees from a specific region (e.g., 50 attendees from the WA area as indicated by the larger red dot). Attendees from AK, HI, and abroad are not shown.



Reach Map: Sense of Place Webinar attendees (n=1000). Hosted by IEI.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Learner Engagement Accessing Real-world NASA SMD Expert Resources (LEARNER)

PI: Dr. Lance Bush

INSTITUTION: Challenger Center

AUDIENCE AGES

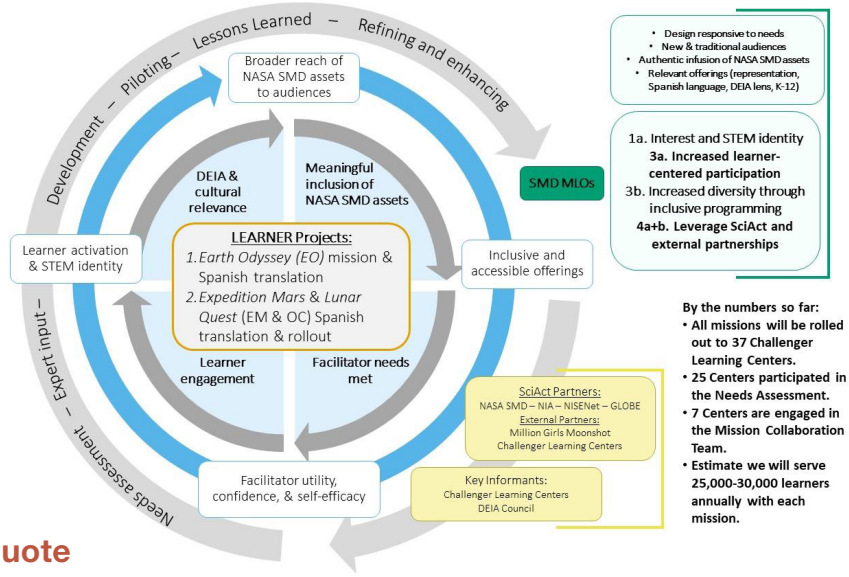
10–15

10–12

13–15

Challenger Center is developing and implementing:

- A new, participatory simulation program called Earth Odyssey, featuring NASA Earth Science.
- Spanish versions of two existing participatory simulations focused on NASA Planetary Science, Expedition Mars, and Operation Comet, developed under our SciAct 1.0 project.
- Subject matter expert (SME) videos integrated into all missions and into a webpage for students to learn more about careers.



By the numbers so far:

- **All missions will be rolled out to 37 Challenger Learning Centers.**
- **25 Centers participated in the Needs Assessment.**
- **7 Centers are engaged in the Mission Collaboration Team.**
- **Estimate we will serve 25,000-30,000 learners annually with each mission.**

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Audience Quote

"I've just seen such a vast improvement in [collaboration between Challenger Center HQ and Centers] in recent years. We've been on the Lunar Quest, the Comet teams. [Challenger Center HQ is] inviting Centers in." —Challenger Learning Center of Las Cruces, NM

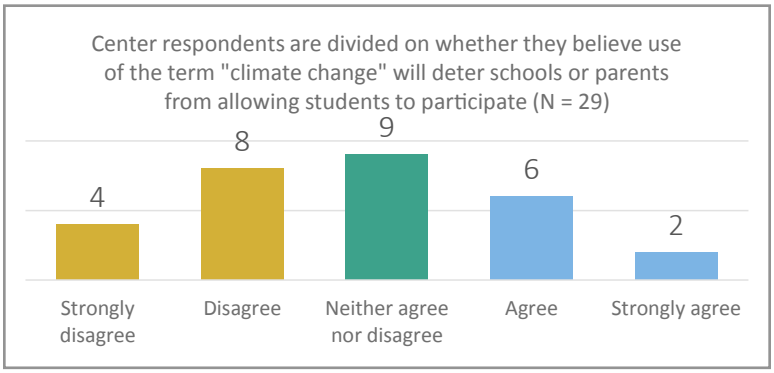
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | **GUIDED BY INFORMAL EDUCATORS** | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

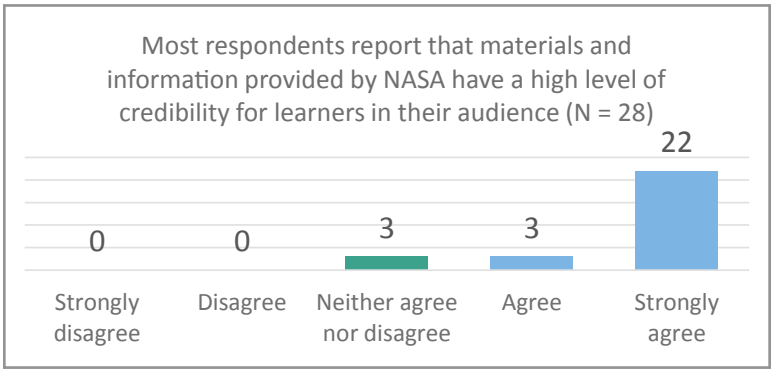
https://science.nasa.gov/science-activation-team/challenger-center

Key 2022 Accomplishments

- Conducted a robust Needs Assessment.
- Conducted surveys and interviews with informal educators at 25 Challenger Learning Centers.
- Conducted interviews and follow up with SciAct partners.
- Conducted discussions and research on best practices in serving African American students, girls (Million Girls Moonshot), and Latinx students (Las Cruces Public Schools, NM).
- Established a Mission Collaboration Team involving 7 Challenger Learning Centers.



In the Earth Odyssey mission, students will be using Earth Science data to study the impact of climate change. We are proactively working with our Center network to provide language, information, and support for their community to highlight our focus on this content.



Incorporating NASA materials and information into Earth Odyssey will add to the credibility of the program.

Key Partners Active in 2022

- 35 Challenger Learning Centers
- National Institutes of Aerospace
- NESEC
- Million Girls Moonshot
- NISENet

Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Learning Ecosystems Northeast

PI: Leigh Peake
INSTITUTION: Gulf of Maine Research Institute

AUDIENCE AGES
10+
10–12
13–15
16–17
18–22
23–29
30–75
76–99

Learning Ecosystems Northeast (previously Real World, Real Science) is creating Connected Learning Ecosystems (CLEs) across Maine and the Northeast focused on supporting informal and formal educators to create linked NASA-powered explorations of local climate change impacts and thereby lift youth STEM interest and agency.

Nearly 700 youth will participate in experiences created and implemented by our CLE educators.

8 Project Partners

We expect ~7,200 students in LabVenture this year!

138 Educators & 12 STCs

6,000+ Educator Contact Hours

EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"I'm leaving feeling energized, enthusiastic and excited about all of the things I've learned. I'm especially excited to learn about all of the resources at the Maine State Library and what they can and want to do for teachers…. I'm going back to Aroostook County looking forward to sharing some of this energy and momentum with the rest of my colleagues." —Sherri Calhoun, teacher, Ashland District School, MSAD #32

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/gmri

Key 2022 Accomplishments

- 5 Connected Learning Ecosystems (CLEs) in Maine continue to thrive!
- 2 Science Centers launched CLEs.
- CLEs serving Indigenous and immigrant/asylee communities are building momentum.
- We created dozens of data-rich climate learning experiences for in- and out-of-school contexts.
- We developed materials with Maine State Library (MSL) for "Oceans of Possibilities" summer reading.
- MSL created program templates, resource lists, and 6 circulating climate science kits.

Lewiston, ME, youth work with GMRI scientists to collect data across a transact to document climate impacts on intertidal communities.

- The program granted $92K in implementation awards for local data/climate learning experiences.
- 8 librarians partnered with Maine 4H to implement climate/data learning experiences.
- Science Center CoP met 10+ times in 2022 with topics like Launching a CLE; Brokering Inclusive Partnerships and Relationships; Climate Stories; CLE Convening & Facilitation; and Professional Learning Practices.
- The Eval Team collected and analyzed 85 surveys of CLE members, 38 Summer Spectacular surveys, 20 project partner surveys, 13 project partner interviews, and 26 interviews with CLE participants.

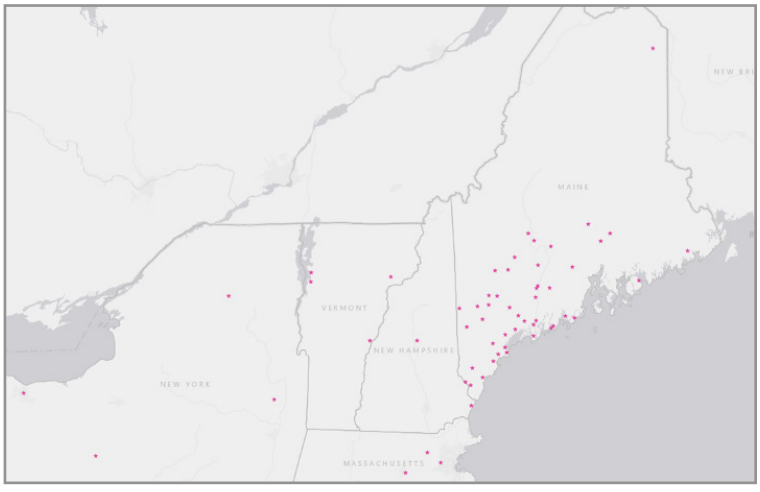
Educators begin an investigation of climate impacts on local pollinators by building background knowledge with NASA SME Dr. Wayne Esaias.

School group contributes to community science investigation of invasive species at Seacoast Science Center (NH).

Key Partners Active in 2022

- EDC
- Maine State Library
- Sciencenter
- Shelburne Farms
- Stanford University
- UMaine 4H
- Wabanaki Youth in Science
- Gateway Community Services
- Network of 12 Northeast science centers

Video
bit.ly/3pRv5JU



2021 Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA Community College Network (NCCN)

PI: Dr. Simon Steel
INSTITUTION: SETI Institute

AUDIENCE AGES
18–75

18–22
23–29
30–75

NCCN engages NASA subject matter expertise, research findings, and science resources to enhance community college learning.

- 49 colleges in 25 states
- 23 Hispanic Serving Institutions
- 58% average female enrollment
- Augmentation to serve Tribal Colleges and Universities (TCUs) teaching astronomy/space science
- 50 SMEs representing 37 institutions, including NASA's Goddard Space Flight Center, Ames Research Center, and Jet Propulsion Laboratory (JPL), the Space Telescope Science Institute (STScI), the Smithsonian Astrophysical Observatory (SAO), the Solar System Exploration Research Virtual Institute (SSERVI), etc.

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"I find this experience very gratifying because I worked for NASA for 10 years and I always feel like NASA needs to have a bigger impact, not in publicity, or everybody knows what NASA is, but in actually reaching people at a more grassroots level. This is exactly the kind of project I've always thought, 'This is the kind of stuff NASA needs to be doing.' I'm very happy to be involved in it and I'm very impressed with how it's going. I've been very satisfied and glad that I volunteered."

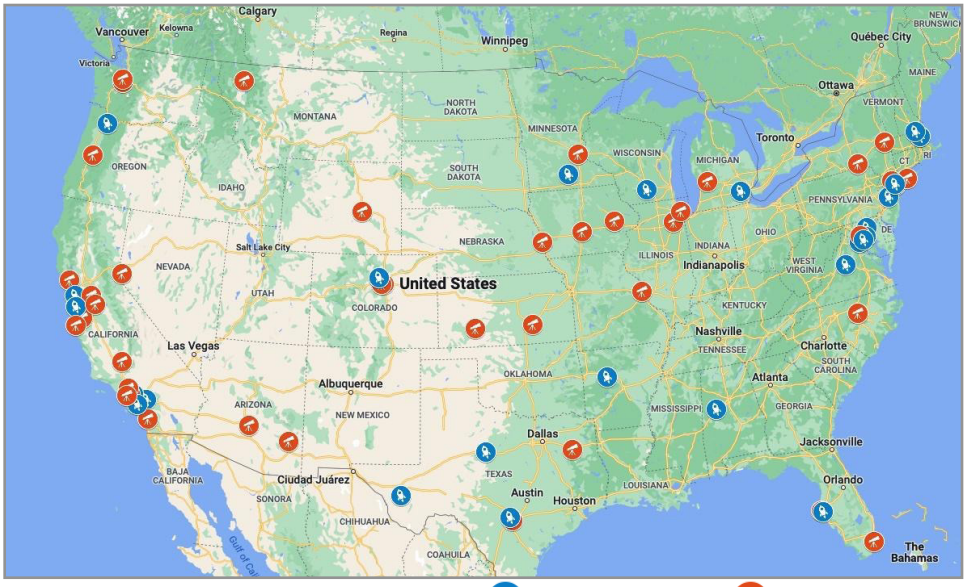
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

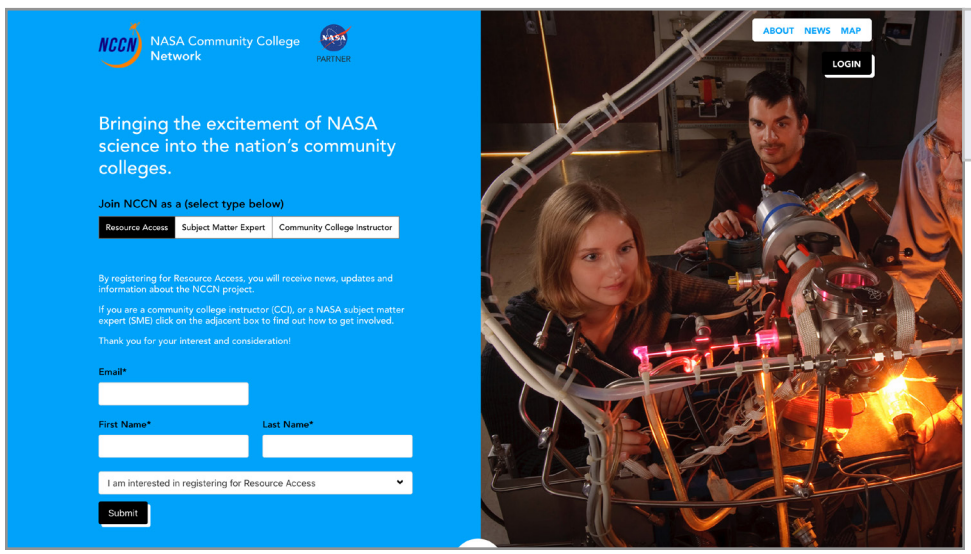
https://nccn.seti.org

Key 2022 Accomplishments

- Doubled Year 1 cohort numbers to 50 SMEs and 50 Community College Instructors (CCIs).
- Created searchable database with 100 curated audience-specific resources.
- Presented professional-development webinars for both SMEs and CCIs.
- Set up a fully functioning NCCN website with resource database, archived PD webinars, and SME:CCI matchmaking collaboration tool. An Active Community of Practice is using Slack as platform.
- Facilitated active citizen science collaboration through SCoPE seed grant (Planet Patrol).



NCCN Reach Map: SME Community College



Recruiting for 2023

https://nccn.seti.org

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA Earth Science Education Collaborative (NESEC)

PI: Theresa Schwerin

INSTITUTION: Institute for Global Environmental Strategies

AUDIENCE AGES

3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

The program enables broad participation in authentic NASA Earth STEM experiences by lifelong learners through three interconnected areas:

- citizen science with GLOBE Observer
- science investigations with NASA assets
- strategic partnerships and collaborations

nesec NASA Earth Science Education Collaborative

Citizen Science Contributions

- **81K+** volunteer hours
- **242K+** GLOBE Observers registered
- **976K+** observations (clouds, trees, land cover, mosquito habitats)
- **1M+** satellite matches to GLOBE Cloud observations

Science Research and Investigations

- **26 peer-reviewed articles** in science and education publications;
  - » **4 with citizen scientist authors**
- **160+** subject matter experts (SMEs) connected with learners
- **7,300+** learners participated in 1,900+ projects
- **728+** Girl Scout Troops
  - » **4,500+** individual scouts selected GLOBE Observer for their *Think Like a Citizen Scientist Journey*
- **37 camps in**
  - » **19 states engaged**
  - » **34,000+ learners**

Strategic Partnerships

- **19 partners**
- **63 collaborators** working with international, national, and local organizations and projects

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"We love the student-centered and real-time data collection tools…and the inquiry and design-based approaches throughout NESEC's work." —2022 NESEC external partner survey

DELIVERY MODELS

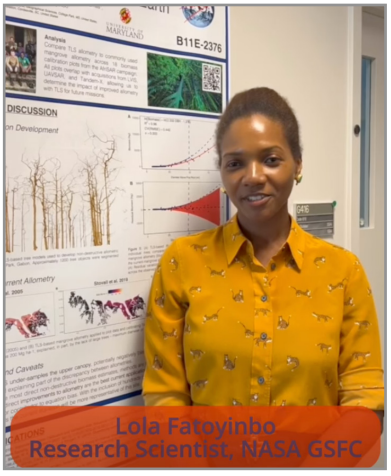
INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nesec

Key 2022 Accomplishments

- Achieved participation in all 50 states, DC, and PR, as well as 105 countries.
- Led three GLOBE Student Research Campaigns engaging learners in studying Earth system phenomena related to air quality, trees, and mosquito habitats.
- Connected 52 scientists and engineers to learners.
- Held three international data challenges: GLOBE clouds, land cover, and trees. Each had the theme "observing change related to climate."
- Exceeded goal of one million satellite matches to GLOBE clouds.
- Published seven new peer-reviewed scientific papers. Three papers included student citizen scientist authors.
- Updated GLOBE Observer app to enable new and improved capabilities and accessibility, including data collection requests in designated areas, communication with volunteers, data quality checks, and access by blind and visually impaired users.
- Hosted first virtual event for GLOBE Observer volunteers on July 26 that was attended by 115 people from 41 countries.
- Partnered with 31 camps in 19 states reaching 17,000+ learners, with an additional 15,000+ reached through camp programming with schools.
- Fostered collaborations that support STEM learning and advance science, e.g., SEES Earth System Explorers 8-week virtual internship, with new team science module and peer mentors; NASA eClips Spotlite Video Challenges; and EPSCoR AI research projects using GLOBE Land Cover and Mosquito Habitat Photos.

