



West Hills Community College District
Western Native Trout Initiative
Program Narrative Report

Award and Program Preparation - Summer of 2017

In July of 2017, West Hills Community College District's Small Grant Program *Transforming Research Opportunities for Undergraduate Training* (TROUT) was selected for funding by the Western Native Trout Initiative Steering Committee. Upon notification, college staff made contact and began work with California Department of Fish and Wildlife (CDFW) representatives, Jeff Weaver (Program Leader for the Heritage and Wild Trout Program) and Bill Somer (Senior Environmental Scientist), to plan student activities centered around the Lahontan cutthroat trout. Partners looked for a field-study site that would meet several logistical requirements including transportation, lodging, and student accessibility and have "Heritage Waters" designation. Heritage Trout Waters, as defined by the California Department of Fish and Wildlife (CDFW), must meet the following criteria:

1. Open to public angling.
2. Able to support, with appropriate angling regulations, wild trout populations of sufficient magnitude to provide satisfactory trout catches in terms of number or size of fish.
3. Domestic strains of catchable-size trout shall not be planted but suitable hatchery-produced wild or semi-wild strains may be planted in designated waters, but only if necessary to supplement natural reproduction.
4. Only waters supporting populations that best exemplify indigenous strains of native trout within their historic drainages may qualify for designation.
5. Heritage Trout Waters shall be able to provide anglers with the opportunity to catch native trout consistent with the conservation of native trout present.

College staff and CDFW partners selected Heenan Lake (38°39'03.3"N 119°39'31.9"W), a Heritage Trout Water designated site for the Lahontan cutthroat trout (LCT). Michael Carl (proprietor of [The Ecological Angler](#)) assisted the project by identifying areas of interest at Heenan Lake, fishing techniques, and flies best suited for catching and studying LCT. Mr. Carl also offered a number of pintable resources for student-use at no cost. College staff began marketing the opportunity to biology students looking to gain experience in undergraduate research and field-study processes. Anticipation and excitement among students built as the college prepared for its first foray into undergraduate research. In preparation for the trip, students learned, in class, about the scientific method and various aspects of wildlife biology, ecology, and water quality and its relationship to fish population health.

Field Study and Undergraduate Research - Fall of 2017

On the morning of October 21, 2017, the last open fishing weekend of the year at Heenan Lake, eighteen students from West Hills College Coalinga biology classes boarded a charter bus bound for the Eastern Sierras in search of LCT. Staff compiled the following information in student notebooks for the bus ride ahead:

1. An angler's guide to the California Heritage Trout Challenge. *State of California Natural Resources Agency: California Department of Fish and Wildlife: Heritage and Wild Trout Program*. 26-31, 106-109.
2. Carl, Michael. (2015, September/October). Heenan Lake, CA: Water worth fighting over. *Southwest Fly Fishing*, 16(5), 46-51.
3. Moyle, P. B., Lusardi, R., Samuel, P. (2017). Lahontan Cutthroat Trout: *Oncorhynchus clarkii henshawi*. *SOS II: Fish in hot water: Status, threats, and solutions for California salmon, steelhead, and trout*. 78-92.
4. 1 college ruled legal pad.
5. 2 pencils.



Figure 1 - Students and faculty learn about equipment supporting LCT populations at ARTH

Saturday afternoon, West Hills College Coalinga students arrived in Gold River, CA to visit the Nimbus Fish Hatchery and tour the American River Trout Hatchery (ARTH). California Department of Fish and Wildlife representative, Andy Walker, lead the group around the hatchery showcasing various life-stages of the Lahontan Cutthroat trout (LCT) and the equipment and techniques used to keep them alive. Students learned about trout life cycles, feeding practices, breeding practices, needed water quality and temperatures, diseases, stocking and planting, conservation, and the effects of drought. West Hills College Coalinga Biology professor, Dr. Atif El Naggar, supplemented the discussion and offered alternative baffling techniques to reduce kill-off during hot summer months.



Figure 2 - Fingerling LCT in holding tanks at ARTH

The majority of the day was spent educating the group on Independence strain Lahontan cutthroat trout (LCT) but Mr. Walker also offered a glimpse at the Eagle Lake Rainbow and California Golden trout. Students learned about a unique project, started in 2016, which successfully migrated threatened California Golden trout from their native waters, Volcano Creek, to specialized tanks at the American River Trout Hatchery to ensure their genetic survival during unprecedented drought.



