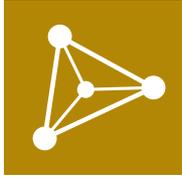




College of Natural Sciences

Education & Outreach Center



Colorado State University



The Natural Sciences are relevant to everyone.

Science, Technology, Engineering, and Mathematics (STEM) subjects are not always presented in a way that captures imaginations and inspires students to pursue STEM careers, particularly for female and minority students.

We harness the intellect of the College of Natural Sciences faculty to solve these problems. In addition to teaching, our faculty are conducting fundamental and applied research relevant to the needs of society. We collaborate with these faculty to translate their top research into unique STEM experiences for 4th – 12th grade students to inspire the next generation to want to learn more about the sciences. Our programs have reached students and educators at all levels, local to global.

Every week we meet new undergraduate students, graduate students, post-docs, faculty, and community members interested in STEM outreach. Their passion helps energize us as we work towards making science more accessible to everyone.

We serve CSU faculty and students as well as 4th-12th grade students and educators through:

1. STEM Experiences

Research questions, data collection and analysis, interpretation, and scientific communication are woven through each of our programs.

2. STEM Educational Kits

The STEM Kits we create are based on current scientific research.

3. STEM Kit Lending Library

Teachers and informal educators can check out a classroom set of 15 kits for a week at a time in a wide variety of scientific topics.

4. Mentoring

We mentor preservice and in-service educators as well as K-12 students.

“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, Retired Science Teacher, Blevins Middle School

FOCUS 1: STEM Experiences

Mathematics, culture, and place are used to help connect students to the science.

Research questions, data collection and analysis, interpretation, and scientific communication are the basic elements that weave through each of our programs.

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 encourage thousands of middle and high school students from across the state of Colorado to participate in science fairs. The fair promotes authentic student driven research often mentored by leading scientists and engineers. (www.csef.colostate.edu)

Keynotes and Workshops

We host a variety of keynote lectures or hands-on professional development workshops attended by CSU and K-12 faculty, students, and informal educators.

SciTrek Summer Camp

Our summer camp for high school juniors and seniors from around the country is the longest running science camp at CSU. Students get to experience cutting edge research such as dendrochronology at Lory State Park and groundwater studies at GetWET.

Triunfo STEM Mentoring Program

Triunfo is an afterschool program for 3rd-5th graders from local high-needs elementary schools. Undergraduate CSU students mentor them in math, science, and reading. Each semester we also take them to various research labs to see researchers in action.



FOCUS 2: STEM Kits

The STEM Kits that we create are derived from the research projects of CSU faculty.

We delve into our faculty's 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 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 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 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 always seeking new partnerships to support our kit lending program.



FOCUS 3: STEM Kit Lending Library

We offer a Lending Library of STEM Kits available to teachers and informal educators.

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 kits for a week at a time. The kits are largely self-guided, so students can work at their own pace and teachers are available to help the students who are struggling or suggest extensions for kids who want more.

Biology

Small Fish - Big Questions
Hominid Skulls
Secrets of the Hibernators
Scrub Jay Beaks (coming soon)

Chemistry

Get Energized!
High-Tech Rocks!
Dissolved Salts (coming soon)
Chemometers (coming soon)

Computer Sciences

Pico Pong

Earth & Environmental Sciences

Anchialine Pools
Vital Ice
Really Ancient Fossils
Soil Carbon
Plankton to Plastic Pollution

Engineering

Solar Cars

Mathematics

Optimization (coming soon)

Physics

Get Critical!
Regenerate



FOCUS 4: Mentoring

We offer mentoring opportunities for students, teachers, and educators.

Pre-Service Teachers

Our center offers opportunities for enthusiastic CSU students to see how effective hands-on teaching methods can be.

- The approximately 55 students in the Bachelors of Science in Natural Science Education major are advised through our center.
- We offer space to study, coffee and snacks, trips to conferences, and opportunities to connect with schools and teachers for the BSNS students.

