

# Supporting K-12 teachers through long-term collaboration

Rosalind Echols  
School of Aquatic and Fisheries Science,  
Roberts Lab  
University of Washington  
January 25, 2023



“We begin by acknowledging that we are on the ancestral land stewarded since time immemorial by the Salish people of the Duwamish, Green, White, Cedar, and Upper Puyallup Rivers, many of these giving birth to the contemporary citizens of the Muckleshoot Indian Tribe. We honor and give thanks that we are able to collectively engage in this conversation on their sacred homelands about the future of teaching and caring for our sacred children and youth.”



Highline School District  
Land & Peoples Acknowledgment

# Big ideas from today's talk

---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

# STORY TIME!



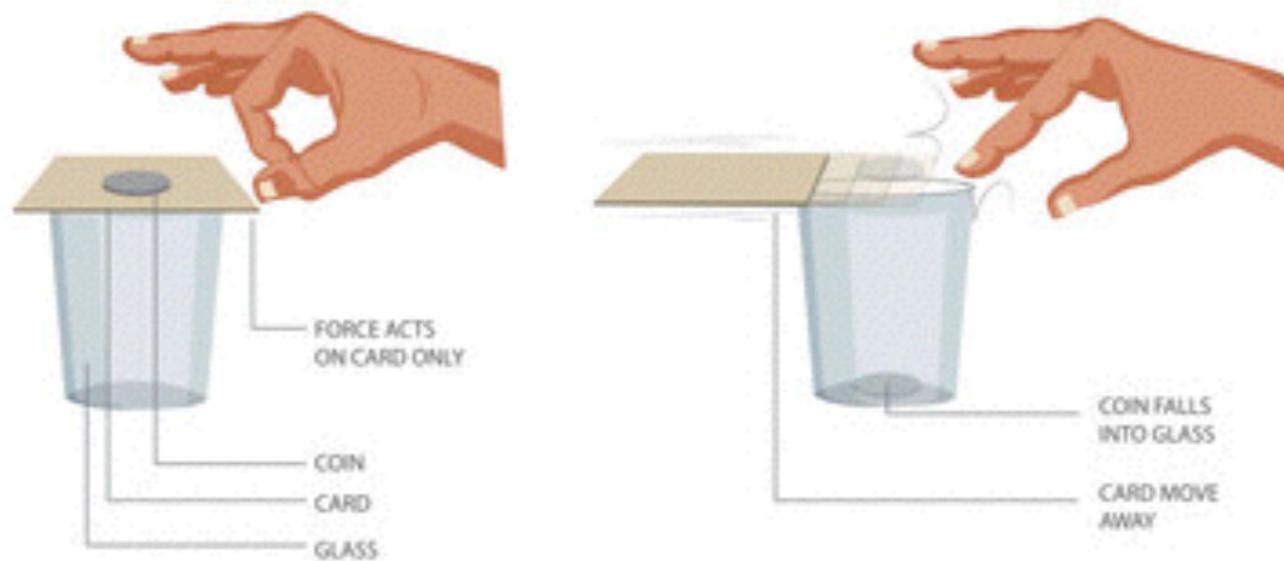
Even Miss Greer found her hands were quite full  
when young Ada's chaos wreaked havoc at school.  
But this much was clear about Miss Ada Twist:  
She had all the traits of a great scientist.

Picture from  
“Ada Twist Scientist”

Counterexample 1: Teachers attend a weeklong workshop about highly specialized science content. . . and have nothing to take home with them.

Counterexample 2: “I found this on Google and now I’m going to teach it to your students.”

INSERT COIN( NEWTON'S LAW)



Counterexample 3: “I made a 45-minute powerpoint for your 9th graders.”

# Big ideas from today's talk

---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

Envision an “average” college class.

What are the students doing?

What is the teacher doing?

# “Traditional” instruction is very teacher centered

---

## Teacher actions:

- Select topics
  - What ideas are important?
- Organize lecture
  - How do these ideas relate to one another?
- Write homework
  - What is the evidence to support this knowledge?
- Deliver lecture

# “Traditional” instruction is very teacher centered

---

## Student actions:

- Listen
- Write notes
- Ask for clarification
- Answer homework questions
- Why are we doing this?
- What is that symbol?
- *What does that even mean?*
- Asks a question about something that happened 5 minutes ago

Student-centered teaching encourages students to do more of the question-generating and idea development

---

## **Student actions:**

- Ask questions
  - What do I already know about this?
- Make observations
  - Why did this happen?
- Suggest hypotheses
  - What can I find out about this?
- Explore data
- Discuss ideas