Figure 3 - Golden trout removal from Volcano Creek by CDFW, 2016 (photo: CDFW)

Sequestered in specialized tanks, Golden Trout brood-stock are now kept at the facility to mitigate further decline of the species. In addition to biological factors, students learned about conservation techniques such as this that help to ensure biologic and ecologic diversity in the future.



Figure 4 - Golden trout tank at ARTH

After departing the American River Trout Hatchery, students and staff headed to Woodford's Station, an unincorporated community 7 miles north of Markleeville, CA. Meals, rooms, and transportation were provided with WNTI grant funds to ensure students had no out-of-pocket expenses for the trip. West Hills Community College District supplemented costs for this trip through California Innovation Award for Higher Education funds that focus on, among other things, new pedagogy practices that improve student outcomes. For some students, this was a first opportunity to travel outside of the Central Valley; for all, it was a first visit to the Eastern Sierras. The group made camp at Woodfords Inn, socialized over a pizza dinner, and then studied information provided regarding the LCT, Tahoe watershed, and research directives and protocols until lights out.



Figure 5 - Woodfords Inn

The following morning, students and staff had a hearty breakfast at Woodford's Station's only eatery, the Mad Dog Café, and picked up sack lunches to get through the day ahead. The group arrived at Heenan Lake by 8:00am to begin field-study research.



Figure 6 - Charter bus at Heenan Lake parking lot

Students hiked from the parking lot to the first of six sampling locations, Heenan Creek inlet, and engaged in on-site lecture and discussion with project lead Dr. Atif El Naggar to review scientific sampling protocol and safety measures. Beginning at Heenan Creek, students under the supervision of Dr. El Naggar and fellow biology instructor Jeff Wanderer sampled Heenan Lake water and logged the following data at six separate locations (36 samples collected):

1. Potential of Hydrogen (pH)
2. Dissolved oxygen (DO)
3. Ammonium (N_4H^+)
4. Surface temperature ($^{\circ}\text{C}$)
5. Total Dissolved Solids (TDS)
6. Chloride (Cl^-)



Figure 7 - Heenan Lake water sampling locations

Sampling Field Study Sites were chosen along Heenan’s north shore to capture data in a linear fashion between the lake’s inlet, Heenan Creek, and terminating outlet, Monitor Creek. Students practiced gathering and testing water samples, set up equipment, and hypothesized what results could reveal about the resident population of native LCT.