GLOBE Goes to Camp at Camp Discovery, in Blythewood, SC.



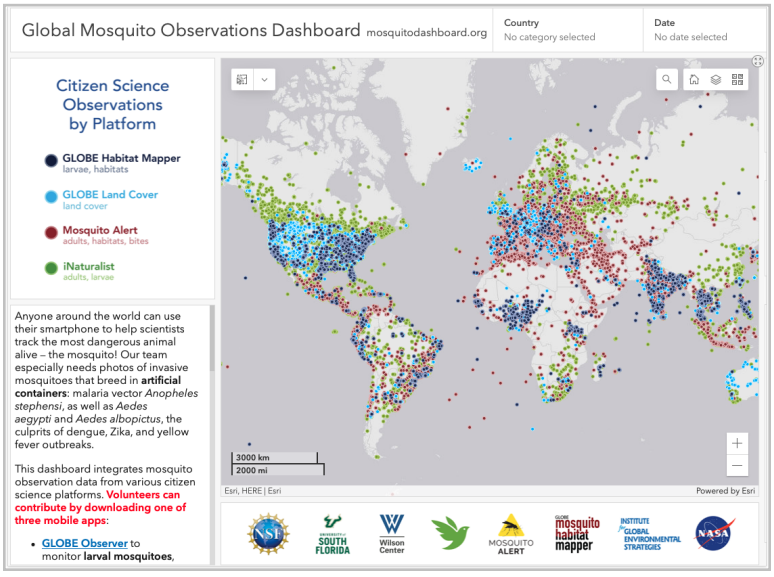
Instagram reel for 2022 GLOBE Trees Challenge with NASA scientist Dr. Lola Fatoyinbo, talking about her trees research. This video reached over 130,000 through NASA Earth social media.

Social media shareable congratulating volunteers for reaching one million satellite matches to GLOBE Cloud observations.

Key Partners Active in 2022

- NASA GSFC
- NASA LaRC
- NASA JPL
- Oregon State University
- SciStarter
- AMS Project Atmosphere
- Accenture
- Camp Discovery
- Polar Citizen Science Collective
- EPSCoR Projects (NM, PR, VT, WY)
- University of South Florida
- Los Angeles Public Library

https://nesec.strategies.org



Global Mosquito Observation Dashboard developed by University of South Florida using GLOBE Observer Mosquito Habitat Mapper and Land Cover data, integrated with data from iNaturalist and Global Mosquito Alert.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA eClips 4D

NATIONAL INSTITUTE OF AEROSPACE

PI: Shelley Duguid Spears

INSTITUTION: National Institute of Aerospace (NIA)

AUDIENCE AGES

6–17

- 6–7
- 8–9
- 10–12
- 13–15
- 16–17

NASA eClips increases STEM literacy through the lens of NASA by bringing together engaging standards-based videos and resources with educational best practices for the national K–12 formal and informal educational communities. NASA eClips introduces learners to STEM concepts and provides educators with engaging resources and tools to support teaching and learning.

Points of Interaction

January - September 2022

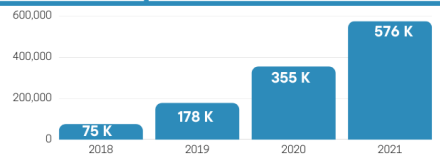
48 Events reaching 3,088 learners, community members, and educators

42% In person events

24 PD events with 768 educators

On the rise

Learners using Nearpod science lessons containing NASA Spotlite videos



2,925 Newsletter subscribers

379,513 NASA eClips website and YouTube channel views

29.1 K **32.4 K** Followers

NASA eClips website and YouTube ~ Nearly 14.5 million lifetime views!

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quotes

"NASA eClips is more than the resources they provide. They are a team of STEM partners who are willing to support and collaborate to help our school system meet our STEM goals."

"They are a scientific organization that is committed to providing high-quality informal education. The people I have worked with have been incredibly reflective and committed to identifying barriers that may prevent interaction with their materials and eliminating them through Universal Design for Learning (UDL). After the project with Sci-Act, eClips has continued to reach out to ensure that they are on the cutting edge of inclusive and equitable educational programming."

DELIVERY MODELS

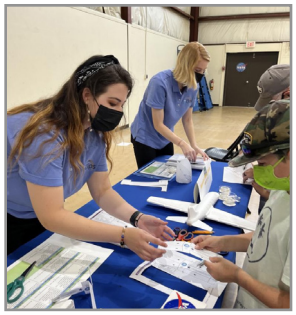
INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/eclips

Key 2022 Accomplishments

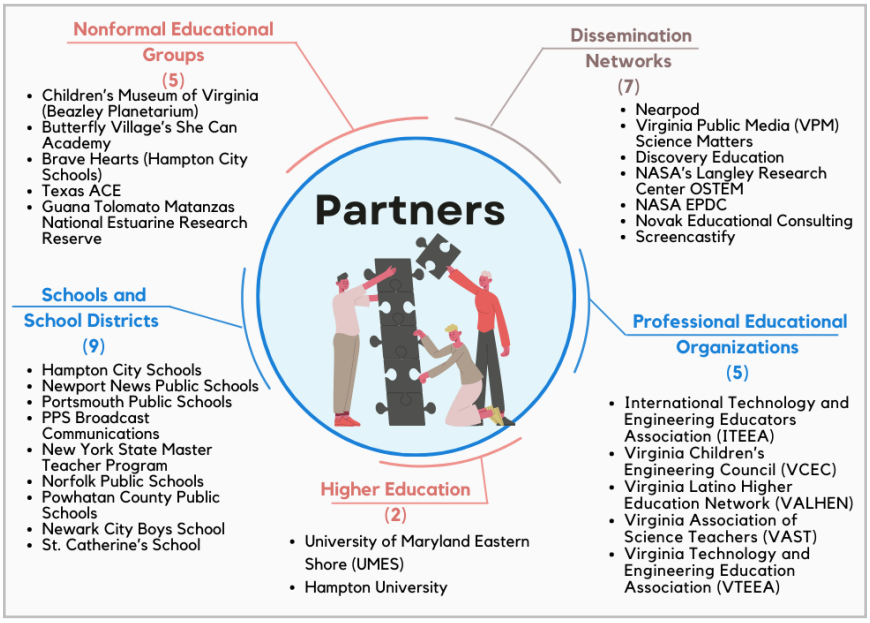
- Leveraged the strengths of the diverse group of educators serving on the NASA eClips Educator and Technical Advisory Boards to provide valuable feedback throughout the design and development of resources.
- Expanded interactions within the STEM Ecosystem through increased outreach events intentionally including underserved and underrepresented populations.
- Integrated collaborations with SciAct partners led to co-development of a second Spotlite Design Challenge: Land Detectives.
- Completed development and testing of revised Engineering Design Packets and Educator Implementation Guide; all are now available on the NASA eClips website.

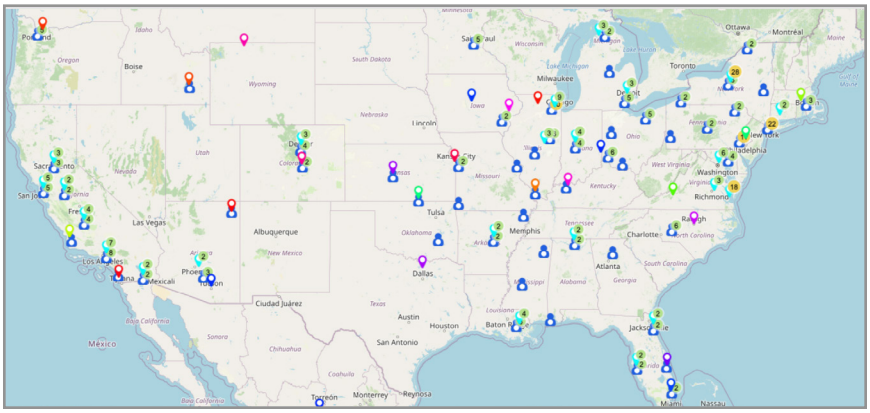
Girls attending STEM Experience Summer Event take a picture with NASA's First Woman display.



Interns help learners make a rotocopter during NASA's Langley Family Day.

Isaiah Marriner and Judy Deichman, NASA eClips Educator Advisory Board members, help participants create star life-cycle bracelets.





Link to draft of reach map

https://app.mapline.com/map/map_42db1646

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA Inspires Futures for Tomorrow's Youth (NIFTY)

PI: Rita Karl

INSTITUTION: Twin Cities PBS

AUDIENCE AGES

3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

In partnership with the National Girls Collaborative, the Space Science Institute, and NASA's Langley Research Center, NIFTY is designed to broaden participation of diverse youth (ages 9–14) in STEM studies by providing opportunities to interact with and learn from NASA STEM professionals. Role models will help youth to learn about NASA missions and careers and provide personal sources of inspiration!

NIFTY will prepare 50+ NASA STEM professionals to use research-based best practices for role models and gender-equitable, culturally responsive, and anti-racist strategies to encourage 500+ youth to pursue STEM studies and NASA career pathways.

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quotes

"You can't be what you can't see." —Marianne Elliott

"If she can see it, she can be it." —Geena Davis

DELIVERY MODELS

- INDEPENDENT/ SELF-DIRECTED
- FACILITATED LEARNING
- GUIDED BY INFORMAL EDUCATORS
- DELIVERED BY FORMAL EDUCATORS
- PEER PROFESSIONAL LEARNING

https://science.nasa.gov/learners/science-activation-team/nifty

Key 2022 Accomplishments

NIFTY was awarded in July 2022. Year 1 Activities:

- Contracting with project advisors and meeting with project champions to help recruit STEM professionals from NASA Centers and programs nationwide.
- Starting a literature review to update the SciGirls Role Model Strategies Guide.
- Creating an RFP for SciGirls, STAR Net, and National Girls Collaborative educational outreach partners.

NASA Role Models:

SciGirls with NASA's Janelle Wellons at the Jet Propulsion Laboratory.

SciGirls with NASA's Alma Stephanie Tapia and Ellen Ochoa at Johnson Space Center.

SciGirls with role model Ramona Kitto Stately of the Dakota Nation working on a project connecting Indigenous and Western astronomy.

SciGirls with NASA Solar System Ambassador Nadia.

Key Partners Active in 2022

- Space Science Institute's STAR Net
- National Girls Collaborative
- Langley Research Center
- Technology for Learning Consortium

http://www.scigirlsconnect.org/groups/role-models/

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

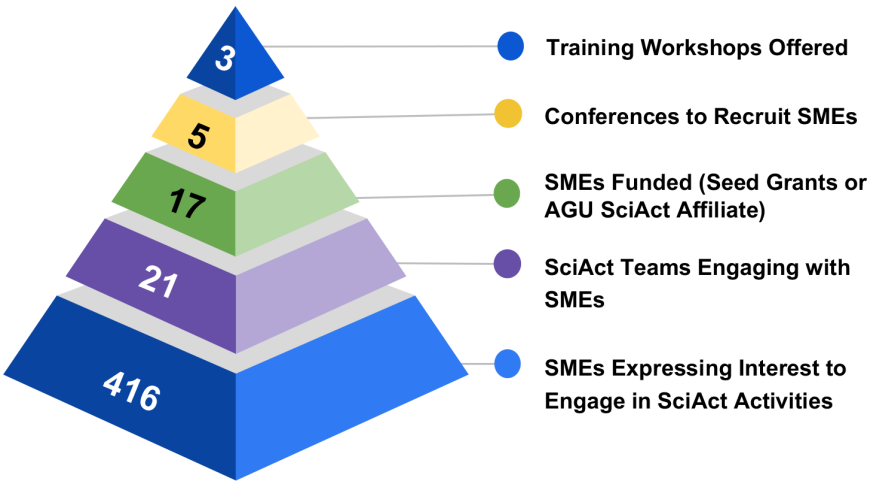
NASA SMD Community of Practice for Education (SCoPE)

PI: Dr. Meenakshi Wadhwa
INSTITUTION: Arizona State University

AUDIENCE AGES
23–75
23–29
30–75

The NASA SCoPE project facilitates connections between NASA experts (SMEs), early-career scientists, and NASA Science Activation teams with emphasis on training, seed-grant support, and broadening participation across all demographics.

NASA SCoPE
CONNECTING SMES AND SCIACT



EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"I learned how to engage with Indigenous communities, how to build and sustain relationships, and how to avoid making critical mistakes that would undermine relationships with local Indigenous communities. This was a fantastic workshop with resources, direct engagement, role-playing, and examples. I learned a lot about why to build long-term and complex relationships with Indigenous communities that go beyond just the work." —Anonymous SME participant

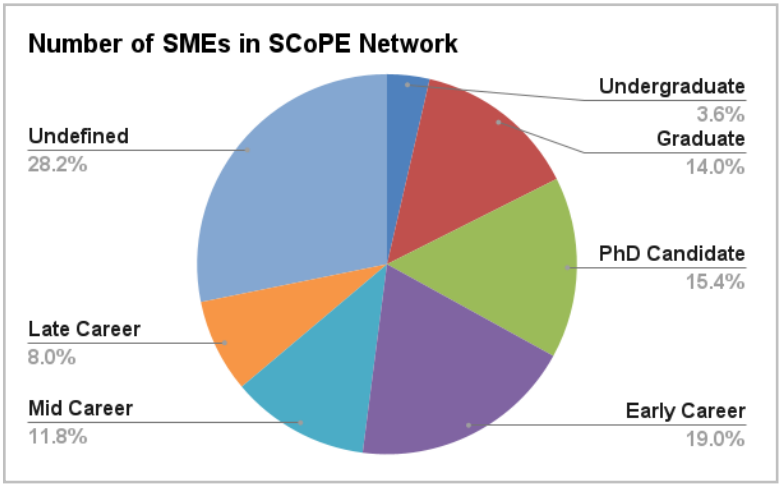
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://scope.asu.edu

Key 2022 Accomplishments

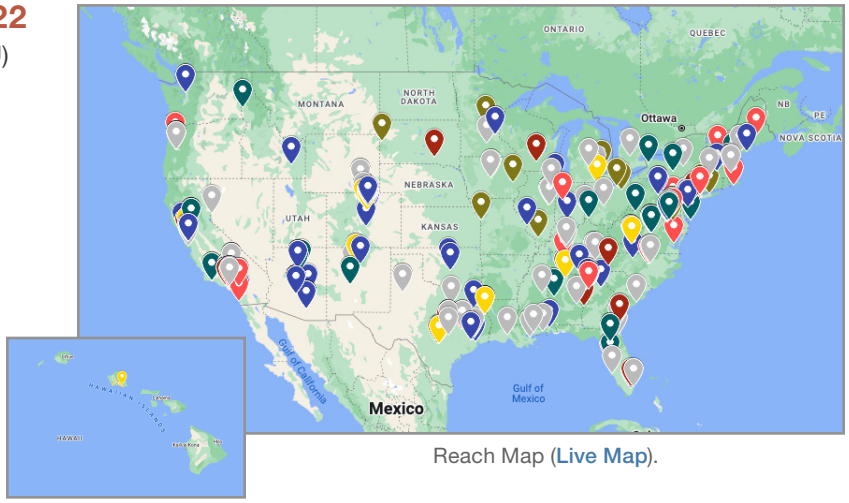
- Seven SMEs funded, two mid-career and five early-career. Six of the seven individuals are members of at least one historically marginalized group.
- Nine SMEs funded as AGU SciAct Affiliates, all from marginalized communities.
- New website launched to support activities.



