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Operationalizing Sustainable Development at the Local Level through K-12 Education

Panel II: Education and Capacity Building
Committee on Operationalizing Sustainable Development
Information Gathering Workshop I: Local Strategies
April 18, 2022

Dr. Carol O'Donnell, Senior Executive, Director, Smithsonian Science Education Center, Smithsonian Institution

Agenda

- Why is the Smithsonian involved in this work?
- How do we operationalize sustainable development at the local level? Through education
- What is our approach and theory of action?
- What are our recommendations?

Appendix:

- Example case studies
- Acknowledgements & Contact Information

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Why is the Smithsonian involved in this work?

SECTION

1

Smithsonian Institution

The Smithsonian is the world's largest museum, education, and research complex with 21 museums, 5 education centers, 9 research centers, one zoo, and with 154 million objects, artworks, and specimens in its collections.

The Smithsonian believes in lifelong experiential learning.

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What is the Smithsonian Science Education Center?

The Smithsonian Science Education Center (SSEC) is the only organization within the Smithsonian to focus specifically on formal K-12 STEM education. We serve students, families and caregivers, teachers, schools, school districts, State Education Agencies, and Ministries of Education. We bring object-driven experiential learning to communities across the globe.

Jointly founded in 1985:

National Science Resources Center
THE NATIONAL ACADEMIES Smithsonian Institution

Smithsonian 2010:

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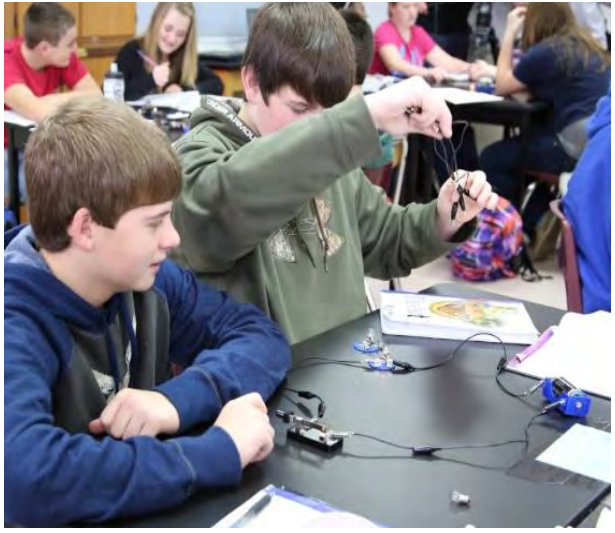
What is our mission?

Transforming *K-12 Education Through Science™* in collaboration with communities across the globe



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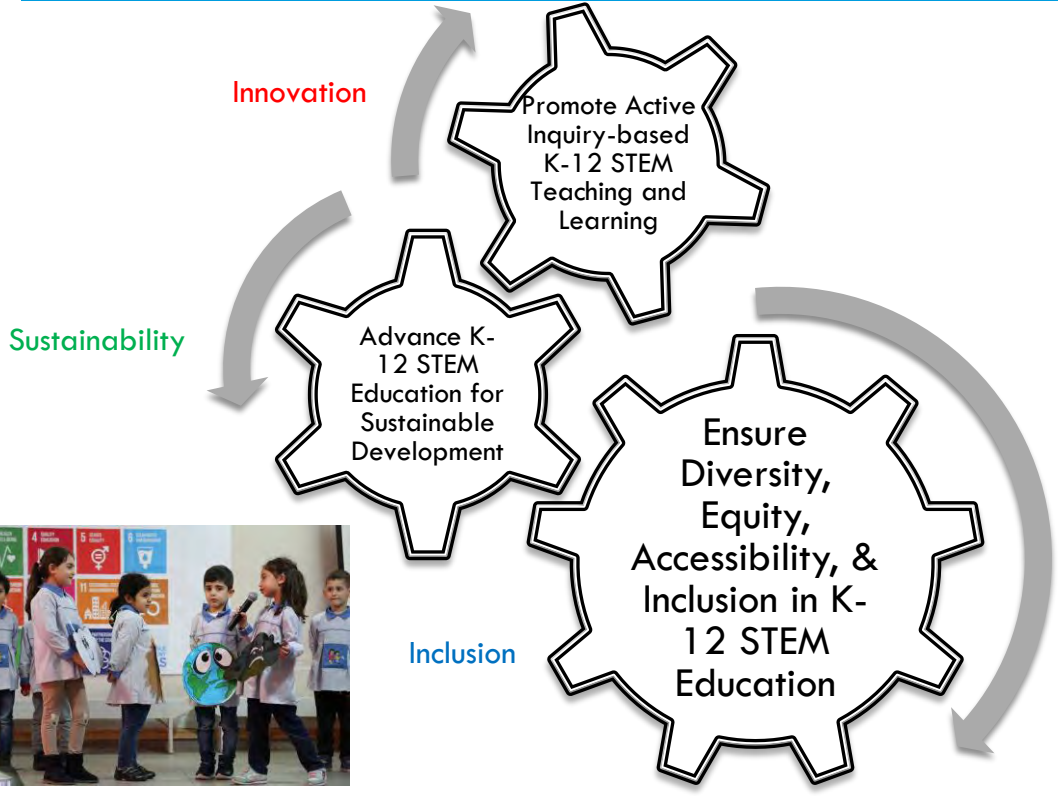
What are SSEC's 3 goals?