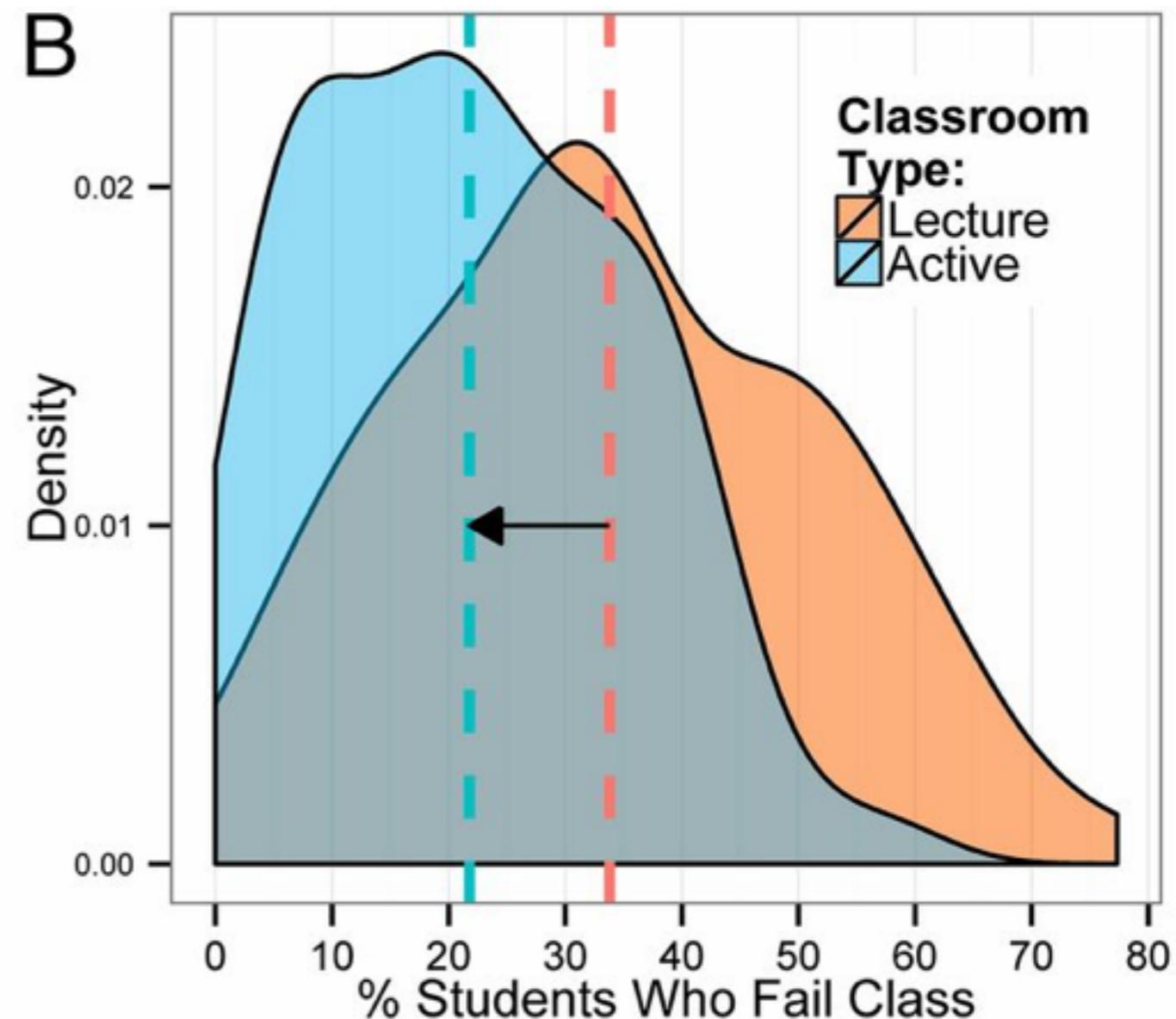
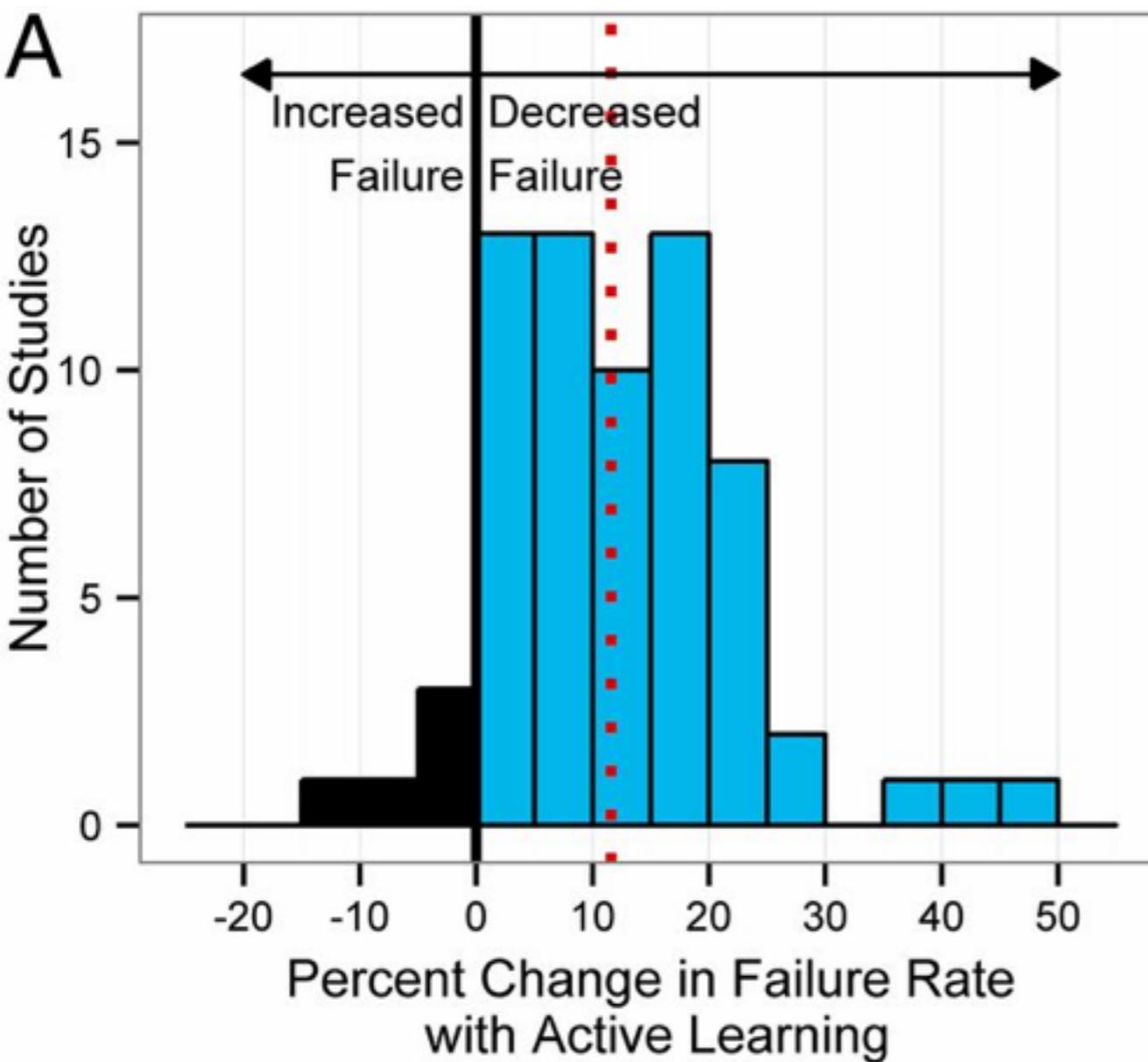
Research shows that student-centered teaching methods are more successful than traditional teaching methods

---

- “Active learning increases student performance in science, engineering, and mathematics” (Freeman et al, 2014)
- “Various findings across 138 analyzed studies indicate a clear, positive trend favoring inquiry-based instructional practices, particularly instruction that emphasizes student active thinking and drawing conclusions from data.” (Minner et al, 2009)
- “The commonplace science instruction resulted in a detectable achievement gap by race, whereas the inquiry-based materials instruction did not.” (Wilson et al, 2009)

Research shows that student-centered teaching methods are more successful than traditional teaching methods

