

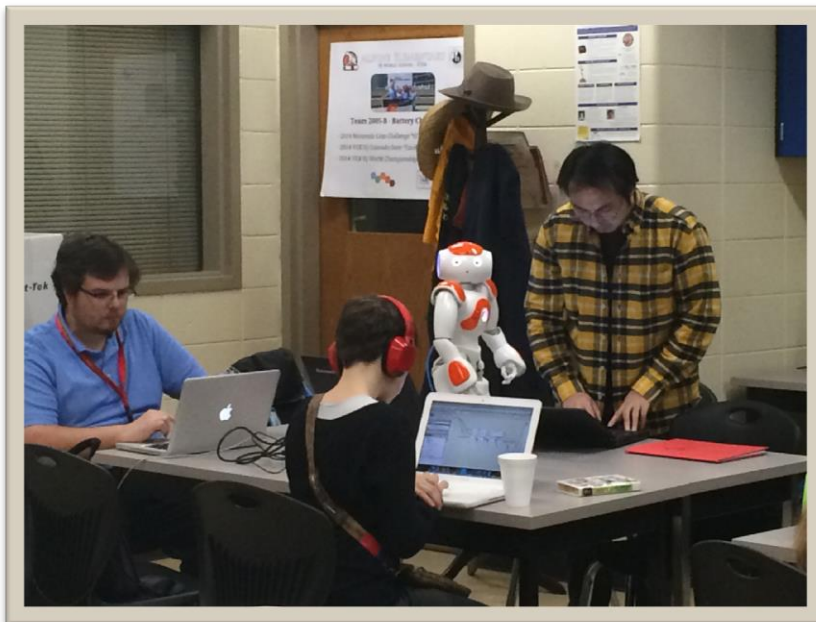
ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Success Spotlight



COLORADO
Department of Education

STORIES OF PROMISING PRACTICE



STEM for All: How St. Vrain Valley Schools Built a Trailblazing Program With Rigor and Relevance

ST. VRAIN VALLEY SCHOOLS has taken impressive steps over the past eight years to implement a comprehensive Science, Technology, Engineering, and Math (STEM) program. Beginning at the earliest grades, students are exposed to the STEM fields and encouraged to think about their interests and passions. The Innovation Center, which launched in 2013 offers students real-life work experiences in tech and engineering fields, many for pay.

Colorado Department of Education surfaces and shares powerful stories from the field that get at the “why” and “how” behind the experiences and success stories teachers, students and administrators are having across the state so other districts can easily find models to apply in their own schools and foster positive learning environments for students. <http://getinspired.2revolutions.net>

[St. Vrain Valley Schools](#) sprawls 411 square miles along Colorado's northern Front Range and Eastern Plains, 30 miles north of Denver. It is the seventh largest school district in Colorado, serving more than 32,000 students. The district encompasses a mixture of suburban, exurban and semi-rural communities. Students range from children of high-tech executives to children of immigrant parents with little education.

Just over a third of St. Vrain students qualify for free or reduced-price lunch, and about 30 percent are Latino. More than 20 percent are English language learners. While Spanish-speakers make up the vast majority of this population, there are also students whose native language is Chinese, Arabic, Russian, Nepalese, Khmer, Vietnamese, and several others.

Over the past eight years, St. Vrain has placed increasing emphasis on Science, Technology, Engineering, and Math (STEM) education. More than \$20 million in federal grants (including the state's first and largest Race to the Top award) have helped the district create groundbreaking STEM programs beginning at the earliest grades. Students have access to a wide variety of hands-on experiences, including school-based jobs in STEM fields that give them strong credentials as they graduate from high school.

And the district has ambitious plans for continuing to expand its STEM offerings, most notably by opening a Pathways in Technology Early College High School (P-TECH) program at Skyline High School in the fall of 2016.

Objective

St. Vrain began planning in 2006 beginning with its highest-poverty high school, Skyline. "Skyline was struggling with culture, with discipline, so we made a really big effort to...start focusing on academics," said Heidi Ringer, Skyline's current principal who was a math teacher at the school back in 2006.

Patricia Quiñones was Skyline's principal at the time and now serves as St. Vrain's executive director of innovation programs. She felt strongly that "we needed to offer programming at Skyline that was inclusive, rigorous, and engaging, and opened career pathways for students."

In 2007 Skyline High School opened its STEM Academy, a new academic program designed to prepare students for success in STEM-related career fields. The program was an instant hit, and remains popular to this day, with 442 students enrolled.

Early on, the STEM Academy planning team led by Quiñones established a partnership with [CU Boulder's School of Engineering](#). Together, they identified the skills students need in order to be successful at the college level and backward mapped them to the Colorado Academic Standards. They also forged an agreement under which STEM Academy students with good grades and high test scores are guaranteed admission to CU's College of Applied Sciences.

Strategy

Based on the success of the STEM Academy, the district decided to think big, and raise money to offer STEM education to all students, from kindergarten through 12th grade, in the Skyline High School feeder pattern, and to provide hands-on learning opportunities for students at a facility called the Innovation Center.