Innovation, Sustainability, & Inclusion



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Our Programs Overlap with UNESCO's Education for Sustainable Development Action Areas

Priority action area 1

Advancing policy

Priority action area 2

Transforming learning environments

Priority action area 3

Building capacities of educators

Priority action area 4

Empowering and mobilizing youth

Priority action area 5

Accelerating local level actions

Logic Model:
Impacts individuals

Theory of Change: Impacts Communities, Societies, Systems

Rangan, K., & Gregg, T. (2019). How social entrepreneurs zig-zag their way to impact at scale. *California Management Review*. 62(1) 53–76.

We partner with the InterAcademy Partnership (IAP) to Support Implementation Globally

IAP for Science

iap SCIENCE RESEARCH HEALTH
the interacademy partnership

SSEC's Director, Dr. Carol O'Donnell, sits on the IAP Science Education Programme (SEP) Global Council, which helps 143 countries collaborate on STEM education. Scientists from across the globe are part of the 130 national and regional academies of science and medicine that are members of the InterAcademy Partnership (IAP).

IAP for Health
(78 members, of which 52 also belong to IAP for Science)

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How do we operationalize sustainable development at the local level? Through education

SECTION 2

Why education?

"The current health crisis has reminded us that climate change and the collapse of biodiversity are major challenges facing humanity. As the pandemic has tragically shown us, our health is inextricably linked with the health of our planet. Education is crucial for raising awareness and generating action to protect the health of our planet and to ensure the wellbeing of all, within the limits of nature. In light of the major environmental challenges the world is facing, education is key as a means of making our societies and economies greener, more sustainable, and more harmonious with nature."

UNESCO ESD, 2021

"We must educate our students to understand the complex global challenges of our time."

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Why the UN Sustainable Development Goals (SDGs)?

The United Nations SDGs are…

- 17 Goals, Adopted in 2015
- Aimed be achieved by 2030
- 232 Indicators
- Developed after broad consultations
- Aimed at ALL countries
- Requires partnership between government, business, civil society, groups, and individuals around the world

- https://sustainabledevelopment.un.org/?menu=1300

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Target 4.7

- "By 2030 ensure all students acquire knowledge and skills needed t promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development"

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What is our approach and theory of action?

SECTION 3

What is *Smithsonian Science for Global Goals*?

- Started January 2016
- Collaboration with IAP across 143 countries and organizations around the world, including the Smithsonian
- Supports young people to understand the science and social science of the SDGs and how to take action to address complex global issues.
- Designed for ages 8-17
- Focused on addressing the SDGs and 21st century grand challenges facing humanity and the world

https://www.ssec.si.edu/global-goals

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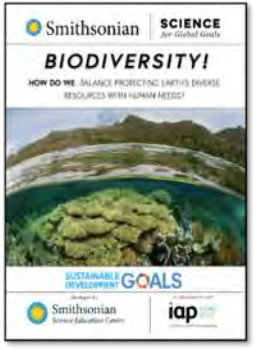
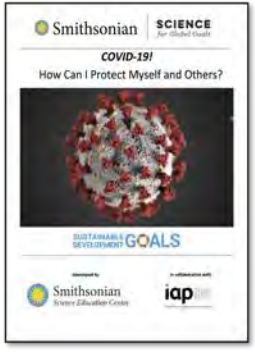
- **Discover**: Youth examine complex socio-scientific problems through multiple perspectives (social, environmental, economic, and ethical).
- **Understand**: Youth carry out local investigations on global problems, using their communities as their laboratories.
- **Act:** Ultimately, youth take local action to address the issue in their own community.





https://ssec.si.edu/global-goals

We develop students' global perspectives by creating learning experiences that are **locally relevant and locally driven**, but globally important. We combine STEM education, social and emotional learning, and civic engagement.

Global Issues

Global Impacts

Local Investigations → Local Decisions → Local Action

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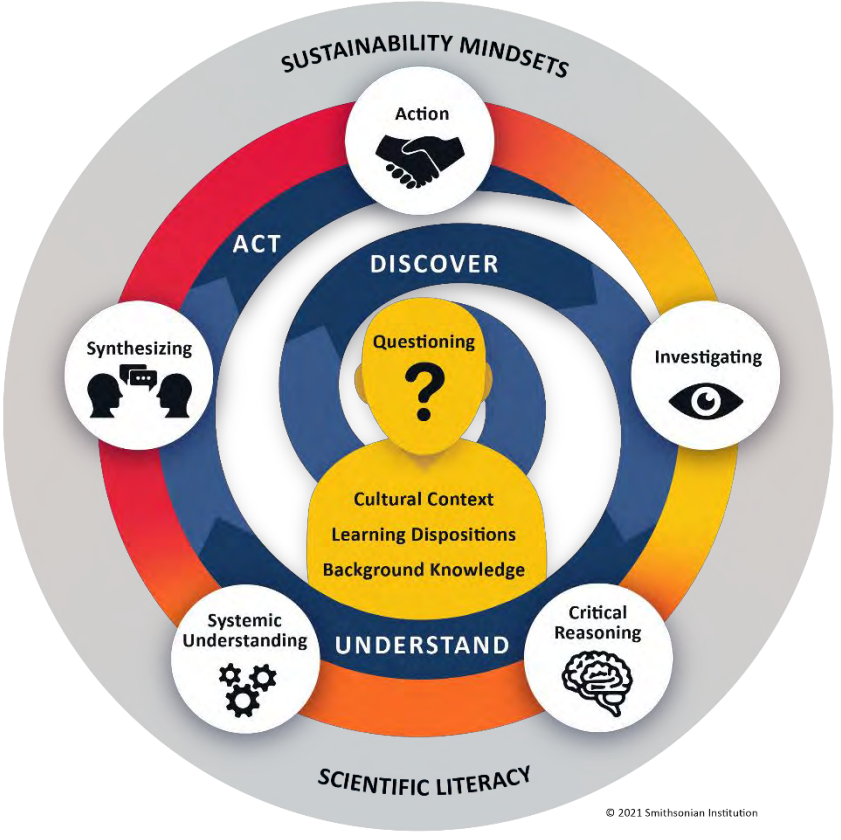
GLOBAL GOALS ACTION PROGRESSION

