



Inspiring Climate Action Now (ICAN)

Primary Grade Science to Investigate, Understand, and Respond to Climate Change

© Curt Carnemark / World Bank

Globally, increasingly destructive weather patterns, rising costs for energy, increased pollution leading to health problems, and depleted resources impacting livelihoods and social stability are most significantly experienced by those who are least able to combat them.

Connecting cause (the climate crisis) to effects (poor health and development outcomes, reduced economic viability, conflict and forced migration) is not always easy, particularly when the link is masked by the related challenge of poverty. Solutions to these complex problems require the understanding and participation of those who are most affected, but education systems are not well prepared to build those skills.

Investing in Climate Action Now (ICAN) supports individual and systemic resilience and adaptation to climate change through practical, meaningful education. ICAN builds strong links between lives lived outside the classroom and instructional practice within the classroom, promoting greater awareness of climate related challenges and responses, instilling a sense of urgency, developing an action orientation, and building an ethos of practical solutions among all types of learners.

Skills for Climate Adaptation

Critical thinking, collaboration, complex problem-solving, judgement, and cognitive flexibility are foundational skills and habits of mind for the growth and well-being of individuals, communities, and societies, as well as the essential skills of science. They enable people to ask important questions, consider and make sense of data, look at conflicting findings in new ways, invent novel approaches, and sharpen evolving understandings: in other words, to apply science concepts and practices to the world around them. This broad set of thinking skills supports success in the workforce and the fulfillment of responsibilities as individuals, members of a community, and global citizens.

In the context of climate change, understanding and application of science skills and habits of mind are crucial. Primary-level science education in particular builds a base of knowledge, skills and attitudes that support broad understanding of and resilient responses to climate and environmental changes, and the development of empowered, climate-adapted citizens.

EDC's Solutions

For more than 60 years, EDC has played a critical role in shaping and strengthening science teaching and learning, driven by the understanding that science is both *what* we learn about the world and how it works and how we go about learning it. Foundational EDC work, such as the groundbreaking Physical Sciences Study Committee (PSSC), the Elementary Science Study (ESS), and the African Primary Science Program (APSP), transformed science instruction worldwide and were crucial to establishing an evidence base for the effectiveness of student-centered, experiential learning. Now, EDC is using the power of science to help communities respond and adapt to climate change.

EDC's approach is driven by the understanding that proficiency in science means:

- ➔ Knowing, using, and interpreting scientific explanations of the natural world
- ➔ Generating and evaluating scientific evidence and explanations
- ➔ Understanding the nature and development of scientific knowledge
- ➔ Participating productively in scientific discourse.

EDC science programs integrate critical reasoning and communication into engaging and relevant activities that help children make meaning of science in their daily lives.

Science Practices	Performance in Daily Life
Asking questions and posing or defining problems	Using rocks to walk over a stream in order to stay dry.
Developing and using models	Constructing a bridge of sticks in a stream so that water flows underneath.
Planning and carrying out investigations	Using sticks and mud to block a stream of water to see where the water will flow.
Analyzing and interpreting data	Trying different materials to create a bridge in a stream so that water flows under and the top is free and clear of water.
Using mathematics, information and computer technology, and computational thinking	Balancing the materials used in the bridge construction; counting the number of sticks so that they are equal on either side.
Constructing explanations and designing solutions	Asking, why does the water flow around objects? Why does water change direction?
Engaging in argument from evidence	After building bridges of different materials, explaining which material works best and why.
Obtaining, evaluating, and communicating information	Drawing a picture of the bridge and explaining the process for selecting materials and steps in building.



This approach supports economic development, strengthens healthy citizenship skills, and promotes peaceful co-existence. It shifts science teaching from knowledge transfer to science practice and develops the capacity of educators to co-investigate with learners how science impacts their daily lives. This investigative practice – observing, asking, testing, responding – is key to being active participants in and positive shapers of the environment.

Inspiring Climate Action Now Pilot

EDC's Inspiring Climate Action Now primary science pilot is demonstrating the power of this approach in low-resource contexts, leveraging the school grounds and the daily lives of students and their community, preparing teachers to serve as skilled guides for students engaging with science, and tapping into and promoting curiosity.

