

STEM Connects Past and Present

Integrating science, technology, engineering, and mathematics (STEM) with social studies can bring new relevancy to the content areas, and incorporating historic sites increases students' engagement even more.

Taking cross-curricular lessons out of school "is a great way to engage kids in science and history," says Janet Sweat, fifth-grade science teacher at Fort White Elementary School in Fort White, Florida. She has been taking students to Ichetucknee Springs State Park in Fort White for several years, first as a seventh- and eighth-grade teacher and now with her fifth-grade students.

Sweat, working with Sam Cole, a park biologist, and Trini Johannesen, a sixth-grade science teacher at Fort White High School, received a Florida Department of Environmental Protection grant to develop a curriculum for the Learning In Florida's Environment (LIFE) program in 2012. "When we created the labs, we thought about what the specific format needed: data gathering, math questions, history, and real-world relevancy, writing portions. We would give them a scenario, real-world problem solving as best we could," she recalls.

Some labs have students assume the role of someone who wants to build in the park; they would have to consider construction sites. "We wanted to get kids to think about their opinions, the where and why, to justify their own thinking. We had 12 labs for the middle school. We'd spend about an hour there and then do analysis at school," says Sweat.

Since the middle and high school was located only a few minutes from Ichetucknee Springs, Sweat says she would take her students there multiple times over several days to conduct the labs. At the park, students collected soil samples, looked for Native American artifacts, and tried to discern natural features from human-made ones. "The land is limestone; it's very porous. The water filters down...Karst [topography] features sinkholes...Students identify sinkholes versus phosphate mines. Water is always a focus [of the labs]...

It's very relevant to everyday life," Sweat points out.

She says many of her former students were inspired to protect the natural springs, often returning to remind her of highlights from the labs. "I see that being huge," she says, adding that scores in the district have been on the rise, justifying the program.

Now as a fifth-grade science teacher, Sweat plans to take her four classes of students to Ichetucknee Springs for a full-day experience. "We'll roll in ecology: land features, weathering and erosion, what's [human] made and what's natural. [They] will go on to middle school, where they are still doing the original 12 labs."

"It's not classic project-based learning, but it's definitely interdisciplinary," explains Jessica Boualavong, as she describes a third-grade field trip that incorporates geology with social studies. Her students at Town School for Boys in San Francisco, California, learn "a lot about how early California was settled," first by Native Americans, and then through the Gold Rush of the 1800s. The highlight of the year is a trip to Columbia State Historic Park (<https://bit.ly/1CGQS2W>), a California Gold Rush town.

"[Town School students] have been going on this trip for many years; there previously hadn't been a STEM or science component to this unit," Boualavong says. When she joined the school three years ago as the Lower School STEM teacher, she met with the K-4 teachers to try to align some units.

"We were very intentional in mapping science to some things they were doing in some other subjects. In Cali-



JESSICA BOUALAVONG

After learning about the California Gold Rush and geology, third graders from the Town School for Boys in San Francisco try their hands at panning for gold at Columbia Historic State Park.

ifornia [it's a] fourth-grade standard to understand California history. Almost every third and fourth grader knows about the Gold Rush," she continues. Noting Town School is a private school, Boualavong says that they are "informed by" the state standards, but had some ability to "rearrange things to fit teacher and student interest."

On the social studies side, students study the history of the Oregon Trail and map out native settlements. In science, they learn about the "geology of the Bay Area. They learn about rocks and minerals and their differences. They learn how to pan for gold and take that skill with them when they go to Columbia and try to pan for gold there," Boualavong says. "It's very immersive, and students look forward to it every year. They're excited that all their different teachers are communicating about it... They start to see more relevance to what they're learning... start to understand, start to learn to identify rock formations. The practical applications make [what they're learn-

ing] come alive, make it come out of the textbook for them...It's definitely something they keep with them after third grade."

STEM-ifying Traditions

In Guam, Laura Arndt of Global GreenSTEM has been working with local K-12 teachers to create curriculum that makes STEM relevant to the island's unique history, culture, and natural environment. "Starting with the science concepts and STEM projects targeted for work with particular grade levels, I identify island-specific environmental and cultural issues and traditions to 'Guam-ify' extension lessons," she says.

Through Global GreenSTEM, Arndt had led professional development sessions on Guam in which teachers build simple stringed instruments that become models for their traditional stringed instrument—the belembaotuyan—as part of lessons on vibration, pitch, and volume. She has challenged teachers to adapt the "classic" foil boat engineering design challenge for buoyancy to test models of their traditional flying proas (a type of sailboat). Teachers compared different mixtures of diverse local soils for creating sculptures that included models of their historic latte stones of Latte Stone Park.

A middle school class has taken its garden project beyond the school walls to collaborate with a professor at the University of Guam to design "seed bombs" modeled after traditional sling stones. The professor, who was a guest STEM expert at one of Arndt's professional development sessions, has worked with students to create a mixture of local soil, compost, and banana ash to encase native seeds into "seed sling stones" so they can be shot into inaccessible deforested mountainsides. The goal is to restore natural habitats burned by human-caused wildfires, curb erosion, and reduce sediment deposits on beaches and coral reefs. Making and shooting sling stones adds modern relevancy to a historic tradition while helping to solve an island-specific environmental issue. ●