Key Partners Active in 2022

- American Geophysical Union (AGU)
- AGU Sharing Science Committee
- AbSciCon

Meet the Seed Grant Awardees



Reach Map (Live Map).

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA Infiniscope

PI: Dr. Ariel Anbar

INSTITUTION: Arizona State University

Infiniscope

AUDIENCE AGES

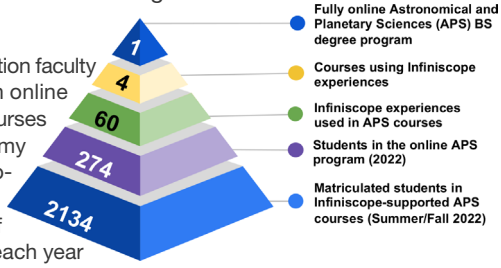
10+

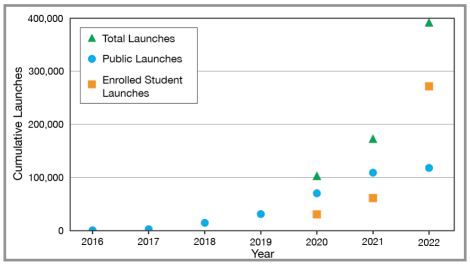
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

Infiniscope brings NASA science to learners nationwide through interactive digital experiences that inspire curiosity, guide discovery, and encourage exploration. Powered by new creator tools and an open-source intelligent tutoring platform co-developed with the Open Learning Initiative (OLI), we serve a growing a community of expert educators using and creating innovative experiences to advance authentic STEM learning.

Infiniscope Goes to College!

Infiniscope now embraces higher education faculty and students using our experiences in online courses. These include foundational courses in the world's first fully online Astronomy and Planetary Science B.S. degree program at Arizona State University (ASU). Infiniscope also reaches thousands of postsecondary learners beyond ASU each year as part of ASU's Universal Learner Courses and Inspark Network.





Infiniscope Is Growing!

The embrace of postsecondary learners increased the total number of Infiniscope launches over the past 6 years to nearly 400,000. Approximately 125,000 come from public launches on the portal, and about 275,000 from students who are enrolled by instructors in middle school, high school, or college.

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"This was one of my favorite courses that I've taken at ASU. I absolutely loved the format of it.… It got me excited about habitable worlds, and exoplanets in general, by how interactive it is." —Sam Campbell, student, Habitable Worlds (SES 106), ASU School of Earth and Space Exploration

DELIVERY MODELS

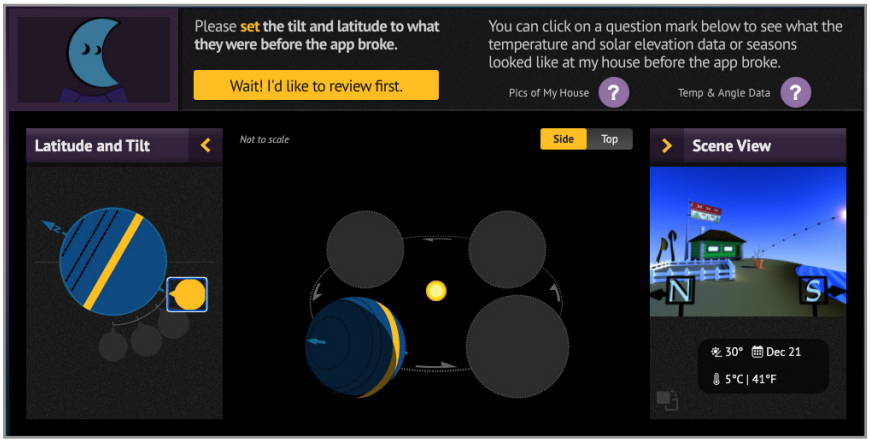
- INDEPENDENT/ SELF-DIRECTED
- FACILITATED LEARNING
- GUIDED BY INFORMAL EDUCATORS
- DELIVERED BY FORMAL EDUCATORS
- PEER PROFESSIONAL LEARNING

https://infiniscope.org

Key 2022 Accomplishments

- New open-source active learning platform co-developed with OLI.
- New versions of the portal and Tour It tool released for community.
- Total Infiniscope experience launches to date approach 400,000.
- Support for the world's first fully online Astronomical and Planetary Sciences B.S. program at ASU with 60 Infiniscope experiences.

New Open-Source Platform!
The Torus platform, co-developed with the Open Learning Initiative at Carnegie Mellon University, enables interactive learn-by-doing experiences like "Tilt Our World" that inspire curiosity, guide discovery, and encourage exploration.

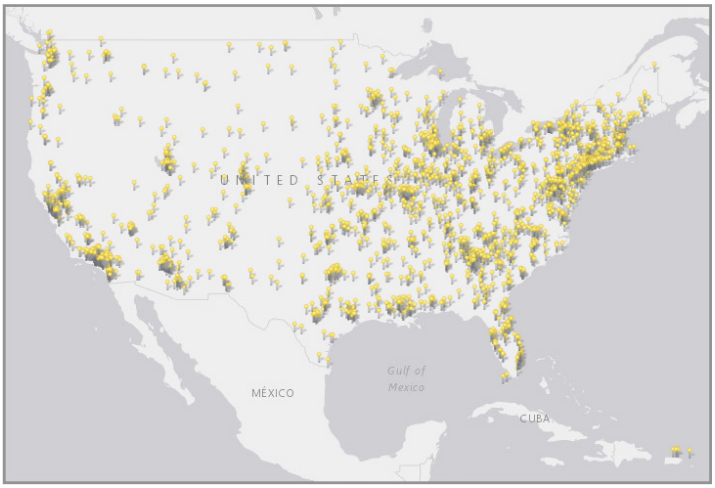


Updated Tour It for Virtual Tour Creation
The latest version of Tour It, our tool for teachers to create virtual tours, has many new features. This is an example of a virtual tour created by Rurik Johnson, a classroom teacher in St. Paul, after an Infiniscope professional development workshop. Mr. Johnson designed a virtual tour that honors the power of the Mississippi River in shaping the landscape and history of the Twin Cities.

Key Partners Active in 2022

- Carnegie Mellon University
- Los Angeles Unified School District–East
- New York State Master Teacher Program

QR code to video



Infiniscope Reach Map.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

National Informal STEM Education (NISE) Network Space and Earth Informal STEM Education (SEISE) Project

PI: Paul Martin

INSTITUTION: Arizona State University

NISE NATIONAL INFORMAL STEM EDUCATION NETWORK

AUDIENCE AGES

3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

The National Informal STEM Education (NISE) Network Space and Earth Informal STEM Education (SEISE) Project leverages a robust network of hundreds of museums across the United States to advance the NASA Science Mission Directorate's vision for education by engaging public audiences nationwide in informal and lifelong learning related to fundamental STEM concepts.

The NISE Network utilizes NASA assets and subject matter experts to create compelling learning experiences that share the story, science, and adventure of NASA's scientific explorations of planet Earth, the solar system, and the universe beyond.

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"I think that the most valuable thing about participating in the PLC [Earth & Space project-based professional learning community] was the opportunity to network with other professionals and learn about their projects. All of the feedback and discussion I think strengthened each person's project and, at least for me personally, helped to spark some ideas for the future." —NISE Network Earth & Space project-based professional learning community participant

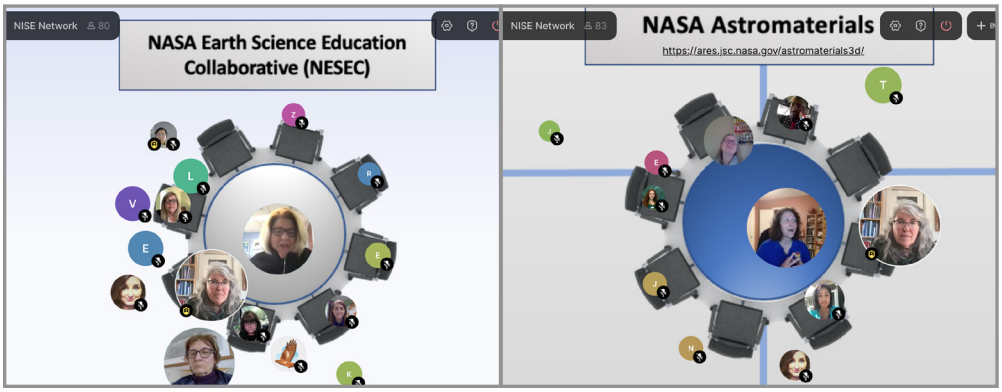
DELIVERY MODELS

- INDEPENDENT/ SELF-DIRECTED
- FACILITATED LEARNING
- GUIDED BY INFORMAL EDUCATORS
- DELIVERED BY FORMAL EDUCATORS
- PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nise-network

Key 2022 Accomplishments

- Completion of Earth & Space project-based professional learning community with 100 institutions over 8 months.
- Planning of Mission Future exhibition, which will integrate authentic Earth and space science, imaginative storytelling, and hands-on activities to explore what central Arizona and space exploration might be like 20 years in the future.
- Celebrations nationwide of the James Webb Space Telescope first images.
- Work conducted with NISE Network partners to broaden participation through the use of Sun, Earth, Universe exhibitions and Explore Science Earth & Space toolkit activities nationwide.



NASA Showcase discussion tables during the NISE Network Earth & Space project-based professional learning community during the 2021–22 convening.

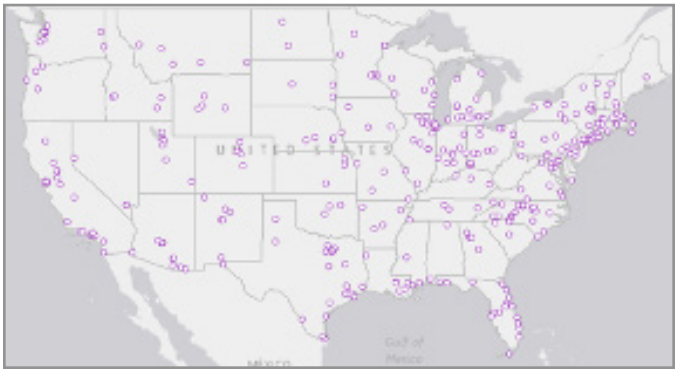
Key Partners Active in 2022

- NASA's Universe of Learning (STScI)
- NASA JPL (including Museum and Informal Education Alliance, Solar System Ambassadors)

Map of 100 organizations participating in the NISE Network Earth & Space project-based professional learning community, 2021–22.

NISE Network Partners Across the United States

Not pictured: Guam, U.S. Virgin Islands, and American Samoa museum partners.



ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA's Universe of Learning

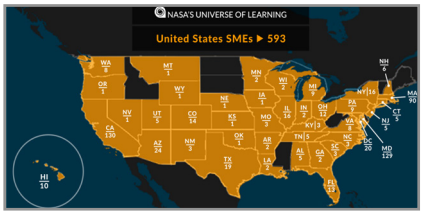
PI: Dr. Denise Smith
PI INSTITUTION: Space Telescope Science Institute
CO-I INSTITUTIONS: Caltech/IPAC, Center for Astrophysics | Harvard and Smithsonian, NASA's Jet Propulsion Laboratory

AUDIENCE AGES
10+
10–12
13–15
16–17
18–22
23–29
30–75
76–99

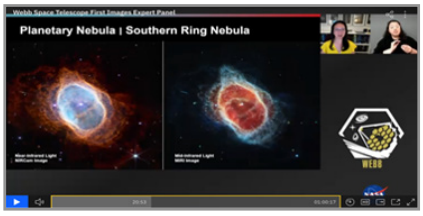
NASA's Universe of Learning (UoL) provides direct access to discoveries, data, and experts of NASA Astrophysics. We combine these assets with best practices in learning to create a range of resources from captivating videos to working with data. We partner with organizations to incorporate these into community programs and professional learning experiences. Subject matter experts ensure the scientific integrity of our work and provide a human connection to science.

20 NASA's Universe of Learning Projects:
Examples of Nationwide Reach for Year 7

- 64 GSAWN webinar participants
- 305 educators attending Science Briefings
- 400 ViewSpace informal education venues
- 21 new Informal Learning Network sites in 15 states
- 13,500 participants who attended the Data Manipulation virtual field trip
- 1,300 cities with MicroObservatory users (180% increase from last year)
- 600 Exoplanet Watch participants who generated 1,000 light curves for 228 exoplanets
- 1,500 submissions for Astrophoto Challenges (275% increase from previous years)
- 5,854 National Science Olympiad participants in 30 events (226.4% increase from last year)



900 subject matter experts in the SME database: 593 U.S.-based across 42 states, with 184 institutions and 66 missions represented.



NASA'S UoL played a key role in the planning and implementation of the Webb Community Events initiative—community events held nationwide to celebrate Webb's launch (615 event hosts) and first images.

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"I had patrons ask questions that I put into the portal and the Webb Scientist picked one of our questions to answer! What made that so incredibly special was that the question was from an 8-10-year-old girl. She was just so excited to hear her question (why do galaxies merge) be asked and answered live. I don't think she will ever forget that." —Webb Community Events Subject Matter Expert Panel participant

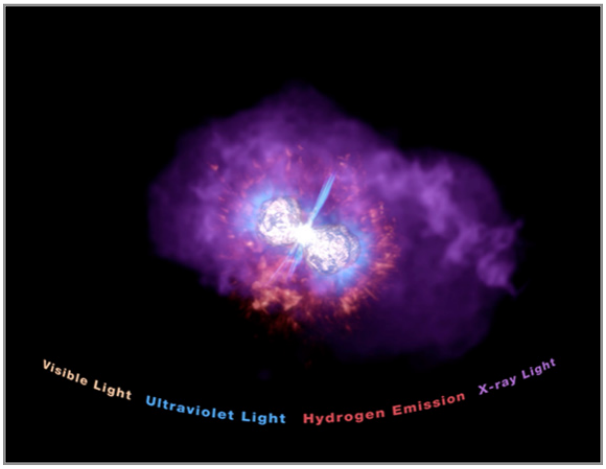
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

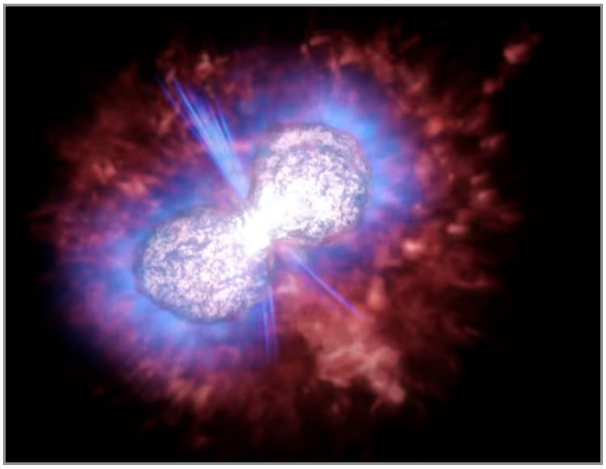
NASA'S Universe of Learning Homepage (https://universe-of-learning.org)

Key 2022 Accomplishments

- **Enabling informal educators and learning facilitators to support their communities:** We create resources that provide an easy and informed entry point to NASA Astrophysics for diverse communities. Select resources include the new Girls STEAM Ahead with NASA's "Celebrating Women in STEM" facilitation guides, rural audiences' exposure to exoplanets through the Discover Exoplanets traveling exhibit, and the adaptation of resources to support local needs through the Informal Learning Network.
- **Increasing access to and exploration of NASA data:** The power of NASA missions is the variety of data that are collected. We strive to create learning pathways or packages to get learners excited about science and develop STEM identity. For examples, this year efforts to share Eta Carinae include an AstroVisualization (93 thousand views in 9 months); a public image gallery on AstroPix; sonification (105 thousand views) from Accessible Learning Resources; and NASA's Astrophoto Challenge, in which learners created their own images and received feedback from scientists (over 1,500 entries, a 275% increase from past years) to create a curated package of learning resources.



Multiwavelength 3D structure of the nebula surrounding the massive Eta Carinae.