Although science and climate are often key topics in national development plans, they can seem unrelated to daily life. Climate science cannot remain the purview solely of scientists and policymakers. If young children are not encouraged to take notice of the changes in climate they and their communities are experiencing, solutions will continue to be divorced from those most affected by climate change. Preparing children and their teachers to participate in learning about and addressing climate science is an investment in finding solutions for their future.

Inspiring Climate Action Now (ICAN) provides a proof of concept for the integration of climate change themes into primary education, furthering critical thinking skills and science knowledge, building cross-curricular math and literacy skills, and infusing practical steps to understand and take action to mitigate local climate effects. Students and teachers both explore and respond to the effects of climate change in their own ecosystem and are introduced to stories of children and communities in other parts of the world who are facing similar climate issues, underlining the fact that climate change is both a local and a global challenge.

ICAN consists of self-contained teacher education and student resource modules built upon three universal principles of science: Change, Data and Design. ICAN draws on evidence-based STEM practices, and infuses eight critical habits of mind:

- Curiosity
- Creativity
- Openness to New Ideas
- Flexibility
- Critical Thinking and Metacognition
- Responsibility and Self-direction
- Perseverance
- Humor

ICAN builds on countries' long-term investments in literacy and math, and supports cross-curricular skill building by using science activities to engage with the language skills of reading, listening, and speaking, and with mathematical concepts such as number sense, calculations, patterns, relationships and analysis of change.

Using the successful design principles of the African Primary Science Program – which built teacher capacity through participatory training and collaborative unit development – ICAN operates within the boundaries of the nature of science to decolonize science education production and include different ways of knowing.

EDC is piloting ICAN modules for grades 2 and 5 in Zambia, Mali, and Antigua-Barbuda in 2023. Although Mali and Zambia are different in many ways, including national languages, level of conflict, and major industries, their climate challenges are relatively similar, including increased temperatures, diminished rainfall and increased weather extremes in Zambia and increased temperatures, diminished rainfall, flooding, and desertification in Mali. Antigua-Barbuda is a maritime environment with unique climate-related challenges, such as intense, destructive storms, periods of sustained drought, increased coral reef degradation and depleted fish and aquatic wildlife stocks in increasingly inhospitable surrounding waters. ICAN piloting accounts for the similarity and differences among the contexts and encourages communication across countries between schools facing common challenges.



The ICAN modules will be based on 3 broad concepts: Change, Data, and Design.

- ➔ **Change** addresses how change is built into the natural world and how it affects both the natural and the built environment.
- ➔ **Data** addresses what is considered data, how we informally and formally collect data, how to read data and what can be considered reliable data.
- ➔ **Design** combines what students have learned in the Change and Data units to solve a problem. Learners will think creatively to plan and implement a climate-related solution that has immediate impact in their community.

The ICAN modules are being workshopped with participating educators, building on locally relevant issues in climate and questions that come from teachers and the local community. Content is aligned with existing curricula and instruction in literacy and mathematics as well as science and reinforces learning expectations for those subjects.

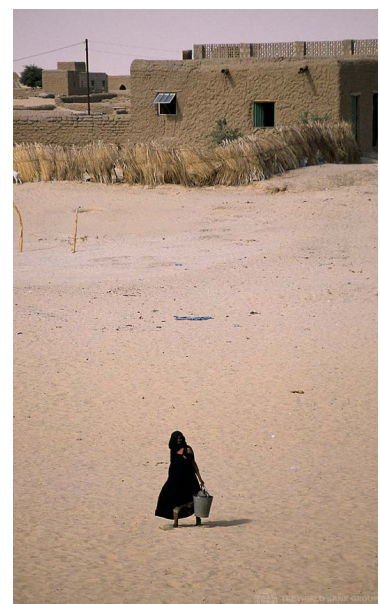
Grade 2 and Grade 5 modules echo each other, with Grade 5 including more complex content and tasks for learners. Pilot teachers are co-developing lessons on climate-related themes within each module. These lessons are used with learners as their teachers develop them, to provide immediate learner feedback and opportunities for refinement.

The ICAN pilot modules cover 6 weeks of teaching or approximately 1 trimester of classes. Children are practicing science by reading, discussing, observing, conducting fieldwork in and around the school, collecting data and engaging in analysis and creative design with their peers and teachers.