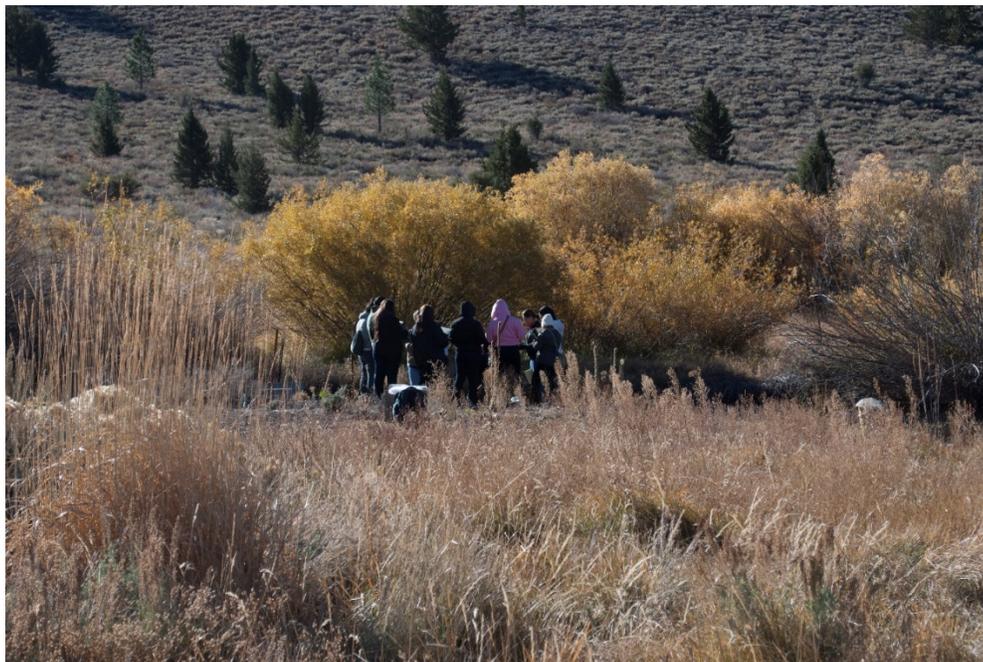


Figure 8 – A group of students engaged in field lecture at Heenan Creek (Site 1)

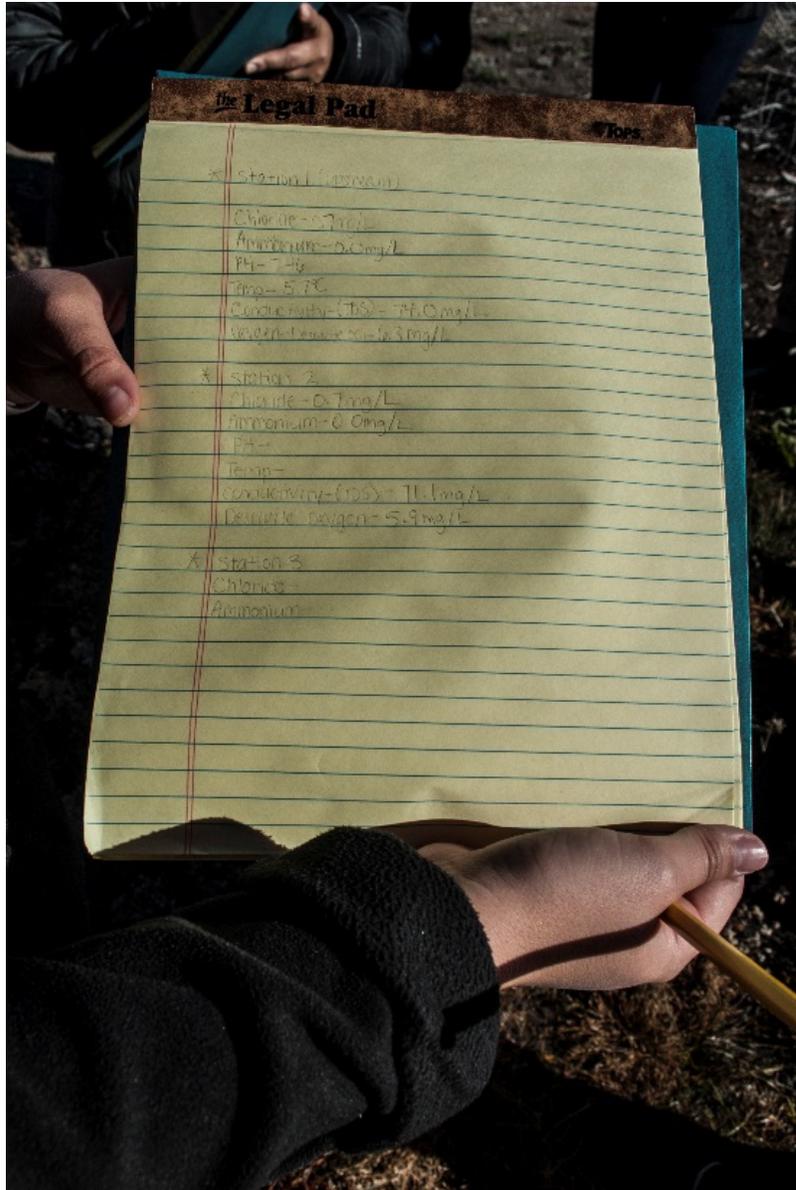


Figure 9 - Student recorded water-sampling data

As students began sampling and recording data, the lake began to fill with anglers who by boat and float tube attempted to catch and land a final LCT for the 2017 season. The next available opportunity to catch, study, and release LCT is September of 2018 (two-month season, annually). As the morning air warmed from a chilled -2.7°C (27°F) to a comfortable 18.8°C (66°F), students witnessed LCT move into the shallows at Heenan's north edge to feed. LCT were actively feeding at Field Study Site 3 where Potential of Hydrogen (pH), Dissolved Oxygen (DO), and Ammonia (N_4H^+) were average; Total Dissolved Solids (TDS) were low; and Surface Temperature ($^{\circ}\text{C}$) and Chloride (Cl^-) were high (compared to other test sites). Following state angling regulations, staff caught two LCT at Site 3 for students to study and record weight and fork length. Fish were bucketed in Heenan Lake water, measured, and released healthy within minutes to ensure their survival.