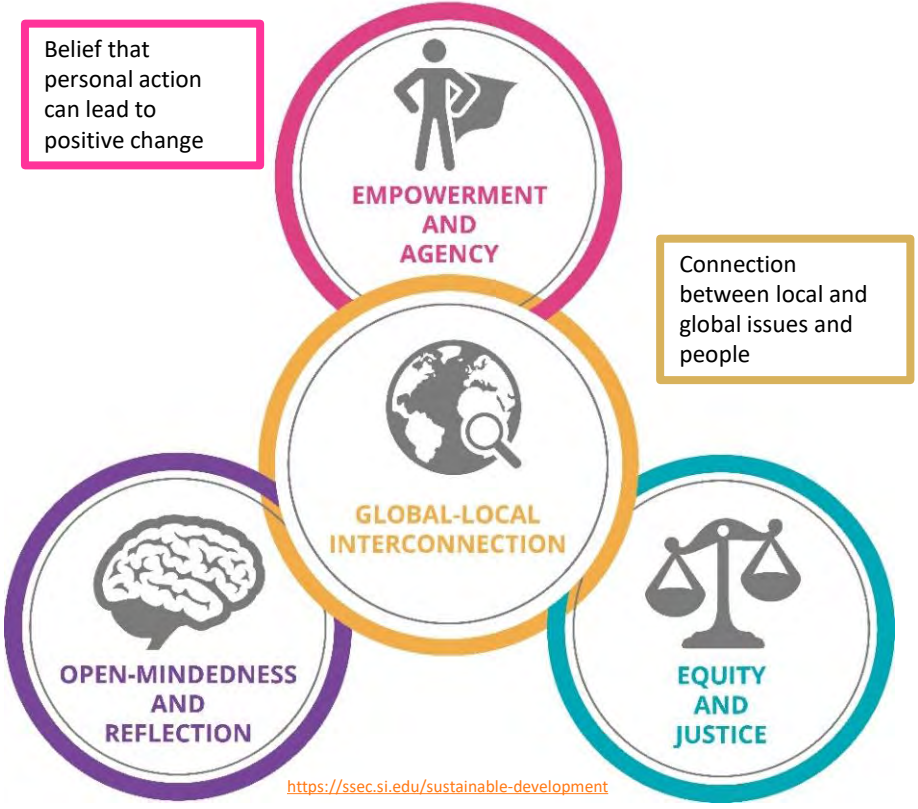


Our work is a progression that takes young people from understanding their own identity (learning disposition and background knowledge) and the identity of their community (cultural context), to questioning and investigating (Discover), to engaging in critical reasoning and systemic understanding (Understand). In this important phase, young people examine their own values and perspectives (environmental, social, ethical, economic), and reflect on how their perspective changes as they learn more about the world around them. Ultimately young people engage in synthesizing all that they have learned and put their new knowledge to use by taking action (Act). Through this process, young people develop sustainability mindsets and scientific literacy.

Gibson, H., Blanchard, K. P., O'Donnell, C. (2020). Learning to act: *Smithsonian Science for Global Goals* and empowering young people to develop a habit of considered action-taking. In Huber, T., O'Meara, J. (Eds.), *Education around the globe: Creating opportunities and transforming lives*. Charlotte, NC: Information Age Publishing.
https://www.infoagepub.com/products/Education-Around-the-Globe

Goal: Build Students' Sustainability Mindsets

Belief that personal action can lead to positive change



Connection between local and global issues and people

Understanding different perspectives and contexts for knowledge

Respecting self, others, ethics, and the environment

https://ssec.si.edu/sustainable-development

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Local Global Connection: Community Research

- Who lives in your community?
- How has your community changed over time?
- Who makes decisions in your community?
- How can we be inclusive in our actions?

