Baltimore County high school increases student interest in STEM disciplines using high-end gaming technologies

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Dan Scroggs, Manager Admin Support, Baltimore County Public Schools

Business Need
Chesapeake High School, in the Baltimore County Public Schools system, was struggling to engage students’ interest in an economically challenged area. Attendance and discipline were recurring issues, and the school district wanted to increase student interest in STEM disciplines (science, technology, engineering and math) to better prepare them for future careers.

Solution
The school reinvented itself from the ground up, including the hiring of a new principal and teaching staff, and built a top-of-the-line 3D simulation lab, incorporating Dell desktops and servers with Intel® processor technology. Students now learn math, science and social studies curricula using the same equipment that teaches astronauts and submarine pilots to drive their vehicles. One of many innovations in the school’s teaching toolbox, the gaming environment stimulates students’ engagement in learning.

Customer Profile
Company: Baltimore County Public Schools
Industry: Education
Country: United States
Students: 103,832
Employees: 17,000
Web: www.bcps.org

Benefits
• Increased student engagement in science, technology, engineering and math
• 50 students competed in an extracurricular game-development contest
• District developing games based on curriculum, rather than shaping lessons around parameters of prebuilt games
• Virtual high school gives students simulated access to out-of-reach tools such as electron microscopes
• 8 months, from concept to completion, to build high-end 3D simulation studio
In classrooms across the country, student engagement is the name of the game—but that doesn’t mean educators are comfortable using games to engage students. For many, introducing electronic gaming into schools seems more likely to hinder than to help learning. Nevertheless, some school districts are bridging the gap between their classroom environment and students’ free-time activities.

“Game’ is no longer a four-letter word in our district,” says Dan Scroggs, manager admin support for Baltimore County Public Schools (BCPS). “The gaming environment is where students are, and we aim to teach students where they are, not where we are.”

BCPS serves a diverse student population of more than 100,000. Several years ago, Superintendent Dr. Joe A. Hairston attended a demonstration of 3D simulation technologies at Johns Hopkins University’s Applied Physics Laboratory. The lab used large-screen TVs and joystick controllers to simulate the experience of piloting space shuttles and submarines. Dr. Hairston instantly recognized the technology’s potential to attract and hold students’ attention.

“Long before leading the school system into partnerships to create the Chesapeake High’s Virtual Learning Environment, I have always believed the fastest way to get technology into the classroom was to look at what the military was doing and what the toy stores were selling to parents and children. When you give students access to current technology, their education is enriched with higher academic performance. The foundation for all that we do is our Blueprint for Progress, which is about improving performance outcomes for all students…and Dell has been with us from the beginning,” remarks Hairston.

**Feet first for a school in need**

The district selected Chesapeake High School as the launch point for its Learning in Virtual Environments, or LiVE, project. The school was already overhauling its approach to education and reinventing itself from the ground up. “Chesapeake High supports an area that’s in transition,” says Scroggs. “The neighborhood historically consisted of blue-collar workers in the manufacturing sector, and Chesapeake High primarily prepared students for those kinds of careers. But those jobs are drying up, and students in the Chesapeake catchment were transferring to other schools.”

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**Technology at Work**

**Services**

**Dell™ ProSupport**

**Hardware**

**Connected Classroom**

- Dell UltraSharp 19-inch flat panel monitors
- Dell XPS 730x desktop computers with Intel® Core™ i7 vPro™ processors
- Dell XPS 730x ARENA desktop computers with Intel Core i7 vPro processor
- Able Planet True Fidelity headphones
- Saitek Pro Flight Yoke System
- Samsung™ 72-inch monitors

**Connected Infrastructure**

- Dell Latitude™ 2100 netbooks
- Dell OptiPlex™ 360 desktop computers
- Dell OptiPlex FX160 flexible computing nodes
- Dell PowerEdge™ R610 servers with Intel® Xeon® Processor 5600 Series
- Dell PowerEdge 2950 servers

**Software**

**Connected Classroom**

- CrazyTalk facial animation software
- DI-Guy SDK human simulation software
- GL Studio® Toolkit
- iClone 3D Animation Software
- Microsoft® XNA Game Studio
- My Own Biome custom-built simulation software
- Presagis™ Vega Prime™ 3D application development toolkit
- Seahawk simulation software from Johns Hopkins University Applied Physics Laboratory
- SpeedTree® tree-modeling software
- Unity Web Player
- Vortex vehicle and equipment simulation software

**Connected Infrastructure**

- Microsoft Windows® XP
- Windows Server® 2003 and 2008 R2
- VMware® vSphere®
Dr. Hairston designated Chesapeake High as a STEM academy, shifting its focus to science, technology, engineering and mathematics. He hired a new principal and secured a state grant to buy equipment for the STEM program. Then the school began building a simulation studio that mirrors the environment of the Johns Hopkins Applied Physics Lab. Partnerships with the lab and with corporations including Dell, Northrop Grumman and Lockheed Martin helped the district bring the simulation lab to reality. “We’ve received a significant amount of knowledge and guidance from outside sources,” says Michael J. Goodhues, CIO, Baltimore County Public Schools. “Schools may think they can’t afford to do this, but there are ways to get help. The partnership model has made this project possible.”