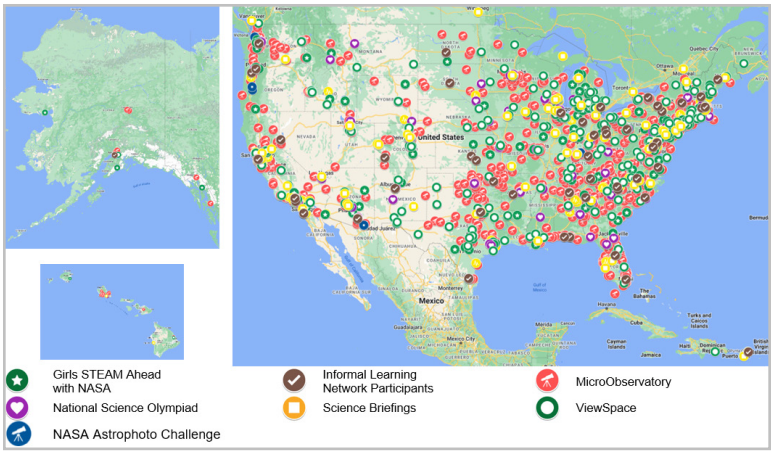
Sonification of Eta Carinae (multiwavelength).

- **Enabling personal connections to NASA SMEs:** Subject matter experts provide a direct link to current NASA Astrophysics research, which enables rapid incorporation of science results into learning products, ensures the accuracy and currency of science content, and connects learners to the people behind the science who can act as role models. Efforts to engage and support SMEs in learning include developing a database of 900 SMEs, providing training opportunities through the speaker toolkit and webinars, and piloting efforts to batch-match SMEs to the Night Sky Network.

Key Partners Active in 2022

- Association of Science and Technology Centers
- National Girls Collaborative Project
- National Science Olympiad
- Smithsonian Affiliations
- SAO Science Education Department

NASA's Universe of Learning Overview—YouTube



Year 7 Reach Map (January 2022 to October 2022).

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA's Neurodiversity Network (N3)

PI: Prof. Lynn Cominsky
INSTITUTION: Sonoma State University

AUDIENCE AGES
6–22

- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22

NASA's Neurodiversity Network (N3) is providing a pathway to NASA participation and STEM employment for neurodiverse learners, with a focus on those on the autism spectrum.

SME Mentors 15	Interns 15	Co-Designers 45
Museum visitors prototyping activities/Astro 564	Museum visitors prototyping activities/Rockets 72	Teens engaged in rocket building 43
Middle school camps Astro/Rocket 23	N3 website users 6200	AfH website users 4860

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quotes

"I had a truly life changing experience working with Prof. Speck on her poetically named 'Stardust' astrophysics project. We are all made of stardust!" —William Wei

"It was truly out of this world experience learning from Dr. Lynn and Dr. Bovill. I am beyond grateful for letting me take part in it." —Ankita Balaji

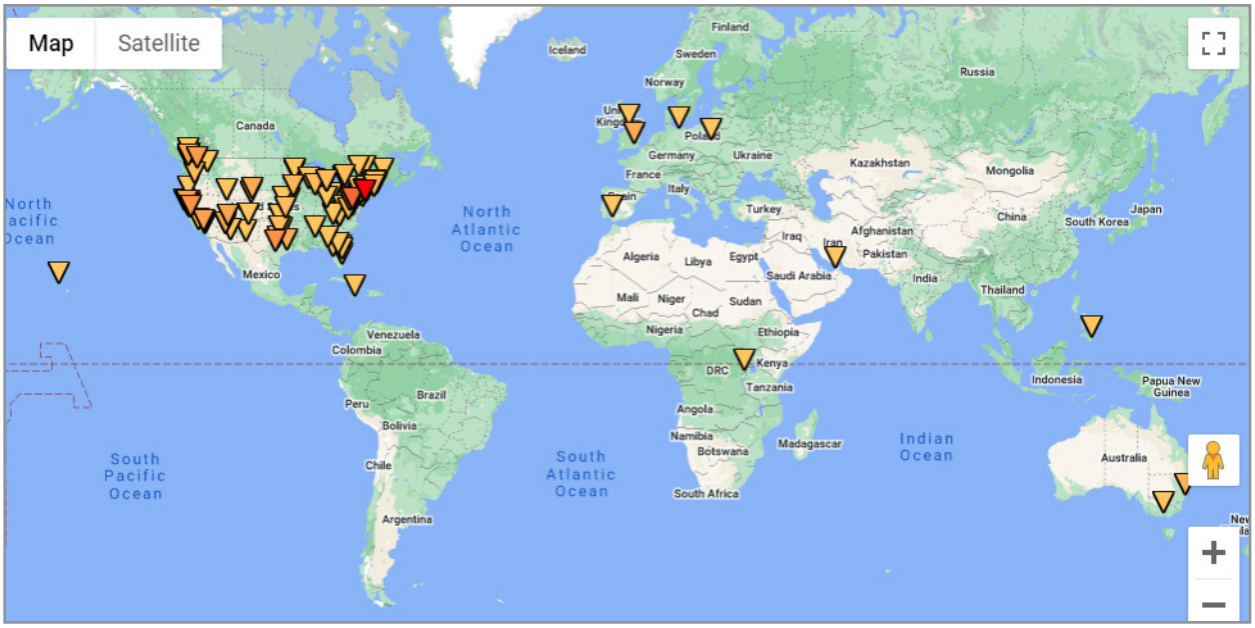
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nasa-neurodiversity-network

Key 2022 Accomplishments

- The project piloted rocketry and payload-building activities at four autism-focused high schools, then engaged in co-design process.
- Fifteen summer interns were supported by 15 SME mentors, engaging in research projects in astronomy, Earth science, planetary science, and space technology.
- Prototype museum rocketry activities were tested.
- Astronomy and rocketry museum camps were conducted with participants and staff.
- The project conducted training in best practices for working with autistic learners for SciAct, mentors, and other NASA groups.



Reach Map for 2022 STEM for All video.

https://stemforall2022.videohall.com/presentations/2273

Key Partners Active in 2022

- EDC
- NYSCI
- WestEd
- Orion Academy
- Stanbridge Academy
- Anova
- Oak Hill School

http://n3.sonoma.edu

Rocket launch in Petaluma, CA, September 9, 2022.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

NASA@ My Library

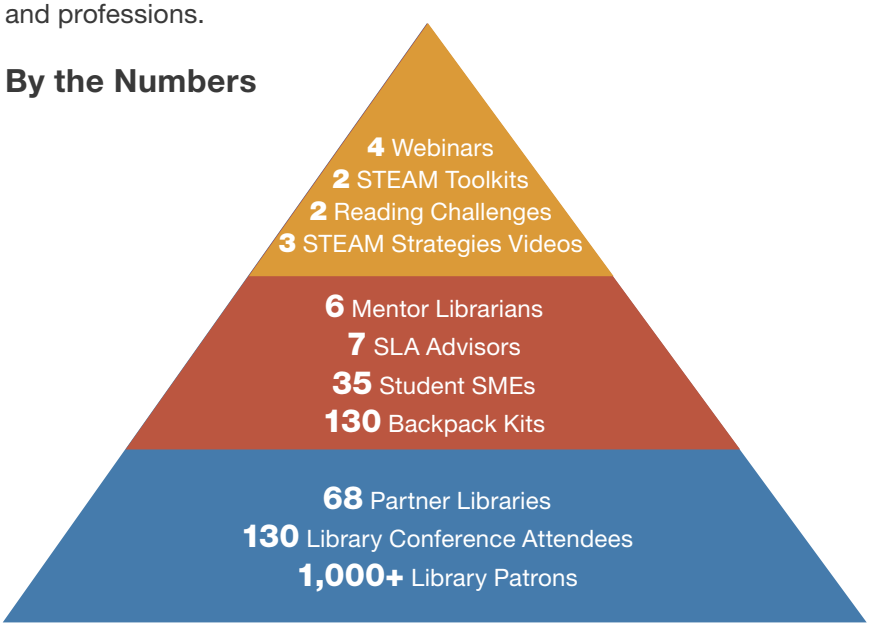
PI: Anne Holland
INSTITUTION: Space Science Institute

AUDIENCE AGES
3+

- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

NASA subject matter experts, library staff, and our partners will increase and enhance NASA STEAM learning opportunities for library patrons throughout the nation, including geographic areas and populations currently underrepresented in STEM education and professions.

By the Numbers



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"[Working with student subject matter experts] elevates the information shared with my patrons and builds community connections. Most important, it reinforces the concept that libraries are central for life-long learning and are 'America's living rooms.'" —NASA@ My Library partner library staff member

DELIVERY MODELS

- INDEPENDENT/ SELF-DIRECTED
- FACILITATED LEARNING
- GUIDED BY INFORMAL EDUCATORS
- DELIVERED BY FORMAL EDUCATORS
- PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nasa-at-my-library

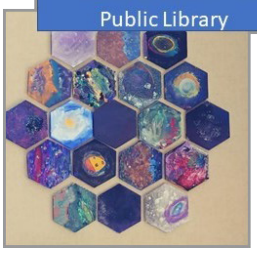
Key 2022 Accomplishments

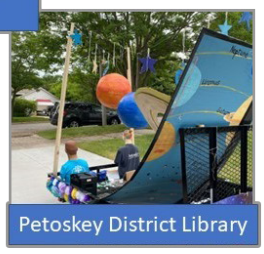
Original 2.0 Plan:

- STEAM strategy videos for library staff
- Virtual STEAM activity toolkits
- Webinars
- Student subject matter experts
- Check-in calls and affinity groups
- Backpack kits
- Reading challenges
- Mentor libraries
- Conference presentations

Supplement:

- Funds received from SMD to support eclipse activities in libraries, in partnership with the Gordon and Betty Moore Foundation–funded Solar Eclipse Activities for Libraries (SEAL) program.

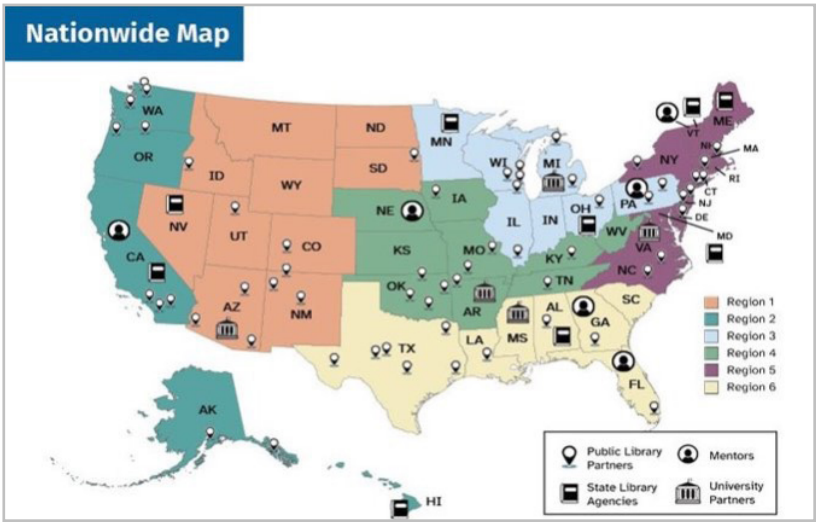




Key Partners Active in 2022

- ALA
- EDC
- LPI
- Partner and state libraries
- Beanstack
- 5 universities
- SciAct cross collaborations

Addressing Earth Confusions Video



ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Nationwide Eclipse Ballooning Project (NEBP)

PI: Dr. Angela Des Jardins
INSTITUTION: Montana State University

AUDIENCE AGES
16–75

16–17
18–22
23–29
30–75

NEBP will engage college teams from across the country to learn and take part in stratospheric ballooning campaigns during the October 14, 2023, annular and April 8, 2024, total solar eclipses. Atmospheric Science teams will fly radiosondes to examine atmospheric changes. Engineering teams will fly livestreaming cameras, precision GPS for catching gravity waves, and individual experiments. The project has a goal of 50% involvement of students who are historically underrepresented or underserved in STEM.

9 Regional Pods	**60** TEAMS	**33%** are MSIs	**18%** are CCs	**18** SMEs
39 States	**800** Students	**25** Technical Lessons	**15** Career Lessons	**100%** will do outreach

EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- **FORMAL EDUCATION**
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"The Eclipse Ballooning Project was a major boost in my confidence for what I am capable of, on a team or individually. I was able to go on to the career I truly wanted." –NEBP 2017 participant

DELIVERY MODELS

- INDEPENDENT/ SELF-DIRECTED
- FACILITATED LEARNING
- GUIDED BY INFORMAL EDUCATORS
- DELIVERED BY FORMAL EDUCATORS
- PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nationwide-eclipse-ballooning-project

Key 2022 Accomplishments

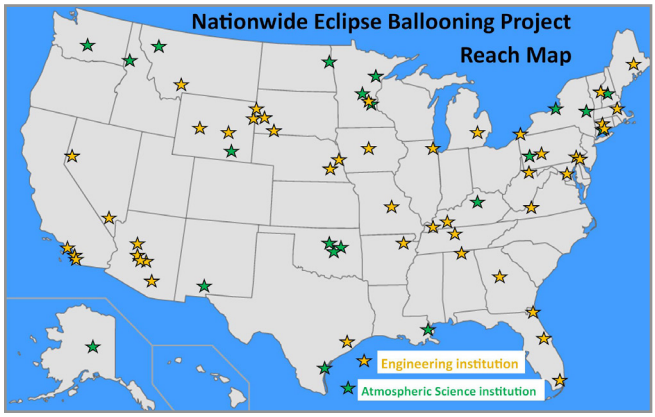
- The primary focus of NEBP in 2022 was preparing, both technically and logistically, to welcome all our participating teams.
- We held in-person Pod Lead workshops in Montana for each track in summer 2022 and have worked hundreds of hours remotely to make the NEBP experience a life-changing one for all the students.

Students conduct preparation activities in summer 2022 in Montana prior to welcoming 60 teams to the project in January 2023.

QR code to NEBP website

Key Partners Active in 2022

- NASA Space Grant
- NASA Balloon Program Office
- Jie Gong, GSFC
- June Wang, SUNY Albany
- Matt Bernards, Idaho Space Grant
- Jamey Jacobs, Oklahoma State U.
- Mary Bowden, U. of Maryland
- Sean Bailey and Suzanne Smith, U. of Kentucky
- Eric Kelsey, Plymouth State U.
- Jani Pallis, U. of Bridgeport
- James Flaten, Minnesota Space Grant
- Rick Eason and Andy Sheaff, U. of Maine



ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Native Earth | Native Sky (NENS)

PI: Dr. Kathryn "Kat" Gardner-Vandy
INSTITUTION: Oklahoma State University

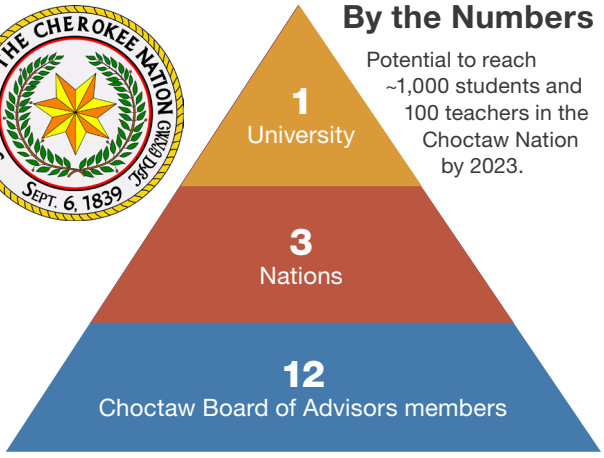
NATIVE EARTH NATIVE SKY

AUDIENCE AGES
10–15
10–12
13–15

Native Earth | Native Sky (NENS) co-creates culturally relevant Earth and sky STEM curricula with three Native American Nations in Oklahoma. We interweave stories, language, and culture into formal classroom Earth and space curricula in an effort to increase Native American participation in STEM careers. Year 2 of NENS has focused on finalizing Choctaw Nation of Oklahoma curricula, preparing for curriculum development with the Chickasaw Nation, and presenting at conferences.

By the Numbers

Potential to reach ~1,000 students and 100 teachers in the Choctaw Nation by 2023.



EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"I'm definitely more empowered to seek alternative methods of teaching by immersing students into a cultural, ecological experience and then weaving in science standard concepts."