Figure 10 - Students and faculty using field technology (Vernier LabPro and laptop computer)



Figure 11 - Lake-form LCT cruising Heenan Lake shoreline; algae (Site 3)



Figure 12- LCT in bucket for observation and measurement



Figure 13- Lake-form LCT at Heenan Lake (Fork length: 511mm) (Weight: 1224g)



Figure 14 - Lake-form LCT at Heenan Lake (Fork length: 488mm) (Weight: 1397g)



Figure 15- Stream-resident LCT at Wolf Creek (Length: 142mm) (Weight: 263g)

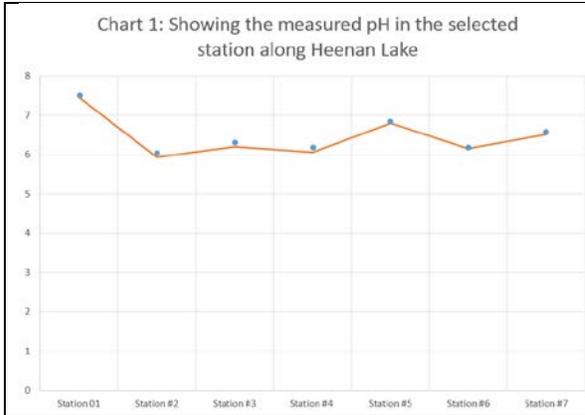


Figure 16 - Students testing water sample

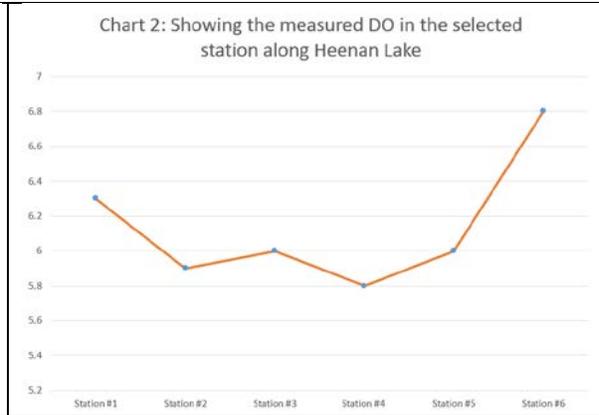


Figure 17 - Jeff Wanderer and Dr. El Naggar with students (Site 6)

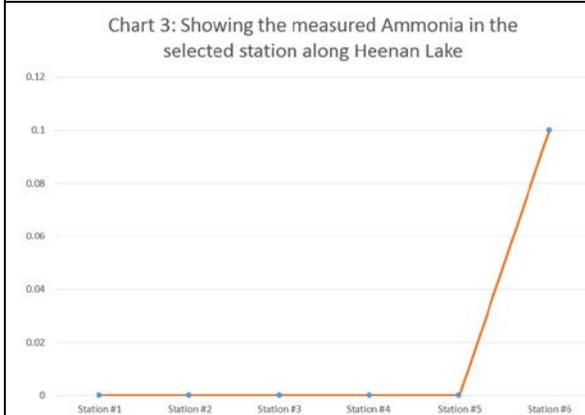
Students made general observations of data results on-site and, once back in the classroom, compiled and graphed data to look for trends. Students exported data from Vernier LabPro Logger Pro software into Microsoft Excel to draw the following conclusions regarding phytoplankton, zooplankton, and human activity (e.g. fishing) impacts on Heenan's water quality:



