

Barrows STEM Academy Boosts Student Learning and Performance in Science on State Tests

Windham Public Schools, North Windham, Connecticut, USA



CASE STUDY: Barrows STEM Academy North Windham, CT, USA



Barrows STEM Academy

K-8
560 students
53% free/reduced lunch
cbs.windhamps.org

Challenges

- Launching a school-wide STEM program
- Meeting the Next Generation Science Standards (NGSS)

Solutions

PASCO® sensors
SPARKvue® software

Implementation Levels

Grades K -8

Results

- Increased student learning
- Improved science scores on state tests
- Increased engagement and motivation in STEM

When students use PASCO's tools to physically engage in activities and collaborate with their peers, they're learning science by doing science.

Heather K. Harkins, Ph.D.
STEM coordinator, Barrows STEM Academy

When Charles H. Barrows STEM Academy opened its doors to students in fall 2013, school leaders and teachers wanted to ensure they had the teaching methods, technology, laboratories and equipment to provide students with the tools to apply effective critical thinking skills to any challenge.

“Our school is the first K-8 science, technology, engineering and mathematics (STEM) magnet school in northeastern Connecticut. As such, we knew we needed to distinguish ourselves in terms of our use of technology in our labs and classrooms,” said Heather K. Harkins, Ph.D., STEM coordinator for the Barrows STEM Academy. “We looked carefully at the NGSS and the Connecticut state science standards, and used these performance expectations to help us evaluate equipment for our school. We chose PASCO Scientific’s sensors and the SPARKvue software because we knew they’d provide an effective way to engage students in STEM practices.”

In the regional STEM academy’s first year of operation, teachers and students began to pilot the use of the sensors and software. In 2014-15, the academy partnered with PASCO to provide job-embedded professional development, giving teachers in grades 3-7 the opportunity to work with the digital sensors in their classrooms and labs. In 2015-16, the PASCO science solutions were rolled out school-wide in grades K-8.

“Our teachers are really excited to have the PASCO sensors and software. They’ve done a great job integrating them into their lesson planning and instruction to ensure students are using technology in a meaningful way,” said Harkins.

Deepening student understanding with hands-on, inquiry-based science

Students now use the PASCO sensors — along with the AirLink® interface, which allows them to connect the sensors wirelessly via Bluetooth® — for accurate, real-time data collection. Available for over 80 measurements, the rugged, reliable sensors combine advanced technology with plug-and-play usability for easy use in and out of the classroom. Students also use the SPARKvue software with the sensors for real-time quantitative measurement and analysis.

“We have an incredible collection of sensors, and our students and teachers are using them in a variety of ways,” said Harkins. “By integrating inquiry-based science instruction with tools for collecting, analyzing and visualizing data, we’re helping students deepen their understanding of STEM concepts and practices, while increasing their engagement and motivation.”

Students at Barrows STEM Academy begin using the PASCO solutions in kindergarten and build upon their STEM skills as they progress from one grade level to the next.

“In kindergarten, students use the General Science Sensor to measure temperature. It helps them become familiar with the sensors and the idea of visually monitoring specific parameters in their environment,” said Harkins. “When they circle back to weather again in the third grade, we can add on variables to measure such as pressure and humidity. Then in the sixth grade, they use the Weather/Anemometer Sensor to measure wind speed and wind chill. What’s nice is that we can integrate the sensors into our instruction as students advance in their learning.”

As another example, in the seventh and eighth grades, students discover the relationship between position, velocity and acceleration using the PASCO Motion Sensor. “In seventh grade, when students are studying the Earth’s history, we ask them to design a structure to withstand earthquakes, and they use the Motion Sensor to determine amount of motion a building can withstand. Then, in the eighth grade, they use the Motion Sensor to measure the interaction between objects,” she said.

With these hands-on learning experiences, students are not only deepening their understanding of core concepts; they’re retaining the information to a greater degree, according to Harkins.

“Kinesthetic learning is sometimes marginalized in the classroom but students need it to develop that ‘muscle memory.’ Research shows that the persistence of learning over time is greater when students go through hands-on, minds-on, inquiry-based activities. Their learning goes much deeper and they retain that learning to a greater capacity. That’s important when we think about the vertical articulation and spiraling of the NGSS,” said Harkins. “When students use PASCO’s tools to physically engage in activities and collaborate with their peers, they’re learning science by *doing* science.”