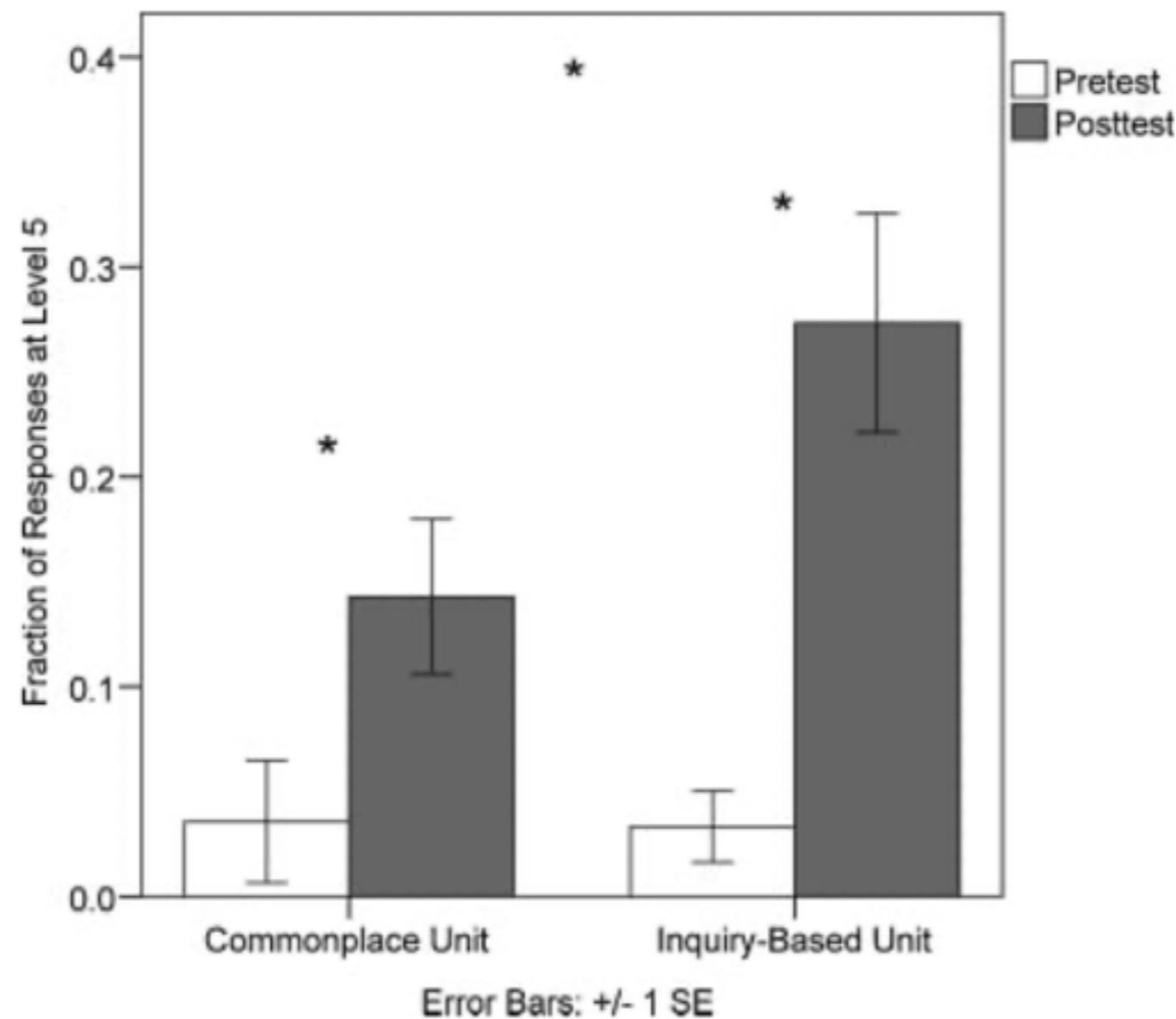
- “Active learning increases student performance in science, engineering, and mathematics” (Freeman et al, 2014)



Research shows that student-centered teaching methods are more successful than traditional teaching methods