“We’ve been intentional in making certain that the skill set they use is workforce ready.”

*Regina Renaldi, Assistant Superintendent
St. Vrain Valley Schools*

“Preparing kids for rigorous STEM coursework in later grades means introducing them to the STEM fields at a young age,” said Regina Rinaldi, a St. Vrain assistant superintendent.

To realize these ambitious plans, St. Vrain in 2012 applied for and won a \$16.6 million Race to the Top grant from the U.S. Department of Education. Providing STEM for all Skyline feeder students and opening an Innovation Center would “improve graduation rates and postsecondary readiness for students through personalized programming,” district officials said.

Underpinning Sr. Vrain’s entire STEM program is the Stanford University Institute of Design’s [Design Thinking](#) approach. Design Thinking continues to provide the foundation for St. Vrain’s STEM strategy. And there’s a wealth of information available for free.

“We went to the Stanford D school site where there is a great deal of information to get you going with learning about design thinking,” Renaldi said. “There are projects available on that site that can provide opportunities for relevant design challenges as a starting point all at no cost.”

Although St. Vrain had large grants to help launch and expand its STEM initiative, focusing on STEM needn’t be expensive, Renaldi said. “We started long before we had the grants,” she said. (See the accompanying implementation checklist for tips from Renaldi and Quiñones on how to get started and build a robust STEM program.)

At the [Innovation Center](#), which opened in 2013, students apply the 21st century skills they are learning to real-world problems and challenges. Student designers receive \$10 per hour to work on STEM-related projects including web development, application development and robotics for industry partners and the school district.

“The Innovation Center is a bridge between what you know and what you’ve learned and real-world application,” Quiñones said. “Students [told us] they wanted to connect with the field and connect with expertise in the industry. That was our focus when we [started STEM Academy] and it continues to be a focus now [at the Innovation Center].”

Colorado Department of Education surfaces and shares powerful stories from the field that get at the “why” and “how” behind the experiences and success stories teachers, students and administrators are having across the state so other districts can easily find models to apply in their own schools and foster positive learning environments for students. <http://getinspired.2revolutions.net>

Innovation Center students also have the opportunity to earn credentials that open doors to gainful employment at an early age.



Results

Lauren Jury, now a sophomore at Brigham Young University (BYU), is a poster child for the success of St. Vrain's STEM initiatives in general and the Innovation Center in particular.

Jury says opportunities offered through the Innovation Center altered the course of her life.

She took an introductory programming class her sophomore year at Skyline, not convinced that she'd like it or stick

with it. "I loved it," she said in a recent phone interview. "I started looking for anything extracurricular I could do with computers."

Quiñones helped Jury land computer-related summer jobs, and she began building a portfolio of marketable skills.

When the Innovation Center opened, Quiñones offered Jury, then a junior, "a cool opportunity to work with some companies, not approaching them as a high school student" but as a qualified young technician, Jury recalled.

"It seemed an awesome opportunity to have the Innovation Center name behind me to show I had qualifications," Jury said. She designed a website for Boulder County aimed at helping underprivileged youth find jobs. She also designed the original Innovation Center website.

Then, during her senior year, Jury took an innovation Center class that made her an Apple Certified Mac Technician, qualified to repair Macintosh computers. "It's usually \$300 to take the test and you have to pay for the training on top of that," Jury said. But the certification cost her nothing.

Before starting her freshman year at BYU, Jury called the university bookstore and said she was Apple certified. She was instantly offered a job working on Macs that pays more than almost any other student job on campus, she said.

Jury is an information technology major and has no doubt she'll pursue a career in a computer-related field. "I'm not sure my eventual job title is even invented yet," she said, but hopes it has something to do with cyber security and programming.

"What's amazing to me is that in middle school I didn't know I wanted to go into tech at all," Jury said. "Now everyone assumes that my whole life I was like this. But I was just a normal kid. This has proved to be a pretty sweet hook-up for me."

St. Vrain's STEM-for-all focus has shown quantitative results as well. Since Skyline's STEM Academy opened its doors in 2007 with a group of 40 students, enrollment has grown exponentially. STEM Academy has a current enrollment of 442 students and boasts over 250 graduates, approximately 40 percent of whom have gone into a STEM-related postsecondary program.

The district has also seen gains in career and college planning. In the Skyline feeder pattern (the focus of the Race to the Top grant), 80 percent of fifth- and sixth-grade students, 88 percent of seventh- and eighth-grade students, and 95 percent of high school students have Individual Career and Academic Plans (ICAPs).

The Innovation Center continues to grow. This year, 225 student designers will work on STEM-related projects using the Innovation Center's state of the art equipment including an Electronics Lab donated by SparkFun, a Robotics center with both Vex and Nao Humanoid (Aldebaran) robots, multiple 3D printers and a laser printer, and a state of the art Apple computer lab for Apple Tech I and Tech 2 coursework offerings. Elementary and middle school students in Skyline's feeder system also attend workshops or other exploratory activities at the Innovation Center.

