CASE STUDY
Hillsborough County Public Schools, Tampa FL
Scores and K-12 Engagement in STEM

District
PreK-12
250 schools
203,432 students
60% economically disadvantaged
http://www.sdhc.k12.fl.us

Challenges
- Engaging digital natives
- Expanding the use of technology
- Launching and expanding a district-wide STEM program

Solutions
- SPARK Science Learning System®
- SPARKvue®
- SPARK Element®

Implementation
- Grades K-12
- Biology, chemistry, earth science, environmental science, physical science, and physics
- Advanced Placement (AP)® biology, chemistry, and physics
- Electives, including marine science

Results
- Improved critical thinking and problem solving skills
- Improved elementary school science scores on state tests
- Increased engagement and motivation in STEM
- Time savings

“Science isn’t about memorizing facts and formulas. It’s about developing an understanding of the scientific process and giving students opportunities to apply that process to their learning. Creating those hands-on experiences with the actual tools of modern science and technology careers is essential.”

-Larry Plank, HCPS
When biology teacher Larry Plank joined Hillsborough County Public Schools (HCPS) in 2007 to oversee the district’s high school science programs, half of the high schools used PASCO probeware and half used probeware from another provider. After receiving a grant from the Florida Department of Education (FLDOE), Plank set out to expand the use of probeware to support inquiry-based learning and help students develop a love of science.

“Through this process, it became obvious that PASCO was the best-positioned partner,” said Plank, who now serves as the director for K-12 science, technology, engineering, and mathematics (STEM) education for HCPS. “Working with PASCO, we were able to develop a long-term vision and plan for implementation. They have been very supportive and they’ve provided us with a lot of helpful advice in planning for the future.”

In 2008, HCPS implemented PASCO’s handheld SPARK Science Learning System in every high school, as well as 15 middle schools and 15 elementary schools. “Since then, we’ve continually purchased PASCO probeware. It’s in all our high schools, most of our middle schools, and about one-third of our elementary schools,” said Plank. “The relationship we’ve developed with PASCO over the past several years has been absolutely incredible.”

HCPS students in grades K-12 use the SPARK science learning solution for accurate, real-time data collection in a variety of core classes, electives, and Career and Technical Education (CTE) classes. Students also use the SPARK in STEM Fair projects, and engineering and design challenges. The all-in-one mobile device seamlessly integrates the power of probeware with inquiry-based content and assessment.

In addition, high school students use the SPARKvue science learning application for real-time quantitative measurement and analysis. The software, which comes preloaded on the SPARK, also works on all platforms.

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Preparing students for college and careers

Local universities support this approach as well. “Several years ago, the University of South Florida (USF) found that freshmen who enrolled in science classes weren’t prepared to utilize the devices in their laboratories. As a result, they had to spend time teaching students how to use them,” said Plank. “So they asked all the local school districts to emphasize these types of technology tools in our high school science labs. Expanding our use of the PASCO probeware has helped immensely in preparing students for college and careers. Our local post-secondary partners are thrilled.”

Innovations Lab

Another way HCPS is infusing technology into STEM education is through the Innovations Lab. The district launched the first Innovations Lab at Turner/Bartels K-8 in 2013 and has since expanded to two middle schools.

The Innovations Lab, which is the size of three classrooms, provides students with an environment similar to that of professional scientists and engineers. It includes a science lab, mobile furniture, a robotics court, netbooks, and SPARKs.

“The Innovations Lab provides an active space where students can build problem-solving and critical thinking skills. They can write on their desks or on the walls to draw out ideas to think like scientists and engineers,” said Plank. “At any given moment, we can work with three different classroom groups in the lab. Students at Turner/Bartels K-8 visit the lab at least once every two weeks to do something STEM-related.”

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In addition, every class at Turner/Bartels K–8 chooses a long-term research project, many of which incorporate SPARKs. “Students use it to collect data throughout the year,” said Plank. “One class created a compost bin and used the probeware to measure the temperature. They determined that compost is warmer than typical ground dirt because of the decomposition that’s occurring. Then they wanted to test which foods from the cafeteria decomposed the fastest into the soil. They had a lot of fun with the project.”

