College of Natural Sciences Education & Outreach Center
Discovery Begins Here

The Natural Sciences are relevant to everyone. However, STEM (Science, Technology, Engineering, and Mathematics) subjects are not always presented in school in a way that captures imaginations and inspires students to pursue STEM careers. This is especially true for girls and minorities.

Our solution to this problem involves the College of Natural Sciences faculty. In addition to teaching, they are actively conducting basic and applied research selected by the scientific community as being the most relevant to the needs of society. We collaborate with these faculty on the design of unique STEM experiences and kits for 4th through 12th grade students that aim to inspire the next generation to want to learn more about the sciences.

Each pin represents a student or teacher who has participated in one of our programs or uses our materials.
“There is a theme to all of the educational opportunities that the CNSEOC provides. Whether it is field research or investigations performed in the classroom, they ask students to seek natural patterns based upon observations, data collection and analysis. The CNSEOC develops and shares educational experiences that model critical thinking skills central to promoting the advancement of science.”

— Mike Viney, Science Teacher, Blevins Middle School
Focus #1: STEM Experiences

Research questions, data collection and analysis, interpretation, and scientific communication are the basic elements that weave through each of our programs. Mathematics, culture and place are used to help connect students to the science.

STEM Fridays: Pre-service science teachers help facilitate weekly hands-on experiences for 4th through 12th grade students and their teacher in our high tech experiential learning lab or in the field at our GetWET water science site.

Colorado Science and Engineering Fair: As one of the top state science fairs in the nation, we draw on thousands of middle and high school students from the best teachers across the state of Colorado. The fair encourages authentic student driven research mentored by leading scientists and engineers. (www.csef.colostate.edu)

Keynotes and Workshops: Each semester we host a variety of keynote lectures or hands-on professional development workshops attended by CSU and K-12 faculty and students, as well as informal educators.

SciTrek: Our summer camp for high school juniors and seniors is a capstone experience where students contribute to a five-year tree ring research project at Lory State Park.

MST-Day: Math-Science-Tech Day brings together culture and STEM. Sixteen classes of fourth grade students from five local schools with the highest percentages of students receiving free or reduced lunches participate in three 45 minute hands-on sessions presented by faculty followed by an interactive cultural performance.
“You have influenced my students directly through STEM Fridays, you have helped me maintain my enthusiasm as a teacher through seminars, and you have opened conversations with teachers and given us tools for teaching controversial topics such as fracking and evolution. You provide continuing education for me in a manner that is not readily available elsewhere.”
— Vicky Jordan, Retired Science Teacher, Wellington Middle School
Focus #2: STEM Kits

The STEM Kits that we create are derived from the research projects of CSU faculty. We delve into their research methods to find the essence that we distill into an educational kit. How does the researcher approach a problem? What sorts of experiments are used to solve the problem? How can we give students the joy of discovery? These are the elements that make a great educational experience. Kits focus on scientific process, scientific illustration, data collection and analysis, and communication of results.

We develop several categories of kits:

**Broader Impacts/CAREER:** Faculty seeking funding from the [National Science Foundation](https://www.nsf.gov) are required to have a concrete plan for how they will inform society about the importance of their work. We make it easy for them to reach a wide audience.

**Distance Learning:** The [Masters of Natural Science Education](https://www.mns.edu) degree serves science teachers globally. A key piece of this exciting program is that every course includes a hands-on lab component. We work with faculty on the design of these labs. We also assemble and ship the kits.

**National Parks:** Since 2012, we have been collaborating with the [National Park Service](https://www.nps.gov) on the design of hands-on STEM kits for schools that surround National Parks in Hawai‘i and Alaska.

**Foundations & Donors:** We have developed kits with specific grants from foundations and gifts from private donors. We are currently seeking new partnerships to support our kit lending program.
"I am grateful for having colleagues like the three of you who share a passion for improving science education. Your support of both research and teaching is invaluable. I love being able to brainstorm with all of you about how CSU can meet K-16 teachers’ needs to improve student learning outcomes and attitudes about science and mathematics."

— Dr. Meena Balgopal, Associate Professor of Biology, CSU

Get Energized! STEM Kit
Focus #3: STEM Kit Lending Library

Kits are packaged to be used individually or by pairs of students and are easy to transport. Teachers and informal educators can check out a classroom set of 15 kits for a week at a time. Because the kits are largely self-guided, students can work at their own pace and teachers are freed up to help the students who are struggling or suggest extensions for kids who want more.

Biology
Small Fish - Big Questions Kit
Hominid Skulls Kit

Chemistry
Get Energized! Kit

Computer Sciences
Pico Pong Kit

Earth & Environmental Sciences
Really Ancient Fossils Kit
Soil Carbon Kit

Engineering
Solar Cars Kit

Physics
Revolution Kit
Get Critical! Kit
“The EOC has coordinated the Colorado Science and Engineering fair for close to two decades. Student winners go on to compete in the International Science and Engineering Fair. The Center does an outstanding job coordinating the fair for the state of Colorado. An important strength of the EOC is the stability of the staff. The Center builds upon past experiences, develops new programs, and brings in new partners. This is critical for long-term sustainability.”

– Dr. Nancy Rader Kellogg, Colorado Science Education Network
Focus #4: Mentoring

**Pre-service teachers:** Teaching science is not an easy job. Our center offers opportunities for enthusiastic students to see how effective hands-on teaching methods can be.

- The approximately 55 students in the **Bachelors of Science in Natural Science** major are advised through our center.

- Our center is the home of the **STEM Educators Club**, where we offer space to study, coffee and snacks, trips to conferences, and opportunities to connect with schools and teachers (e.g. STEM Fridays).

**In-service Teachers:** The best teachers are life long learners themselves. We offer a selection of opportunities for teachers to reinvigorate their passion for teaching.

- **STEM Fridays** allow us to show teachers in real-time what elements are needed to create successful hands-on STEM lessons for their students.

- A variety of **Professional Development Workshops and Lectures** provide networking opportunities and support for topics that are difficult to teach (e.g. evolution).

**Under-represented in STEM fields:** All of our programs strive to encourage young women and minority students to consider a STEM career. Two programs in particular include their success as the primary goal.

- **SciTrek** is a weeklong summer camp that attracts mostly female students from across the nation.

- The weekly after school **Triunfo Mentoring Program** pairs first generation college students with mostly Hispanic youth for homework help and STEM activities.
“As a teacher, I look forward every week to having the lessons of the week revisited and explained from a different point of view by college students. This is a tremendously valuable experience for these kids, especially because many of them have no family members who have had the college experience. My fourth graders get to actually sit in a college lab with college students just a few years older than they are and this makes the goal of attending college seem more attainable. Tutoring is the highlight of many of these kids’ week.”
— César Fuentes, Teacher, Harris Bilingual Immersion School
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