

# Loveland High School Geometry/Construction Program

## Loveland, Colorado

### Focus on Integrated Academic and CTE Content

## Colorado Innovation Profile

*Colorado's Career and Technical Education programs are developing a seamless system of education that ensures ease in student transition from one educational system to another and from one level of instruction to another.*

*There are eight key strategies that Colorado CTE teachers and administrators are applying:*

- *Implementing Career and Technical Education Plans of Study;*
- *Strengthening Accountability for Results;*
- *Moving to a Project-Based Focus for Local Planning and Implementation;*
- *Assessing Career and Technical Skills;*
- *Integrating Academic and CTE Skills and Knowledge;*
- *Transforming Professional Development, Recruitment and Retention of CTE Teachers;*
- *Ensuring Effective Instruction and Strategies for Special Populations; and*
- *Connecting CTE to Employers and Workforce Priorities.*

*The Colorado Community College System has prepared a series of "Innovation Profiles" that describe how Colorado's schools, community colleges and community partners are creating innovative strategies to improve their programs on behalf of students.*

## Key Innovation Activity

***Related Strategy: Integrating Academic and CTE Skills and Knowledge***

Loveland High School in Loveland, Colorado, offers a fully integrated program that presents Geometry in the context of a Construction program. One cohort of 40 freshman and sophomore students takes the course in two block classes which are offered back-to-back, so they are seamless. All students in the program are gaining deep knowledge of geometry concepts by immediately applying these concepts in a real-world application. Students in this program are scoring among the highest in the school district in terms of measurement and geometry standards.

## Background

In the 2006 school year, Loveland High School launched its Construction/Geometry Program under the guidance of veteran Geometry teacher Tom Moore and Construction teacher Scott Burke.

According to Loveland High School, “the original idea for the class stemmed from the large local demand for skilled workers in all aspects of the construction/building industry” (Loveland High School, 2007). While business and industry leaders needed competent employees with solid math skills, Loveland High School needed a way to improve the math skills of students. Meeting both needs, the Geometry in Construction Program benefits Loveland High School, business and industry, and most importantly, the students. Recently the Geometry in Construction Program partnered with the Interfaith Hospitality Network to build a small, affordable housing unit for a homeless family.

Moore and Burke were the first to attempt a side-by-side contextualized course in their school. Though one is an expert in the math content, and the other in the construction content, Moore and Burke say they view each other’s curriculum as equally important. Both teachers have been willing to learn the other subject matter so that when students ask questions, they can help whether they are in the classroom or out on the construction site. Sometimes, that has meant the student and the teacher learn how to do it together.

The program is a three-hour block with 40 freshmen and sophomores, in which students take a rigorous high school geometry course with one teacher, and apply what they learn in a construction course with another teacher. The teachers reorganized the content of the geometry so students could learn, in sequence, how to build a house. Over the course of the school year, the 40 students in the Construction/Geometry Program build a portable house to provide affordable housing in the area. Geometry in Construction began in 2006-2008 at Loveland High School, and though the program is quite young, it has produced major results. In Colorado, the CSAP, a standardized assessment is given to sophomore students. On the geometry and measurement section of that assessment, all of the Construction/Geometry Program students who took the CSAP outperformed every Geometry cohort of students in their school district, and every one of them had a rating of advanced or proficient.

Business and industry gets involved in the program by sending guest speakers or allowing the class to take a field trip to their site. Guest speakers are from fields such as engineering, architecture, surveying, real estate, marketing, construction management, construction trades, and heavy equipment operations. Students have a chance to go on field trips to job sites to study the stages of home construction.

## Key Factors in Implementation

### *Sequencing the Curriculum to Maximize Contextual Learning*

Moore and Burke essentially “ripped apart” the Geometry book and rearranged the content to coincide with the sequence of constructing a house. They say the last quarter of the year contains specialized Geometry content that doesn’t closely match with the construction process. However, by that time, students are well grounded in Geometry concepts and are able to handle the more abstract learning

without direct context on the work-site. At the same time, the construction project is focused on the intense work of getting the house finished, not on learning new skills and concepts.

### ***Teaching Side-by-Side and Fully Integrated Cohort of Students***

The teachers discovered some insights early on about side-by-side contextualization as they began teaching this course. One of the insights was how important it is to get the dynamic of integration by making a connection between the two classes. The course started off as two sections: 20 students in the geometry classroom during the first block and 20 students out on the construction site during the first block. When the bell rang, the two groups would switch places. Even though the teachers had reorganized the curriculum, the dynamic still felt like two separate courses. Six weeks into the program, the teachers decided to combine the two groups into one and do everything together. Because they were moving together from the classroom to the construction site, and were able to see their teachers working as a team, the students made stronger connections to the unity of the course. They began to view construction as an applied side of geometry rather than as two separate courses.

### ***Setting expectations for field work and classroom work***

Another interesting lesson was how important and enjoyable the building side of the program was for many students who were less disciplined and/or less academically inclined. Some of those students were not getting their homework done, so a stipulation was set that homework must be complete in order to participate in building with their teams. Once this rule was enforced, these students rose to the occasion which encouraged them to come in for additional tutoring after school if needed.

### ***Building Respect among Students for Relative Strengths in Classroom and Field Work***

The teachers observed that the learning dynamic changed. Some students learn very well in an abstract setting, while others learn well when they can see the concept come to life. Having both settings in one program offers a balance, where both kinds of learners can capitalize on their strengths and rely on others to help them improve their weaknesses.

### ***Replication and Adaptation through Communities of Practice***

Moore and Burke are now working with other teachers in their school who are interested in adapting the concept in other fields. They have developed an integrated Algebra II and Transportation Systems program that will be offered beginning in fall 2008.

### ***A Tool for Professional Revitalization***

Moore, a long-time mathematics teacher, says that teaching the Construction/Geometry Program has had a profound effect on him. "*We've had people say, 'You know, you're having too much fun.' And I am. I've taught 27 years. Last year was by far the most rewarding...it's a kick for me.*"

## Results

Although only in place since 2006, the program has produced major results. In Colorado, the CSAP is a standardized test given to sophomore students. On the Geometry and Measurement section of the CSAP, the 20 or so students who had taken Construction/Geometry outperformed every Geometry cohort of students in their school district, and the few sophomore students who took Construction/Geometry and received unsatisfactory or partially proficient ratings on the test showed a larger gain compared to other students.

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## Contact Information

Elizabeth J. Garcia, Coordinator  
Career & Technical Education  
School-to-Career  
800 S Taft Ave.  
Loveland, CO 80537  
(970) 613-5027  
[garciae@thompson.k12.co.us](mailto:garciae@thompson.k12.co.us)  
Mailing Address - 2890 N Monroe  
Loveland, CO 80538

Tom Moore, Math  
970-613-5200 ext. 1366  
[mooret@thompson.k12.co.us](mailto:mooret@thompson.k12.co.us)

Scott Burke, Construction  
970-613-5273  
[burkes@thompson.k12.co.us](mailto:burkes@thompson.k12.co.us)

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