MathCore for Museums

\$1.71 million

Develops and evaluates a set of open-ended math exhibits that use body motion to engage children and their families in learning experiences with ratio and proportion over multiple museum visits.

The Matter of Origins

\$300,000

Supports the Liz Lerman Dance Exchange, in partnership with universities and a science advisory panel, in producing The Matter of Origins, a two-part experimental program that engages the public in explorations of the nature of beginnings and the physics of the origin of matter.

Pushing the Limits: Building Capacity to Enhance Public Understanding of Math and Science Through Rural Libraries

\$697,000

Finds new ways of communicating STEM concepts, with a focus on rural libraries and adult residents in places that are geographically remote from typical venues such as museums, zoos, and science centers.

SciGirls

\$2.60 million

Subsidizes a PBS show and multimedia project designed to encourage and empower more girls ages 8-13 to pursue careers in the STEM fields.

Tornado Alley

\$990,000

Supports a large-format 2D/3D film and comprehensive outreach program exploring the science behind severe weather events.

NOTE: Figures reflect either total funding or amount awarded to date. SOURCE: National Science Foundation Meanwhile, according to Mr. Storksdieck, some

institutions that pursue informal science learning have been disappointed that the

NSF has been so focused on research and the development of new ideas, rather than continued support for established programs or practices.

"Once you develop the new idea, you have to let go" of the federal funding, he said. The NSF is "not there to sustain funding."

Moreover, he said: "There are people who complain that spending 10 to 20 percent [of a project grant] on research or evaluation is a waste of money."

Also, some observers have expressed disappointment that funding for the NSF's Informal Science Education program has not kept pace with the fairly robust growth over time in the agency's overall budget, which climbed from about \$4.4 billion to nearly \$7 billion from fiscal 2001 to fiscal 2010.

"Basically, the NSF budget for Informal Science Education has experienced no appreciable growth for at least five years," said Anthony "Bud" Rock, the chief executive officer of the Association for Science-Technology Centers, in Washington. His group received startup funding from the NSF that helped expand the presence of science centers around the country.

The Informal Science Education budget has seen a couple of significant bumps since the mid-1990s, but has changed little more recently, rising only about 5 percent over the past five budget years. It was \$66 million for fiscal 2010.

Even that growth, however, could be reversed, given the

current push in Washington to scale back federal spending. For example, the Republican-led House approved a fiscal 2011 budget plan in February that would cut the NSF's Education and Human Resources Director-

and Human Resources Directorate budget, which includes the Informal Science Education program, by \$166 million or about 20 percent.●



Evelyn Cariño, left, Brian Ventura, and Valerie Estrella take part in a river cleaning activity at the Bronx River in New York. The students are enrolled in Heroes in Conservation, an after-school program coordinated by the Committee for Hispanic Children and Families.

Environmental Issues Inspire Children to Dig Into Science

BY CARALEE ADAMS

tudents in the science club at Pickens Middle School in Pickens, S.C., had been planning a trip to swim with manatees in Florida when news of the oil spill in the Gulf of Mexico hit

last year. "I was kind of worried about the manatees," said 12-year-old Alex Womack, who had been studying the marine mammals in the club after school and in the summer. "I thought the oil might hurt them and make them extinct."

In February, 54 students from the school took that trip, traveling 12 hours by bus to see the creatures in their winter-migration home of Crystal River, north of Tampa, Fla.

"You actually got to see how pretty they are, and you feel more for them and how much they are endangered," said Alex, an aspiring marine biologist who said the manatees looked like a cross between a dolphin and a cow and felt like seaweed when she petted one. "It made me like science a whole lot more."

That's just why science teacher Susan Hilyer, the faculty adviser to the science club, along with two other teachers—Laura Anderson and Louise Hope—persuaded the 16,000-student Pickens school district to overcome its concern about exposing children to water and wild animals. They knew the experience would be more powerful than a classroom lesson.

"There is no comparison to just being outside and in the midst of it," said Ms. Hilyer, adding that the experience doesn't have to be as extreme as swimming with manatees. "You can get that same 'wow' just digging in dead logs with little shovels. It's real. If it's not real, they don't care."

Informal science programs that focus on the environment often hook young people because they are about issues that really matter in their lives—the quality of the air and water and the wellbeing of animals. If it's relevant, they want to learn. And often, children are motivated, in response, to make a difference by cleaning up a stream, starting a recycling program, or advocating eco-friendly policies.

"It's that application to reallife experiences that brings environmental education alive," said Brian Day, the executive After-school and summer activities offer the flexibility for young people to pursue their own interests—without the stress of grades.

director of the North American Association for Environmental Education, a nonprofit group in Washington. "It turns kids on if they take an action component and can make an improvement in their school community or backyard. Then all that education has a focus and a purpose."