**Engaging technology natives and saving time**

By facilitating quick and accurate data collection, the PASCO probeware also helps teachers and students save time. “Today’s students are obviously technology natives and they’re looking for that kind of engagement with science tools. Plus, as teachers get busier and schools get more pressed for time, technology is exactly what we need to help us make better use of the time we have with our students,” said Plank.

“The PASCO probeware minimizes set-up and clean-up time, and the time it takes students to collect and analyze their data,” he said. “So in a class like biology, which is tested in our state, teachers can implement a full complement of labs in less time. And in classes like AP Biology, a lab that used to take two to three hours can now happen in 45 to 50 minutes using the technology tools PASCO has developed.”

In addition, because students have a faster, easier way to collect data, they can focus on data analysis rather than data collection, which results in deeper conceptual learning. “Because the data is available instantaneously and in a form that’s visually pleasing, students can spend more time analyzing data points and talking about what that data or what those trends mean. That’s very powerful,” said Plank. “It also organizes the data in a way that makes it easy for students to share with their peers or the teacher.”

**Supporting argument-driven inquiry**

“Argument-driven inquiry is one of our district initiatives. In our high schools, instead of asking students to write a traditional lab report, several teachers now ask students to engage in the process of argumentation,” said Plank. “After students collect and analyze their data using the PASCO probeware, they’ll create a poster to share their findings with the class. Then their classmates will ask them questions. It’s a great learning experience. Students are learning how to make a good argument based upon evidence and building their critical thinking skills. Having this data has changed the way we approach science in the classroom and the PASCO technology has been integral in making that transformation.”
Engaging parents in STEM

Several schools also host STEM nights two to three times a year to engage parents in STEM. During the hands-on events, students will guide their parents through a lab they’ve done, often using the probeware.

“Parents are critically important in the decision making process for what interests students might pursue beyond high school, so it’s important to provide these hands-on opportunities for them too,” said Plank.

Supporting professional development for teachers

In 2014-15, thanks to a Math-Science Partnership Grant from the FLDOE, HCPS was again able to expand its implementation and purchase additional probeware for its elementary, middle, and high schools. The grant project, Accelerating Maximum Potential in STEM, is a collaborative project with Polk County Public Schools.

“The focus of this grant is to provide professional development to improve the practice of each district’s math and science teaching faculty to increase student achievement in STEM,” said Plank. “We’re utilizing the PASCO probeware in all of our workshops and training.”

“We’re so pleased to have PASCO Scientific as a partner in achieving excellence in STEM education. We look forward to many more years of thoughtful collaboration. There is no better type of partnership to have than two committed organizations trying to do what’s best for our kids.”

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Achieving gains
According to Plank, the use of technology-supported inquiry is helping to improve students’ understanding of STEM concepts and practices, while increasing their motivation to learn more.

“Hillsborough is typically above the state average in science and math, and we’ve seen some significant gains over the past three years at the elementary level. Among the 10 largest districts in Florida, we’ve moved from seventh or eighth place all the way up to second in science scores for elementary schools,” he said. “Our focus on STEM and technology tools such as the SPARK has definitely had an impact. It’s created a culture shift around the importance of science and the idea that science can be fun. It’s this shift in thinking, especially among teachers and students in the early grades, that has gotten us to where we are now.”

Moving to the SPARK Element
In 2015-16, HCPS will introduce the SPARK Element handheld science learning device to the high schools and to three middle schools with STEM programs. The rugged, water-resistant, lightweight, and portable device is engineered with a multi-touch display and high-def camera, as well as USB, Wi-Fi, and Bluetooth® connectivity. It also comes preloaded with the SPARKvue science learning application for sensor-based data collection, sharing, visualization, and analysis.

“We’ve purchased 200 SPARK Elements, which we’ll begin using this fall. It aligns with our goal of making technology available to all students at all times during the school day. It’s also very versatile and makes it easy for students to share their data,” said Plank.

A partnership for STEM success
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