ICAN pilot teachers are being trained in a sequence of knowledge - methods – practice, first learning basic facts about climate, then learning methodologies for teaching science critically and inclusively, then learning how to conduct investigations with all students. All participants’ understanding of content and core beliefs around climate, science education, learner capacity and capacity of schools to teach science are assessed before and after the training. During the training, participants build the ICAN lessons based on the module outlines and walk through investigations as teams and with students.

Community Engagement in the ICAN Pilot

ICAN invites representatives from the pilot communities to a workshop to explore their current understanding of climate, climate impact and climate solutions that are currently being implemented in the area, and this information is incorporated into module design. The session includes information on the ICAN pilot and its expected outcomes, along with a hands-on investigation to help participants understand the ICAN approach. At the end of the pilot, participating teachers will conduct a second community session, showcasing what learners have learned. Media and social media will be leveraged to share the results of the pilot with the broader community in Koulikouro, Noussombougou, and Bamako in Mali, in Zambia within Lusaka Province, across Antigua and Barbuda, and in national and global forums.



© Curt Camermark / World Bank



ICAN Pilot Evaluation

The ICAN pilot evaluation examines changes in basic knowledge and attitudes related to science education overall and to the climate content of the modules, in particular. Initial data are collected during teacher training and lesson development, and endline data will be collected at the end of module implementation. Additional contextual data is collected during weekly coaching visits to teachers while they are implementing the pilot modules.

ICAN Mali

In Mali, ICAN is being piloted in 10 schools in Koulikouro, Nossombougou, and Bamako in collaboration with their respective CAPs. Both urban and rural schools are included, and the sample covers a combination of private and public schools, including schools currently being supported by EDC under the McGovern Dole FFE4 project. EDC has had a mutually productive relationship with the CAPs in these regions for decades, supporting literacy, mathematics, and early childhood programming that has transformed the experience of Malian teachers and learners.

Materials have been developed in French. They will be delivered to Grade 2 students in Bamanankan and to Grade 5 students in French. Final materials can be translated into Bamanankan for teacher use. The EDC ICAN team is developing a digital library of information, illustrations, and lesson tools such as question banks, planning pages and simple classroom assessments for use by teachers, and a list of free, locally available resources for classroom instruction.

The ICAN Mali lead will visit each participating teacher 6 times during the pilot to coach and support their implementation of the module with learners in the classroom.

ICAN Zambia

In Zambia, ICAN is being piloted in 10 schools in Lusaka Province in collaboration with the Provincial and District offices. Both urban and rural schools are included, and the sample covers a combination of private and public schools, including schools currently being supported by EDC under the USAID Let's Read (USLR) project. EDC has had a mutually productive relationship with the Lusaka Province in the past and continues to expand its support for literacy, mathematics, and early childhood programming that has transformed the experience of Zambian teachers and learners.

Materials are being developed in English. They will be delivered to Grade 2 students in Cinyanja and to Grade 5 students in English. Final materials can be translated into Cinyanja for teacher use. The EDC ICAN team is developing a digital library of information, illustrations, and lesson tools such as question banks, planning pages and simple classroom assessments for teacher use, and a list of free, locally available resources for classroom instruction.

The ICAN Zambia lead will visit each participating teacher 6 times during the pilot to coach and support their implementation of the module with learners in the classroom.

ICAN Antigua-Barbuda

In Antigua-Barbuda, ICAN will be piloted in 10 primary schools, in collaboration with the Ministry of Education, Sport, and Creative Industries. School selection will represent a range of communities and contexts on both islands, and participating schools and teachers will be linked in a community of practice to enrich the pilot and promote the use of the approach. Materials for Grade 2 and 5 students and teachers will be developed and delivered, and the EDC ICAN team will develop a digital library of information, illustrations, and lesson tools such as question banks, planning pages and simple classroom assessments for use during the workshop and provide a list of free, locally available resources for classroom instruction.

The ICAN Antigua-Barbuda lead will visit each participating teacher 6 times during the pilot to coach and support their implementation of the module with learners in the classroom.

Post-Pilot

Pilot results will be used to adapt and enhance the ICAN curriculum and training approach, enriching Grade 2 and 5 content and building out to additional primary grades. Expansion will include additional climate and environmental contexts, such as forested and highly urban environments with unique challenges.