



2022

**SMITHSONIAN SCIENCE
EDUCATION CENTER**

**ANNUAL
REPORT**

LETTER FROM THE DIRECTOR AND BOARD CHAIR

Secretary Lonnie Bunch III has set a bold vision for the Smithsonian Institution: Through our educational resources and programming, the Smithsonian aims to reach every classroom in America, in pursuit of greater reach, greater relevance, and profound impact. Working in partnership with educators, we strive to close gaps and open opportunities for students, so that all students, and our nation, may thrive.

Secretary Bunch's vision comes at a challenging moment for education, after the pandemic caused unprecedented gaps in student learning, especially for students who are traditionally underserved. The Smithsonian Science Education Center is more determined than ever to do our part to reduce the effects of learning loss for K–12 students worldwide, particularly in the areas of science, technology, engineering, arts, and mathematics (STEAM) education. A 2021 report published by the National Academies of Sciences, Engineering, and Medicine (NASEM) found that on average, elementary school students are spending a mere 20 minutes per week learning science. Given the current reality, our work is more critical and urgent than ever.

This is why, in 2022, the Secretary established the Smithsonian's STEAM Education Initiative, through which the Institution aims to amplify science through inquiry-based STEAM education programs that build on Smithsonian collections and research, so that science is accessible to youth, their families, and educators, no matter where they are.

The Smithsonian Science Education Center, in collaboration with the Smithsonian's National Museum of Natural History and our STEAM education colleagues throughout the Smithsonian, was identified by the Secretary to co-lead the Smithsonian in accomplishing this audacious goal through our ever-growing number of collaborative partnerships and successful outreach efforts.

Our mission is to transform K–12 Education Through Science, in collaboration with communities across the globe. In 2022, the Smithsonian Science Education Center directly engaged 3.6 million students and teachers through our curriculum, digital products, professional development, and leadership development programs. Educators who attended our programs indirectly impacted 87,000 STEAM educators and 12.5 million young people across 88 countries. Within the pages of the Smithsonian Science Education Center's 2022 Annual Report, you will read stories describing our resources and programming, all of which are part of our three priorities of Innovation, Inclusion, and Sustainability in STEM education.

In pursuit of our first priority to increase Innovation in STEM education, the Smithsonian Science Education Center launched several freely available resources to promote innovation in STEM education, including Smithsonian Science for Computational Thinking, a series of high-touch to high-tech resources for elementary school students,

and Aww Snap!, a digital life science game that helps students conduct simulated field studies on snapdragons.

In pursuit of our work to achieve Inclusion in STEM education, the Smithsonian Science Education Center led multiple leadership summits focused on diversifying the STEM teacher workforce and ensuring all students across the spectrum of human ability have access to a high-quality STEM education experience. In pursuit of our final priority, STEM Education for Sustainable Development, the Smithsonian Science Education Center launched three new Smithsonian Science for Global Goals Guides: Environmental Justice!, Biodiversity!, and Biotechnology!, and implemented these new guides and existing guides with educators and youth across the globe.

This is just a snapshot of the Center’s achievements in 2022. The Smithsonian Science Education Center’s 2022 Annual Report highlights these accomplishments and more, including our appearance at the 27th annual United Nations Climate Change Conference of the Parties (COP27) in Sharm El Sheikh, Egypt.

None of this would have been possible without the dedication and commitment of our valued staff, volunteer National Advisory Board, and supporters. The Smithsonian Science Education Center’s success happens as a result of the generosity of our donors, advisors, volunteers, and partners. You are making a difference in the lives of students and teachers. Thank you for helping us transform K–12 Education Through Science, in collaboration with communities across the globe. We appreciate each and every one of you.

Best,



Dr. Carol O’Donnell,
Director, Smithsonian Science
Education Center



Dr. Frazier Wilson,
Board Chair, Smithsonian
Science Education Center



ARTIST'S STATEMENT

The 2022 Smithsonian Science Education Center's Annual Report highlights our interdisciplinary work and our mission under the themes Innovation, Inclusion, and Sustainability. The graphics in this report conceptualize these themes as a balance between the organic and the mathematical, showcasing the relationship between art, design, and science.