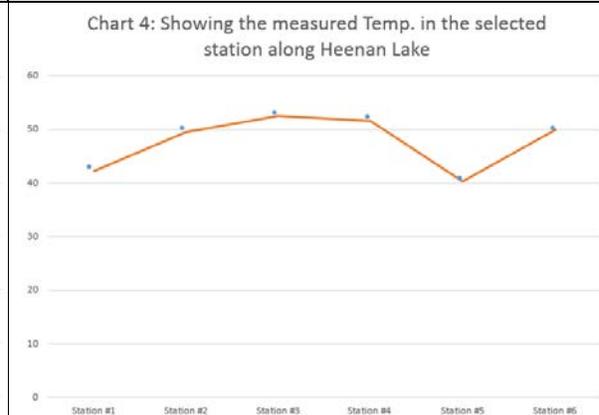
Showing pH data. It is clear that the pH in the inlet recorded the highest level.



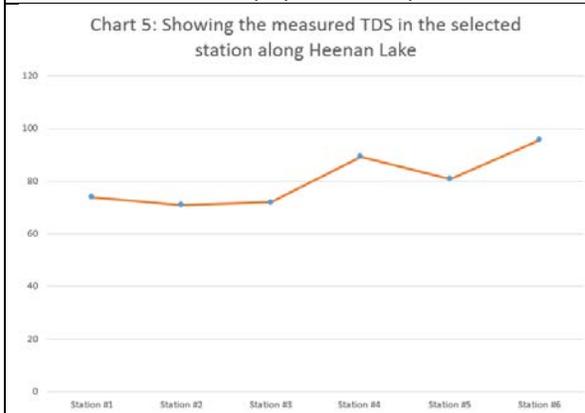
Reflecting the dissolved oxygen (DO) and showing increasing DO in the inlet and outlet stations. We recognized a high rate of air-water mixing in these two stations.



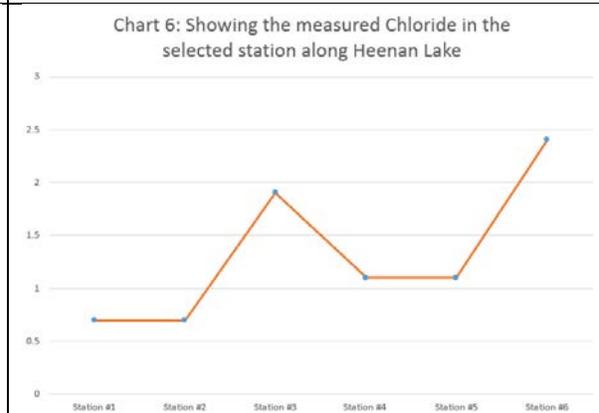
Ammonia levels in the six stations showing almost zero reading except the outlet. The outlet station gathers condensed water from human activity in addition to abundant phyto and zooplankton.



Showing the surface temperature of the lake water.



Showing relatively high reading of Total dissolved solids (TDS) in the last three stations and this is maybe due to the human activity including fishing.



Showing that the chloride readings was relatively high in stations 03 and 06. Station 03 has a unique stone structure and blooming of the green and brown algae. Station 06 has gravel and stone structures similar to station 03.

Poster Completion and Presentation - Spring of 2018

Students worked with instructors, Dr. Atif El Naggar and Jeff Wanderer, to explicate research findings and develop a poster to disseminate findings to college students, staff, faculty, and members of the community. Toward the end of the spring 2018 semester, biology students held an open-house style symposium on the West Hills College Coalinga campus to discuss research findings, experience using the scientific method, and data observations centered on the created poster.