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. data analysis).

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 and SummerVet are summer camps that attract 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, in partnership with El Centro.



The Education & Outreach Center is an incubator for innovation in STEM education.

We find new ways to promote scientific creativity and innovation – attributes essential for facing global challenges in the 21st century.



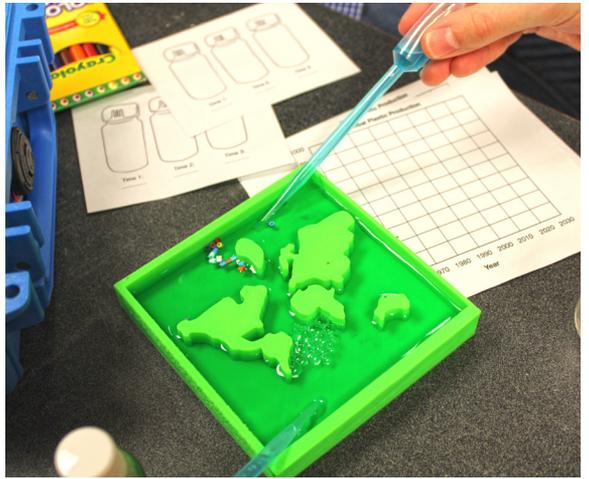
10
YEARS OF
SERVICE

15
STEM KIT
OPTIONS

1,800 STUDENTS
GRADES 4-12
PER YEAR

90

HANDS-ON
MINUTES
PER STEM KIT



\$14M

GRANTS SINCE 2010

55

UNDERGRAD
STUDENTS
MENTORED





2019 was a big year for the EOC.

We started new collaborations, celebrated our partnerships, embarked on 8 new STEM kits, and more.

New STEM Kits on the Horizon

We have several exciting new kits in the works: scrub jay beak micro-evolution with Cameron Ghalambor and Chris Funk, magnetic imaging with Joe Zadrozny, mathematics of optimization with Patrick Shipman, dissolved salts with Ryan Bailey, chemical test cards with Chuck Henry, Antarctic rift zones with Dennis Harry, microscopy with Tim Stasevich, and pollinators with the Gardens on Spring Creek.

STEM Kits in Todos Santos

Ursula Quillmann almost got washed away trying to photograph our new STEM kit at the beach in Todos Santos! The “Plankton to Plastic Pollution” kit traces the origin of plastic back to marine plankton and follows it full-circle to its recent discovery in zooplankton. The CSU Center in Todos Santos has a classroom set of these kits to use with local schools. We have also made classroom sets for Semester at Sea, Kaloko-Honokōhau National Historical Park in Hawai‘i, and the EOC. Andrew Allsup (B.S. Natural Science Ed., 2021) and Zoë Tauxe (B.S. Psychology, 2019) were the primary designers on the kit and presented their work at the 2019 CURC, winning 3rd place in the Service Learning category!



GetWET Grows

In collaboration with Mr. Kaleo Chung, chair of the science department at Rocky Mountain High School, we received funding from the Poudre School District to double the number of field equipment backpacks. Our existing backpacks have also been completely overhauled. The GetWET program model has been honed over approximately 12 years and will be used in the National Western Water Education program that we are helping to design.

National Western Water Building

CSU is collaborating with Denver Water and a number of other partners on the design of a new Water Building at the National Western Center in Denver slated to break ground in early 2020. We have been leading the CSU side of the water education facility design, with plans to establish a STEM kit lending hub and a GetWET experience along the South Platte River.

Twenty Years of CSEF!

2019 marks the twentieth year that Courtney Butler has been the director of the Colorado Science and Engineering Fair! She has solidified the fair's presence at CSU, significantly expanded the annual budget through fund raising, raised the stature of the Colorado fair relative to other states, and holds a leadership position at the International Science and Engineering Fair. Other states routinely seek Ms. Butler's advice as they work on improving their own fairs. Her passion for seeing students reach their potential is what keeps her going!

