

# Case Study

Central High School Builds Unique Identity with STEM

Central High School, Mesa County Valley School District #51, Colorado

## SCHOOL

9-12 Grades

1,598 Students

# STUDENTS

.2% American Indian/ Alaskan Native

> .5% Asian

.6% Black/African-American

> 33.7% Hispanic

60.1% White

4.4% Two or More Races

51% Free/Reduced Lunch

# Central High School Builds Unique Identity with STEM

What does it mean to be a STEM high school? That depends on your staff and students, according to Phil Johnston, the STEM coordinator for Central High School (CHS).

"STEM education isn't something that will look the same in every school," he said. "It's about your culture, the people you have in place, and your learners. That's the beauty of STEM. It's fully adaptable to meet the needs of the students who are on your campus right now."

#### STARTING THE JOURNEY TO BECOME A STEM SCHOOL

CHS became the first high school in Colorado to earn the National Certificate for STEM Excellence (NCSE)–Campus Certificate in 2018. Located in Grand Junction, the largest city between Denver and Salt Lake on the I-70 corridor, CHS enrolls 1,598 students and more than half of students qualify for free and reduced lunch.

"When we said we wanted to be a STEM school 10 years ago, there wasn't a clear definition for it," said CHS Principal Lanc Sellden.

"Some schools call themselves a STEM school because they add an engineering class, but our students, teachers, and parents need more than that," said Assistant Principal Tracy Arledge.

CHS's STEM journey took a big leap forward when Johnston received an email from the National Institute for STEM Education (NISE) and decided to enroll in the National Certificate for STEM Teaching (NCST) in 2016. "I completed the certification and thought it provided a solid framework for understanding what STEM looks like in education," he said. "I wanted to bring it back to our staff and develop the idea of STEM across all content areas."

"When Phil completed his certification, we looked into campus certification through NISE," said Arledge. "It made sense because it gave us a framework to work with our teachers, provide professional development, and increase their understanding of what it takes to create a STEM classroom regardless of the subjects you teach."

### PURSUING STEM CERTIFICATION

When CHS partnered with NISE in 2017, school leaders began working toward the NCSE-Campus Certificate, and several teachers began working toward the NCST. The certification programs provide an evidence-based framework for defining and understanding STEM, and focus on high-impact STEM instructional strategies that work synergistically across content areas in preK-12 classrooms.

"The NISE certification was exactly what we were looking for," said Sellden. "To be a STEM school doesn't mean that STEM can only occur in a math or engineering class. It's not about the title of a class; it's how you teach and how you set your kids up to be successful."

With the support of a virtual STEM coach from NISE, CHS teachers developed digital portfolios demonstrating their understanding of 15 STEM Teacher Actions across three domains that are essential for effective STEM teaching: Creating an

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Environment for Learning, Building Scientific Understanding, and Engaging Students in Science and Engineering Practices. To earn the Campus Certificate, school leaders also developed a digital portfolio demonstrating the application of the 15 teacher actions.

To date, one-third of CHS teachers have completed the NCST, and several more will complete certification by the end of the 2020-21 school year.

"Our school has a mix of new and experienced teachers, and all of them have taken away at least one major 'aha!' from the STEM certification program," said Johnston. "I've done about 1,600 evaluations, so I've had 1,600 glimpses into teachers' classrooms. It's been really neat seeing how they've taken what they learned from NISE to improve their practices. It's very personalized."

"I've heard some of our teachers say that the NCST program was the best professional development they've ever had," said Arledge. "They like that they can adapt the program to meet their individual needs and that there are many different ways to approach their certification portfolio."

#### **STEM FOR ALL**

During the NISE certification process, CHS teachers and leaders learned that STEM is about implementing rigorous instructional strategies that can be applied in any content area and at any grade level.

"There's this idea in schools that you're either a 'STEM kid' or you're not. STEM education should be for everyone," said Sellden. "Any teacher — whether they're teaching P.E., theater, Spanish, or AP Calculus — can implement the 15 STEM Teacher Actions in their classes. Being a STEM teacher means that you can teach anything in a 'STEMMY' way. A STEMMY classroom isn't passive; it's active."

At CHS, STEM for all means that all classrooms will emphasize five STEM pillars: Problem Solving, Critical Thinking, Citizenship, Resiliency, and Creation. "We created these STEM pillars collaboratively with our staff, and they define STEM education at our school," said Sellden.