Figure 18 - Students at work in the lab

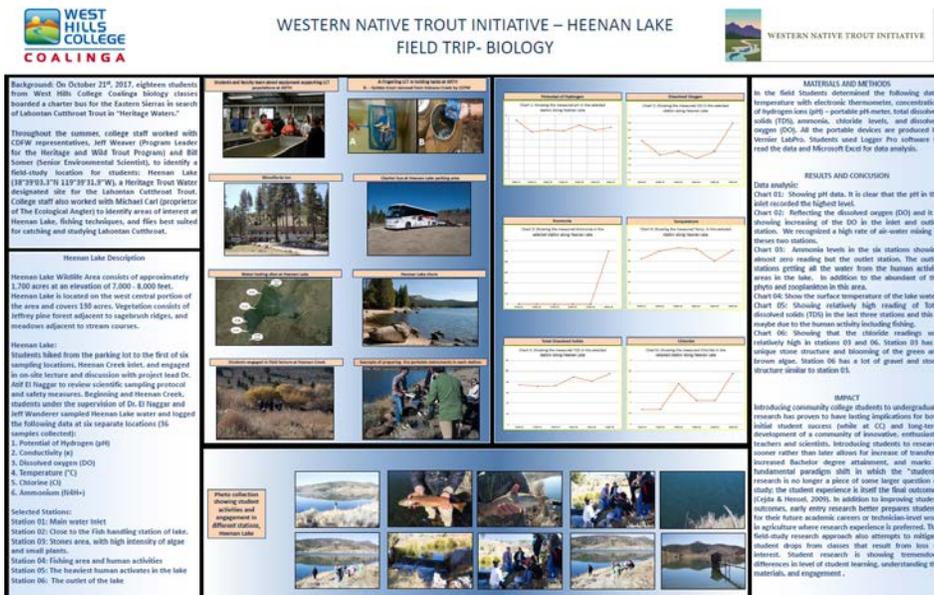


Figure 19 - Student Poster

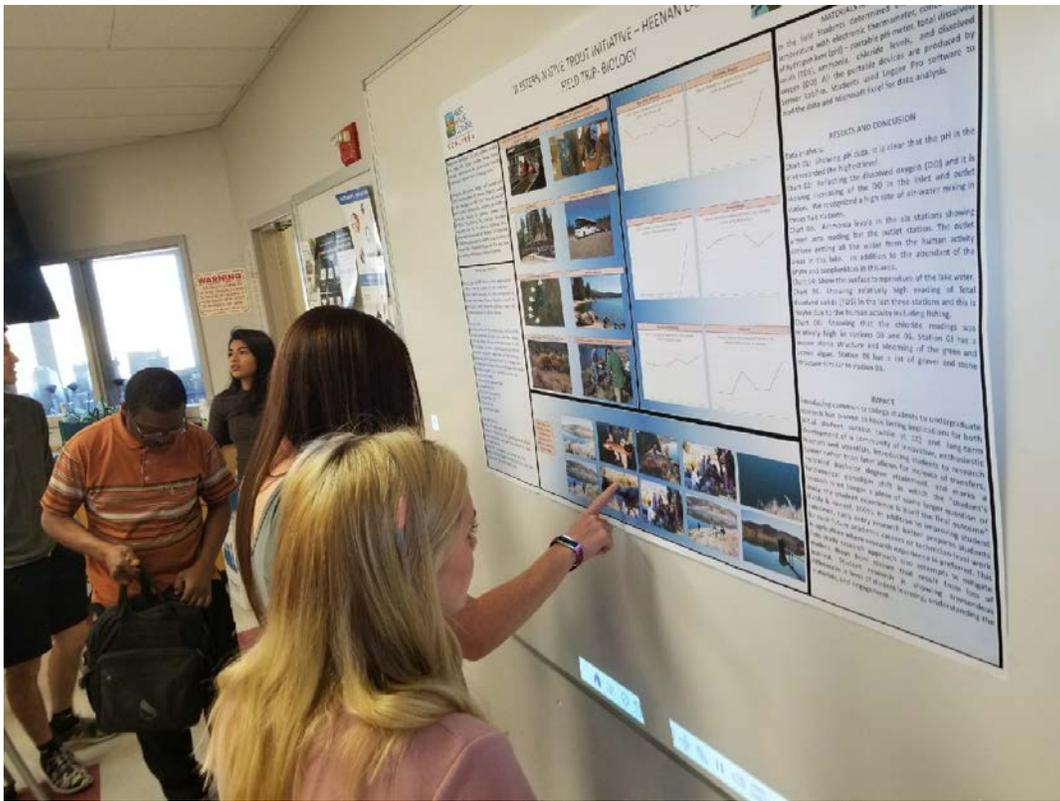


Figure 20 - Poster Presentation



Figure 21 – Attendees listen to discussion about results

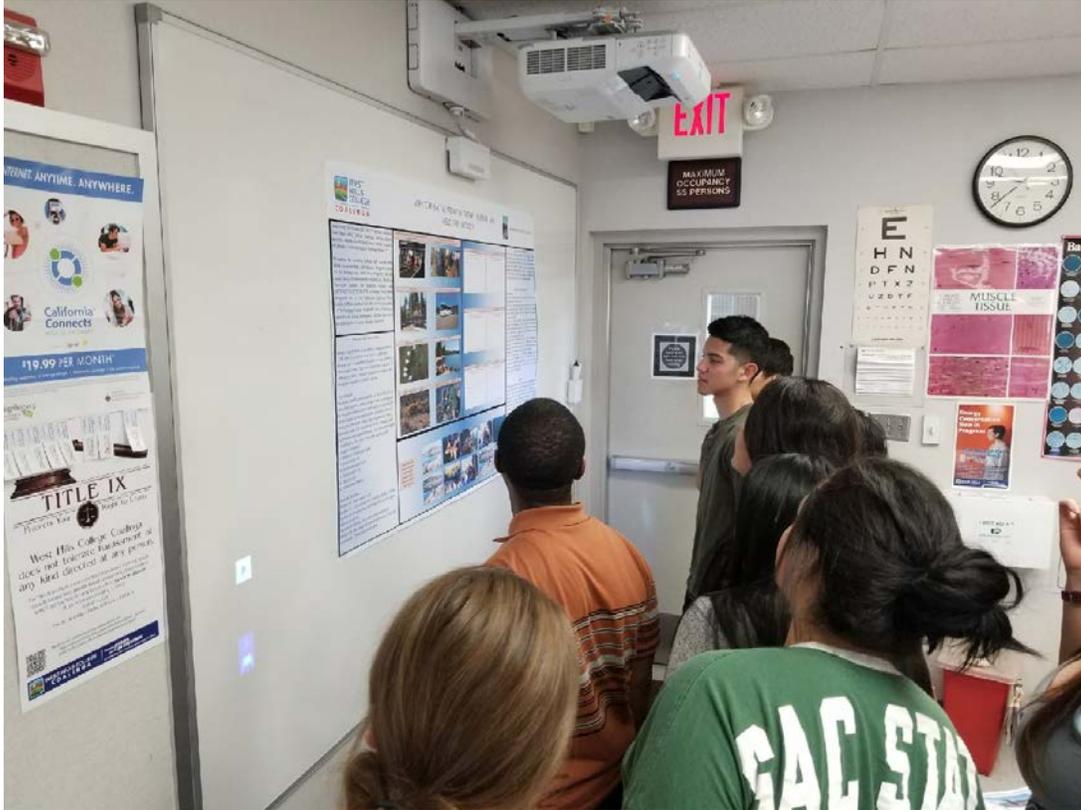


Figure 22 - Students learn about Heenan Lake, water quality, and LCT

Educational Characteristics:

Introducing community college students to undergraduate research has proven to have lasting implications for both initial student success (while at CC) and long-term development of a community of innovative, enthusiastic teachers and scientists. Introducing students to research sooner rather than later allows for increase of transfers, increased Bachelor degree attainment, and marks a fundamental paradigm shift in which the "student's research is no longer a piece of some larger question or study; the student experience is itself the final outcome" (Cejda & Hensel, 2009). In addition to improving student outcomes, early entry research better prepares students for their future academic careers or technician-level work in agriculture where research experience is preferred. This field-study research approach also attempts to mitigate student drops from classes that result from loss of interest. Student research is showing tremendous differences in level of student learning, understanding the materials, and engagement at West Hills College Coalinga.

Enrollment and retention of students in Biology at West Hills College Coalinga were positively impacted through this opportunity. Enrollment increased 45.8% in Bio 38 (Microbiology) and Bio 15 (Biology for Education), which this undergraduate research trip targeted. Student retention was also beneficially impacted by reducing drops from these classes by 42.8%. Data includes all students (146 students) enrolled in Coalinga campus Bio 38 (2 courses) and Bio 15 (6 courses) classes between spring 2017 and spring 2018 semesters. Anecdotaly, it can be gathered that college and word-of-mouth marketing for undergraduate research opportunities improved student outcomes and the student experience at West Hills College Coalinga.