



STEM education: Science, technology, engineering, and math

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Research, education, and extension are viewed by the U.S. Department of Agriculture's National Institute of Food and Agriculture (USDA NIFA) as three equal and essential parts of the value proposition that is transforming agriculture. One of the strategic goals of USDA NIFA is to develop human and intellectual capital. To support this goal, the REACCH education team is working to introduce innovative agricultural approaches to climate change mitigation and adaptation into K-12 curricula to prepare citizens and professionals for climate-related challenges and to define agriculture's role in providing food, energy, and

IMPACT

Science, technology, engineering, and mathematics (STEM) education focused on agricultural sciences is a key building block to training future scientists and informed consumers that will help ensure sustainable food systems into the future. It is imperative in our region to understand the impacts of climate change, so that regional producers will continue to be a strong economic driver in our communities.

ecosystem services. As Diogenes once said, "The foundation of every state is the education of its youth." In the past year, REACCH hosted three science, technology, engineering, and mathematics (STEM) education events with lab, field, and classroom activities, assisting many youth on the path of lifelong learning.

Washington State University Leadership Development Camp

REACCH participated in a week-long camp for 40 middle and high school students, ages 13 to 15, from the Coeur d'Alene Tribe. Coeur d'Alene land is located in the major wheat-producing region of the ID panhandle.

The REACCH team discussed crops, soils, and the importance of conservation to farming systems. The students learned how parts of a cropping system build on and affect one another in a hands-on soil erosion simulation and in a discussion about cropping systems. Comparing the economic impact of erosion on wheat yields under different scenarios proved to be impactful, as one student exclaimed, "\$35,000 lost! That's enough to buy a new car!" A soil erosion demonstration using simple bread pans, water, and crop residue to simulate erosion in the field further strengthened the students' understanding of erosion (Figure 1).

REACCH was joined by Jim Kackman, Coeur d'Alene Tribe public works director and the tribal farm manager. Jim familiarized the kids with maps of the tribe's farmlands, pointing out specific regions where their families farmed. He introduced them to equipment used on the farm and discussed the tribe's efforts to improve conservation using precision management. The students realized that they are stakeholders in their own land. Pride in home and culture is a key component to understanding and appreciating conservation.

University of Idaho Living Systems Class

Budding scientists were busy and engaged as REACCH co-hosted 55 students from Moscow, ID, in fourth to eighth grade, introducing them to innovative ways engineers use science to solve problems. Twenty-seven UI students in the Introduction to Living Systems class designed eight science engagement activities that challenged students to think creatively about engineering design and solutions, including activities involving solar ovens, hydropower, wind energy, biofuels, water filtration, prosthetic leg design, precision agriculture, and the use of microorganisms in engineering. The precision agriculture session demonstrated an unmanned aerial vehicle (UAV) and GPS navigation system. The activity not only benefited the elementary school students, it challenged mostly freshman-level college students to come up with creative ways to communicate science to a younger audience, and to define for themselves what it truly means to be an engineer/scientist (Figure 2). At the end of the field trip, 75% of the students raised their hands when asked if they wanted to go into science and engineering when they grow up. A successful day indeed!

University of Idaho HOIST: Helping Orient Indian Students and Teachers

Sixteen Native American high school students interested in pursuing their higher education in a STEM field resided at the



If we teach today's students as we taught yesterday's, we rob them of tomorrow.

—John Dewey

Figure 1. Chelsea Walsh demonstrates the importance of crop residue in protecting soil from erosion and loss through a simple simulation. Photo by Stephen Cole.



I hear and I forget. I see and I remember. I do and I understand.
 —Confucius

Figure 2. Erin Brooks and University of Idaho student Joel Wilson watch while two seventh-grade students compare the effectiveness of various water filter designs. Photo by Bill Loftus

University of Idaho this past summer. REACCH organized a science communication thread for all of the students, in which they blogged weekly about their individual STEM experiences. Additionally, each student identified a professional mentor and created a career path video to be posted online so that other students could learn more about STEM careers.

REACCH hosted five of these students for a comprehensive four-week study of the integrated science needed to help create resilient farms that are ready for the future. Themes for the first three weeks included pests, weeds, and beneficials; cropping systems; and monitoring and modeling. Each day the HOIST students were mentored by a different REACCH scientist and graduate student, with total exposure to more than 25 of the REACCH team members, enriching their integrative science learning. Students garnered lab, classroom, and field experience.

The HOIST students tested REACCH high school curriculum units under development and will go back to their respective science classes at their home high schools and teach the unit to others, with a total potential impact of 550 students exposed to the REACCH curriculum. Idaho Public Television monitored the summer program and plans to use REACCH material in an upcoming science program for middle and high school students. All the students self-reported that their understanding of climate science, agriculture, and cereal-production systems greatly improved over the summer and said they would gladly participate again.

Equipped with his five senses, man explores the universe around him and calls the adventure Science.
 —Edwin Powell Hubble

Figure 3. Dave Huggins in the field with HOIST students studying soil health.