---

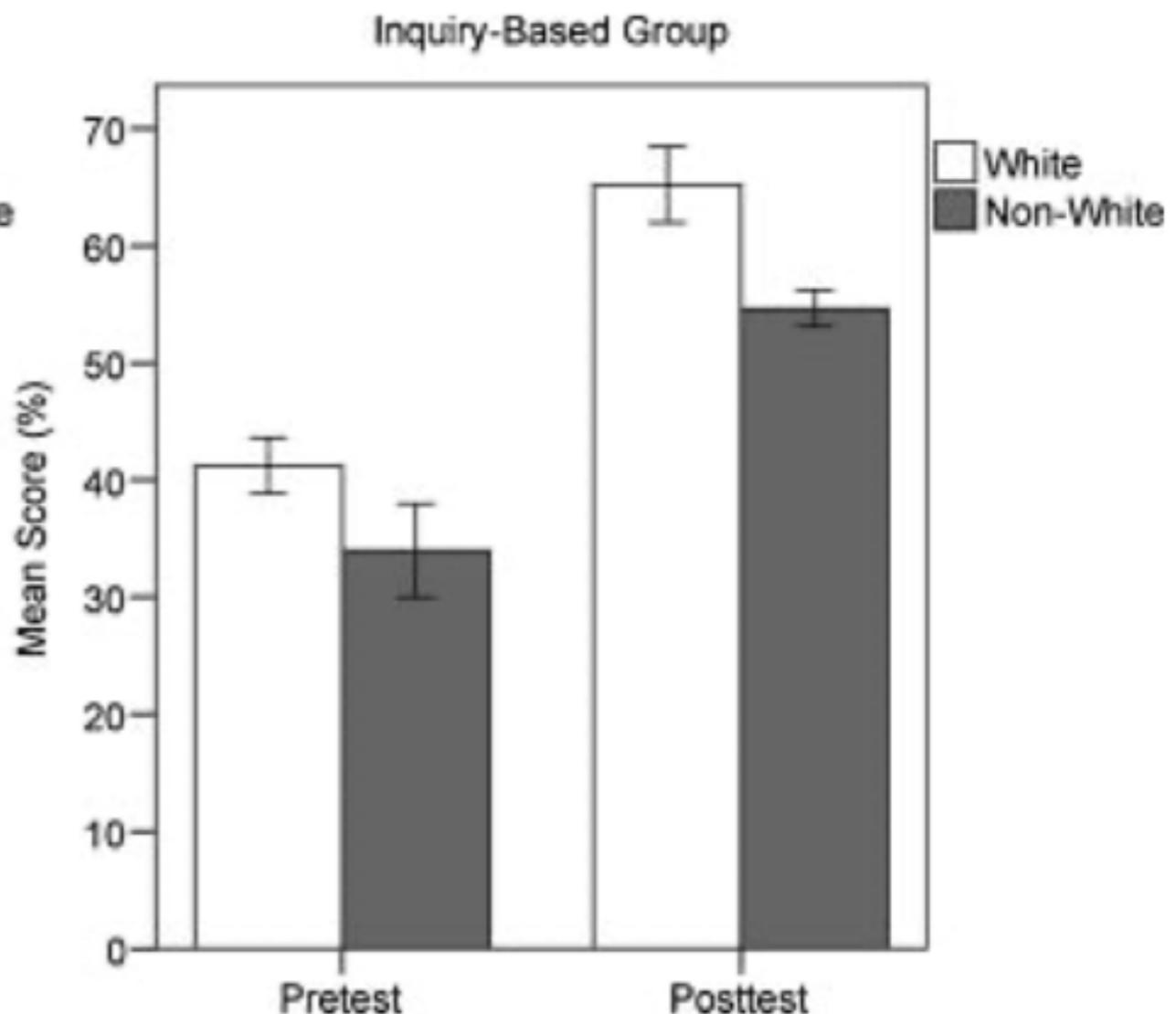
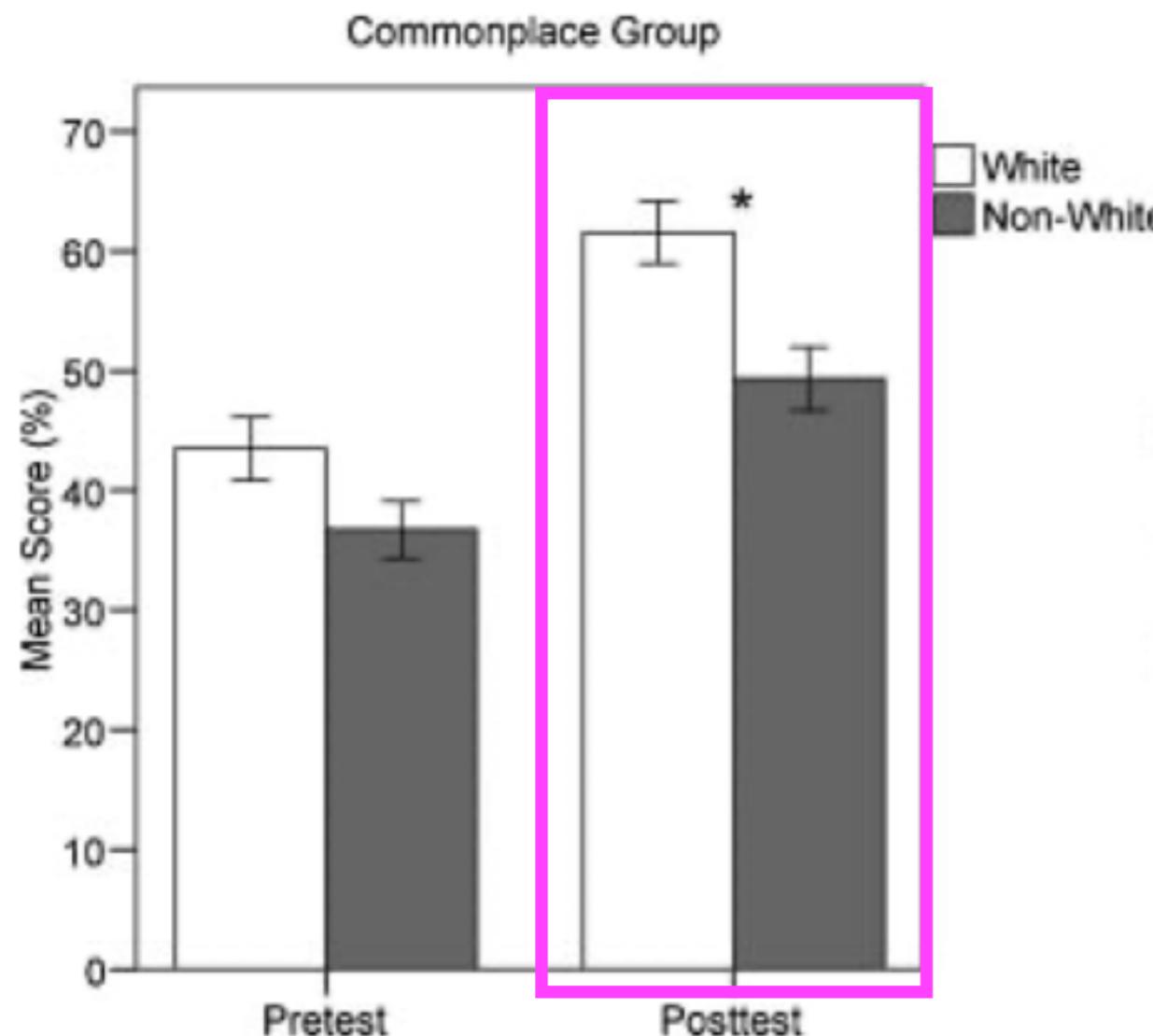
- “The commonplace science instruction resulted in a detectable achievement gap by race, whereas the inquiry-based materials instruction did not.” (Wilson et al, 2009)



Research shows that student-centered teaching methods are more successful than traditional teaching methods

---

- “The commonplace science instruction resulted in a detectable achievement gap by race, whereas the inquiry-based materials instruction did not.” (Wilson et al, 2009)



# Big ideas from today's talk

---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

# What is my job and how does it relate to these big ideas?

- “Develop inclusive educational experiences and products for underserved groups”
- “We will develop programs to afford students opportunities to learn about ocean acidification and shellfish aquaculture through experiences and projects in the field, wetlab, and drylab.”



A photograph of a small sailboat with two masts and a yellow sail, carrying several people in orange life jackets. The boat is on a large body of blue water. In the distance, a range of mountains with snow-capped peaks is visible under a clear blue sky.