—Participant at NENS Teacher Professional Development Workshop at Choctaw Nation Cultural Center (March 2022)

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://education.okstate.edu/research/centers/native-earth-native-sky/index.html

Key 2022 Accomplishments

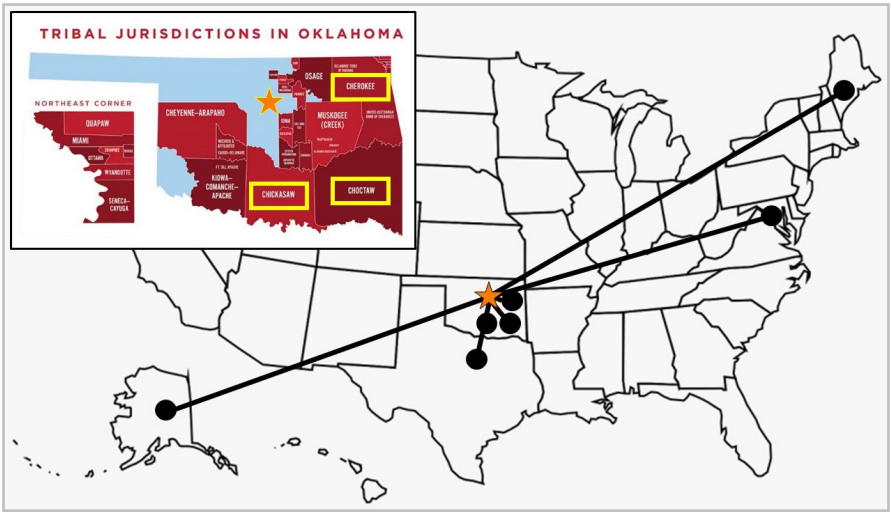
- NENS focused on curriculum development with the Choctaw Nation in Year 2.
- The curriculum is based on 6 different Choctaw stories.
- We held a professional development workshop for teachers at the Choctaw Cultural Center and presented our findings at the National Indian Education Association meeting.
- We also presented two literature reviews and a NENS overview at the School Science and Mathematics Association convention.
- Relationship building with the Chickasaw Nation and Cherokee Nation has continued.

A teacher PD participant views an exhibit at the Choctaw Cultural Center.

GRA Sarah McDowell presents at an NIEA meeting.

Key Partners Active in 2022

- Choctaw Nation of OK
- Chickasaw Nation of OK
- Cherokee Nation of OK
- OSU Center for Sovereign Nations
- Texas Christian University
- University of Alaska
- Gulf of Maine Research Institute
- Boeing



ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | **HELIOPHYSICS** | PLANETARY SCIENCE

Science Activation

Navigating the Path of Totality

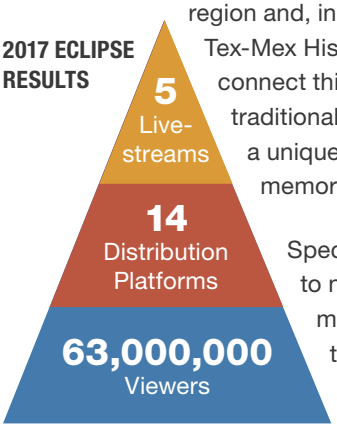
PI: Dr. Robert Semper
INSTITUTION: Exploratorium

AUDIENCE AGES
3+
- 3–5
- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

Navigating the Path of Totality is a public education program leveraging interest in the solar eclipses of 2023 and 2024 and achieved through an array of livestreams, on-demand videos, and social media postings in both English and Spanish. The Exploratorium's team of scientists, educators, and media producers, in partnership with the Indigenous Education Institute and Univision's Emmy-award-winning host Kira Vilanova, leverage the public's curiosity of these dramatic eclipse events to educate them about the Sun and NASA's Heliophysics System Observatory. The live broadcast locations bring the opportunity to create relevance through local culture: in 2023 by highlighting traditional knowledge of Navajo elders from the Four Corners region and, in 2024, by highlighting the traditions of the Tex-Mex Hispanic community. This enables the team to connect this awesome celestial event, NASA heliophysics, traditional ways of knowing, and Latinx culture for a unique mix of science and culture that is both memorable and meaningful to our broad audiences.

Special attention, information, and trainings are given to networks of libraries and museums, as well as to meteorologists and news agencies to guarantee the widest possible use of our assets.

2017 ECLIPSE RESULTS



EDUCATIONAL SETTINGS

- **INFORMAL/ OUT OF SCHOOL**
- **FORMAL EDUCATION**
- CITIZEN SCIENCE
- **PROFESSIONAL**

Audience Quote

"The Spanish feed was quite interesting and related the eclipse to the human experience and grounded it in some historical and local context."

DELIVERY MODELS

- **INDEPENDENT/ SELF-DIRECTED**
- FACILITATED LEARNING
- **GUIDED BY INFORMAL EDUCATORS**
- **DELIVERED BY FORMAL EDUCATORS**
- PEER PROFESSIONAL LEARNING

https://science.nasa.gov/learners/science-activation-teams/exploratorium

Key 2022 Accomplishments

- Live broadcast locations secured for 2023 and 2024.
- Past SciAct 1.0 products evaluated.
- Focused concept inventory developed and shared.
- Website and mobile app redesigned.
- 6 new K–12 Science Activities in line with NGSS.
- Field media production underway.

Interviewing Navajo elders, Monument Valley.

Drone work 2024 location: Junction, TX.

2023 location: Valley of the Gods, UT.

Key Partners Active in 2022

- Indigenous Education Institute
- Edu, Inc. (Evaluation)
- NASA HEAT

https://www.exploratorium.edu/eclipse

Nationwide Reach

On-Demand Videos in Spanish and English

- Eye Safety
- Eclipse 101
- Navajo Knowledge of Sun, Moon, Eclipse
- Parker Solar Probe (3)

Livestreams Available on Eclipse Day

- 3-hour live telescope-only feed
- 1-hour live English educational program
- 1-hour live Spanish educational program

Social Media

- Facebook, Instagram, TikTok
- 52 posts over 1 year

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Northwest Earth and Space Science Pathway (NESSP)

PI: Dr. Darci Snowden

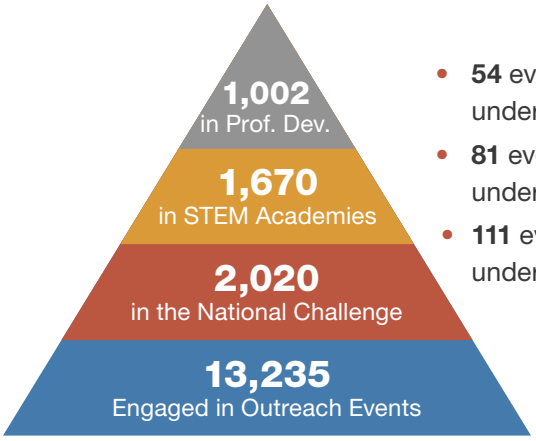
INSTITUTION: Central Washington University

AUDIENCE AGES

8+

8–9
10–12
13–15
16–17
18–22
23–29
30–75
76–99

NESSP uses NASA-related STEM activities to increase underserved and underrepresented students' aspirations toward STEM careers. NESSP also works closely with stakeholders to identify and address the unique challenges in underserved and rural communities and strives to make participants feel like they are part of the NASA community.



- **54** events with **40 to 80%** underrepresented participants.
- **81** events with less than **40%** underrepresented participants.
- **111** events with more than **80%** underrepresented participants.

NESSP reached 18,000 participants in 18 states, including school-aged learners, educators, and families.

NESSP engaged 6,617 participants in rural areas.

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Audience Quote

"[My students] were completely engrossed and engaged with the robots, the coding, and the possibilities…students expressed their interest in pursuing technology and coding goals—ideas that hadn't been available to them before the U of I NESSP team visited. This type of program is essential to low income schools. It brings a tangible opportunity that allows our students to look into a new vision of the future." —Principal at a rural school in northern Idaho

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/nessp

Key 2022 Accomplishments

- NESSP partners reached over 18 thousand participants nationally, including school-aged learners, educators, and families. The programs provide authentic, hands-on learning experiences based on NASA missions, science, and engineering.
- A majority of events that collected demographic information had at least 80% underrepresented participants.
- NESSP worked with tribal communities to adapt materials from the National Challenge.
- A total of 942 students participated in the Icy Worlds National Challenge, which included 10 hands-on Mission Objectives.
- NESSP took 50 students and 10 educators to Kennedy Space Center, where they witnessed a Falcon 9 launch.

The Red Tailed Hawks Flying Club hosts a rocket launch.

Students complete a week-long Icy Worlds Mini Mission.

Students listen to a talk by Dr. Gioia Mass about growing plants in space at Kennedy Space Center.

Students learn how to program a rover at an academy in Montana.

Key Partners Active in 2022

NESSP extends its reach through its partnerships with other Science Activation Teams:

- SEES: Texas Space Grant Consortium
- ASTRO CAMP Community
- Aurorasaurus
- Idaho Dark Sky STEM Network
- Smokey Mountain STEM Collaborative

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Ocean Community Engagement and Awareness Using NASA Observations and Science for Hispanic/Latino Students (OCEANOS)

PI: Dr. Juan L. Torres-Pérez

INSTITUTIONS: NASA's Ames Research Center,
University of PR at Mayagüez,
Inter American University of PR,
University of Miami,
EcoExploratorio Science Museum of PR,
Sociedad Ambiente Marino,
Taller Ecológico de PR

AUDIENCE AGES

16–22

16–17

18–22

OCEANOS is a 4-year project (2022–25) that aims at closing the gap between NASA technologies and underrepresented minorities by providing training opportunities to Hispanic/Latino (e.g., Puerto Rican) students through summer internship experiences focused on NASA Earth observations (EO), remote sensing, ocean color, and coastal ecosystem characterization led by a network of Puerto Rican subject matter experts.

The project's main goal is to improve capacity and awareness among first-generation Hispanic/Latino students on the availability of NASA EO for ocean color and coastal parameters. The students will have the opportunity to participate in a real-life oceanographic course, build their own do-it-yourself water-quality instruments, get trained on NASA's award-winning NeMo-Net application for coral reef characterization, and present project results to community members and national audiences.

EDUCATIONAL SETTINGS

- **INFORMAL/ OUT OF SCHOOL**
- **FORMAL EDUCATION**
- **CITIZEN SCIENCE**
- PROFESSIONAL

Audience Quote

"This is a fantastic idea! How can I collaborate?"

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | **FACILITATED LEARNING** | **GUIDED BY INFORMAL EDUCATORS** | **DELIVERED BY FORMAL EDUCATORS** | **PEER PROFESSIONAL LEARNING**

https://www.nasa.gov/oceanos

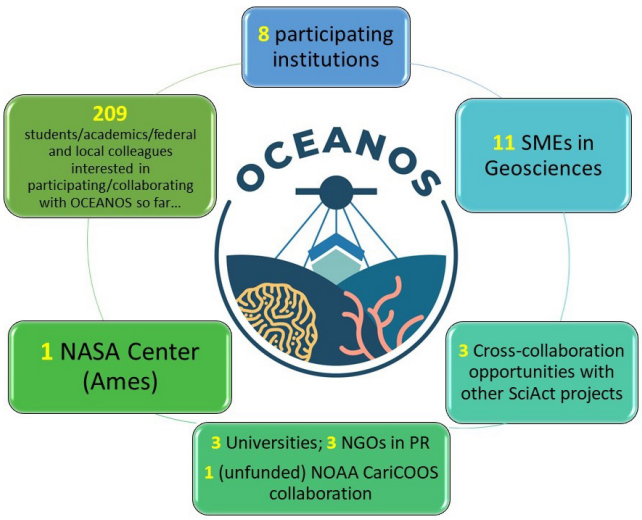
Key 2022 Accomplishments

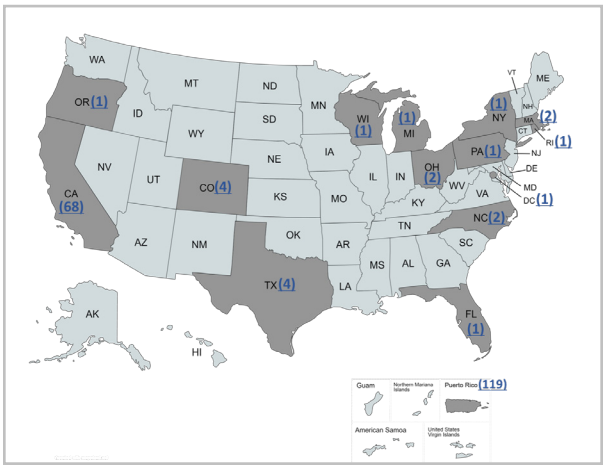
- Cross-collaborations with SciAct SaSa, N3, and SCoPE.
- Invited presentations to NASA Associate Administrator for SMD Dr. Thomas Zurbuchen and NASA Earth Science Division Director Dr. Karen St. Germain.
- Invited talks at CSU Stanislaus; University of PR; and Las Positas College in Livermore, CA.
- Recruitment of a Fellow from the Inter American University of PR.
- Educational modules are in progress; some are finished and ready for the summer 2023 internships!
- Booth exhibition at SACNAS in San Juan, PR; many colleagues interested in collaborating with the project; more than 70 students interested in participating left their contact information.
- Accepted project augmentation will allow participation of engineering students as mentors during the summer internships.

OCEANOS Co-Investigators meeting at PR Science Museum.

OCEANOS booth at the SACNAS NDiSTEM conference in San Juan, PR.

Planning design of DIY water-quality instrument with N3 intern.





Reach Map based on people who have shown interest or have participated in outreach activities about OCEANOS.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

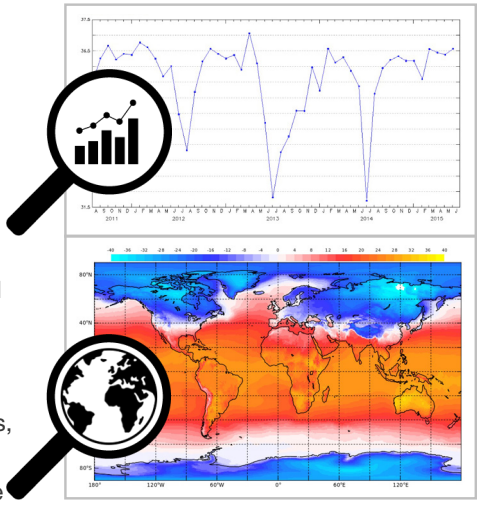
Place-Based Learning to Advance Connections, Education, and Stewardship (PLACES)

PI: Kirsten R. Daehler
INSTITUTION: WestEd

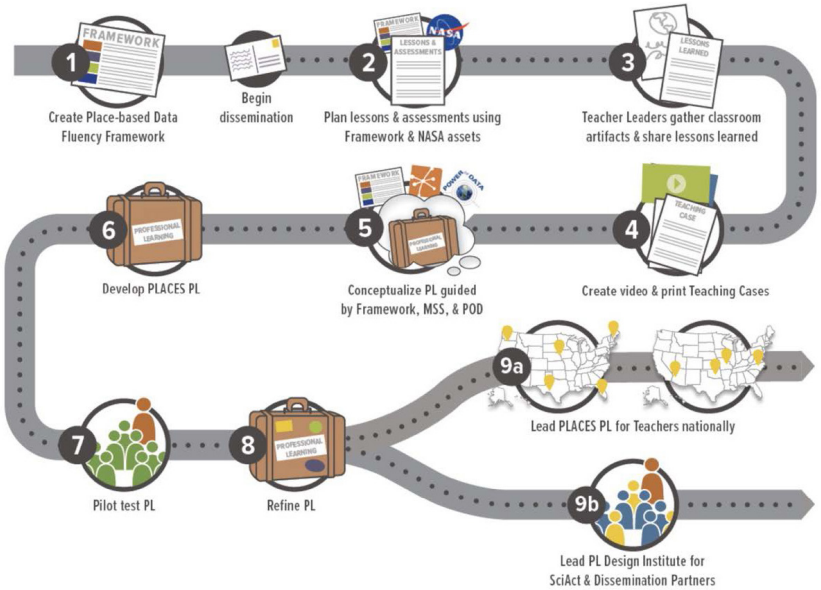
PLACES

AUDIENCE AGES
10+
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

NASA PLACES is developing professional learning to support data-rich Earth science learning—especially supporting educators who work with youth that bring a diversity of cultures, languages, and meanings of "place" to their understanding of science, including students who are underrepresented in STEM, such as indigenous youth and recent immigrants.



We draw on NASA datasets, images, and other assets to increase "data fluency"—the ability and confidence to make sense of and use data and data tools. This means knowing when, how, and why to use data for a specific purpose, such as solving problems and communicating ideas grounded in evidence.



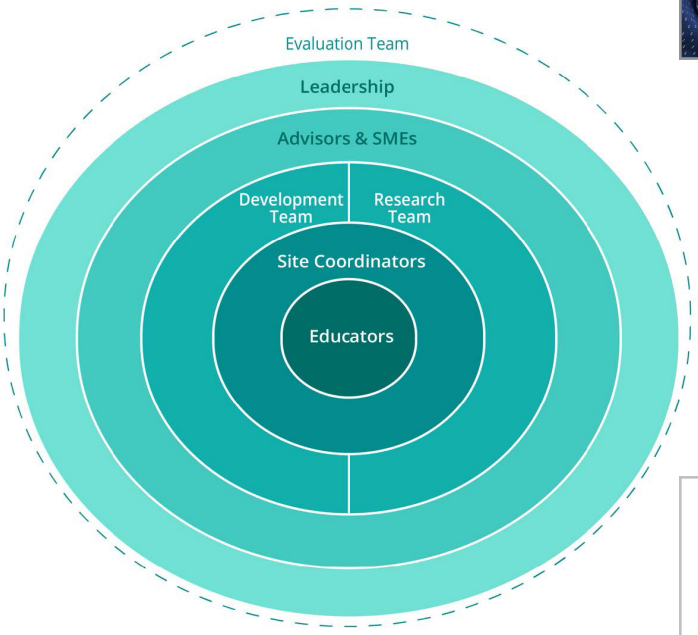
"Road Map" for developing, testing, and disseminating PLACES Professional Learning nationally.