Construction took only eight months. The studio has two seats, each of which is surrounded by five 72-inch Samsung TVs arranged in a semicircle and powered by three Dell XPS 730x ARENA desktop computers with Intel Core i7 processors. In an adjacent lab, each of 30 Dell XPS 730x desktop computers with Intel Core i7 processors connects to three 19-inch Dell UltraSharp flat panel monitors. Every workspace includes headphones and a flight simulation joystick, and all can simultaneously display the same 3D environment so that an entire class experiences the same lesson at once. All of the equipment was sourced through Dell partner Data Networks.

On the Dell XPS computers, Chesapeake High deployed software developed by the Johns Hopkins Applied Physics Lab in a project called Seahawk. The software provides a geospatially accurate simulation of travel around the Mount St. Helens area of Washington State. As students move through the virtual environment, they learn physics, math and social studies concepts. “This software requires the highest-level gaming equipment we could purchase at that time,” says Scroggs. “So students are learning on the exact same equipment that astronauts and submarine pilots use.”

Transformative power of gaming in education

It’s hard to overstate the degree to which this type of technology can transform a learning environment. “From the first day, students have taken to this environment like a bear to honey,” says Scroggs. “They are engaged immediately.” Now the district is working to ensure that the games are teaching the engrossed students all the right lessons.

“At first, we tried to design games that fit our curriculum around the Seahawk software,” says Goodhues. “Now we’ve moved to the next level, which is using our curriculum as a starting point and designing games from there.” For example, when science teachers identified the concept of biomes—biological zones that accommodate a particular type of life—as subject matter students were struggling with, the district engaged local university students to help. They developed a game called My Own Biome, which utilizes the 3D simulation lab to teach biome-related lessons from the district’s science textbooks. “In order to succeed in the game, you have to learn the Baltimore County Public Schools curriculum on biomes,” says Scroggs. “We’re not taking games and trying to put our curriculum into them; we’re taking our curriculum and making games from it.”

Gaming ideas are even coming from students themselves. The district held a contest among its high school students; the winning ideas for games are being built by professional gaming developers. “The interest this contest generated among students was unbelievable,” says Scroggs. Although the contest was time-consuming and entirely extracurricular, more than 250 students showed up the first day, and around 50 completed contest entries.

Increasing student engagement

Chesapeake High teachers and administrators see the gaming environment as a tool they can leverage to stimulate students’ interest in learning across the curriculum. Along with the other implements in...
the school’s teaching toolbox, the LiVE project is helping Chesapeake High reframe its educational environment. “The LiVE project is in its second year, so it’s too early to draw a line directly to measures of student achievement such as test scores,” says Scroggs. “But we certainly see improvements in the tone in our classrooms. Students at Chesapeake High are now far more focused on learning. Attendance is up, and students are in class rather than roaming the hallways. The feeling you get now when you walk through Chesapeake High is that this is a school that’s committed to excellence.”

Revolutionizing education with Dell
Dell hardware provides the foundation for the revolution in K-12 education at BCPS. “We’re a total Dell shop,” says Scroggs. “Our servers are Dell; our desktops are Dell. We’ve been standardized on Dell for several years.” The district uses Dell OptiPlex 360 desktops and Dell Latitude 2100 netbooks in classrooms, along with some virtualized desktop seats on Dell OptiPlex FX160 flexible computing nodes. The district’s data center houses Dell PowerEdge R610 servers with Intel Xeon processors 5600 series, about 60 percent of which are virtualized with VMware vSphere, and PowerEdge 2950 servers.

The district knows it can depend on Dell ProSupport to keep all this equipment running. “Dell has always provided great support,” Goodhues says. “In the simulation lab, multiple computers are running a single program, so if one computer goes down, the entire lab is disabled. The equipment has held up well, and when we’ve had minor glitches—for example, a faltering computer power supply—Dell has fixed them right away.”

One of Goodhues’ roles in the district is to cultivate long-term partnerships with technology providers. “Over the years, Dell has been a great partner,” he says. “Not only does Dell add value, but the people we work with are interested in what we’re doing and want to help us become successful. Customer service is why we keep coming back to Dell.”

Extending the change
The next major challenge for Baltimore County Public Schools is to create similar learning environments district-wide. “We compare the lab at Chesapeake High to a concept car,” says Goodhues. “It was expensive, but now that we have it, we can see what works and what doesn’t work.”

In preparation to deploy the concept across 25 more high schools, BCPS is working with gaming developers to make its simulation programs work on Dell OptiPlex 360 desktops. “The Dell XPS desktop computer is a solid machine for gaming,” says Scroggs. “But when our simulator can run on Dell OptiPlex desktops—which we already have throughout the district—we won’t have to buy all new XPS systems to build a new lab.”

The district is also developing a virtual high school that looks like one of its physical high schools and includes social interaction functionality. Through the virtual classrooms, students can access simulated curriculum and tools that the district can’t provide outside the simulation. For example, the prototype virtual high school has an electron microscope. “None of our high schools is going to be able to give students access to an electron microscope,” says Scroggs. “In the physical world, our students can only look at plant cells through compound microscopes, but in our virtual school, they can use an electron microscope. That opens up entirely new experiences to them.”

In fact, simulations open such great opportunities for students that many BCPS employees are brimming with enthusiasm. “As a former teacher, I’m very excited that we’re making learning fun again,” says Scroggs. “It’s not often that school system personnel get so excited about projects. On several occasions school employees have asked to come over just to show their friends. When a lesson is engaging students and engaging the teacher, the students learn so much more. We’re really introducing a different environment for learning in Baltimore County.”