**Maritime High School**

# What is Maritime High School?

---

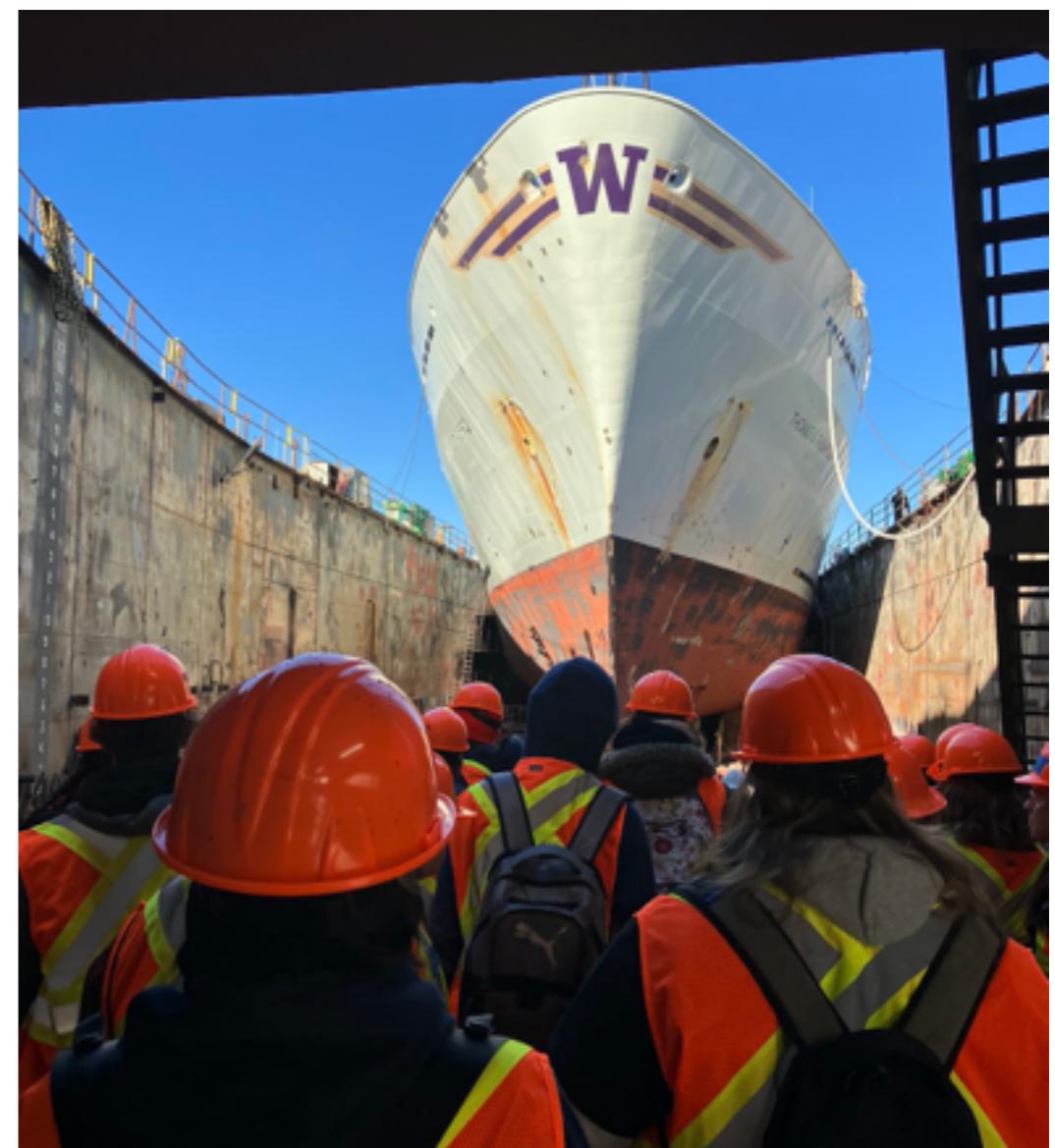
- Student-centered, equity-driven, maritime-focused
- Collaborative effort of Port of Seattle, Northwest Maritime Center, Duwamish River Community Coalition & Highline Public Schools
- Launched September 2021
  - currently has 9th and 10th graders



# What does education at Maritime High School look like?

---

- Project-based learning pedagogical approach
- Developing authentic, relevant skills to solve local & global problems
- Extensive field work and out-of-classroom learning
- Maritime industry partners



# What does project based learning at Maritime High School look like?

---

<b>Grade</b>	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>	<b>Quarter 4</b>
9	Duwamish River Communities	Microplastics	Vessels and Voyages	Water quality and systems
10	Fisheries and Aquaculture Management	Shipping and Port Operations	Marine Spatial Planning	Maritime of the Future

# All of these ideas are essential to produce a successful collaboration!

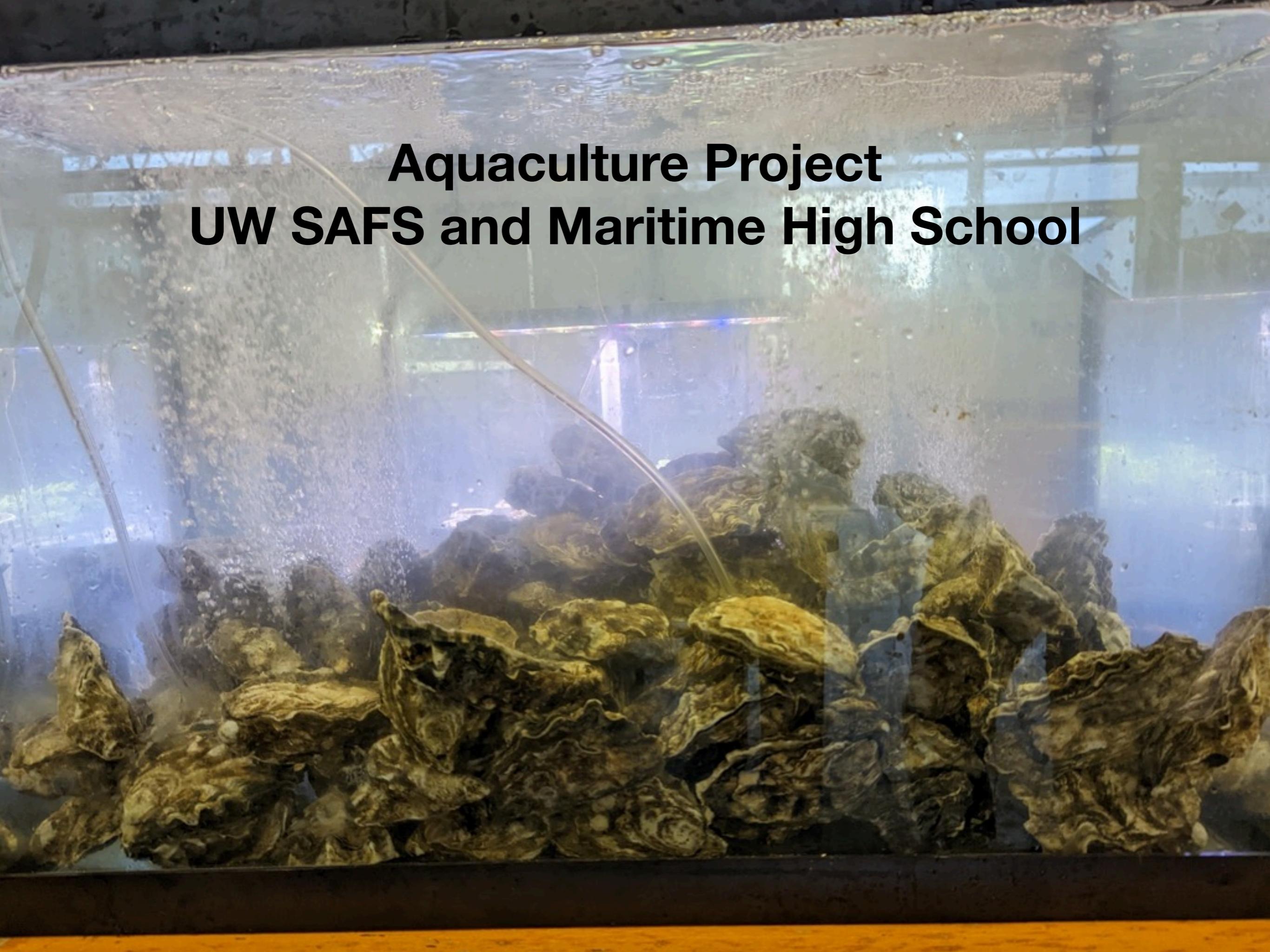
---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

