

Intel® Education Boosts Science Learning and Exploration at Crellin Elementary School

Case Study - Crellin Elementary School
Intel® Education Software
Intel® classmate PCs



AT A GLANCE

School Snapshot

- Crellin Elementary School, a 106-student, K-5, public elementary school in rural Garrett County, Maryland

Education Focus

- Develop 21st century skills through student-centered, inquiry-driven, project-based learning

Impact on Teaching and Learning

- Teachers bring science and math to life, engaging students in using technology to learn about their world, identify problems, work toward solutions, and share their findings
- Students master basic skills while developing the higher-order abilities they will need for 21st century life and careers, including critical thinking and evaluation, research, collaborative problem-solving, innovation, communication, and technology literacy

Technologies

- Intel® classmate PC convertibles with Intel Education Software

Inspired Teachers Use Powerful Solutions to Develop High Achievers and Critical Thinkers

Built near an abandoned coal mine in Maryland's Appalachian highlands, Crellin Elementary School was once an underachieving school with declining test scores, a stream full of toxic chemicals, an ailing playground, and a tough reputation.

Today, Crellin students have a different reputation—as delightful kids, poised leaders, and some of the highest achievers in the state. Crellin earns national awards for student achievement, parent involvement, environmental leadership, character education, and more. It has been featured as an Intel Schools of Distinction winner, profiled in the *Schools That Change Communities* documentary, and in the spring of 2014 will be featured on Edutopia in the *Schools That Work* series. When college professors, educators, scientists, and government leaders hear what's going on at Crellin, they want to come see it with their own eyes—then bring their students and colleagues to observe, learn, and collaborate.

Crellin's transformation is the result of inspired leaders and dedicated teachers who have involved the community in cleaning up the school grounds, building a new play structure, creating collaborative relationships, and raising student achievement.

Technology plays a role in Crellin's success. Crellin teachers use Intel® Education solutions, curriculum resources, and expertise in their drive to create authentic learning and give each child a first-class education. Crellin's technology tool box includes mobile, child-friendly Intel® classmate PCs, interactive whiteboards, teacher laptops, science probes, and other portable learning tools.

Purposeful Use of Technology

Crellin teachers combine a student-centered focus with the need to make every minute count. Technology is integrated across the curriculum, used not for its own sake, but to support interdisciplinary, inquiry-based projects that develop 21st century skills. Those projects often combine technology with math, science, social studies, research, writing, media and communication, and a healthy dose of creativity and fun.

"When we talk about what we're passionate about, it's our kids," explains Crellin's teaching principal, Dana McCauley. "Our students come first. We don't have that much time with them, so we have to be extremely purposeful in what we're doing. We're not going to do something with technology just to be doing it. We're going to be using it to teach the kids—to provide what they need as little individual beings and help them be good people, critical thinkers, and problem solvers. That's our focus. There are lots of specific skills they need to have, but that's the end result."

Beyond Textbooks and Standards

At Crellin, textbooks are valuable resources, but not the whole curriculum. National and statewide standards are a floor, not a ceiling. "Even the Common Core State Standards are just a standard," McCauley says. "They tell you what you should be striving for, but not how you have to get there. Really, they're the bare minimum we want our kids to do."

Crellin teachers use real-life issues as focal points for research and problem-solving. The school's grounds, neighboring areas, community, and entire state serve as an open classroom and living lab in which children master scientific and mathematical concepts, grow as higher-order thinkers, and develop citizenship skills. Teachers often use the 5E instructional model of engagement, exploration, explanation, elaboration or extension, and evaluation, and they incorporate technology whenever it adds educational value.

"Presenting to us or to their families or peers is great, but it's also important that students have the chance to get up in front of a group with their work projected on a great big screen behind them and microphone in some cases, and talk about their project. They gain a lot of confidence from working through the butterflies, making their presentation, and answering questions on the fly, and the feedback and conversations can be very exciting. They're developing tremendous real-life skills."

Dana McCauley, Principal and Teacher,
Crellin Elementary School

Powerful Tools for Inquiry-Based Learning

The classmate PC convertibles and the rich set of Intel Education solutions that integrate with them provide power and flexibility to support such projects through exploration, research, and analysis. Intel classmate PC convertibles can switch between laptop and touch-enabled tablet operation. They come with a variety of Intel Education solutions and integrate easily with a broad range of add-ons. Glenville State College has lent Crellin a full set of PASCO Scientific sensors that students use with the classmate PC convertibles to gather data relevant to their scientific inquiries—from weather forecasting to testing soil nutrients to comparing the chemical properties of the state's rivers, streams, bays, and watersheds.