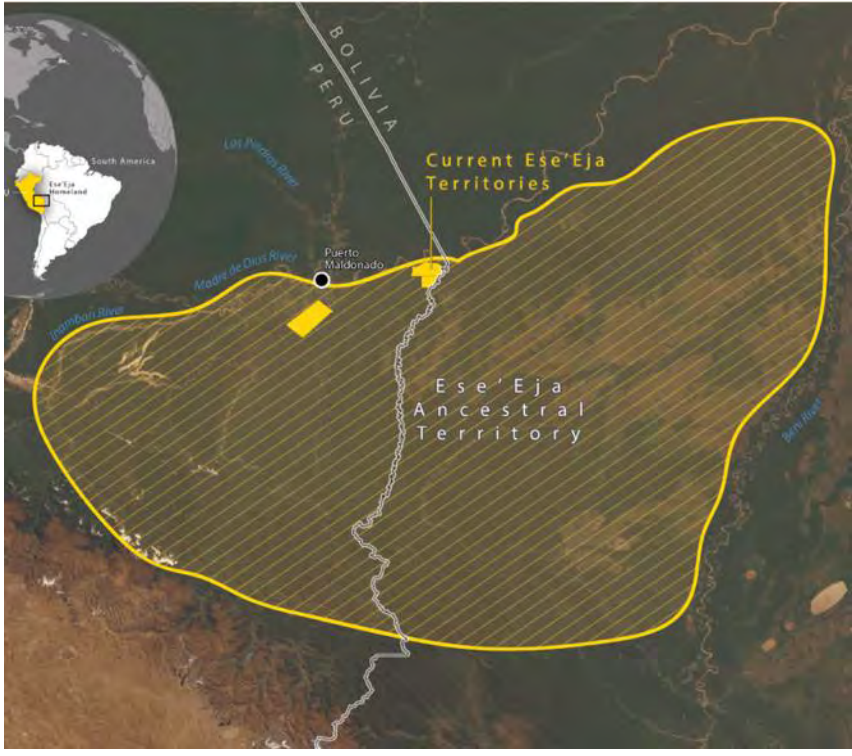

Image courtesy of the Field Museum

Activity 1: Open-Mindedness & Reflection: Self-Awareness/Social Awareness: Students begin by building an identity map (and reading the identity maps of scientists so they can see themselves in others).

MEERA VENKATESAN

MALARIA TECHNICAL ADVISOR

Organization:
President's Malaria Initiative, (USAID)

RUSTY LOW

SENIOR EARTH SCIENTIST

Organization:
Institute for Global Environmental Strategies

KELLY BENNETT

BIOLOGIST

Organization:
Smithsonian Tropical Research Institute (STRI)

https://ssec.si.edu/global-goals

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Activity 2: Open-Mindedness & Reflection: Responsible Decision Making/Perspective Taking: Students examine statements about the issue from multiple perspectives then discuss how they arrive at their decision.

- It is okay to kill all the mosquitoes on the planet. (ethical)
- Mosquito nets should be used to protect humans when they sleep; they should not be used for fishing. (economic)
- In order to protect living things in our community we should make certain spaces into nature preserves. The people who live in those spaces will need to find other places to live. (social / environmental)

Equity and Justice: Multiple Ways of Knowing

Dr. Angela Mashford-Pringle

"Often the way we think about scientific research is a Western paradigm. We have to think about knowledge in many different ways.

If you are researching a plant, a Western scientific researcher might understand it by pulling it apart and dissecting it. An Indigenous researcher might spend months watching it grow and trying to examine the surroundings.

It is not that one researcher is better than the other, but rather we're doing research in different and unique ways."

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Equity and Justice: Inclusive Investigations

- "Safe fieldwork strategies for at-risk individuals, their supervisors and institutions" by Monique Avery Pipkin and Amelia-Juliette Demery

Monique Avery Pipkin

Monique: You should always have a buddy or find ways to check in with your teammates. If someone is unable to stand up for themselves, stand up for them and show your support.

Amelia-Juliette Demery

Amelia-Juliette: Ask if the teammate is alright after someone makes them feel excluded, or say, "Hey, I don't think there's anything wrong with who this teammate is." It's important to check in with them and see what type of allyship they are most comfortable with.

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Empowerment & Agency: Action Taking

- What action will be meaningful to you and your community?
- How have you included the voices of those who will be affected?
- Have you communicated this to the community?

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Empowerment & Agency: Applying science knowledge to solve problems through the: SDG Action Continuum

Executed Actions

Informed Actions

6 year olds collected plastic trash near their school to reduce standing water

17 year olds developed their own mosquito repellant

Connected Actions

Considered Actions

Gibson, H., Blanchard, K.P., & **O'Donnell, C.** (2020). *Learning to act:* Smithsonian Science for Global Goals *and empowering young people to develop a habit of considered action-taking.* In T. Huber & J. G. O'Meara (Series Eds.) Education Around the Globe: Creating and Transforming Lives. A volume in the series International Education Inquiries: People, Places, and Perspectives of Education 2030: Vol. 3. Charlotte, NC: Information Age, pp 139-177. Available: https://www.infoagepub.com/products/Education-Around-the-Globe

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Summary:

- The Smithsonian Science Education Center (SSEC) operationalizes sustainable development on a local level through education
- Education plays a key role in achieving the SDGs.
- The Smithsonian Science for Global Goals (SSfGG) project educates youth on these topics by promoting discovery, understanding, and action.
- Sample activities demonstrate how the SSfGG community research guides help build youth's Sustainability Mindsets.
- Case studies from around the world (which I have included in the Appendix of these slides) demonstrate how students use their local community to drive action.

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What are our recommendations?