# What does project based learning at Maritime High School look like?

---

<b>Grade</b>	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>	<b>Quarter 4</b>
9	Duwamish River Communities	Microplastics	Vessels and Voyages	Water quality and systems
10	Fisheries and Aquaculture Management	Shipping and Port Operations	Marine Spatial Planning	Maritime of the Future

A large, rectangular aquarium tank is shown from a slightly elevated angle. The tank is filled with clear blue water and contains numerous clusters of oysters attached to rocks. A thick, clear plastic tube or hose is submerged in the water, extending from the bottom left towards the center. The background shows the dark interior of a building.

# **Aquaculture Project**

## **UW SAFS and Maritime High School**

# How do you plan for a project on something when you are not an expert?

---

- What are the big ideas that we want students to know?
- What can they do that will show that they understand the big ideas?
- What learning experiences will enable them to learn the big ideas?
- Who are the maritime industry experts that we can partner with?

We worked with a range of community partners to develop the project and create on- and off-campus learning opportunities

---

- UW SAFS
- NOAA NWFSC
- Taylor Shellfish
- Pacific Hybreed
- King County Department of Natural Resources
- King County Water and Land Resources Division
- Puyallup Tribe
- Maritime Blue
- PlauchéCarr Legal Group



# Students participated in a variety of field work experiences

---

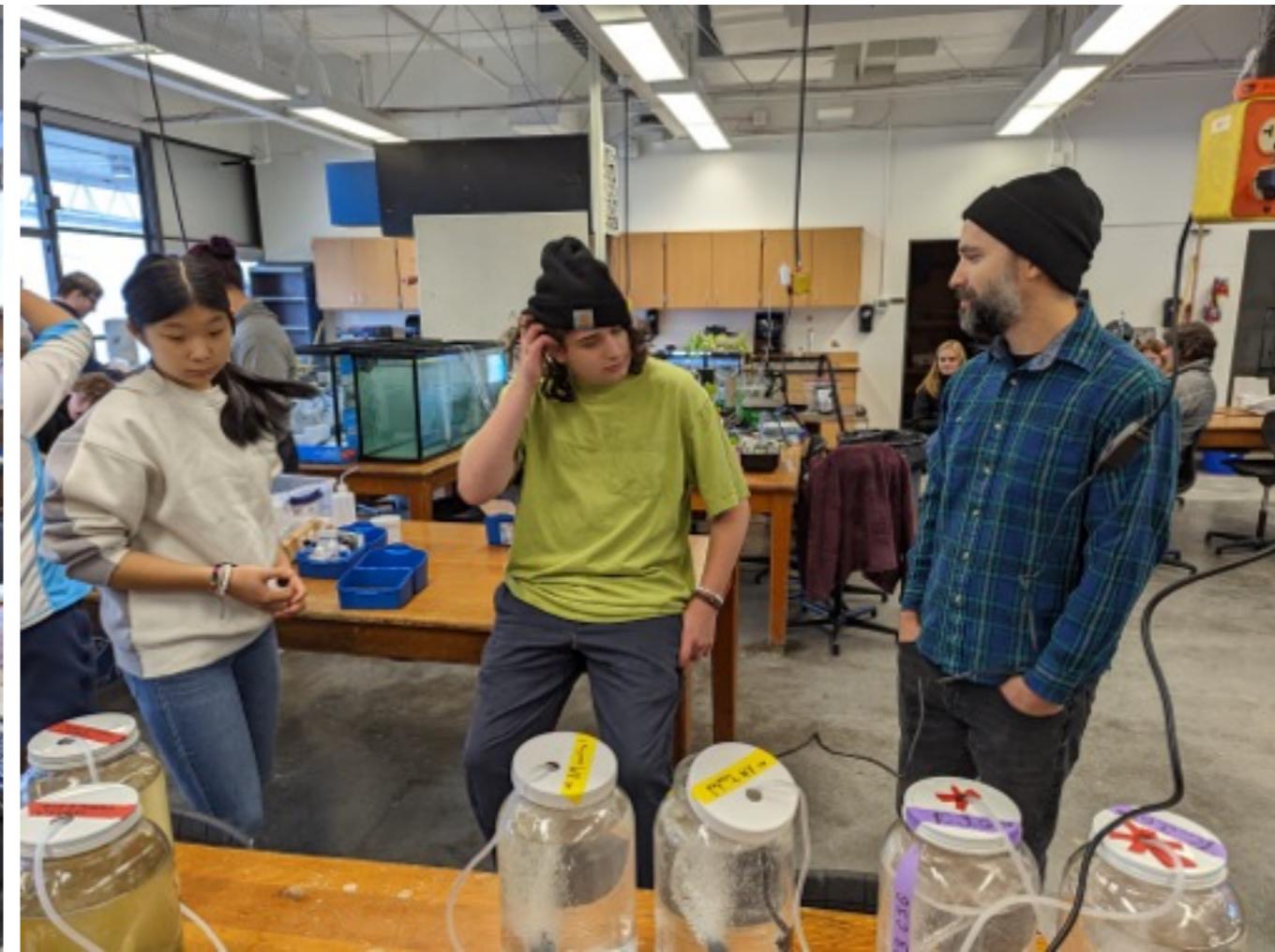
- NOAA Manchester Research Station:
  - Roberts Lab Ocean Acidification/Shellfish research
  - Pacific Hybrid Oyster hatchery
  - Puget Sound Restoration Fund
- MaST Center (Aquarium)
- Poverty Bay



# Collaboration with shellfish experts enriched the learning experience for students

---

- Scientists from UW, NOAA, King County
- Industry experts from Taylor Shellfish, PlauchéCarr
- Business experts



### (c) Bivalves



Student centered lessons using real data fostered understanding of complex science

- What do students already know about Puget Sound?
- What questions do students have about the ocean, climate change, and ocean acidification?
- How do different shellfish species relate to these oceanic conditions?