And an after-school or summer science experience offers time and flexibility for children to explore and follow their own interests, with no stress of grades, said PAGE 16>

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Lucy Friedman, the president of The After-School Corp., or TASC, in New York City. "Science and after-school programs have such great synergy. Kids feel it's OK to take a risk," she said. "Sometimes there isn't always a right answer."

When TASC does science training for after-school staff members, it emphasizes that the leader is merely guiding the process. "There is a tendency of adults to explain to kids what happens," said Ms. Friedman. "It's much more powerful when kids discover on their own and make some of the mistakes."

Some TASC programs take students to New York's Coney Island to measure the temperature of the water and sand. "All of a sudden, the beach they connect with fun becomes a learning environment," Ms. Friedman said.

MAKING IT REAL

In California, water is the "new gold," because it's a limited resource in great demand, so it's important for children to understand it, said Marianne Bird, the youth-development adviser for the Sacramento County 4-H Water Wizards, a 12-week afterschool program for grades 4-6.

"Young people need to be aware that there is no new water," she said. "Water is always involved in a system, and they are in the system."

The nearly 500 children who take part in the program learn about the water cycle, the watershed, and wetlands, and they conduct experiments. A servicelearning piece and a field trip to a water education center where Sacramento's water is held are also part of the program.

Being outside and part of a larger environmental project is a big motivator for young people, said Rick Bonney, the director of the Cornell University Laboratory of Ornithology program and a co-founder of the lab's Citizen Science Program. Many students participate in the lab's Great Backyard Bird Count and BirdSleuth as campers or in an after-school setting. They learn the protocol of identifying birds and collecting data.

"This is authentic, real science. We are answering questions whose answers aren't known," Mr. Bonney said.

Another citizen-science initiative, the Monarch Larva Monitoring Project at the University of Minnesota-Twin Cities, engages middle schoolers. In the summer, groups track monarch butterflies once a week to see how they change over time, said Karen Oberhauser, a professor of fisheries, wildlife, and conservation biology.

The children all do independent research questions and set up experiments, Ms. Oberhauser said. One student recorded the fate of 60 larvae that she tied to various locations to study monarch predators. Another studied the timing

There is no comparison to just being outside and in the midst of it."

SUSAN HILYER

Science Club Faculty Adviser

of the arrival of monarchs, who only lay eggs on milkweek, vs. the availability of that milkweed for their larvae to eat.

"In the end, when we gather around the picnic table, I love hearing them come up with questions. They're so focused," Ms. Oberhauser said.

Once, students observed butterflies mating, which triggered a discussion. "In school, it would be a reason to be giggling and not pay attention to the science of it," she said. "But they took it very seriously."

EXPOSURE TO NATURE

The St. Louis Science Center takes small groups of teenagers from its Youth Exploring Science program to a pond at dusk armed with flashlights to sit still, listen, and record frog calls. Their information goes into a larger database as part of a project examining the impact of climate change on frog populations.

By participating, the youths begin to understand the process of science better, said Kerri Stevison, the senior educator in charge of the Communicating Climate Change program. "Science isn't something people just write about," she said. "They learn to follow strict rules and understand the protocol."

Over time, those inner-city



students—many of whom don't have much exposure to nature become more comfortable with animals and stomping around in the mud.

Likewise, at New York's Captain Manuel Rivera Public School, in the Bronx, many K-8 children don't have much of an opportunity to connect with the outdoors. The after-school program Frontiers in Urban Science Exploration, sponsored by TASC and coordinated by the Committee for Hispanic Children and Families, is designed to provide that link with trips to zoos, parks, and rivers to explore natural resources, said Helena Yordan, the site coordinator for the committee. Through the inquiry-based, hands-on activities, children get excited about learning and the scientific process. "Science is for everyone. That's our slogan," said Ms. Yordan.

In the program's informal setting, leaders can talk about careers in science. Ms. Yordan also keeps teachers informed about the projects to connect the afterschool work with what's happening in the classroom.

Contests such as the Siemens

Mikiany Pena, left, and Alondra Sanchez, foreground, examine plants and animal tracks during an overnight trip to the High Bridge Empowerment Center, in Goshen, N.Y. The children in the Committee for Hispanic Children and Families after-school program are expected to take on the role of scientists. We Can Change the World Challenge give children a chance to create an environmental solution and compete for prizes.

Last year, 6th graders Rani Iyer and Isha Laad, both living in Lexington, Mass., at the time, spent 200 hours each working on an entry for the contest. Concerned about the harmful impact of chemicals used in dry cleaning, they tested a wetcleaning process and worked to persuade businesses to switch to a more eco-friendly process.

The girls did testing in nearby college labs, where they used chemicals they wouldn't have had access to at school. "No one was telling us what to do," said Rani, 13, who has since moved to West Lafayette, Ind. "It seemed like it meant more than what we do in school, where the teacher knows the outcome of the experiment. We don't know what it is."

The team was a finalist, and each girl won a \$5,000 savings bond and a pocket camera. Rani is considering entering the contest again and perhaps pursuing a career in science or math. \bullet