The spherical graphics are abstract and versatile, acting as a through line for the stories, as well as embodiments of their respective missions. For the Innovation theme, the sphere has points that branch outward from the center, giving a sense of expansion and growth, and a search for new and different ideas. For Inclusion, the sphere appears as undulating, emulating a topographic map with dips, turns, and hills that connect to make up a whole, like the perspective of a diverse and interconnected world. For Sustainability, the sphere gives the impression of the inner rings of a tree that has lived a long life, inspiring readers to work toward environmental longevity through sustainable action.

By embracing art as a tool with which science stories can be told, we open our world to new possibilities and perspectives. Now let this art guide you through our stories!

Sofia Elian
Lead Graphic Designer,
Smithsonian Science Education Center



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INNOVATION
INNOVATION
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INNOVATION
INNOVATION

“For the Innovation theme, the sphere has points that branch outward from a center, giving a sense of expansion, growth and a search for new and different ideas”

- Sofia Elian

Improving Digital Literacy with
Smithsonian Science
for Computational Thinking

A New Look at Space:
Smithsonian Science Education Academies
for Teachers in Alabama



Improving Digital Literacy with

Smithsonian Science for Computational Thinking

In the evolving world of digital education, there is an emerging need to integrate high-touch to high-tech solutions within science, technology, engineering, and math (STEM) classrooms. At the Smithsonian Science Education Center, we believe the building blocks of computational thinking begin well before high school.

This year, the Smithsonian Science Education Center launched Smithsonian Science for Computational Thinking, a set of freely available instructional units for grades three and five that integrate STEM and computational thinking (CT). This project was a collaboration with the US Department of Defense STEM Office.

Using phenomenon- and problem-driven pedagogy, elementary school students use computational thinking skills to define and solve real-world problems in a high-touch to high-tech environment. The instructional units feature both hands-on physical (high-touch activities) and digital (high-tech) games, simulations, experiments, and coding, and are aligned to the Next Generation Science Standards, the Computer Science Teachers Association

K–12 Computer Science Standards, the International Society for Technology in Education (ISTE) Standards, and the Common Core Mathematics Standards.

Since launching Smithsonian Science for Computational Thinking in 2022, the Smithsonian Science Education Center has provided professional development to 80 schools, serving more than 7,500 students in rural communities across the country, to support teachers in implementing the freely available instructional units in their classrooms.

In December 2022, the White House held a summit announcing the launch of the Science, Technology, Engineering, Math and Medicine (STEMM) Opportunity Alliance and highlighted Smithsonian Science for Computational Thinking as part of the Smithsonian’s commitment to make STEM equity a priority and cultivate the STEM talent of tomorrow. By taking a high-touch to high-tech approach to teaching computational thinking in a science classroom, all students can improve their digital literacy—with and without access to computers and other high-tech devices.

WHAT IS COMPUTATIONAL THINKING?

Computational thinking is a problem-solving strategy that is fundamental to computer science, it includes, for example, components such as:

DECOMPOSITION

breaking down problems into manageable pieces

ABSTRACTION

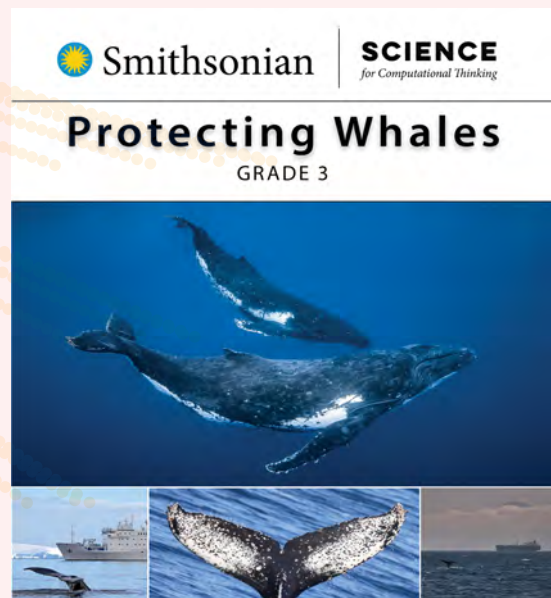
reducing problem complexity through data collection and analysis, pattern recognition, and modeling