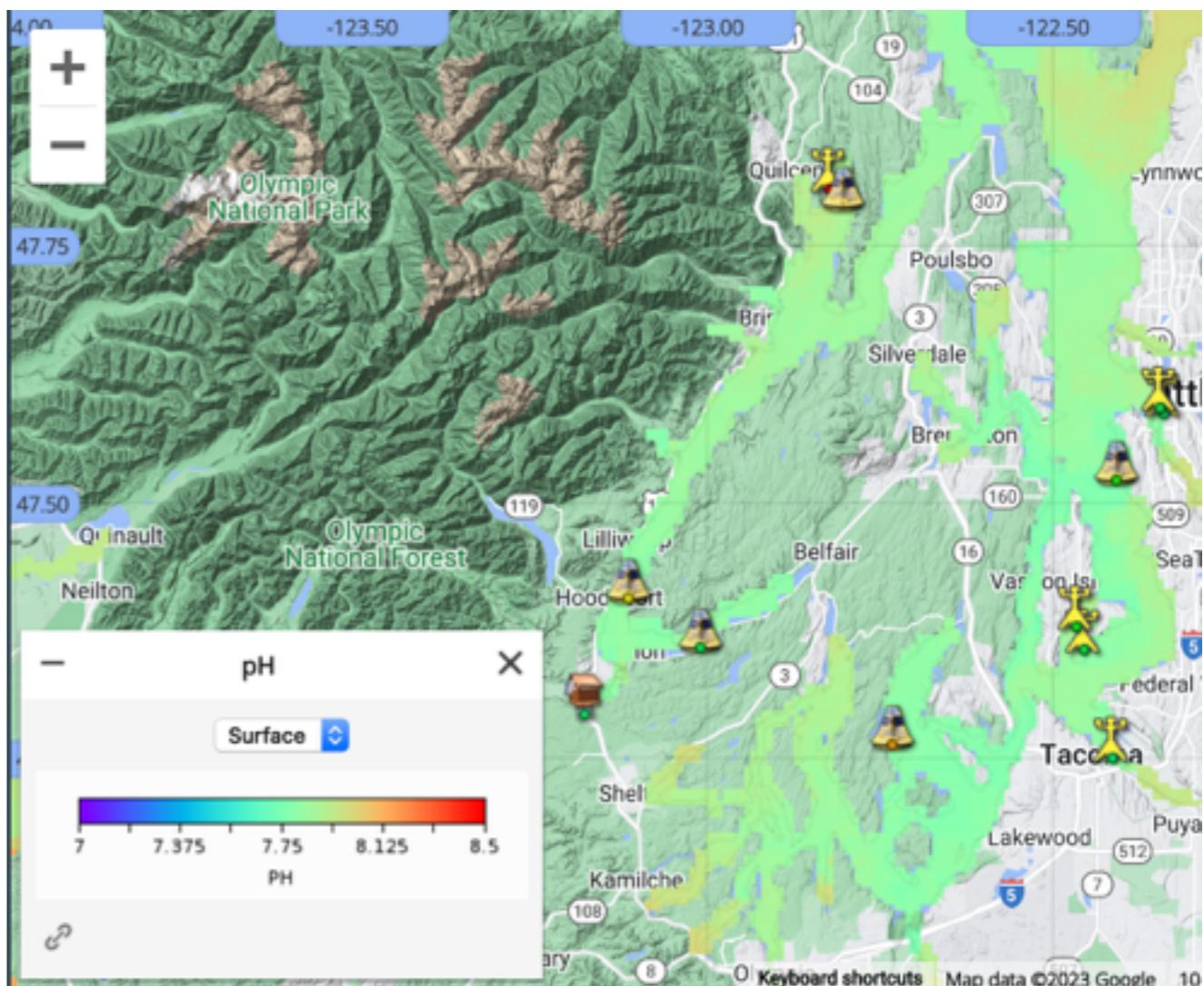
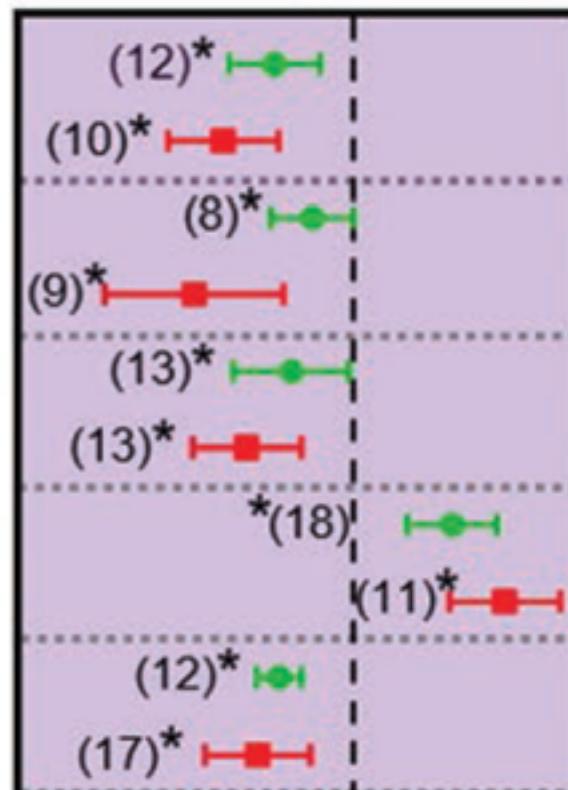
Fertilization

Hatching rate

Larval developmental rate

Abnormal larval development

Metamorphosis



# Big ideas from today's talk

---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

# What's next?

---

- Expand partnerships for this project
  - Pacific Shellfish Institute
  - Pacific Coast Shellfish Growers Association
- Identify new field work opportunities
- Build out genetics and climate change components of project

How can YOU be involved at Maritime High School  
(or other K12 schools)?