EDUCATIONAL SETTINGS
- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

https://science.nasa.gov/science-activation-team/places

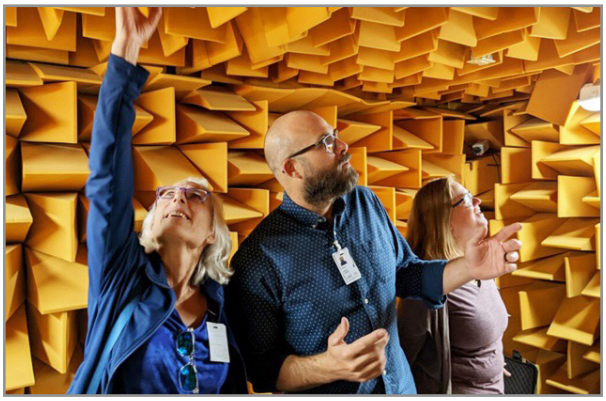
Key 2022 Accomplishments

- Conducted a literature review on place-based learning to support data-rich instruction that would inform the development of a "Place-Based Data Fluency Framework."
- Conducted a needs assessment to capture the perspectives of teachers about PL focused on place-based data-rich instruction, including a careful process for recruiting respondents who serve the populations of focus (i.e., Indigenous youth, emergent multilingual learners, and recent immigrants).
- Clarified terminology to ensure common understanding of such terms as "place-based learning," "data fluency," and "NASA assets."
- Recruited a group of educators who work with diverse learners to be our Case Writers and supported these educators in developing teaching cases.
- Co-planned instructional sequences with Case Writers and began to document their teaching experiences.



Key Partners Active in 2022

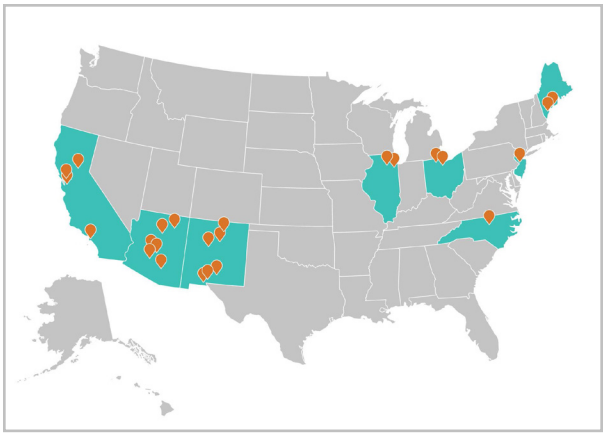
- Dataspire
- Concord Consortium
- GLOBE Mission EARTH
- Gulf of Maine Research Institute
- NASA Langley Research Center
- Northern Arizona University



Photos from our professional learning Development Team retreat and visit to NASA's Langley Research Center.

By the Numbers

- **21** Educators/Case Writers
- **2,100** Youth impacted in 2022
- **>25** Collaborating institutions
- **9** SMEs
- **6** Site coordinators



Case Writers nationwide.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Planetary Learning that Advances the Nexus of Engineering, Technology, and Science (PLANETS)

PI: Joëlle Clark

INSTITUTION: Northern Arizona University

AUDIENCE AGES
6+

- 6–7
- 8–9
- 10–12
- 13–15
- 16–17
- 18–22
- 23–29
- 30–75
- 76–99

PLANETS is an out-of-school time (OST) program for educators and youth in grades 3–8 that provides STEM learning with NASA planetary science and engineering, particularly for underserved audiences, using principles of diversity, equity, access, and inclusion. Our intended groups of learners include Indigenous learners, emergent multilingual learners, and learners experiencing physical and/or sensory disabilities.

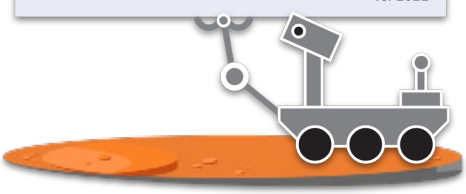
5,176 youth ▲122% vs. 2021

3,371 educators ▲518% vs. 2021

1,177 families ▲371% vs. 2021

Unit Downloads

Remote Sensing	580	▲269% vs. 2021
Water in Extreme Environments	460	▲357% vs. 2021
Space Hazards	633	▲433% vs. 2021



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- HOME/FAMILY
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"I wish more curriculum creators would reach out and do the same [process] to make sure topics are culturally sensitive and inclusive with end-users in mind. Please keep doing this and make it the norm!"

DEIA Experts and Co-Design Team Members

- **5** Indigenous learners
- **4** multilingual learners
- **5** diversability
- **9** subject matter experts

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | **GUIDED BY INFORMAL EDUCATORS** | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://www.planets-stem.org

Key 2022 Accomplishments

- PLANETS partnership is functioning well and is fostering a sense of collaboration and shared vision.
- The Co-Design team collaborated on edits to "Remote Sensing" for DEIA, science content, and additional NASA assets.
- The Research team developed "A Practical Guide for Out-of-School-Time Professionals to Promote Inclusion and Engagement in STEM Learning."
- PLANETS dissemination included 6 conferences, 2 publications, and 5 working sessions.

PLANETS team at Partner Working Group.

Outreach table at NAA Las Vegas 2022.

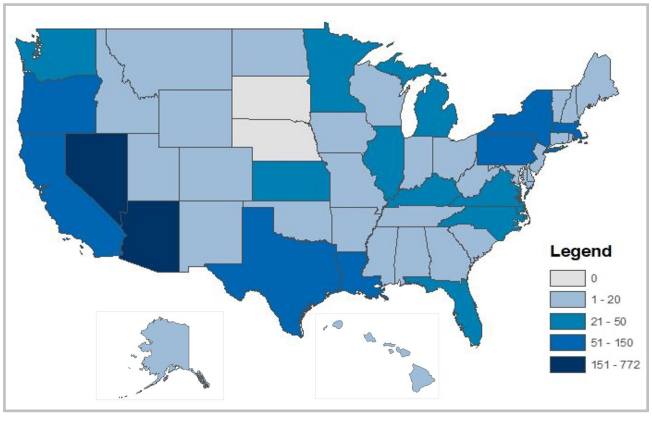
Sean Ryan of PLANETS leading a working session with OST educators.

Testing out an activity about how water shapes landforms on Mars.

Key Partners Active in 2022

- Museum of Science STEM Curricula PreK–8
- USGS Astrogeology Science Center
- WestEd.org

Visit our site to learn more



PLANETS Reach 2022.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | **PLANETARY SCIENCE**

Science Activation

Planetary Resources and Content Heroes (ReaCH)

PI: Andy Shaner

INSTITUTION: Lunar and Planetary Institute

AUDIENCE AGES

10+

10–12
13–15
16–17
18–22
23–29
30–75
76–99

Planetary ReaCH conducts workshops for planetary science subject matter experts (SMEs).

These workshops provide SMEs with tools for creating and sustaining deliberate, authentic partnerships with informal educators in diverse communities.

Workshop participants confront personal biases and learn to engage diverse audiences from an assets-based approach.

A post-workshop public event allows participants a chance to implement lessons learned during the workshop.

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Audience Quote

"[T]hank you for the opportunity to be part of the Planetary Reach workshop. The effort to make us mingle and to feel in a safe place to share is much appreciated and was a crucial aspect for the whole thing. I already loved outreach activities but now I feel more confident and prepared." —SME workshop participant

"I don't want to go home." —Public event participant

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | **GUIDED BY INFORMAL EDUCATORS** | DELIVERED BY FORMAL EDUCATORS | **PEER PROFESSIONAL LEARNING**

https://www.lpi.usra.edu/planetary-reach

Key 2022 Accomplishments

- Conducted three Culturally Inclusive Planetary Engagement pilot workshops.
- Partnered with two DEIA and STEM researchers to identify effective engagement strategies and co-design materials for workshops.
- Used an iterative workshop development process to design our approach for increasing participant knowledge of culturally relevant, authentic ways to build relationships; confidence in building new relationships; and understanding of evidence-based engagement strategies.

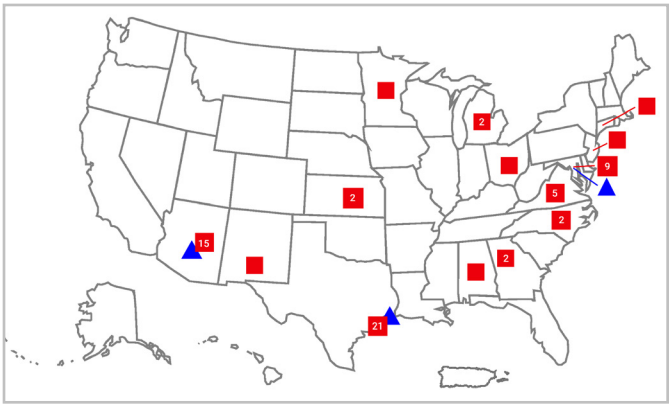
Planetary ReaCH

Residential States of ReaCH Workshop Participants	Number Attending Workshops	Workshop Locales Attended
TX	21	AZ, MD, TX
AZ	15	AZ, MD, TX
MD	9	MD
VA	5	AZ, MD
GA, KS, MI, NC	2 each	AZ, MD, TX
AL, CT, MN, NJ, NM, OH	1 each	MD, TX

Participants of the ReaCH workshop at the Applied Physics Lab (MD) discuss the importance of creating authentic partnerships with diverse communities. Credit: LPI

A planetary SME engages with young participants at the public event following the ReaCH workshop at Arizona State University. Credit: Sanlyn Buxner

Post-workshop public event participants in Pasadena, TX, learn about impact cratering. Credit: LPI



A total of 64 SMEs and informal educators participated in ReaCH pilot workshops in 2022. Workshop locations are identified by blue triangles. Red squares identify the residential states of workshop participants.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

SciAct STEM Ecosystems

PI: Dr. Rae Ostman

INSTITUTION: Arizona State University

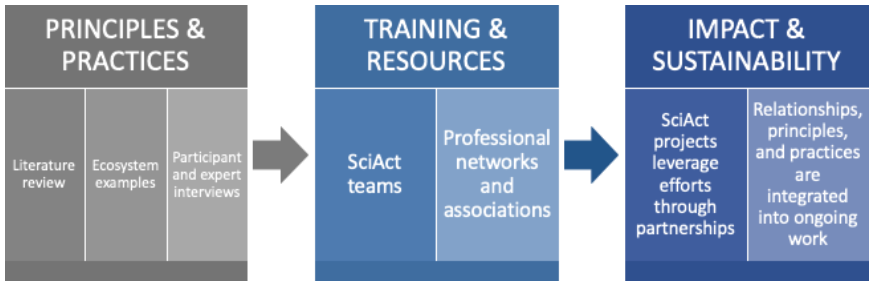
AUDIENCE AGES

18+

- 18–22
- 23–29
- 30–75
- 76–99

SciAct STEM Ecosystems works across the NASA SciAct community to strengthen collaborations and provide professional development related to principles and practices of STEM learning ecosystems.

The project is identifying approaches and creating resources that SciAct teams and partners can use to broaden participation and connect learners with authentic STEM learning experiences.



EDUCATIONAL SETTINGS

- INFORMAL/ OUT OF SCHOOL
- FORMAL EDUCATION
- CITIZEN SCIENCE
- PROFESSIONAL

Audience Quote

"The driving factor is to provide [STEM engagement] opportunities for underrepresented populations and groups of learners that don't normally have these opportunities." —Practitioner from a STEM learning ecosystem

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/stem-ecosystems

Key 2022 Accomplishments

- In 2022, the project team completed three inquiry cycles focused on identifying principles and practices of STEM learning ecosystems that are intentionally designed to broaden participation in authentic STEM engagement.
- We are also planning professional development opportunities and resources for SciAct, which will be implemented in 2023–24.

Annual meeting with project team and advisors (virtual).

GLOBE Student Research Symposium, 2022, Fairbanks, AK.

Project WILD presentation, NC.

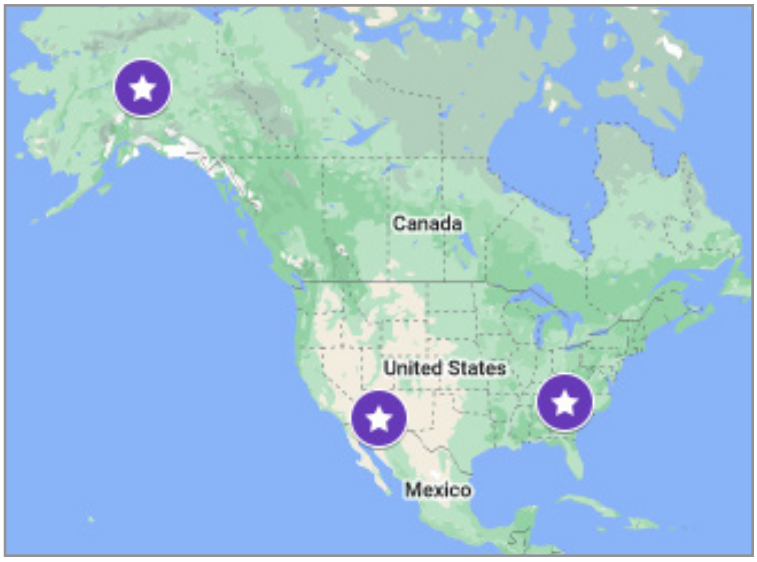
Youth climate change program, AZ.

Key Partners Active in 2022

- NASA SMD and SciAct program
- Arizona State University
- University of Alaska Fairbanks
- Southwestern Community College
- Arizona Science Center
- Museum of Science

Participating STEM Learning Ecosystems

- Arctic and Earth SIGNs, AK
- Rural Activation & Innovation Network (RAIN), AZ
- Smoky Mountains STEM Collaborative, NC



ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | **HELIOPHYSICS** | PLANETARY SCIENCE

Science Activation

Science Through Shadows

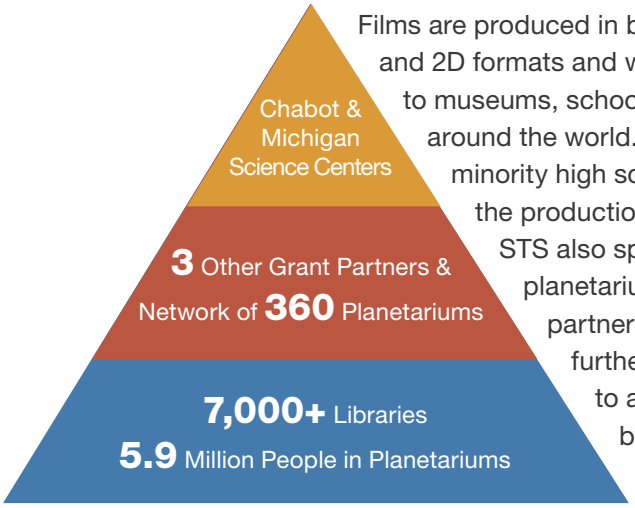
PI: Dr. Douglas Duncan
SCIENCE PI: Dr. John Keller
INSTITUTION: Fiske Planetarium, Univ. Colorado Boulder

AUDIENCE AGES
6+

6–7
8–9
10–12
13–15
16–17
18–22
23–29
30–75
76–99

Science Through Shadows (STS) increases astronomy literacy and informs people about NASA's project and workforce diversity through dissemination of short films about solar eclipses, occultations, transits, and small bodies of the solar system.

FISKE PLANETARIUM
University of Colorado Boulder



Films are produced in both fulldome and 2D formats and will be released to museums, schools, and libraries around the world. STS involves minority high school students in the production of these films. STS also sponsors 5 inflatable planetariums, given to partners so that they may further outreach efforts to areas underserved by brick-and-mortar museums.

EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"We are extremely excited to start working with high schoolers from Chabot Science Center on co-production of videos for diverse audiences." —Science PI John Keller

DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/science-through-shadows

Key 2022 Accomplishments

- Hiring of educational project manager.
- Hiring of video producer and editor.
- Purchase of 5 inflatable planetariums to be used by Fiske and partners.
- Production of films about upcoming annular and total solar eclipses, in both English and Spanish.
- Establishment of relationships and initiation of collaborations with partners around the United States.