ALGORITHMS

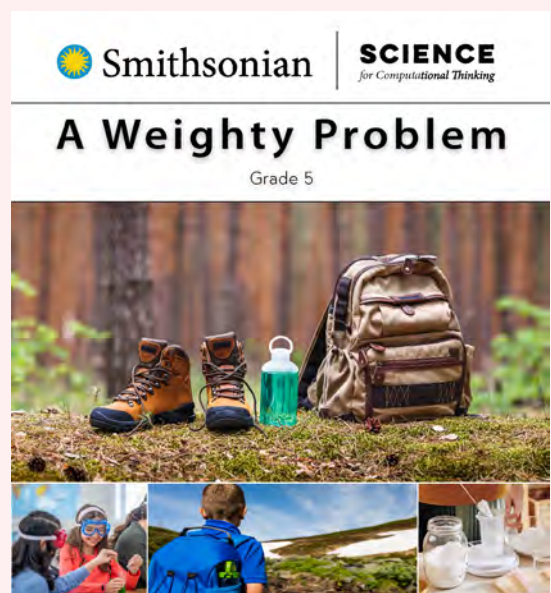
using a sequence of steps to solve problems

AUTOMATION

determining whether a computer can help



As a component of the Under Secretary for Education's initiative—Engaging with Rural Communities—the Smithsonian will offer education resources to help meet rural communities' needs. Building learning assets that are high-touch to high-tech, like our computational thinking curriculum, is fundamental to ensuring all students, regardless of broadband availability, have access to high-quality Smithsonian STEAM resources.



A New Look at Space:

Smithsonian Science Education Academies for Teachers in Alabama

The Smithsonian Science Education Center is committed to supporting educators, administrators, and other stakeholders who are aspiring to transform science and STEM education. As part of that commitment, the Smithsonian Science Education Center offers innovative professional development opportunities both virtually and in person to increase science content knowledge and skills in educators.

In 2022, the Smithsonian Science Education Center hosted a Smithsonian Science Education Academy for Teachers (SSEAT) at the US Space and Rocket Center (a Smithsonian Affiliate Museum) in Huntsville, Alabama. This year's program, which focused on Earth and space science, included a series of pre-academy webinars, a three-day in-person academy, post-academy professional development, and the distribution of the Smithsonian Science for the Classroom curriculum (with kits of hands-on classroom materials and digital assets to teach space science), along with telescopes.

At the summer Academy, teachers strengthened their understanding of space science concepts, such as Earth patterns, gravity wells, orbit paths, and the scale of the solar system. Teachers also toured the US Space and Rocket Center and heard directly from top space scientists from NASA, the Smithsonian, and Aerospace Corporation.

Through a partnership with the Alabama Math, Science, and Technology Initiative (AMSTI), teachers who attended the Academy are receiving ongoing support in implementing the inquiry-based Smithsonian Science for the Classroom space science kits in their classrooms.

At the conclusion of the in-person Academy, teachers who attended increased their knowledge of space science concepts by 1.59 points, which our researcher, Dr. Hyunju Lee, found to be a statistically significant increase in teachers' content knowledge.



“This program has made me a better teacher.”



“For the Inclusion theme, the sphere appears undulating, emulating a topographic map with dips, turns and hills that connect to make up a whole, like the perspective of a diverse and interconnected world”

- Sofia Elian

Students as Stakeholders:
Zero Barriers in STEM Education Summit

Fostering Connections:
STEM Educator Exchange



Students as Stakeholders:

Zero Barriers in STEM Education Summit

According to a 2019 study conducted by the National Center for Learning Disabilities, just 30 percent of US public school teachers feel strongly that they can successfully serve students with disabilities in their classrooms. With only seven of 50 states mandating that new teachers take coursework focused on teaching students with disabilities, there is a clear need to provide teachers with additional support as they seek to ensure their classrooms are truly accessible to all students.