SECTION 4

Promote local action on global topics

1. Don't focus on teaching students **about** the SDGs themselves; instead, promote sustainable development **through** education
2. Help youth develop the tools (knowledge, skills, behaviors) needed to understand global problems and produce sustainable actions on a local scale
3. Sustainability requires balancing multiple perspectives (environmental, ethical, social, economic)
4. Education must be accessible to people around the world

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Set Learning Goals

1. Make complex subjects understandable
2. Build sustainability mindsets for long-term engagement
3. Change abstract SDGs into locally relevant issues
4. Develop a habit of taking action

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Develop Guiding Principles for Operationalizing Sustainable Development on a Local Level through Education

1. Align classroom experiences with the goals of sustainable development.
2. Promote inquiry-based learning and scientific thinking and practice by using your community as your laboratory.
3. Encourage interactive, learner-centered teaching that enables exploratory, action-oriented, reflective and transformative learning.
4. Foster independent thinking and responsible action that takes place in the learners' own community, which strengthens capacity for agency.
5. Strengthen evidence-based and reasoned argumentation, recognize complexity, promote diversity of opinion and change of perspectives, and encourage the critical reflection of values.

Source: Pahnke, J., O'Donnell, C. & Bascopé, M. (2019). Using Science to Do Social Good: STEM Education for Sustainable Development. Position paper presented at the second "International Dialogue on STEM Education" (IDoS) in Berlin, December 5–6, 2019. See: www.haus-der-kleinen-forscher.de

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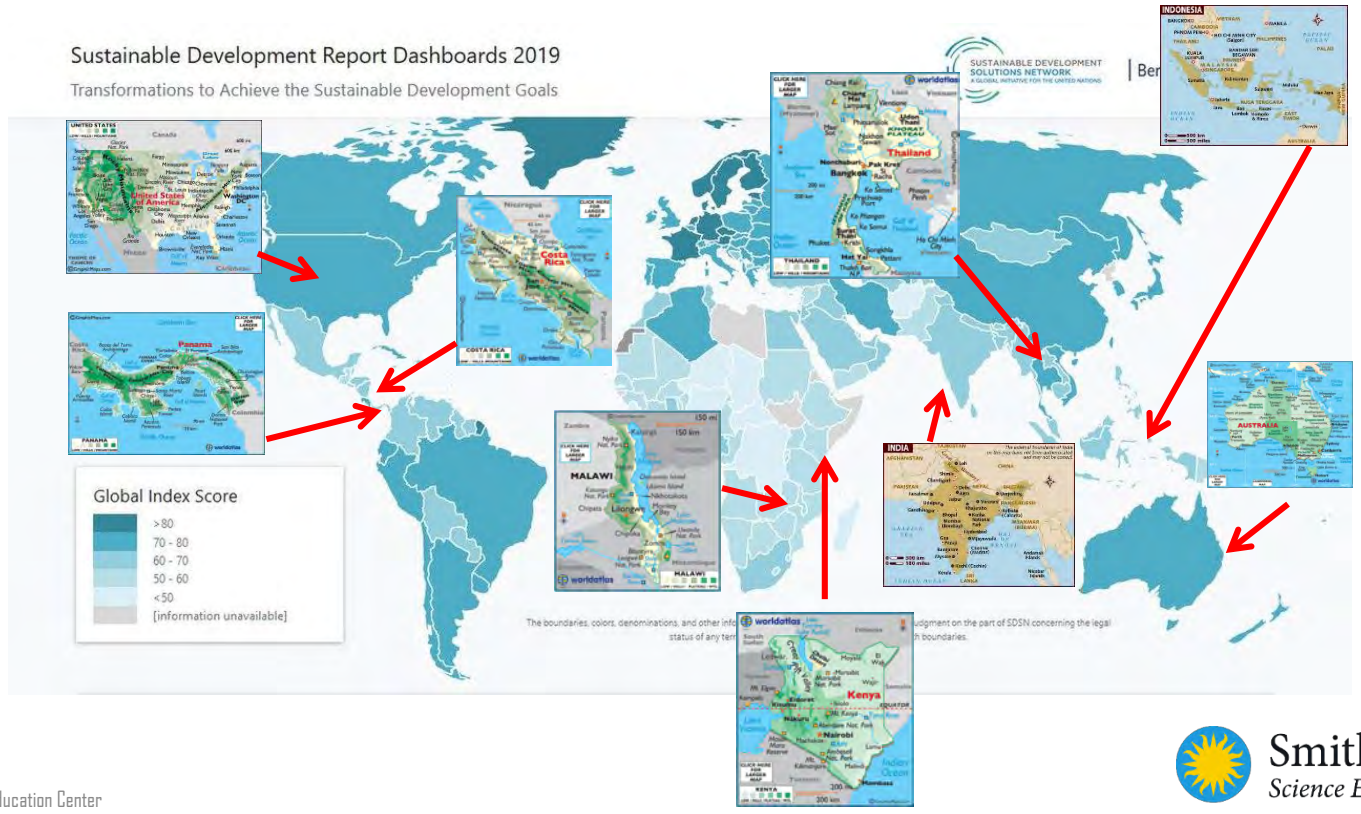
Appendix: Example case studies

SECTION

A

We partner with the InterAcademy Partnership (IAP) to Support Implementation Regionally