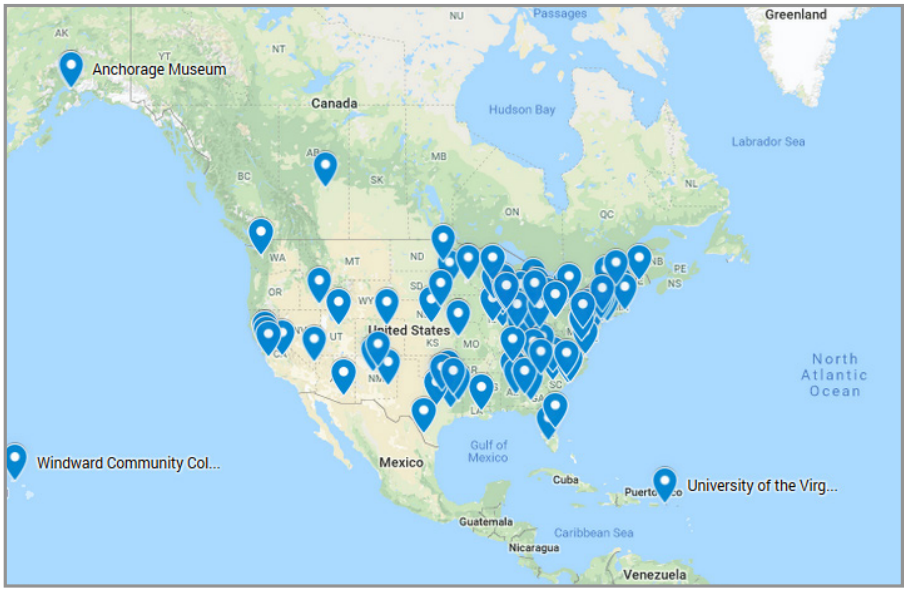
Science through Shadows

Aerospace students watching the 2017 solar eclipse. Sponsored by Fiske, the group launched a rig of GoPro cameras to video the eclipse from 107,000 feet.

The shadow of the Moon over Grand Teton National Park during the 2017 solar eclipse. This view was captured by the students seen in the picture to the left.

Key Partners Active in 2022

- Michigan Science Center
- Chabot Space and Science Center
- Houston Museum of Natural Sciences
- NASA ASTRO CAMP
- American Museum of Natural History



The network of over 200 U.S. planetariums and science technology centers that Fiske has established from 2015 to the present. This network serves 6.3 million guests annually.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Sea Level Education, Awareness, and Literacy

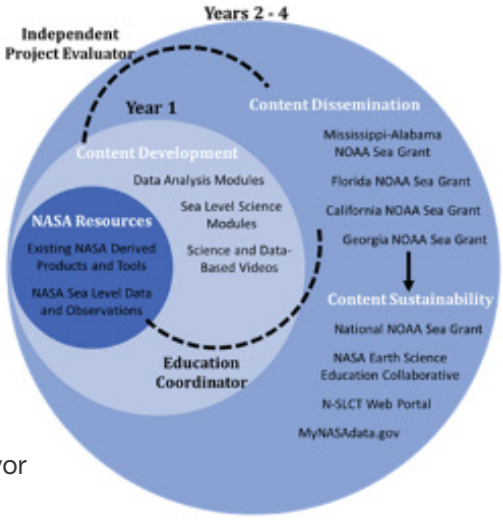
PI: Dr. Benjamin D. Hamlington
INSTITUTION: NASA's Jet Propulsion Laboratory

AUDIENCE AGES
8+
8–9
10–12
13–15
16–17
18–22
23–29
30–75
76–99

In this project, we leverage and extend the impact of NASA's significant investments into the global sea level observing network and research, as well as the science translation and dissemination expertise of the National Oceanic and Atmospheric Administration's (NOAA) Sea Grant to foster the activation of NASA sea level change science.

SEA LEVEL CHANGE
Observations from Space

We focus on educating youth and adult formal, informal, and nonformal audiences on past, present, and future sea level rise in coastal communities that are highly affected.



EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"You can't stop the floods, you can't stop the rains. You can only learn how to adapt." —Mayor of the City of Tybee Island, Georgia

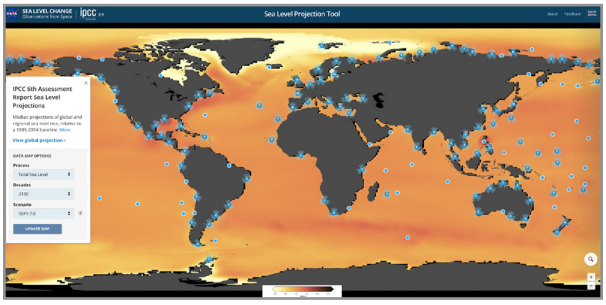
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

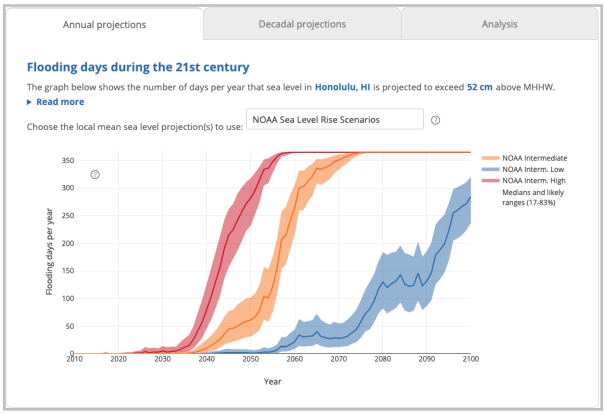
https://sealevel.nasa.gov/

Key 2022 Accomplishments

- Started mid-cycle.
- Initiated group organization.
- Executed a programmatic sharing session for all organizations involved.
- Completed an extensive survey of NASA resources and content that are currently available from past or existing efforts.
- Conducted a survey and associated summary report of the sea level change content within the existing Sea Grant programs.
- Worked on establishing learning objectives.
- Worked on developing evaluation plan.



NASA Sea Level Projection Tool.



NASA Flooding Days Projection Tool.

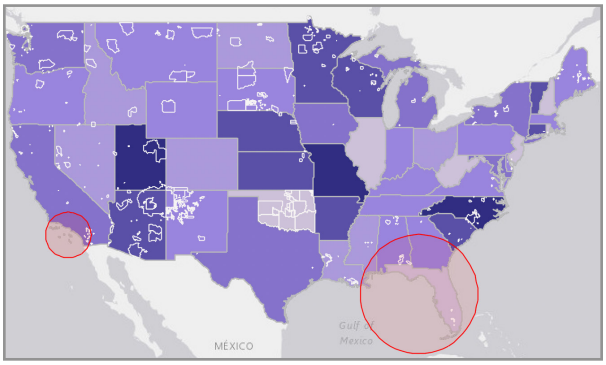
Key Partners Active in 2022

- CA, GA, FL, and MS-AL Sea Grant Programs
- Climate Science Alliance
- Dauphin Island Sea Lab's Discovery Hall Program
- Georgia Institute of Technology
- University of Georgia
- University of Southern Mississippi's Marine Education Center

NASA Observations and Research Supporting Sea Level Change Education and Community Awareness

Wave overtopping in Imperial Beach, CA, during a high tide.

Georgia Sea Grant Flood STEAM Challenge participants.



Hands-on programming along the Gulf and Southern California coasts, as well as web content publicly available nationwide.

ASTROPHYSICS | BIOL/PHYS SCIENCES | EARTH SCIENCE | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Smoky Mountains STEM Collaborative (SMSC)

PI: Matthew Cass

INSTITUTION: Southwestern Community Colleg

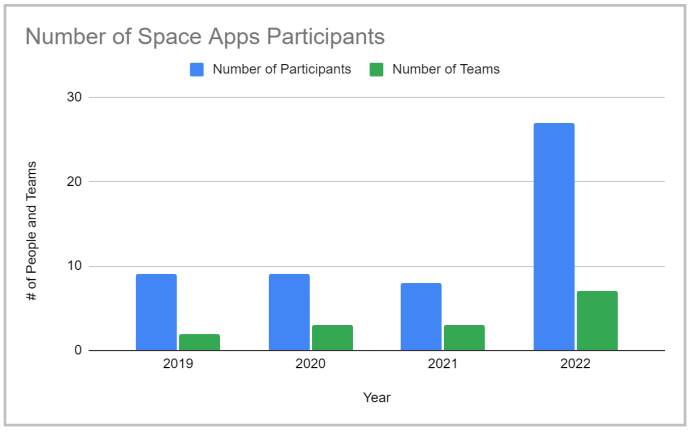
Smoky Mountains STEM Collaborative

AUDIENCE AGES

6+

6–7
8–9
10–12
13–15
16–17
18–22
23–29
30–75
76–99

We work with learners from a diverse population, including enrolled members of the Eastern Band of the Cherokee Indians and many first-generation college students. These learners are underrepresented not only in STEM fields, but in higher education in general. Our continuing mission is to expand and engage the region's public schools, tribal schools, community colleges, and universities in a cohesive, learner-centered STEM ecosystem that leverages subject matter experts (SMEs) and science centers to achieve NASA's mission to help learners of all ages "do" science in their own communities.



EDUCATIONAL SETTINGS

INFORMAL/ OUT OF SCHOOL

FORMAL EDUCATION

CITIZEN SCIENCE

PROFESSIONAL

Audience Quote

"Research is fun, and really creative, and makes you think hard until you get closer to the right answer."

—From a PARI Camp student

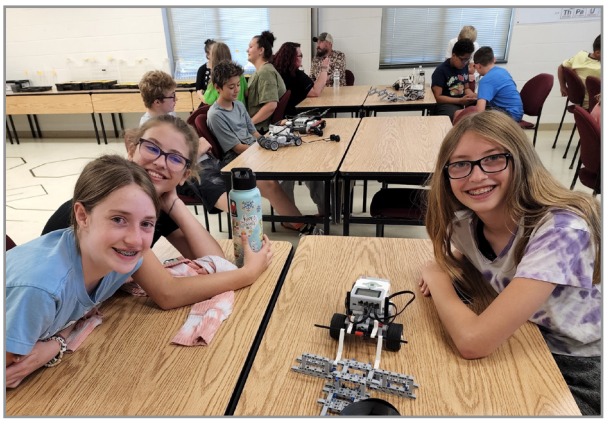
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/smsc

Key 2022 Accomplishments

- James Webb Space Telescope first images events (college and community).
- Summer camp success (ASTRO CAMP) and continued badging success.
- 2022 Space Apps Challenge (hosted at PARI, largest turnout yet!).
- Earth to Sky Partnership representation and leadership (Randi Neff).
- 10 NASA Ambassadors in community K–12 schools (previously 6 in Year 1).
- Personnel: expanded team and leadership training (Alex Lewis, Communications/Matt Cass, Rural Education Program).

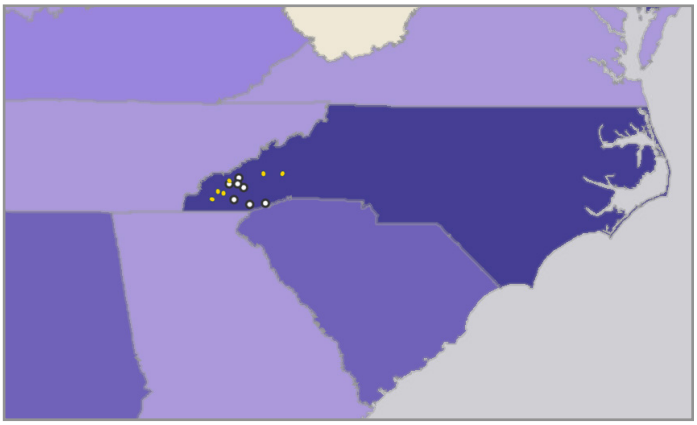


Robotics Camp—MS mentored by HS.
Credit: Alex Lewis

Space Apps at PARI.
Credit: Alex Lewis

Key Partners Active in 2022

- Pisgah Astronomical Research Institute
- Appalachian State University
- Fontana Regional Library
- Nantahala Regional Library
- 6 public school districts
- Western Regional Education Service Alliance
- Boys & Girls Club of the Plateau
- The Science House
- Great Smoky Mountains National Park
- STEM West
- Western Carolina University



2022 current and extended* reach.
*Gold dots represent new reach.

ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

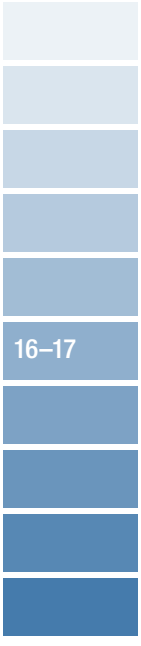
STEM Enhancement in Earth Science (SEES)

PI: Margaret Baguio

INSTITUTION: UT Center for Space Research

AUDIENCE AGES

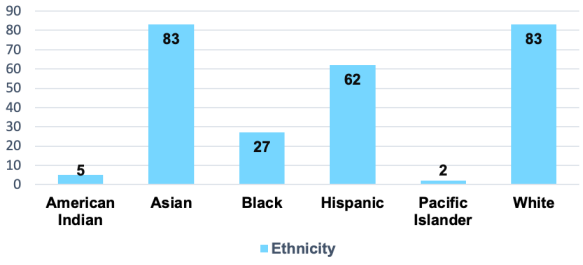
16–17



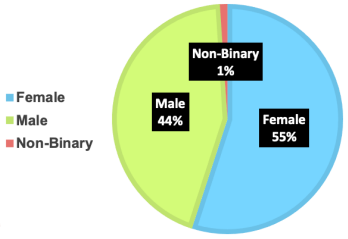
The STEM Enhancement in Earth Science (SEES) project addresses the national need to increase the number of high school students, particularly underrepresented minorities and those from underserved areas, who will pursue STEM college degrees. In 2020–21, we partnered with institutions, organizations, and Science Activation partners to identify NASA missions, data from NASA's fleet of Earth observing satellites, mission planning, and citizen science projects as a catalyst for the virtual high school intern program.

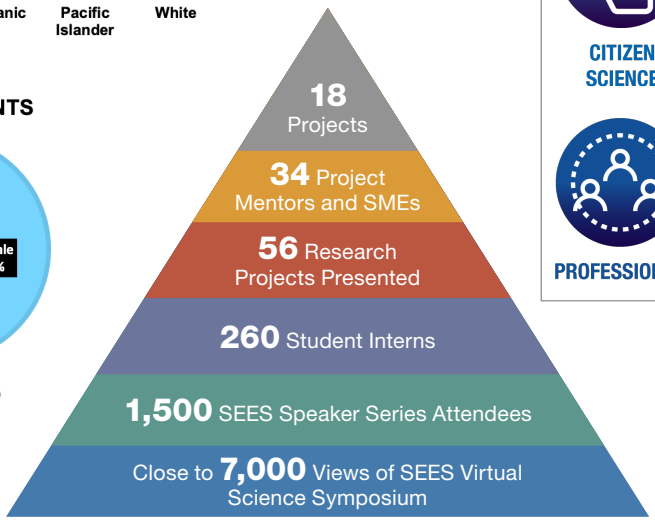
The interns analyze and visualize data, learn about careers from subject matter experts, explore career choices from university experts, and conduct virtual tours of NASA facilities. Content knowledge, coupled with hands-on experiences, allows the intern to gain experience in authentic research through field investigation and data analysis.

ETHNICITY



TOTAL STUDENTS





EDUCATIONAL SETTINGS


INFORMAL/ OUT OF SCHOOL


FORMAL EDUCATION


CITIZEN SCIENCE


PROFESSIONAL

Audience Quote

"It is difficult to find the words to describe the incredible experience I had at SEES. The remarkable people I met and experiences I enjoyed will be remembered for a lifetime."