Since the Innovation Center opened, students have collaborated with industry partners on projects ranging from designing mobile phone applications to building websites to redesigning the life jacket to automating operations in a restaurant.

Through a collaboration with the [Ottercares Foundation/Otterbox](#), a group of students designed and manufactured the company's holiday ornament. Over the course of several weeks, students went through the entire manufacturing cycle from design to production to packing and delivering the product. It is this type of real-world application of 21st century skills that makes the Innovation Center such a powerful learning experience for students.



St. Vrain's STEM work is supported by over 50 industry partnerships including some of the biggest names in technology, including [Apple](#) and [IBM](#). [Aldebaran Robotics](#) worked with the Innovation Center to promote the first [US Nao Humanoid Robotics Challenge](#), a competition for student teams to program robots, following a defined implementation plan with required coding elements.

Looking Ahead

This fall, St. Vrain will open a 9-14 grades P-TECH program, one of the first such offerings in Colorado. The program, a partnership with IBM and Front Range Community College, provides an Associate of Applied Science degree in Computer Information Systems. Students enroll in ninth grade and can earn an Associate degree in between four and six years, at no cost.

The district's goal over the next several years is to continue to improve access to STEM in other ways as well. By the start of the 2016-17 school year, every middle and high school student in St. Vrain will have a tablet or laptop computer provided by the district.

Finally, St. Vrain has plans to build a new, larger (50,000 square-foot) Innovation Center. A \$20 million bond issue to fund construction of the new center will be on the ballot this fall.

"What we're doing is creating a pipeline to go into those careers."

*Patty Quiñones, Executive Director
St. Vrain Valley Schools*

Thanks to the district's STEM focus, "our graduating students today are more equipped to problem solve, to persevere to meet challenges," Quiñones said. "They have experience in the work environment, they can identify choices and careers. They can also say 'I worked as a project lead and a designer,' which looks great on

their resumes.

"All of this identifies them as something pretty special on college applications. They look pretty darn good."



How to Do It: Tips for Implementing a STEM for All Program

1. Define Your Overall Objective

- How can a systematic expansion of Science, Technology, Engineering, and Math (STEM) programming help engage your district's K-12 students in postsecondary and career planning?
- How can your district forge strong partnerships with local businesses and industries to ensure that students have relevant, real life STEM experiences?
- How might you use design thinking to inform not only the building of your STEM program but student STEM-related design experiences as well?
- How can you find funding to make STEM for all a reality?

2. Preparation

- Identify resources, tools and materials that will inform and support your work.

I. St. Vrain Valley Schools offers a number of online resources:

1. [Skyline STEM Academy](#)
2. [St. Vrain Innovation Center](#)
3. [St. Vrain STEM website](#)
4. [St. Vrain P-TECH school](#)

II. Other relevant links:

1. [Stanford Design School Design Thinking Process](#)
2. [CU College of Engineering and Applied Science](#)
3. [Eight Ways to Land K-12 STEM Funding](#)

“Start with research around design thinking. We went to the Stanford D school site where there is a great deal of information to get you going with learning about design thinking. There are projects available on that site that can provide opportunities for relevant design challenges as a starting point all at no cost.”

*Regina Renaldi, Assistant Superintendent
St. Vrain Valley Schools*



- “Begin thinking about local relevant and authentic challenges available in your own local community and approach business and community leadership about the possibility of partnering to develop a solution to the challenge by using design thinking to solve that local and authentic problem. Resources and expertise from the community will likely follow and enhance efforts,” says Renaldi.
- Share what you have learned often with others in your district to open dialogue and gather more ideas and feedback.
- Enlist the help of local media to highlight and share student work and challenge solutions with student voice at the center.
- Think about a STEM exhibition once you have some prototypes and invite the community to talk to your students about their solutions and ideas.
- Put together a plan on how to present the STEM concept to students:
 - I. Real-world relevance, experience.
 - II. Hands-on opportunities.
- Student voice is critical in creating a feedback loop and sparking ideas to create classes, academies, and projects:
 - I. St. Vrain elementary schools have student STEM advisory groups.
 - II. Innovation Center student designers give feedback on client-based work, creating new workshops, job quality, and equipment needs.
- **Implementation**
 - Join [Resource Area For Teaching \(RAFT\)](#). Membership costs \$25. This is a great start with building a STEM resources space and building prototypes at a minimal cost.
 - Start small. Is there a school in your district interested in piloting STEM?
 - Begin setting the expectation with your school staff to integrate design thinking and project-based learning into their classrooms. Be specific in what you would like to see in a lesson (design challenges, tied to standards, different assessments, teamwork, etc.).
 - If your district has an Individual Career and Academic Plan (ICAP) program, link the STEM offerings and the ICAP team.
 - Hold a design thinking workshop. “Without this, STEM is just stuff,” says Patty Quiñones.
- **Assessment/reflection**
 - What worked?
 - What did not work?
 - How can it be adjusted?