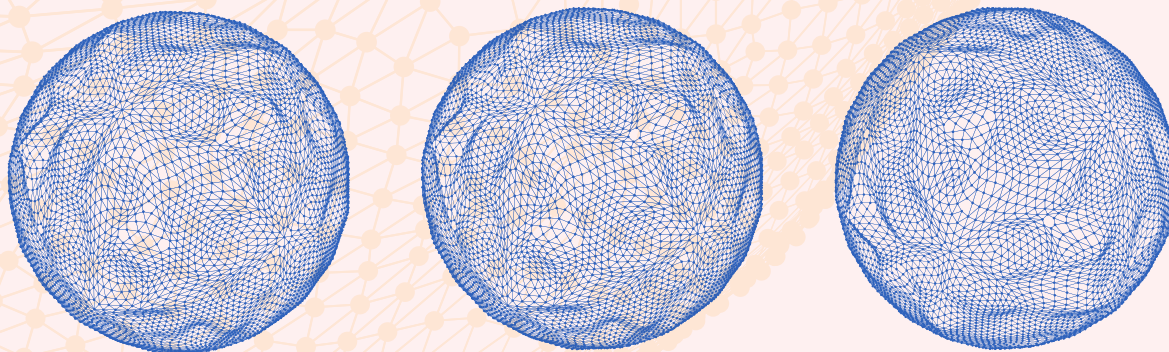
To respond to this systemic challenge, the Smithsonian Science Education Center established the Zero Barriers in STEM Education program. The goal of this program is to ensure that all learners along the continuum of human ability have robust STEM experiences.

In July 2022, the Smithsonian Science Education Center convened 20 teams totaling more than 120 educators representing schools, districts, and state education agencies across the US who serve more than 800,000 students at the Zero Barriers in STEM

Education Summit in Washington, DC. At the summit, teams developed logic models that use the principles of Universal Design for Learning to address a problem of practice related to accessible and inclusive STEM programs and school culture for students with disabilities.

As a key part of this year's Summit, the Smithsonian Science Education Center collaborated with the Muscular Dystrophy Association to host a youth panel discussion featuring students living with disabilities, providing the educators with an opportunity to hear directly from students.

“By connecting students with disabilities and educators directly, we can bring student voices to conversations that focus on designing learning spaces and experiences in which all students, regardless of their ability, feel welcome and engaged,” said Sherrell Williams, Program Manager for Diversity, Equity, Accessibility, and Inclusion (DEAI) at the Smithsonian Science Education Center.



During the panel discussion, students shared their perspectives on what resources have been most helpful for them, how they learn about accessible, exciting STEM programming, how they have personally overcome barriers, and how young people can meaningfully advocate for themselves within schools.

When asked how educators can best support the STEM career goals of students with disabilities, high school student Caeden Parisi suggested that teachers focus on factors within their control. For example, while teachers may not be able to adjust the height of lab counters, they may be able to shift furniture around to accommodate wheelchairs. Caeden pointed out that the power of creating an inclusive classroom environment extends beyond students with disabilities. She said, “Everyone is different, whether they have a disability or not. Everyone has their own preferences and needs.” With the help of the Zero Barriers Program, we are helping STEM teachers meet the needs of all students.

Other advice that was offered by students included: using classroom technology effectively, proactively anticipating the needs of the students, identifying exciting STEM programs for students, and establishing trusted relationships with students so that young people feel comfortable expressing their needs.

Zero Barriers in STEM Education

Accessibility & Inclusion Workbook



 **Smithsonian**
Science Education Center

Fostering Connections:

STEM Educator Exchange

Secretary Lonnie Bunch has laid out a bold set of strategies around the Smithsonian’s role as a trusted source in *Our Shared Future: Reckoning with Our Racial Past*. The Smithsonian Science Education Center plays an important role in supporting this initiative, as we collectively build toward a more equitable future through our annual STEM Education Diversity Summit, which aims to attract and retain 30,000 STEM teachers from diverse populations by 2030.

Like many programs, the Smithsonian STEM Education Summit: Building a Coalition for Attracting and Retaining a Diverse STEM Teaching Workforce (STEM Education Diversity Summit) was held virtually in 2021 and 2022, due to the COVID-19 pandemic. Recognizing the value of in-person collaboration, the Smithsonian Science Education Center reconvened participants from each of the 2021 and 2022 and summit cohorts for the first in-person STEM Educator Exchange.