Crellin teachers often collaborate to create all-school projects that may last a full year. One year, students studied the science behind energy. First graders learned where food comes from and how much energy it takes to bring it to local stores. Fifth graders studied and modeled alternative energy sources.

For a 2013/2014 agriculture project, teachers started from the Intel Seasoning the School Year unit as a starting point and developed activities for each grade (see Table 1). Their preparations started in the 2012/2013 school year and included acquiring lambs and chickens, working with the community to build a barn that could shelter them, and gaining certification to sell eggs. Extra support for the project came from Title 1 funds, volunteer labor, and fund-raising by students and parents.

Students are using the Intel classmate PCs convertibles throughout the project to conduct research, gather and analyze data, and document and report on their results. Older students will create Excel* spreadsheets, then calculate averages, and convert between Celsius and Fahrenheit. Students will perform the calculations manually before using the Excel functions to check their work, and will create graphs to help them understand and explain their data. All grades will work together to author a book using data, charts, and photos created throughout the year, and will use PowerPoint,* Glogster,* and other solutions.

Versatile, Child-Friendly Platforms

Classmate PCs are based on Intel's research in schools around the world. Students can carry the PCs outdoors, eliminating the need for a separate digital camera and video recording equipment and redundant data entry.

"The classmate PCs are well built enough that I'm not as nervous when we have our little guys out in the mud or down by the stream capturing data or taking pictures," McCauley says. "You're not holding your breath as much. You can do so much on a classmate, and not just with all the sensors. You can write on the tablet, which is great for our kids when they're in the field, and then click a button and it types it all up for them. It works beautifully, and they can use the classmate as a laptop to edit it."

Crellin students will also station the PCs in the barn and at various data collection stations and use the motion-sensing software to record videos showing the animals' behavior.

Table 1. Sample Activities with Intel Classmate PC Convertibles and Science Sensors

Grade Level	Activity
Kindergarteners	Do animals prefer the aroma of coyote urine or raspberries? Kindergarteners will set up scent stations throughout the schoolyard for a week or more each season. They'll observe and identify the animals' tracks left behind as they visit the stations, and use the motion-sensing capability of the Intel® Education Lab Camera by Intellisense software to record the stations at different times.
First Graders	Do chickens prefer to lay eggs in straw, shredded paper, or a combination? First graders will collect, document, and compare the number of eggs laid by chickens in each nesting box. They'll track the data on an Excel® spreadsheet and learn to create graphs with the data. They will analyze the data to determine next steps. They'll also use sensors with the classmate PCs to collect temperature data and determine if temperature effects egg production. When the snow melts in the spring, first graders will collect, document, and compare the number of eggs laid by chickens in the barnyard (where they eat chicken feed) and in a movable chicken tractor (where they eat whatever is in the school yard).
Second Graders	Is there a difference between the weight of the brown and white eggs? Second graders will measure the weight of the eggs to identify any differences. This will also help them determine prices for the eggs when students sell them. Students are using a Pasco Sensor Lab specifically created for this project by Glenville College students and professors.
Third Graders	How do chickens affect their environment? Third graders will test the soil for nutrients and contaminants before and after a chicken tractor is located in an area of the school yard to identify any differences and decide how often the chicken tractor should be moved to avoid degrading the soil. They'll set up Intel Education Lab Camera to monitor the movements of the chickens within the chicken tractor, and will use technology to gather data, create Excel spreadsheets to organize the results, and use other presentation and multi-media software to present their findings.
Fourth Graders	Can lambs' activity levels predict the weather? Inspired by a visit to Penn State, where the dairy cows wear pedometers so students in the Agricultural Science College can make sure the animals are getting enough exercise, Crellin fourth graders will put pedometers on their school's lambs. They'll use sensors to collect daily weather data and compare it with data from the lambs' pedometers to see if there is a correlation between lambs' activity and weather. They'll build Excel spreadsheets to organize and analyze their data and present their findings.
Fifth Graders	During winter, it's important to keep animals warm enough but also ensure a free flow of oxygen throughout the barn. Fifth graders will use sensors and PCs to monitor the temperature inside and outside the barn and the CO2 inside the barn. They'll use Excel to organize and analyze their data, and other software on the systems to report and present their findings.