Collaboration with the Gardens on Spring Creek

The close proximity of the GetWET site to the Gardens makes for a natural collaboration, especially given our mutual collaborators of Compass School and Rocky Mountain High School. Our first project together will be a new STEM kit on Pollinators.





New Solid State Chemistry Kit

During the summer of 2018, BSNS student Antoinette McIntosh Smith (B.S. Chemistry/B.S. Natural Science Chemistry Ed., 2018) did a “Research Experience for Preservice Teachers” in the Neilson Lab. In addition to shadowing graduate students, she developed a new kit with the help of the EOC called “High-Tech Rocks!” It is one of our most multidisciplinary kits and is proving to be highly popular among teachers.

National Park Service STEM Kits

In November, we returned to Kona, Hawai'i to work with our partners at Kaloko-Honokōhau National Historical Park. We spent the first day organizing the STEM kits that we have in place at the park. The next two days, we visited 11 classes at Kealakehe Elementary School, Kealakehe High School, West Hawai'i Explorations Academy, and ran a teacher professional development workshop on the beach at the park. The final two days were spent running a water cycle session at the annual Children's Cultural Festival attended by approximately 400 4th graders. We also shipped two more classroom sets of Vital Ice kits to Denali and Kenai Fjords National Parks in Alaska.

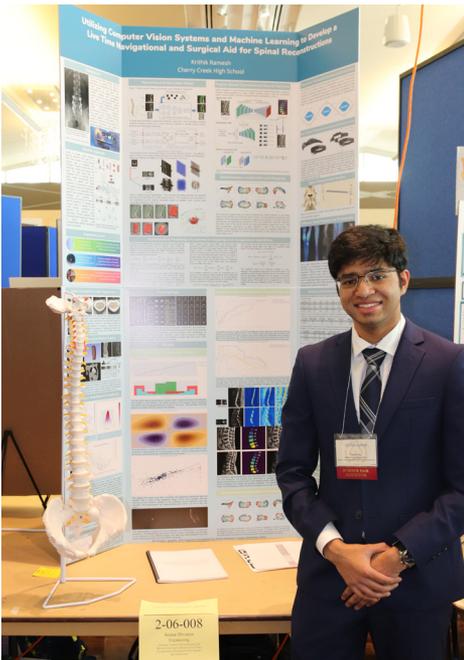
Platte River Power Authority Supports STEM Fridays

PRPA provides our electrical power and also provides funds to power our STEM Friday program! Transportation expenses are a major barrier for many schools and PRPA's continued generosity helps keep the program going.



“I had so much fun and not only that, I got to experience what it feels like to be a college student. Thank you for everything!”

— S.G., 8th grade student,
Timberline PK-8 School,
Longmont, CO



Krithik Ramesh won first place at this year's Colorado Science and Engineering Fair and went on to win first place at the Intel International Science and Engineering Fair. We are incredibly proud of his outstanding achievement, which came with a \$75,000 scholarship.

“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. 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.”