“Given the backdrop of the global pandemic, our transition to virtual 2021 and 2022 STEM Education Diversity Summits represented our swift response to the unprecedented

times. But despite the challenges, the way the community of educators was able to come together for a common goal was truly inspiring,” said Dr. Amy D’Amico, Division Director of Professional Services at the Smithsonian Science Education Center. “There is so much to be gained from gathering in person after a long period of virtual idea sharing. The spark that happens in the room just can’t be replicated online.”

The STEM Educator Exchange was held in the fall over two days in Washington, DC. During the STEM Educator Exchange, 18 educators from five states, serving 2.7 million students, shared progress and updates to their logic models, as well as recommendations and lessons learned. The Exchange featured networking sessions and a panel discussion among STEM educators, organization leaders, and community partners, who provided insight and partnership opportunities to support teams in sustaining their implementation plans to diversify their school, district, or state STEM teacher workforce.

Minority students often perform better on standardized tests, have improved attendance, and are suspended less frequently when they have at least one same-race teacher.

Lindsay & Hart: Educational Evaluation and Policy Evaluation, 2017

PUBLIC SCHOOL DIVERSITY

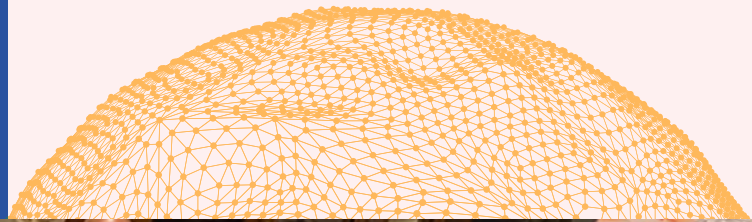
53%
STUDENTS OF COLOR

21%
TEACHERS OF COLOR

National Center for Education Statistics, 2018

“I learned so much and made so many new contacts. I think my data and background information was really expanded.”

“[Our work] never ends, so the need for this exchange is critical!”





SUSTAINABILITY
SUSTAINABILITY
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“For the Sustainability theme, the sphere gives the impression of the inner rings of a tree that has lived a long life, inspiring readers to work towards environmental longevity through sustainable action”

- Sofia Elian

Communities as Laboratories:
Smithsonian Science for Global Goals

Bringing the
Smithsonian Science Education Center
to a Global Stage



Communities as Laboratories:

Smithsonian Science for Global Goals

Worldwide, people are recognizing the need for collaborative action to address the evolving challenges we face as a global community. The United Nations Sustainable Development Goals (SDGs) represent a plan for a sustainable world in which peaceful societies collaborate to improve health and education, reduce inequality, and spur economic growth while addressing environmental threats.

The Smithsonian Science Education Center's commitment to addressing these global challenges and adding to the collaborative framework of thought leadership around the SDGs began in 2016 with the launch of Smithsonian Science for Global Goals. Developed in collaboration with the InterAcademy Partnership (IAP), the Smithsonian Science for Global Goals project is centered around the idea of providing youth around the world, ages 11 to 18, with the knowledge and skills to Discover,

Understand, and Act on the world's most pressing socio-scientific issues and to become agents for change in their communities.

In 2022, the Smithsonian Science for Global Goals project published its eighth freely available community research guide, encouraging young people to use their communities as laboratories to investigate the science that underlies the SDGs and implement sustainable actions to solve the greatest scientific challenges of our time. Our three new guides published in 2022 are shown here.

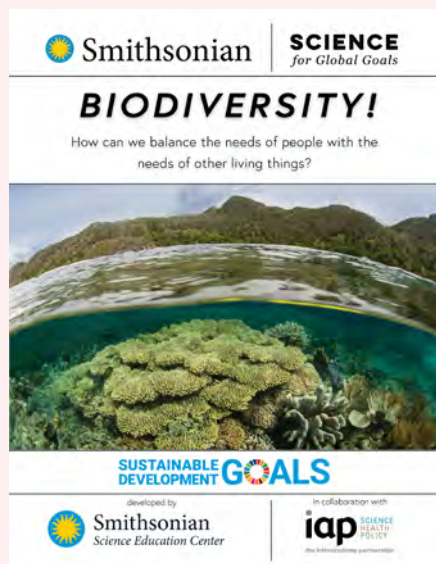
“To make progress toward a better world, we need the ideas, enthusiasm, and energy of every young person. With these guides, young people are given the tools to understand issues in their own community and take sustainable actions to make the world better,” said Heidi Gibson, Manager of the Global Sustainability Series.