As they use the PCs and laptops for research, analysis, writing, and presentations, students are also increasing their computer literacy. "Assessments are all headed online, and students who aren't used to navigating text on a computer are going to be at a disadvantage," McCauley says. "Our kids won't have that problem."

Teachers as Learners

The commitment to do what's best for children inspires Crellin's teachers to be active learners themselves. "We're always looking at what's coming up next—not just tomorrow, but down the road," McCauley says. "We have to be ready for it so we can make sure the kids are ready for it. This means we have to be willing to learn and change to meet their needs and to prepare them for what's coming."

Crellin approaches new technologies through a three-step process: learn how to use the technology itself, incorporate the technology into effective teaching strategies, then teach others and share what's been learned. Intel's professional development courses and curriculum resources have been a boon, according to McCauley. Crellin teachers have taken the 80-hour Intel® Math course and worked with

Intel Education experts to brainstorm ways to incorporate the Intel Education Lab Camera and Media Camera by Intellisense into their lesson plans. Teachers also make extensive use of Intel Education resources on project design and instructional strategies.

"The Intel courses and training have been highly relevant to our needs and to the approach we take to teaching and learning," McCauley says. "The information and skills we have gained through the trainings is being transferred to students and is evident in how they use computers and the products they are producing."

To augment their own expertise and resources, Crellin teachers cultivate "learning partners," drawing from the local community and from colleges, universities, business, and government agencies. When a learning partner comes in to talk about his or her area of expertise, teachers share their own enthusiasm for learning. "They'll be sitting right there taking notes along with the children, excited to be learning and exploring a new area," says McCauley. Teachers and students also use technology to collaborate with remote learning partners.

Envisioning a Brighter Future

Since sharing results is an important part of any research, Crellin students present their findings at the end of each project. In many cases, they use laptop computers to project the reports, visuals, and models they've created.

Teachers reach well beyond the school's walls to line up relevant audiences that will have the expertise and interest to ask meaningful questions and offer thoughtful feedback to the students. Students have presented their projects to the Garrett County commissioners and Board of Education, local garden clubs, business and community associations—even the West Virginia Environmental Outdoor Educators Conference.

"Presenting to us or to their families or peers is great, but it's also important that students have the chance to get up in front of a group with their work projected on a great big screen behind them and microphone in some cases, and talk about their project," McCauley says. "They gain a lot of confidence from working through the butterflies, making their presentation, and answering questions on the fly, and the feedback and conversations can be very exciting. They're developing tremendous real-life skills."

The research presentations dovetail with another important goal: inspiring students to envision themselves as future college students. Many presentations are made to classes of college students, and by the time they leave Crellin, fifth graders will typically have visited three to five colleges. Recent visits have taken Crellin students and teachers to Glenville State College, Duquesne University, California University of Pennsylvania, Penn State, and West Virginia University.

"Many of our students will be the first in their family to apply for and attend college, so it's very meaningful to see what happens to them when they go into a college classroom, present their research, and take a tour of the campus," says McCauley. "They see that they are as skilled as anybody else in the room. They see that college can be an option for them, and they really start thinking in terms of where they want to go to college. To see them realize the doors that can open for them—that is key."

Crellin's Best Practices for Technology Use

- **Start from the desired learning outcomes.** Then look at how technology can support the lesson.
- **Build relationships.** Changes proceed more smoothly when you've created a foundation of trust.
- **Provide personalized, individualized professional development,** just as you do the student's education. Don't feel that every teacher needs to know everything. Collaborate with colleagues and build a knowledge network. Crellin's learning partners include a retired chemist who expands everyone's inquiries into science topics, and local bird watchers, who work with the students and have connected Crellin to Cornell University's Feeder Watch Program.
- **For K-5 education, choose devices that are portable,** rugged enough to be used by children in an outdoor setting, and powerful enough to run the applications and web sites and support the sensors you want to use.



For More Information

Or teaching ideas for Intel® Education software and Intel classmate PC convertibles and tablets, please visit www.intel.com/education.