

Linking Real-World Science to Schools

By **Benjamin Herold**

Cultural institutions, researchers, and "makers" are using technology to expand their connections with K-12 science educators, push students and teachers to become creators of science content, and blur the boundaries between classrooms, the real world, and virtual environments. Among the initiatives that are working to make those changes happen:

Smithsonian Institution

More, Deeper Learning Connections

As part of its new approach to K-12 education, the **Smithsonian Center for Learning and Digital Access** hosted a **three-part online conference** this summer about astrophotography.

In mid-August, from a small conference room outside Baltimore, astronomer Frank Summers and education specialist Dan McCallister, both with the Space Telescope Science Institute, talked into headsets connected by computer to a few dozen educators from Eugene, Ore., to Moscow.

After a whirlwind multimedia tour of photos from the Hubble telescope, Mr. Summers and Mr. McCallister talked the participants through strategies for using the images in their classrooms to foster such skills as observation, estimation, and classification.

The pair—old friends, with a familiar banter—quickly got into an enthusiastic argument.

"This is the basics of how you start scientific research," Mr. Summers eventually said to the educators listening in. "We're supposed to disagree. The discussion about why you disagree is more important than the answers themselves."

Lynn-Steven Engelke smiled.

These days, Ms. Engelke, the director of the Smithsonian's teacher programs and services, is focused on using digital technology to expand the institution's reach and spark curiosity, foster 21st-century skills, and connect educators directly to the Smithsonian's many experts and vast resources.

Ms. Engelke said a total of almost 400 people took part live in the three sessions on astrophotography, and thousands more are expected to access the online archive in the coming months. Many will earn digital badges on such topics as teaching with telescopes, for educators, and astrophotography, for students.

"Teachers and students can be encouraged to make their own pathways through learning," Ms. Engelke said. "The Smithsonian in general has become more focused on the learner."

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—Swikar Patel/Education Week

Learning Technologies Media Lab

Massively Open Real-World Adventures

For almost a decade, Aaron Doering has used technology to provide students and teachers with a window into his globe-spanning scientific adventures.

His GoNorth! project with the **Learning Technologies Media Lab** at the University of Minnesota in St. Paul, for example, connected more than 3 million participants to a series of Arctic expeditions related to climate change and its impact on local populations, according to information provided by the lab. While Mr. Doering and his team rode dog sleds across Greenland and other far-flung locales, teachers and students followed along online, supplementing classroom lessons with live chats, multimedia blogs, and digital field reports filed by Mr. Doering's team.

"This was back in 2004. Chatting in real time wasn't normal. Facebook wasn't even around," said Cassie Scharber, who co-directs the lab along with Mr. Doering. "The projects blew the doors open. It was like, 'Oh my gosh, we can do this.'"

But almost immediately, Ms. Scharber and Mr. Doering said, teachers' enthusiasm for Go North! turned into a question: How can we do it ourselves?

"Everyone wants to be part of an adventure," Mr. Doering said, "but not everyone can get the grants" to pay for an Arctic expedition.

Enter **WeExplore**, a new virtual environment and technology platform from the lab that will allow classrooms to conduct their own local expeditions and share the results all over the world.

It's like a massively open online course, or MOOC, with a much greater sense of adventure and ownership, Ms. Scharber said.

"This is more participatory, collaborative, and inquiry-focused," she explained. "We're trying to challenge teachers and students by giving them all the power."

Harvard University

No Child Left Inside, or Offline

Researchers at Harvard University are hoping that technology can help facilitate new partnerships in the STEM subjects that help remove the boundaries between K-12 classrooms, the online world, and students' surrounding communities.

With **EcoMUVE**, Harvard now offers schools access to immersive "multi-user virtual environments" that let middle school students explore the bottoms of ponds and the microscopic activity in forests, all from a computer. The university researchers are also piloting **EcoMOBILE**, an augmented-reality application for smartphones that aims to get students outside to observe their own local ecosystems for tech-enhanced field trips and science experiments.

The ideal, said Shari Metcalf, a project director for EcoMUVE, is for the two technologies to be used in conjunction.

"We're making the argument that blending virtual and real ecosystems can have a positive impact on student learning," Ms. Metcalf said. "Environmental scientists have a motto of 'no child left inside,' but understanding complex causal relationships in a single field trip is really hard."

Significant school-based challenges to creating truly blended environments for exploration of science, technology, engineering, and math remain, however. Rather than using technology to create engaging, hands-on lessons that meet curricular standards, said Ms. Metcalf, many educators, squeezed by accountability regimes, still approach EcoMUVE as a luxury to be deployed at the end of the school year, after state tests have been administered.

And teachers' use of EcoMOBILE, she said, is still limited by a lack of adequate technology infrastructure in many schools and surrounding communities.

"Connectivity and dead batteries are a huge deal when you have 40 kids trying to connect [to the Internet via smartphones] at a pond," Ms. Metcalf said.



—EcoMUVE project/Harvard University

Brooklyn Aerodrome

Doing It Yourself, Online

Before this July, the **Brooklyn Aerodrome**, a small company in New York City devoted to do-it-yourself flight, had managed to formally reach only about 100 students, mostly through occasional appearances by company officials at summer camps and local museums.

Then the company's founder, Breck Baldwin, connected with *MAKE Magazine* and Google+, which teamed up this summer to host an online "virtual summer camp" for tens of thousands of children all over the country. According to information provided by *MAKE*, a publication devoted to promoting hands-on learning through do-it-yourself projects, more than 7,000 people have taken part in the aerodrome's "hangout," with many watching a **live-streamed instructional talk** and making their own gliders at home, all while asking questions and sharing their results online.

For Mr. Baldwin, who has long hoped to expand the reach of his educational offerings, the new platform was a revelation.

"We're going to go heavier into digital [distribution] because it's the easiest way to disseminate a lot of content quickly to a lot of people," he said.

Mr. Baldwin said digital distribution also allows for complex concepts of aerodynamics to be learned through the best possible combination of media: some text and illustrations, a lot of videos, and frequent opportunities to do three-dimensional modeling. He recently partnered with a New York City high school science teacher to develop a curriculum that employs all three techniques while seeking to incorporate rigorous academic standards—and focusing on hands-on building projects.

The approach, he said, appeals to students' attention spans and to the challenging realities facing a small outfit with big ideas but a limited budget.

"We're not going to hit a classroom in Kansas," Mr. Baldwin said, "unless we can do it online."

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—Breck Baldwin/Brooklyn Aerodrome