“Climate change is inextricably linked to racial justice, migration, health, and the forces that shape our lives. Its costs are born disproportionately. Collaborating locally and globally to address climate change is the civil rights movement of the 21st century.”

- Smithsonian Secretary Lonnie Bunch



Environmental Justice! How can we create environments that are healthy for everyone?



Biodiversity! How can we balance the needs of people with the needs of other living things?



Biotechnology! How can we ethically create a sustainable future using biotechnology?

Since its launch, Smithsonian Science for Global Goals has reached 4.7 million students and 41,000 educators across 88 countries

Bringing the

Smithsonian Science Education Center to a Global Stage

At the heart of its mission, the Smithsonian Science Education Center brings together communities across the world to support taking action on pressing global socio-scientific issues.

In 2022, the Smithsonian Science Education Center collaborated with Egyptian education organizations, including the Bibliotheca Alexandrina Sustainability Studies Program, the Bibliotheca Alexandrina Planetarium Science Center, and the Children's University of Egypt, to implement the Smithsonian Science for Global Goals research guide, Sustainable Communities! How will we help our community thrive? The Smithsonian Science Education Center showcased students' transdisciplinary work to a global audience at the 27th United Nations Climate Change Conference of Parties (COP27), in Sharm el-Sheikh, Egypt.

In advance of COP27, the Smithsonian Science Education Center convened and trained 62

Egyptian educators in a hybrid professional development workshop. After the workshop, educators turned this knowledge into action and implemented the Sustainable Communities! research guide with 350 students from across Egypt.

At COP27, Smithsonian Science Education Center Director Dr. Carol O'Donnell and Division Director for Advancement and Partnerships Holly Glover premiered three selected student video projects during several panel presentations within the Climate Education Hub, the Children and Youth Pavilion, and the Oceanic Global Forum. The videos highlighted the students' transdisciplinary research and proposed solutions to local sustainability issues, including addressing issues of traffic, emissions, green spaces, alternative transportation options, and reducing carbon emissions.

"Our job is to understand the questions that young people bring to us—their cultural context, the



knowledge they already have, their learning disposition. Once we know that about a student, we can engage them in a series of activities to discover, understand, and act. When students discover issues on a local level, understand issues by using their community as their laboratory, and engage in critical reasoning with evidence, their actions are informed and powerful,” said Dr. O’Donnell.

“The children determined three issues to fix in Matrouh city: rationalizing consumption of electricity and water;

supporting green energy by using wind and solar energy to cover the shortage of both water and electricity; and garbage separation from homes and plastic recycling. The ideas the children shared about the sustainable city showed how children look to the future in an optimistic and sustainable way, supporting the SDGs regarding climate change. Dr. Mayada M. Khalil and I enjoyed the training and look forward to joining you in future activities,” said Enas Ahmed, a lecturer and researcher at Matrouh University.



OTHER 2022 PROJECTS

Aww Snap! A Snapdragon Study

a life science game where players become field researchers, observe and collect data, and interpret their findings. Aww Snap! is aligned with education science standards for grades 3 to 5 and can be played as a standalone game or used in conjunction with Smithsonian Science for the Classroom.

Your Place in Space STEM Resources

a pair of web pages hosted on SSEC's website for the federal Your Place in Space initiative. Your Place in Space is a collection of space-inspired STEM educator resources and career resources. It's a one-stop shop to find K–12 space STEM materials from not only the Smithsonian, but our federal agency colleagues who also have space-focused missions.

Stories of Women in STEM Biotechnology

an eBook about how biotechnology is changing the world by editing genes, creating technologies to prevent animal extinction, and inventing new methods to feed a growing human population. Stories of Women in STEM: Biotechnology tells the story of seven ingenious women in biotechnology who are helping to create a better world.