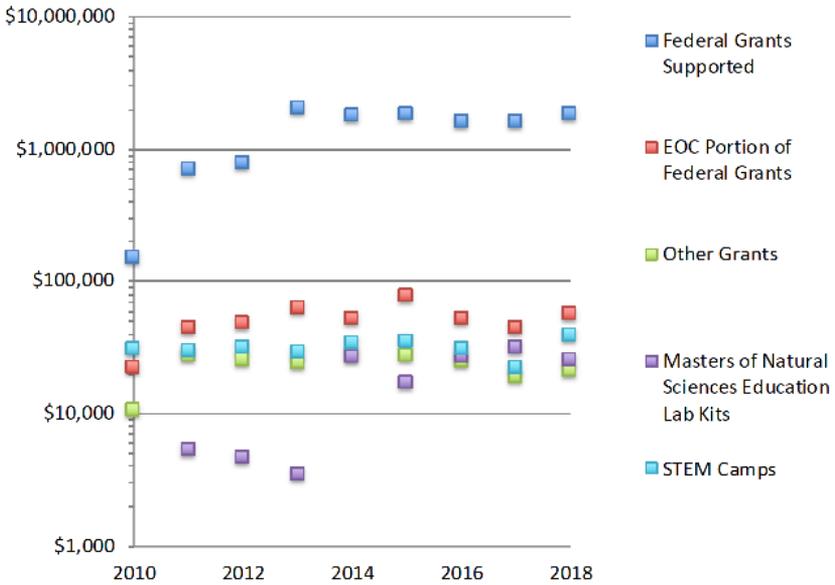
— César Fuentes, Teacher, Harris Bilingual Immersion School



FUNDING

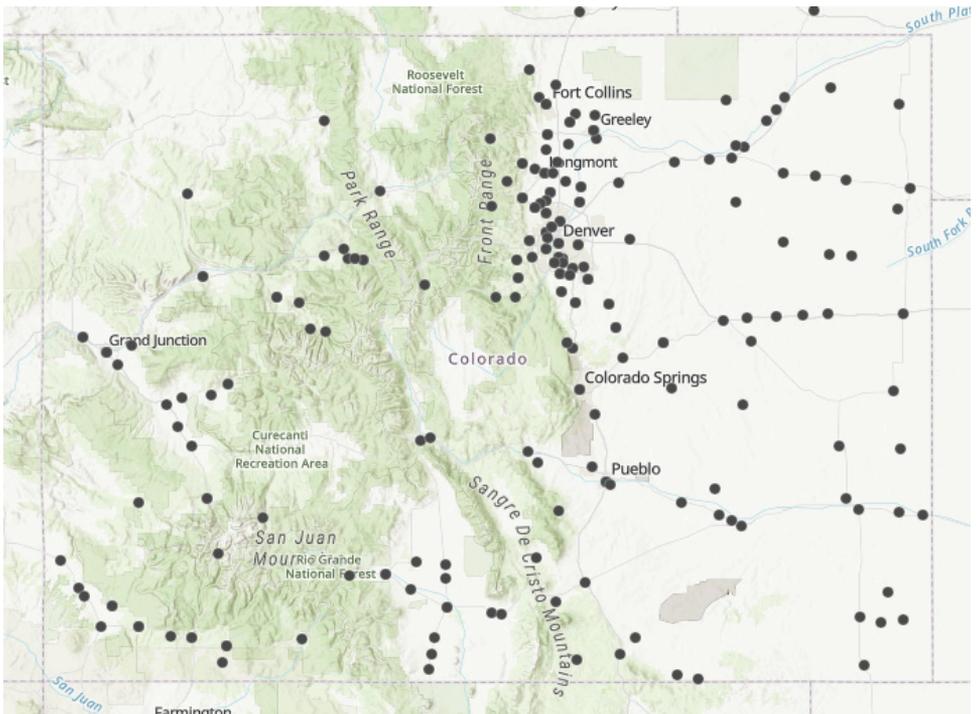
The EOC staff is supported by the College of Natural Sciences and constitutes 0.5% of the college's annual resident instruction budget. Additional funds are derived from participation in grants led primarily by college faculty at large and led by EOC staff from the National Park Service, Bohemian Foundation, and private individuals.

EOC Fundraising History



REACH

Each dot represents a student or teacher who has participated in one of our programs or who uses our materials.



SUPPORTERS



COLLEGE OF
NATURAL SCIENCES
COLORADO STATE UNIVERSITY





EOC staff left to right: Lynne Judish, Courtney Butler, Mike Viney, and Andrew Warnock

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The “Plankton to Plastic Pollution” kit at the beach in Todos Santos, Mexico



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