THE EFFECT OF PLACE-BASED EXPERIENCES ON SCIENCE IDENTITY, ATTITUDE, AND ACHIEVEMENT IN A REMOTE LEARNING ADVANCED PLACEMENT ENVIRONMENTAL SCIENCE CLASSROOM

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Background

This study was conducted at Bremerton High School, an urban school.

- All first-time Advanced Placement students
- 21 freshmen: 15 female, 5 male, 1 non-conforming
- 38% free or reduced lunch rate
- 55% first-generation college bound students

Many of my students were more passive learners and consumers of knowledge. They did not see themselves as scientists or having anything of value to contribute to the science field. This was exasperated by virtual learning during the COVID pandemic. Place-based and hands-on education allows students, especially females and students of color, to see themselves as scientists and owners of the scientific information they are creating and consuming. It also gives value to communities and cultures in which the students live. If students are able to strengthen their science identity through place-based fieldwork, then their attitude and achievement will follow.

Research Questions and Data Triangulation Matrix

How does utilizing our local region support scientific engagement and achievement in the Advanced Placement Environmental Science classroom?

How do place-based learning experiences impact students'...

➢ **ability to generate scientifically oriented questions?**	Data Nuggets	Student Lab Design	Teacher Observations
➢ **ability to formulate evidence-based explanations?**	Data Nuggets	Student Lab Design	Teacher Observations
➢ **science identity?**	Student Interviews	Journal Responses	Student Identity & Attitude Survey
➢ **sense of place?**	Student Interviews	Journal Responses	Student Identity & Attitude Survey
➢ **attitude during remote learning experiences?**	Student Interviews	Teacher Observations	Journal Responses

Methodology

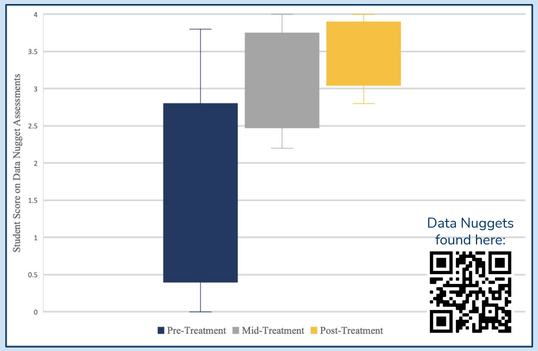
Through this action research, students were exposed to place-based experiences in a variety of formats.

Teaching soil testing remotely (above), and student home lab (below).

Data Collection Tools

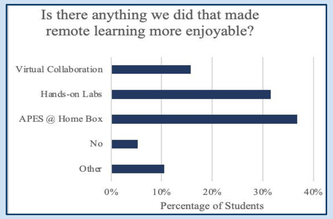
- **Data Nugget Assessments**
- **Student Journal Responses**
- **Student Identity and Attitude Survey**
- **Direct Teacher Observations**
- **Student Interviews**
- **Student Authentic Lab Design**

Science Achievement Results



Science achievement on pre-, mid-, and post-treatment Data Nuggets. This tool assessed students' abilities to ask scientifically oriented questions and formulate evidence based explanations. This tied into their ability to do the design of their authentic lab.

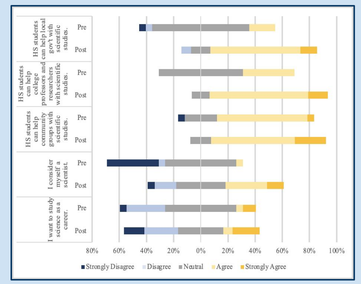
Attitude During Remote Learning



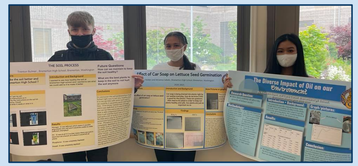
Student attitude with regards to the course and remote learning. Hands-on labs and the APES @ Home Box (seen above) were reported as being the most enjoyable part of remote learning. This was followed by virtual collaboration, done through their authentic lab project.

Student quote: "I really enjoyed getting the mail package for hands on activities. Online learning is harder when it isn't hands-on so that made it easier to have a little lab kit."

Science Identity



Science identity was assessed through a student attitude and identity survey at the beginning of treatment and at the end of treatment. Some student scientists seen below with their work.



Student quotes:

"I feel very smart being able to say that I can run this experiment on my own."

"Honestly, I feel so important when I'm doing the work when it is going somewhere else and going to help people and not just an assignment."

Sense of Place

Sense of place was evaluated using the student survey, as well as student interviews and journal responses. Sense of place did not shift notably throughout the treatment, but students self-reported their content knowledge about their community increased.

Student journal response (left) and student showing off their Junior Ranger badge from National Park Service (right).

Conclusions

- **Remote learning is difficult and draining for both students and instructors.**
- **Place-based learning can help students draw connections to their communities.**
- **Hands-on authentic work increases science identity and attitude during remote learning**
- **Sense of place is more difficult to influence remotely.**
- **Science achievement can be increased through place-based and/or hands-on work.**
- **Teacher satisfaction is increased through place-based and hands-on work due to an increase in student interaction and engagement.**

Student scientists with their authentic citizen science work, researching how vegetable oil has an impact on our local waterways and vegetation.