Attracting All Learners to STEM Using Culturally Based Pedagogies

a professional development webinar that trained 140 educators from 15 states and six countries through 11 hours of programming. Educators learned from academic experts who implement and conduct research on ways to ensure that every student, regardless of their ability or identity, has access to high-quality STEM learning opportunities.

Women in Science, Technology, Engineering, Math, Manufacturing, and Design (WiSTEM²D)

a collaborative project with funding from Johnson & Johnson enabled the Center to disseminate STEM²D activities at more than 20 community events across the country, impacting more than 300,000 students. As a part of this program, the Center also hosted a three-day STEM Educator Action Planning Institute, focused on Innovation, Inclusion, and Sustainability.

Smithsonian Science for the Classroom

a K–8 education standards-aligned curriculum consisting of Earth and space science, life science, physical science, and engineering modules at each grade level. Smithsonian Science for the Classroom has served 2.78 million students in grades K–8 since 2017, and its efficacy is being tested through a study funded by the US Department of Education.

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Institutional gifts over \$100,000

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WHAT WE DO CANNOT HAPPEN WITHOUT YOU

The Smithsonian Science Education Center is grateful to our donors, volunteers, and partners for many things:

Through your generosity, you have made it possible for K–12 students to receive innovative science curriculum, games, and simulations; because of you, a diverse group of STEM teachers are being recruited and retained within their schools and districts; and you are part of a global movement to engage youth in STEM education for sustainable development that could save the planet. None of this is possible without you.

Together, we have accomplished so much. Thank you!

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The Smithsonian Science Education Center receives no federally appropriated funds. We apply for public and private grants, and rely on the support of individuals like you.

LEADERSHIP



Secretary Lonnie G. Bunch III

Lonnie G. Bunch III is the 14th Secretary of the Smithsonian. He assumed his position June 16, 2019. As Secretary, he oversees 21 museums, 21 libraries, the National Zoo, numerous research centers, and several education units and centers. Bunch was the founding director of the Smithsonian's National Museum of African American History and Culture, and is the first historian to be Secretary of the Institution.



Monique M. Chism, PhD

Monique Chism is the Smithsonian's Under Secretary for Education. She is responsible for defining the Institution's educational priorities. She oversees the Smithsonian's collective initiatives, communication strategies, and funding for programs that benefit learners of all ages.



Dr. Carol O'Donnell

Dr. Carol O'Donnell is the Senior Executive and Director of the Smithsonian Science Education Center, an organization of the Smithsonian Institution dedicated to transforming K-12 Education Through Science, in collaboration with communities across the globe.

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IN MEMORIAM

Greg Dudkin

1957–2023

It is with great sadness that we share with you that our Advisory Board member Greg Dudkin passed away this year. Greg was executive vice president and COO of PPL Electric Utilities and a dedicated board member of the Smithsonian Science Education Center.

Greg joined PPL Electric Utilities in 2009 as senior vice president of operations, and was named president of the company in 2012. Prior to joining PPL, he served as Comcast's senior vice president of technical operations and fulfillment, and as a regional senior vice president for the telecommunications company.

Through Greg's leadership, PPL directly sponsored SSEC's work with students and teachers in Allentown, Pennsylvania, schools, in collaboration with the DaVinci Science Center, during the 2020 school closures. He also sponsored the Smithsonian Science Education Center's efforts to support seven museums and learning centers in Pennsylvania that serve students in rural communities. This project has become a part of the Office of the Under Secretary for Education's Rural Initiative. Whenever Greg saw opportunities for the Smithsonian Science Education Center to work with youth in rural, urban, and suburban communities in his region, he was quick to make a connection on behalf of the Smithsonian.

As an Advisory Board member, Greg was known for his thoughtful and strategic advice. He spoke eloquently at board meetings, bringing his organizational expertise to the work of our nonprofit. Because of Greg's and PPL's generosity, many young students and teachers were given the opportunity to develop critical STEM skills.

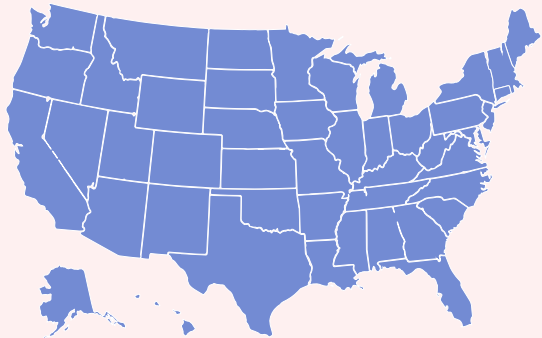
Greg was a gifted leader and advisor. We will miss him and feel grateful to have known him.