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Connecting science to the real world

At Barrows STEM Academy, teachers are effectively addressing core science ideas and crosscutting concepts, while engaging students in real-life scientific and engineering practices with the PASCO software and sensors.

“When students use the probeware, they’re taking part in authentic experiences using the same tools that scientists and engineers use,” said Harkins. “Recently, when a hurricane came through this area, the television meteorologist in the field measured wind speed with an anemometer. It’s exciting for students to see professionals measuring the same things they’re measuring using similar tools. It creates those real-life connections that are so important to student learning.”



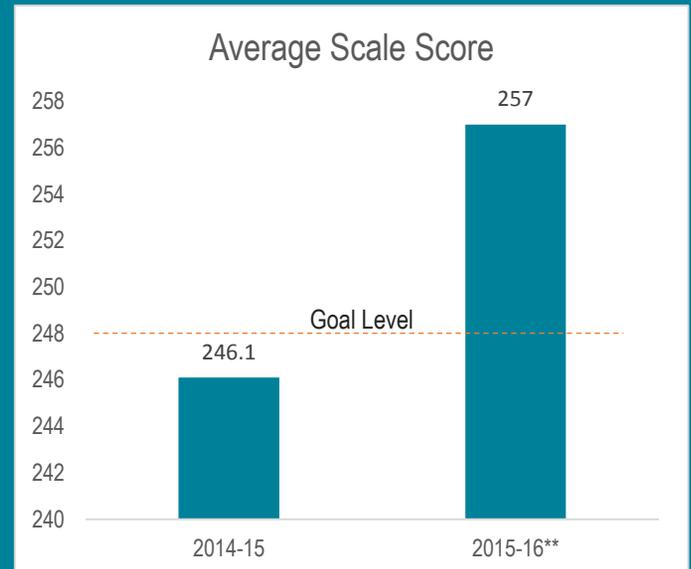
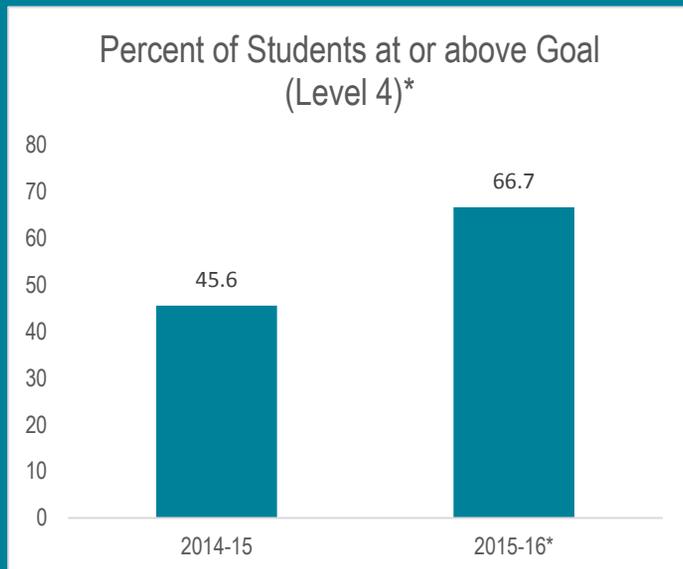
Improving student performance in science

“Since our school opened its doors, we’ve seen student growth in science, as well as mathematics and English language arts. We’re encouraged by our results. By combining technology with high expectations for student achievement, our students are engaged in a rigorous curriculum,” said Harkins.

On the state science test, the percentage of fifth graders performing at or above the “Goal Level” (Level 4) increased by more than 20 percentage points from 2015 to 2016.

“Technology excites student about what they’re learning,” she continued. “They get enthusiastic about using tools such as the PASCO sensors, and that gets them actively engaged in their learning.”

Grade 5, Barrows STEM Academy Connecticut Mastery Test (Science)



* Score Range: Advanced (Level 5) 300–400; Goal (Level 4) 248–299; Proficient (Level 3) 213–247; Basic (Level 2) 188–212; Below Basic (Level 1) 100–187

** Preliminary results

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