

# Water Quality Experiential Learning Utilizing ARCS Pedagogical Model: Motivating Student in Undergraduate Chemistry Essentials Courses

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## ► Statement of Problem:

Undergraduate chemistry education can derail into a boring and overly technical exercise in memorizing disembodied facts, abstract principles, and obscure relationships. Unfortunately this can result in limited student motivation and failing to equip student to apply learning to real world scenarios.

## ► Research Objective:

*This educational study seeks to demonstrate that an experiential learning field trip focused on applying chemistry to real world scenario can effectively motivate student learning by capturing student attention, connecting content with relevant real-world issues, develop confidence in technical skills, and increasing learning satisfaction.*

## ► Method:

Participants were community college students enrolled in CHEM102, (n=38), the essentials of organic and biochemistry. The class included mixed science majors, ie. applied health and biology natural resources.

## ► Evaluation:

Students were surveyed and comments evaluated for trends in perceived relevance, content confidence, and learning satisfaction.

## ► Experiential Learning Description:

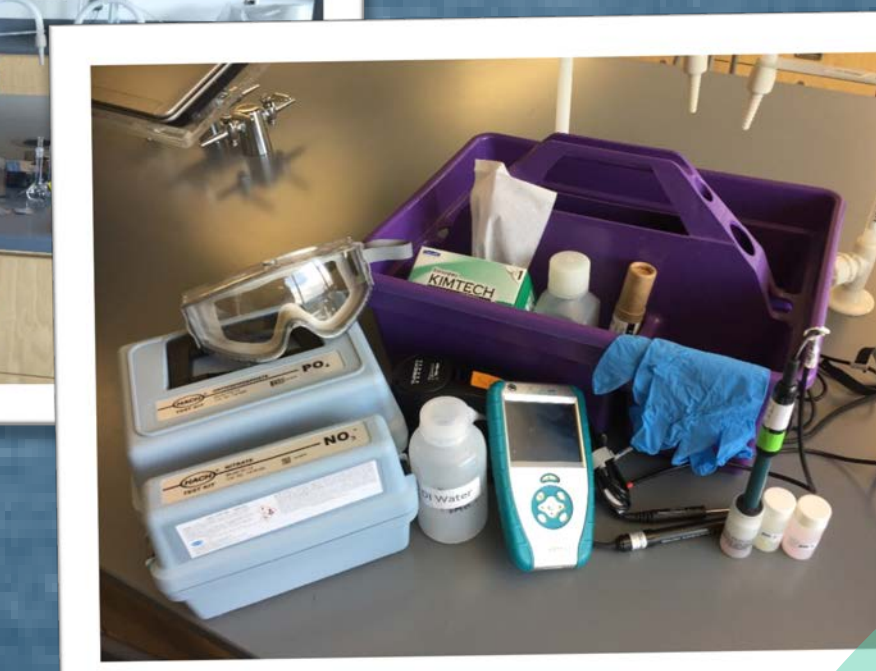
Groups of two or three students were asked to obtain water quality measurements related to a local lake known to be impaired for phosphorus and toxic blue green algae.

Week 1: Groups met at their chemistry laboratory and were provided with a surface water sample obtained from the lake and the equipment and procedure to obtain common water quality measurements. It was emphasized that the time constituted preparation for a field trip where the students would act independently.

Week 2: Students were provided with coordinates to their previous samples source location and tasked to complete their measurements in the field.



Materials
- Vernier LabQuest
- temperature probe
- conductivity probe
- turbidometer
- pH probe
- dissolved oxygen probe
- hach nitrate and phosphate test kits
- calibrating solutions, DI water, waste bottle
- gloves, goggles, glassware,
- paper towels, kimwipes, parafilm



"Going out to the lake was fun and it made the experiments much more realistic."

"The healthier our river is the better quality of life our valley will have. We eat fish out of the river, swim in our river, and the water fills our aquifer. We want to assure that the quality of our waters stays high so we are not adversely affected by our misuse of the resource."

"This lab was actually pretty cool to take part in. Now I can say I know a little bit about water testing and can volunteer in the future with more experience."

"Understanding the [chemical] vocabulary helps to know if water is safe or not for the environment, animals, and humans."

"I am extremely interested in helping collect samples [in the future]. The cross between chemistry and ecology is awesome and the subject is definitely something I would like to explore further. If you need volunteers, let me know."

"Thank you for this opportunity. I would have never done this without a bit of a push from you. I hope to continue to participate in the future. It... was very fun and I like participating in our planet's longevity."

## \* A: Attention >>>>>

- Social/Environmental Issue: Inviting students to contribute to a real world local issue was empowering and engaging.
- Change of Context: Transferring the traditional indoor chemistry lab to an outdoor experiential learning site infused excitement and cut boredom.
- Inspire Individual Responsibility: Raising the stakes by impressing on the class that the group data would only be as quality as their individual work.

## ► R: Relevance >>>>>

- Choosing a location that is publicly accessible and within 20 minutes personalized the study and enabled the possibility of continuing involvement.
- Many students commented that this was the first time they had been to the Lake, increasing their connection to their community and environment.
- I observed an increased sense of ownerships for the watershed and many students were able to identify implications for their everyday lives.

## ► C: Confidence >>>>>

- I observed greater willingness to engage and increasing self-assurance over the course of the exercise.
- Feedback from the pre- and post-lab survey indicated that students reported feeling 30% more confident in their abilities after the field exercise.
- Students who reported lowest confidence before the lab reported the highest increase in confidence.

## ► S: Satisfaction ✓

- I have several students contact me asking if they could continue to be involved in water quality research.
- Overall, feedback from students was positive.