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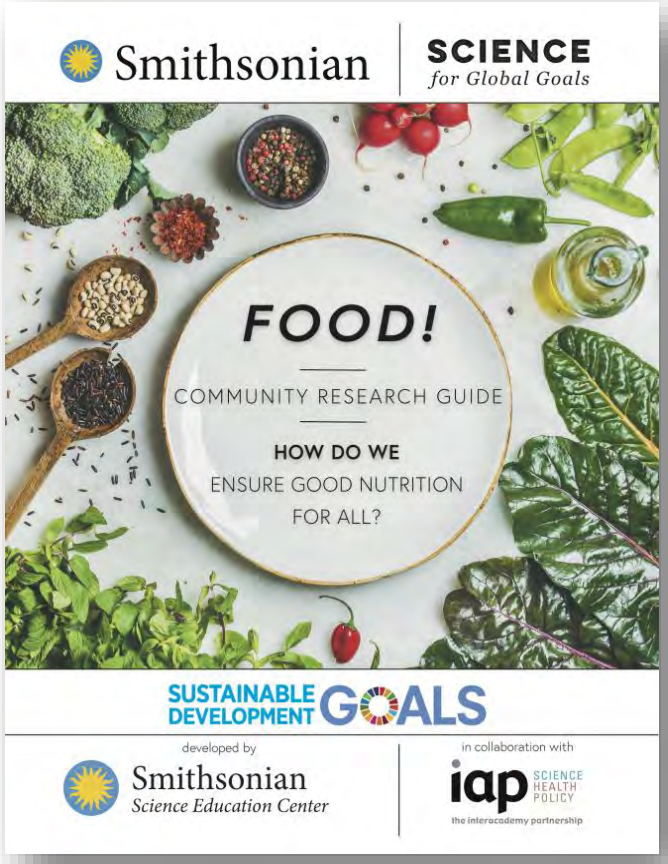

To ensure greater health for all and our efforts to combat hunger, malnutrition, and overnutrition, we must focus on advancing innovative approaches to education across diverse contexts.

When students engage in their own health, and understand methods of prevention and mitigation, we should see measureable improvements in safety and quality of life (Dentzer, 2013; Laurence et al, 2014).

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https://ssec.si.edu/mosquito-espanol

Partnership with the Smithsonian Tropical Research Institute in Panama: Professional Development + Curriculum

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SCIENCE
for Global Goals
MOSQUITO!
GUÍA DE INVESTIGACIÓN COMUNITARIA
¿CÓMO PODEMOS
GARANTIZAR LA SALUD DE TODOS
ANTE LAS ENFERMEDADES
TRANSMITIDAS POR MOSQUITOS?
developed by
Smithsonian
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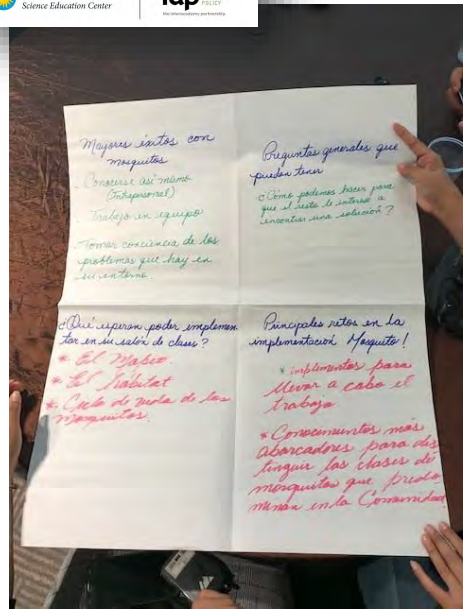
in collaboration with
iap
SCIENCE
HEALTH
POLICY

Professional Development for Educators



A group of change agents and more than 50 teachers participated in workshops to explore the Mosquito! module.

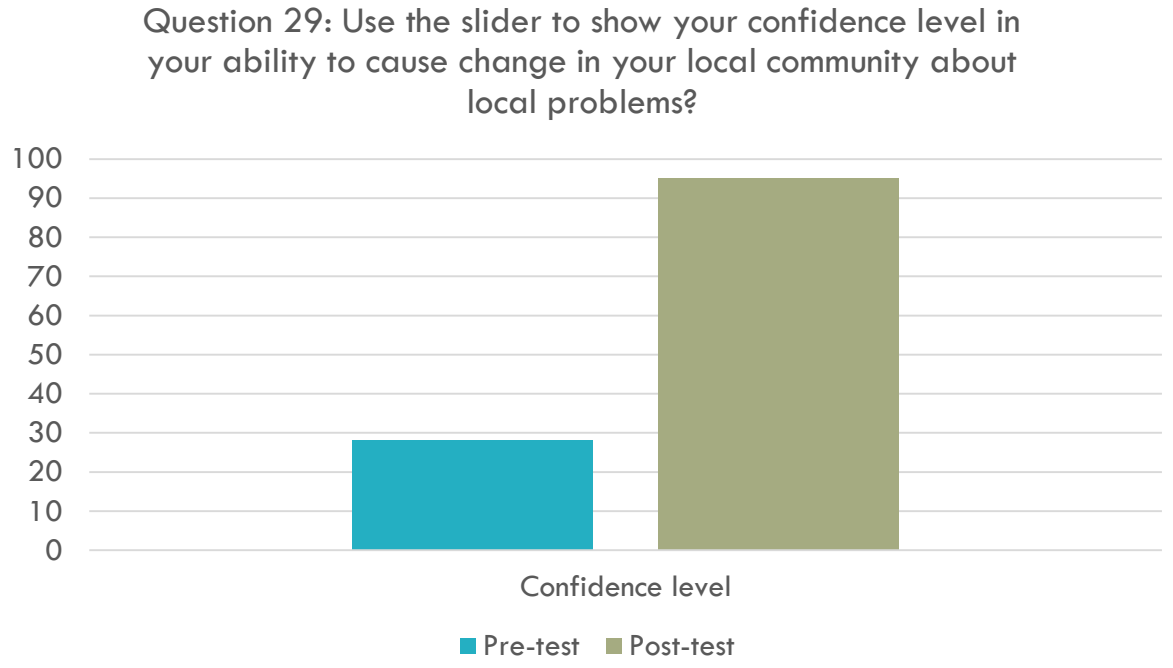
Mosquitoes and Youth

- Tour of the forest
- Collect samples
- Observe and analyze in the lab
- Connect results with citizen science

Citizen Science Tip

Collecting and sharing data about your research site can be helpful to scientists when making and updating maps like these about diseases around the world. Think about how you could share your data with others.