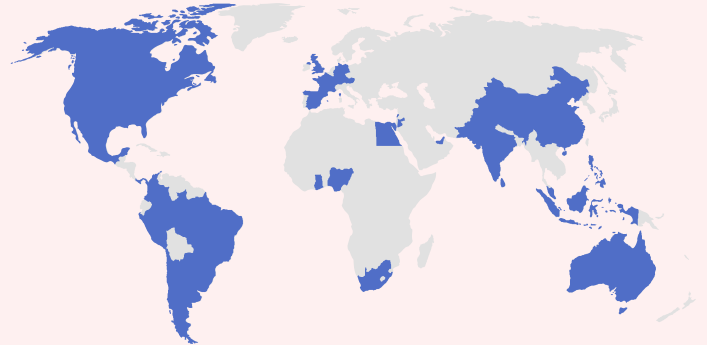
SSEC NATIONAL & GLOBAL IMPACT

3.6 million students and teachers in 2022

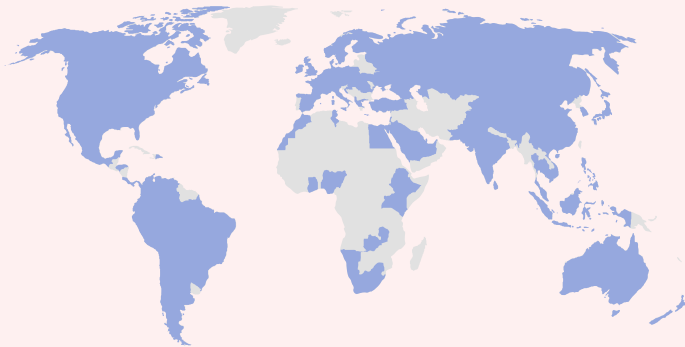
K-8 National Curriculum Usage (50 states)



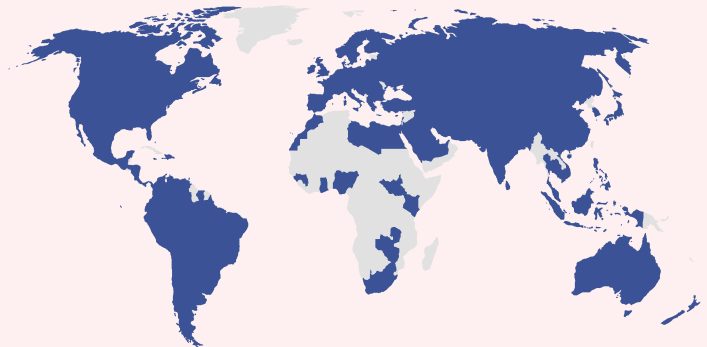
Educator Professional Development (33 countries)



Games (104 countries)



Smithsonian Science for Global Goals (88 countries)



SSEC 2022 FINANCIAL SNAPSHOT

SUSTAINABILITY

56%

\$3.46M

Raised

Private Philanthropy

CORPORATIONS – 58%

FOUNDATIONS – 38%

INDIVIDUALS – 4%

INCLUSION

27%

INNOVATION

12%

**ORGANIZATIONAL
HEALTH**

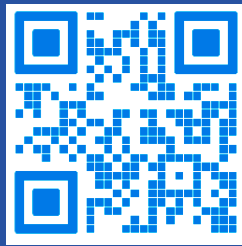
5%

WAYS TO GIVE!

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Every donation, from \$10 to \$1 million, goes toward helping the Center fulfill its mission of transforming K–12 *Education Through Science*, in collaboration with communities across the globe. Your support makes a significant impact on the lives of youth the world over. With your help, we are shaping and inspiring the STEM superstars of the future!

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Or follow the QR code:



Or to contribute by mail, please send a personal check made payable to the Smithsonian Science Education Center and mail to:

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