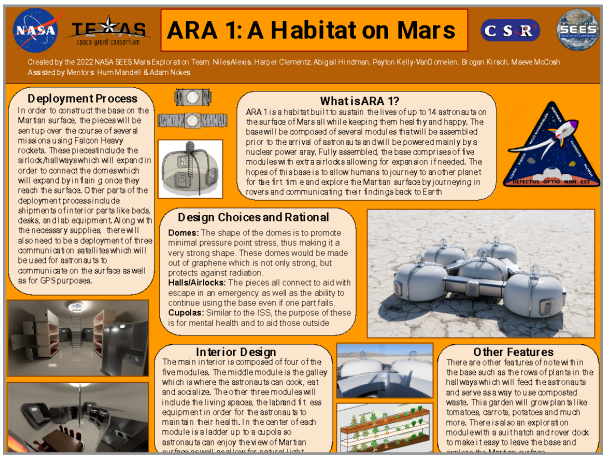
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED	FACILITATED LEARNING	GUIDED BY INFORMAL EDUCATORS	DELIVERED BY FORMAL EDUCATORS	PEER PROFESSIONAL LEARNING

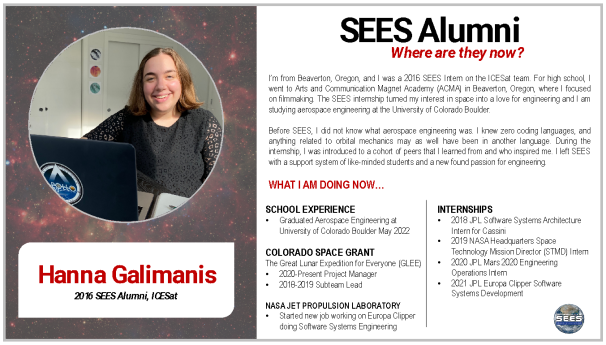
https://www.csr.utexas.edu/sees-internship/

Key 2022 Accomplishments

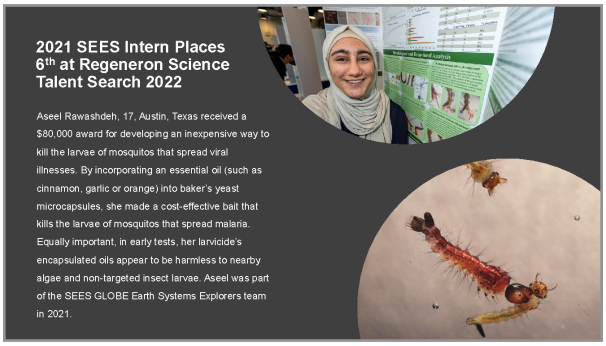
- 1,130 applications/800 completed.
  - » 92 selected for onsite projects.
  - » 110 for Earth System Explorers.
  - » 60 for virtual projects.
- 210 contact hours per student.
- 42% underrepresented, 25% underserved.
- 56 research projects presented.
- 35 AGU posters/abstracts submitted.



Poster created by 2022 SEES Mars Exploration Team.



SEES Speaker Series: 2016 SEES intern Hanna Galimanis spoke to 2022 SEES interns about how her SEES internship opened pathways to new experiences and opportunities.



2021 SEES intern Aseel Rawashdeh places 6th at the 2022 Regeneron Science Talent Search.

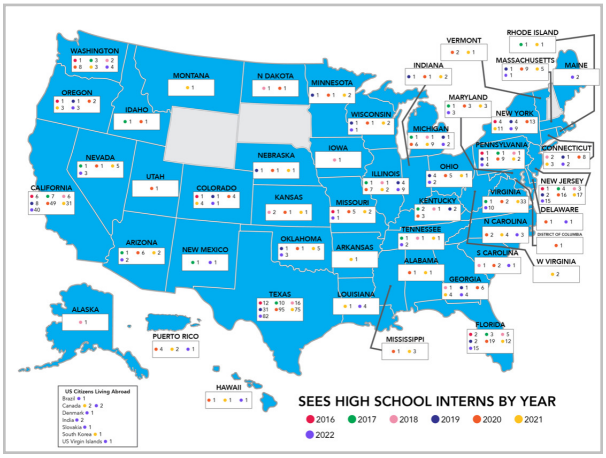
Key Partners Active in 2022

- GLOBE Mission EARTH
- NASA Earth Science Education Collaborative (NESEC)

View the presentation from the SEES Mars Exploration Team from the 2022 SEES Science Symposium.

Watch the Value of Authentic Research for All High School Students video on YouTube.

15 SEES 2022 teams join the Great Lunar Expedition for Everyone, which will deploy 5-gram LunaSats programmed by SEES students to the surface of the Moon.



ASTROPHYSICS | BIOL/PHYS SCIENCES | **EARTH SCIENCE** | HELIOPHYSICS | PLANETARY SCIENCE

Science Activation

Student Airborne Science Activation (SaSa)

PI: Dr. Charles K. Gatebe

INSTITUTION: NASA's Ames Research Center

AUDIENCE AGES
16–22
16–17
18–22

Key Partners: Coppin State University, Hampton University, NASA's Goddard Space Flight Center, Howard University, NASA's Langley Research Center, Morgan State University, University of Maryland Eastern Shore, University of Maryland Baltimore County

Short Description: The Student Airborne Science Activation (SaSa) Project completed its second year of implementation for first- and second-year undergraduate students from Minority Serving Institutions (MSIs) to conduct a summer internship with NASA. The SaSa geoscience learning ecosystem (GLE) strived for effective student engagement with NASA scientists and engineers, academic advisors, peers, and the local communities.

Toward Greater Diversity in Earth Sciences: NASA's Student Airborne Science Activation Program: https://www.nasa.gov/feature/ames/toward-greater-diversity-in-earth-sciences-nasa-s-student-airborne-science-activation

EDUCATIONAL SETTINGS
INFORMAL/ OUT OF SCHOOL
FORMAL EDUCATION
CITIZEN SCIENCE
PROFESSIONAL

Audience Quote

"Throughout the flight, I felt my dreams of becoming a scientist become more tangible, as I saw the science happening in front of me." —Sophia Ramirez, California State Polytechnic University in Pomona

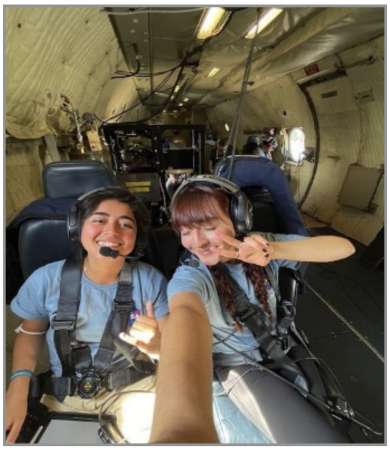
DELIVERY MODELS

INDEPENDENT/ SELF-DIRECTED | FACILITATED LEARNING | GUIDED BY INFORMAL EDUCATORS | DELIVERED BY FORMAL EDUCATORS | PEER PROFESSIONAL LEARNING

https://science.nasa.gov/science-activation-team/student-airborne-science-activation

Key 2022 Accomplishments

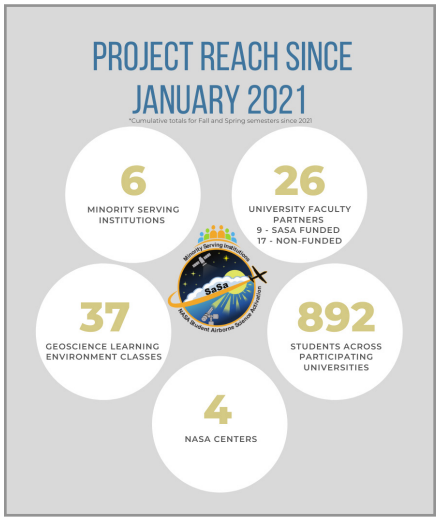
- Twenty-five undergraduate students across the nation participated in a 2-month airborne research experience.
- The Geoscience Learning Ecosystem (GLE) was infused into existing courses in spring 2022 at all the 6 MSIs that were taken by over 300 students.
- Cross-collaborations took place with SciAct OCEANOS.



Romina Cano (left) and Sophia Ramirez (right) buckled up and ready for takeoff! Credit: Sophia Ramirez

Participants of SaSa's inaugural class and some of their mentors pose in front of NASA's P-3 aircraft, which they used to collect some of the Earth science data needed for their research studies. Credit: NASA

Posing with friends in front of the P3 Orion before boarding. Credit: Raffa



Reach map—SaSa has 6 participating MSIs and 4 NASA Centers. So far, 26 university faculty members have participated in the program and taught 37 courses, reaching out to more than 892 students.

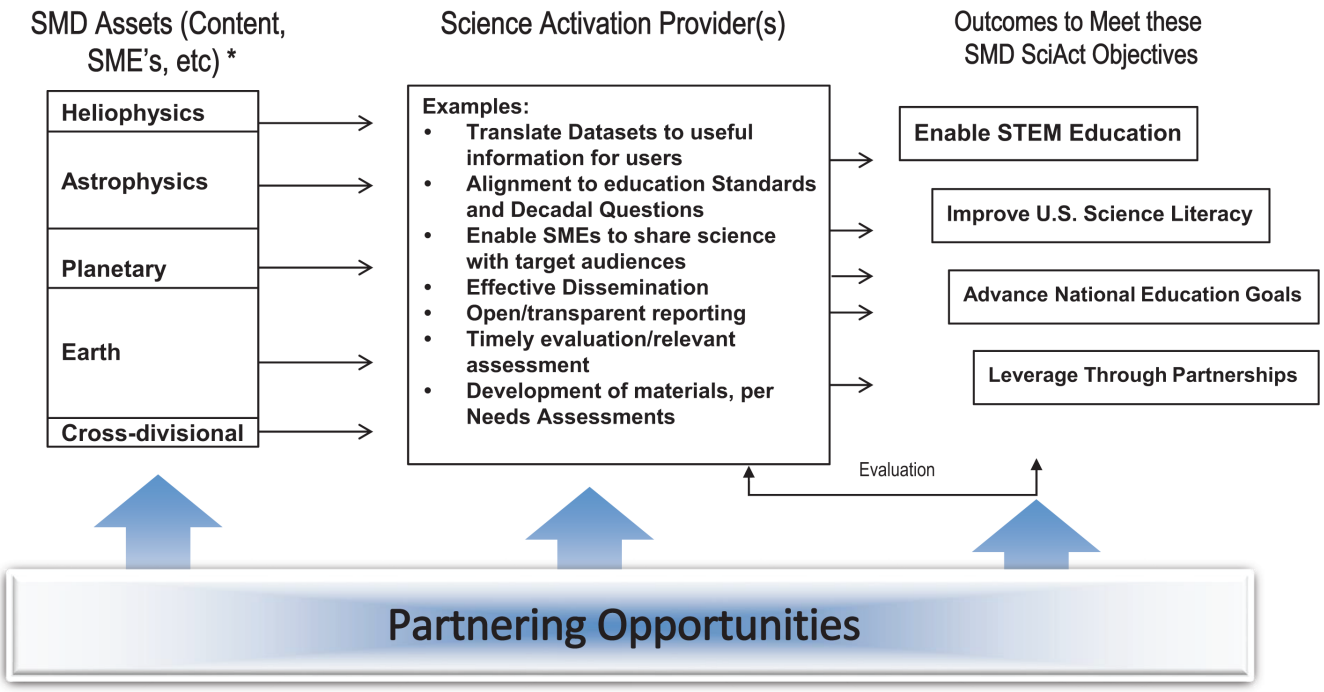
NASA's Student Airborne Science Activation

https://www.youtube.com/watch?v=mFRIA_C-I2c

APPENDIX

Science Activation Model and Mid-Level Objectives

SMD Science Activation Model



SCIENCE ACTIVATION DESIRED OUTCOME/VISION STATEMENT:

*To further enable **NASA science experts and content** into the learning environment more effectively and efficiently with learners of all ages.*

OBJECTIVES:	Mid Level Objectives:
Enable STEM Education	Inspire participants' interest in **STEM** and the development of their identities as science learners.
	Provide opportunities for participants to engage with the disciplinary content related to **NASA science and engineering.**
	Increase number of and frequency with which **NASA SMD assets** are used by learners across the US.
Improve U.S. Scientific Literacy	Advance participants' understanding of the process of science using **NASA SMD assets.**
Advance National Education Goals	Increase participation in learner-centered experiences based on **NASA SMD assets.**
	Increase the diversity of participants reached by **Science Activation** through intentional, inclusive programming.
	Engage participants in learning experiences that promote development of skills for **STEM** careers.
Leverage Efforts through Partnerships	Leverage internal mechanisms to support sharing and learning across the **Science Activation** portfolio.
	Utilize external partners to leverage reach and effectiveness of the **Science Activation** portfolio.

NASA SMD assets = science content and data, space and airborne platforms, and scientific and technical personnel.

Competitively selected in 2019, Science Activation's Independent Portfolio Evaluator, Pacific Research & Evaluation, LLC, conducted a survey of attendees at the 2022 Annual Review.
(Shown below is the summary report with...)

KEY FINDINGS
FROM THE
2022 ANNUAL MEETING EVALUATION REPORT

2022 ANNUAL MEETING EXIT SURVEY

The survey gathered feedback about general experiences, the usefulness of individual sessions, the extent to which the Meeting provides space to discuss lessons learned, and considerations for future Meetings.

- Cross collaboration is highly valued across the portfolio. The Annual Meeting is a unique opportunity for individuals to intentionally and organically build relationships with others.
- Virtual participants found the experience to be useful, though they noted various technical challenges that prevented them from fully immersing themselves into the Meeting.
- The keynote speakers played an important role in shaping the conference, however attendants would prefer to have less didactic presentations and more interactive presentations.
- First-time attendees struggled, somewhat, to adopt the "norms" of SciAct at the annual meeting, sharing that it took them some time to understand commonly referenced acronyms, understand how to maximize the schedule, and know what to expect from social time.
- In addition to building in more time for breakout activities and group work, scheduled time to reflect or pause between activities could help attendees with processing the volume of information shared.

MLO 3B SURVEY AND BREAKOUT GROUP

Individuals completed a survey, sharing the primary obstacle their project faces as each seeks to increase the diversity of participants. Discussion groups were organized based on responses, exploring needs and solutions relative to these barriers.

- SciAct teams acknowledged the importance of utilizing a community-centric approach across projects, taking the time and effort to ask communities questions about their needs, rather than assuming they know the best collaboration needs for the community that they are serving.
- SciAct teams were aware that the weight to strengthen DEIA efforts tends to fall on diverse project members and colleagues within SciAct. This work may extend beyond what they were hired to do and can potentially add pressure on these individuals.
- Accessibility barriers that projects continue to navigate include offering activities in multiple languages and ensuring that transportation is available.
- For community members, partnership with a SciAct project can often result in an increased workload, impacting to what extent an organization is able to integrate project-based activities (e.g., a complete series of workshops on a set cadence). Projects noted that the teachers they partnered with often had limited financial resources and more strict curriculum constraints.
- Multiple participants indicated a need for creating project and program materials that are accessible for neurodivergent students, such as utilizing "no-fluff" language and providing/presenting materials in various modalities.

KEY FINDINGS (CONTINUED)
FROM THE
2022 ANNUAL MEETING EVALUATION REPORT

MLO 4A SURVEY DATA

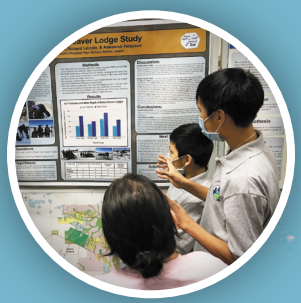
Attached to the 2022 Annual Meeting Exit Survey were three questions prompting respondents to reflect on ways in which internal sharing and learning can be activated across SciAct mechanisms

- Existing mechanisms, such as Monthly Meetings, Action Groups, and Communities of Practice are all valued as regular opportunities to check in. Suggestions for enhancing these mechanisms included allowing presenters more meeting time for sharing and allowing projects to present at times that better correlate with milestone activities.
- There is a desire to follow-up on ideas or needs expressed in Monthly Meetings or Annual Meetings, particularly in ways that allow for organic and intentional collaboration (e.g., action groups, communities of practice, messaging boards in WebEx and on Slack).
- Regardless of mechanism, the ability to participate in these kinds of conversations varied across projects. Some respondents shared their project budget does not support participation in these spaces, meaning they have to limit their engagement or opt out.
- Motivation to, or explanation of, collaboration activities differed across projects. Some respondents highlighted the "togetherness" of this work and intent to diversify perspectives present. Others focus their collaboration on aligning activities (e.g., efforts with similar audiences, work in the same region, etc.). Projects that were relatively new to SciAct indicated that they were not yet collaborating with others, but were eager to do so and were inspired by the work they've observed across the portfolio.

SCIACT 3.0 BREAKOUT GROUPS

PRE reviewed documentation from the SciAct 3.0 Breakout Group future visioning activity, through the lens of MLO 3b Breakout Group Assignments.

- While several projects have strong pre-existing relationships with the communities they seek to impact through project work, this is not always true. Some SciAct teams are working to establish these relationships as work is initiated.
- Many groups highlighted the added time it takes to build meaningful relationships with communities, and that often time for this work is under-resourced.
- Community partners are eager to work with SciAct projects, but often have limited flexibility in their professional schedule to take on added tasks that support project work. Further, some partners (especially those in K-12) indicated that added barriers such as transportation, or access to software licenses, prevent them from fully implementing project activities.
- Turnover is a persistent problem internally (SciAct projects) and externally (Partners). This reiterates the needs for relationships to be established across project teams and partnership organizations, rather than between individuals.



National Aeronautics and Space Administration

NASA Headquarters
Mary W. Jackson Building
300 Hidden Figures Way SW
Washington, DC 20546-0001

www.nasa.gov

NP-2023-05-3126-HQ