What's been our impact? - Agency



The Smithsonian Science Education Center administered both the pre- and post-test for the second round of field testing. For the Our Lady of the Pines Mosquito! module survey, 73 participants completed the pre-test and 82 participants completed the post-test for this item.

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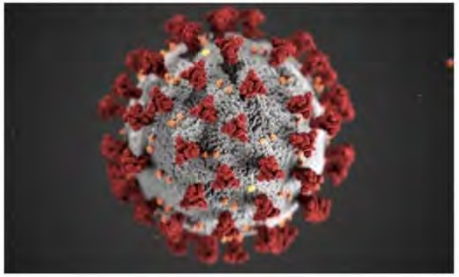
COVID-19!

How Can I Protect Myself and Others?



SUSTAINABLE DEVELOPMENT GOALS

developed by

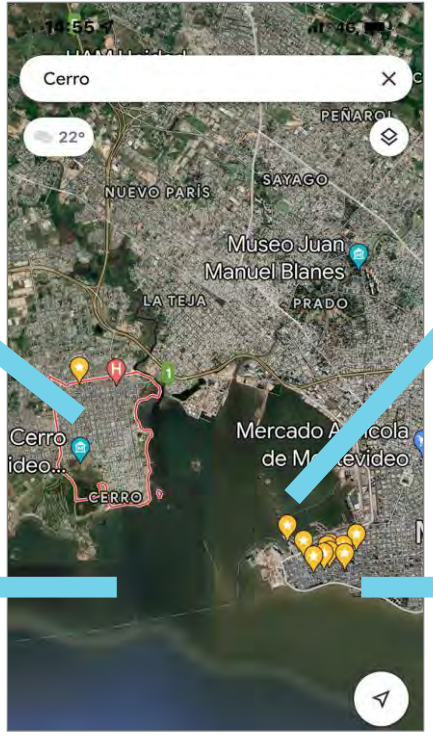
Smithsonian Science Education Center

in collaboration with

iap SCIENCE HEALTH POLICY the interacademy partnership

Sustainable Communities! Uruguay Community Research Area

Cerro neighborhood around the school.



Cerro

Industrial Port

Río de la Plata

Historical area of Montevideo. Old town

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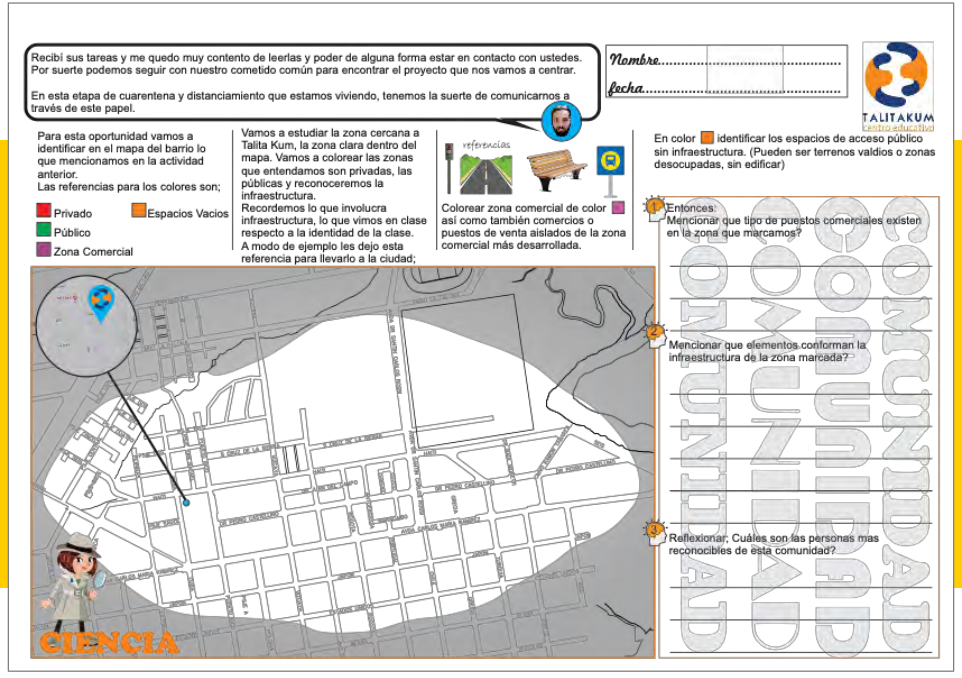
Urban analysis about my community:

Existing public and private spaces, commercial areas and green spaces.