CHS has launched several campus-wide initiatives to promote its STEM pillars, according to Arledge. "STEM classroom actions such as implementing the engineering design process [Problem Solving pillar] and the Claim, Evidence, Reasoning (CER) framework [Critical Thinking pillar] are now universal practices that almost every teacher uses in some form in their classrooms," she said.

#### BOOSTING COLLABORATION AND CAMARADERIE

The certification process has also helped boost collaboration between classrooms and departments.

"Teachers who have gone through the certification have a common language and common understanding of STEM," said Johnston.

"They have more camaraderie and are able to talk with each other about things like, 'What did you do for this indicator under this STEM Teacher Action?' or 'Here's a new idea I tried in my class,'" said Arledge.

#### MAKING LEARNING MEANINGFUL AND RELEVANT

To help students be STEM-ready — and ready for postsecondary careers and education — CHS teachers strive to deliver high-quality instruction every day in every classroom. This includes addressing the content area standards along with 21st century skills and workforce expectations.

"I experienced STEM environments in industry," said Johnston. "Education is a second career for me. When I started teaching, I tried to teach the way I had been taught. It didn't take long to realize that I didn't like that type of instruction when I was a kid and it didn't represent my experience in industry — and as such, our students deserve more. We don't know what jobs our students will have when they're in their 30s and 40s. Many of those jobs haven't been created yet. So, we have to teach our students the skills they will need for the future, like how to utilize data and apply information to solve problems."

"The old ways of teaching don't work for our students. The students that Phil is teaching today are different from the students I taught six years ago," said Arledge. "Most students aren't going to do an assignment because they're supposed to. They want to know why they're doing it and why it's relevant. That's what STEM is all about. If we're going to adapt to the needs of our learners, then we have to make their learning relevant. If we don't, we're missing out on a great opportunity. That's why STEM education is critical." "As a school, we now have a greater emphasis on creating student-centered classrooms," said Sellden. "If a teacher lectures three days in a row, students are going to call them on it. Students expect more — and they want their teachers to expect more of them. They see how much they are learning when they engage in 'STEMMY' activities and they want more of that."

#### **GIVING STUDENTS A GREATER VOICE**

School leaders and teachers are also working to prioritize student voice and participation. "Going through the STEM certification process opened my eyes to the importance of student voice," said Sellden. "Now, when we have initiatives like school construction projects, we invite students to be part of the decisionmaking process. The work we've done with NISE has helped us see that students can be problem solvers on a schoolwide basis, too."

In addition, groups of CHS students have presented to the local school board and at the Colorado Association of School Executives conference about what education should be today. "When students describe their vision for education, they're talking about what STEM certification is about. They want to do more than listen to the teacher; they want their learning to be active and relevant. Their classes are designed for them. Education is designed for them," said Sellden.

#### ADAPTING TO REMOTE LEARNING

As a result of CHS's STEM focus and commitment to its STEM pillars, teachers have found that students are better able to adapt to changes and tackle challenges when they arise.

"When we transferred to remote learning due to the COVID-19 pandemic, our students were better prepared than students in other schools because of their background in STEM and their experiences being problem solvers," said Sellden.

"Our teachers who went through the STEM certification were also better equipped to create more meaningful and relevant coursework during remote learning because they understood how to create studentcentered activities. They already had that in their wheelhouse," said Arledge. "On the flip side, when we started digging into instances where students weren't engaging or turning in their work, it was often because they didn't understand the relevance. They felt like it was just busy work that didn't have a point." "I've been at Central High School for 20 years. Over the last four years, we've been able to create an identity as 'the STEM school.' Students, parents, and the community know it and they see our school in a very positive light."

#### **IMPROVING STUDENT ATTENDANCE AND LEARNING**

"We're trying to move the needle as a school. You can't do that if only the science department does STEM. STEM is about teaching philosophies and practices that can be incorporated into any instructional area, and we're seeing improvements," said Sellden. "Unexcused absences have decreased by 38%. Student scores on the SAT have increased by 12 points. This shows us that our STEM focus is working."

#### **CREATING AN IDENTITY AS A STEM SCHOOL**

"I've been at Central High School for 20 years. Over the last four years, we've been able to create an identity as 'the STEM school.' Students, parents, and the community know it and they see our school in a very positive light," said Sellden.

At the same time, Johnston likes to remind educators that STEM will look different in their schools. "When I talk with other schools, I tell them, 'Don't try to be like Central High School.' You can't be anyone other than who you are," he said. "NISE provided an excellent framework to fit our needs. Whether you're just getting started or you've already given a lot of thought to STEM, it can help you create your own identity and define how you engage in the business of STEM teaching and learning in your school."