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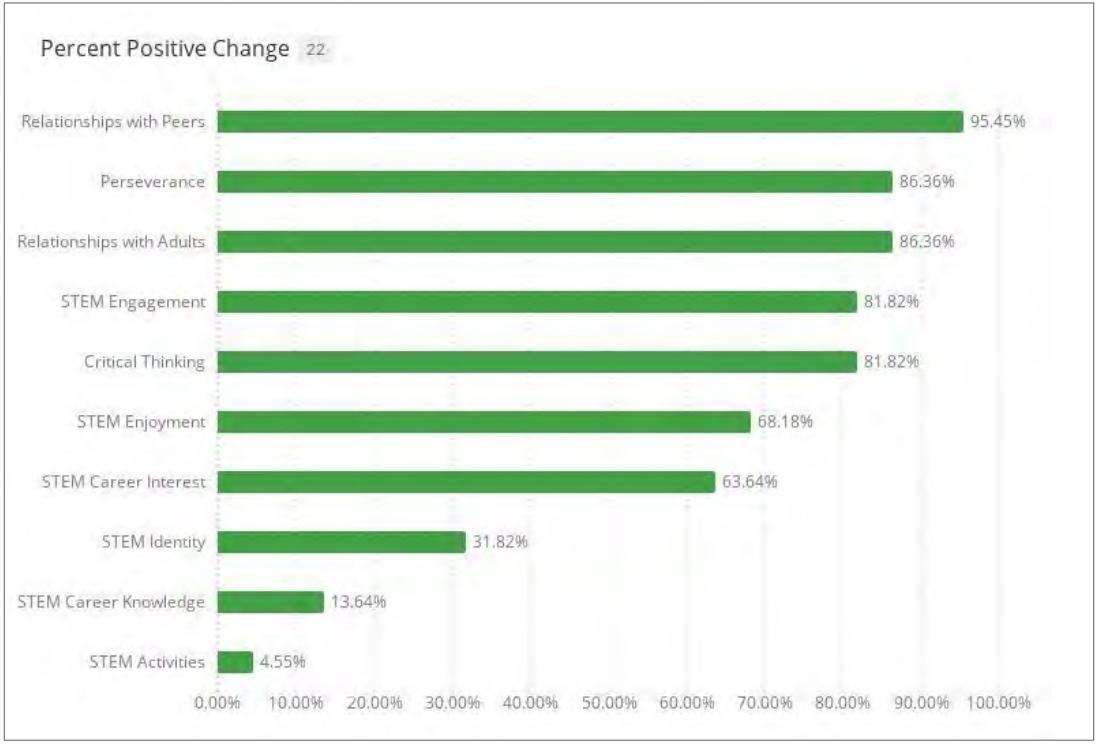
Assessment: Post implementation results



France In Focus - *Earth Optimism: Our Shared Future and Sustainable Communities*

- Virtual Exchange Program
- Collaboration with Smithsonian Office of International Relations and the US Embassy in Paris
- Implemented with students from September 2021-March 2022
- Four live sessions with "expert" presenters
- Asynchronous online interactions
- Serving 40 educators, 51 classrooms and over 1,000 students in the US, France, and French Territories

https://ssec.si.edu/sustainable-communities

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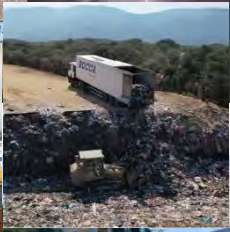
Things you were proud of

All pictures shown are from student triptychs

Things that could be better



Students' Local Actions: France/US Exchange Program

Student action projects included:

- Increasing native plants around their school
- Fundraising for important causes
- Managing green spaces in their community
- Building green bus shelters and green roofs
- Reducing plastic packaging
- Creating a phone app to reward bike commuters
- Preserving forest trails
- Collecting food waste from their school
- Planting trees
- Collecting rainwater

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Local Relevance: Global Presence


G7 Executive Talk Series

Science and the SDGs

Reviewed by: Dr. Carol O'Donnell

Science Education, Identity, and Civic Engagement: Empowering Youth through the UN Sustainable Development Goals

Schools around the world are facing similar challenges of increased urban migration, digital divides, and unsatisfactory teacher training; meanwhile, there is an explosion of scientific knowledge and exponential shifts in career paths, which demand that schools prepare students to be scientifically literate. Globalization indicates that the problems of one country affect everyone; therefore, educating all children to be responsive to the issues of the day is critical. As Emmanuel Nnandozie, of the African Capacity Building Foundation (PAS, 2015) notes, "real transformation will not happen unless countries give real priorities to STEM" education. A powerful and sustained implementation of inquiry based science education (IBSE) teamed with civic learning and social emotional learning (SEL) can help students focus on the issues of critical importance, such as climate change, the health of the world's oceans, and clean energy, while examining each issue from multiple perspectives. Educating youth about complex socio-scientific issues will help to inoculate young people and their teachers and parents against societal and health problems that can adversely affect their lives.

Figure 1: United Nations Development Programme Sustainable Development Goals

O'Donnell, C. (2018). *Science education, identity, and civic engagement: Empowering youth through the UN Sustainable Development Goals*. G7: The Executive Talk Series Global Briefing Report (p. 108). https://digital.thecatcompanyinc.com/g7magazine/june-2018/science-education-identity-civic-engagement/

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Acknowledgments & Contact Info

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- In-kind support provided by the InterAcademy Partnership and the World Health Organization

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Contact Information

Dr. Carol O'Donnell
Director
ODonnellC@si.edu

Connect with the Smithsonian Science Education Center

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https://www.youtube.com/channel/UCGdyNTnSopdgye2gQBVSNVg

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