# Dedicated outreach positions are not the only model for sustained collaboration with K12 schools and teachers!

---

- Each year, Puget Soundkeepers works with students in the field and in the lab to do environmental micro plastics and water quality analysis.
- Former UW student/APL researcher currently mentor the Maritime High School ROV team



# Partner with Students Explore Aquatic Sciences (SEAS) to develop (and teach?) lessons!

---

- SEAS seeks to increase access to and promote career options in aquatic and fishery sciences for K–12 students in the Seattle area.
- SEAS has several classroom lessons developed already, and we are working together to develop more.
- [seasafs@uw.edu](mailto:seasafs@uw.edu)



# Partner with Students Explore Aquatic Sciences (SEAS) to develop lessons!

- Currently developing a lesson framework to facilitate student-centered lesson design and facilitate communication with teacher partners

1	Topic	Lab Men
2	Salmon sex determination assay	Mac (+ R)
3	Intertidal ecology	Chris + e Ariana
4	Marine heatwaves	Matt + ev Rosalind Ariana
5	Marine organism life histories/reproduction	Ariana
6	European green crab	Sarah, Z:

## ENGAGEMENT

- Describe how the teacher will capture students' interest.
- What kind of questions should the students ask themselves after the engagement? (please note that as much as possible the goal is to build on student questions rather than purely teacher questions)

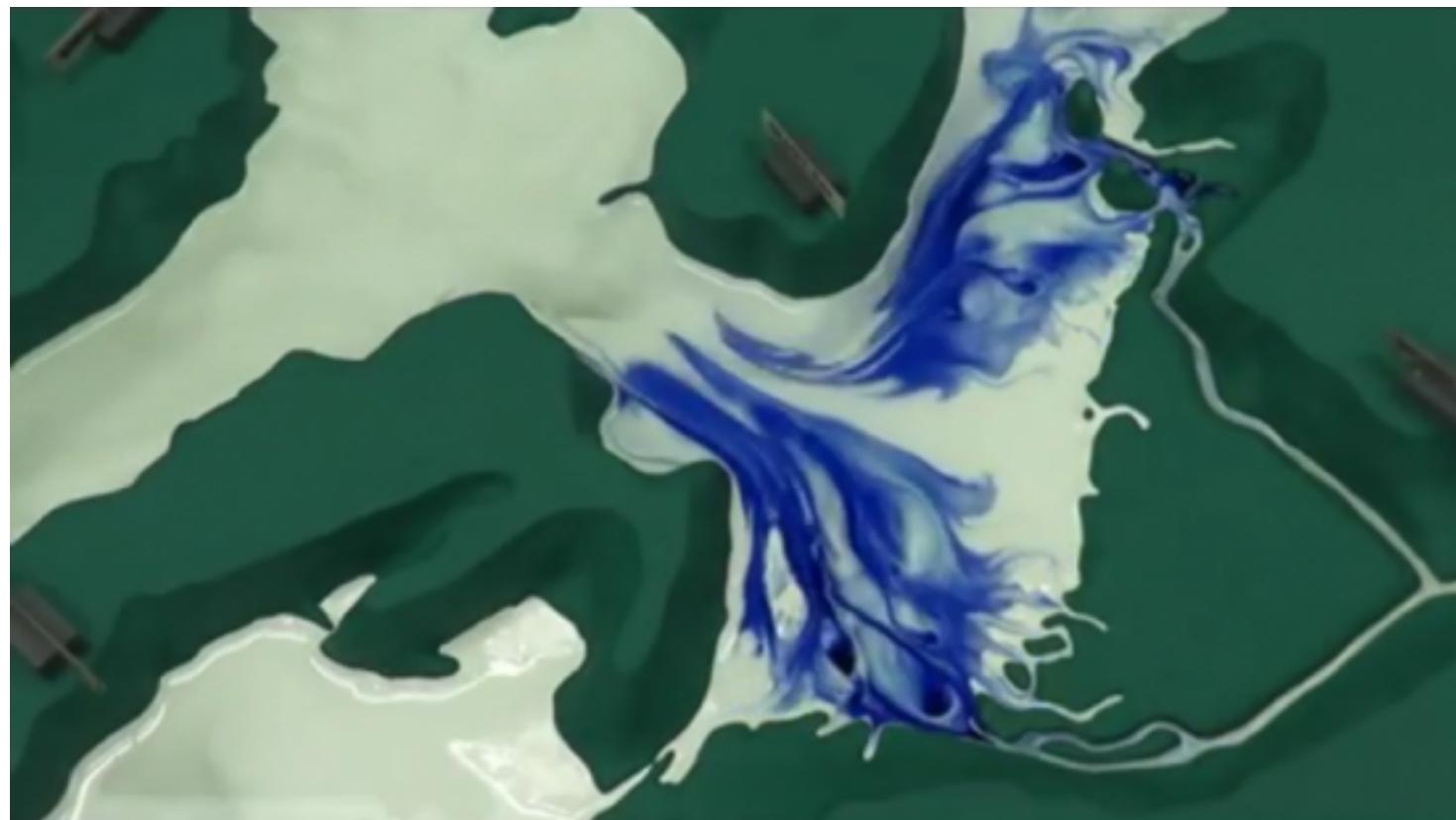
## EXPLORATION

- Describe what hands-on/minds-on activities students will be doing.
- List "big idea" conceptual questions the teacher will use to encourage and/or focus students' exploration

# Host a campus visit from students that relates your research to classroom learning

---

- What is special about the research you do?
- What are students learning in school?
- How can your research support student learning?



Picture Credit: Richard Strickland, Encyclopedia of Puget Sound

Picture Credit: Dennis Wise, UW

# Host students for an internship!

## CHARACTERISTICS OF HIGH QUALITY INTERNSHIPS



**Skill Variety**  
Am I using a variety of skills to complete a task?



**Task identity**  
Do I see the bigger picture and the end product?



**Task Significance**  
Is the task meaningful?



**Autonomy**  
Do I have the ability to plan and make decisions to best complete the task?



**Feedback**  
Am I receiving continual feedback to get better at what I do?

[\(Getting Smart / GPS Education Partners, 2022\)](#)

- Our vision is that every MHS 11th & 12th grader will have multiple high-quality internship experiences
- Internships will be tailored to every student & worksite, but generally aim for 1 full day per week for at least 1 quarter (~8-10 weeks).

# Explore hosting students for an internship!

---

Get more info from the Maritime High School team:

- Tuesday, Feb. 7 @ 8:30-9:30 AM (zoom)
- Wednesday, Feb. 8 @ 4:30-5:30 PM (in person on MHS campus)
- Thursday, Feb. 16 @ 12:00-1:00 PM (zoom)
  
- Reach out for RSVP info

# Big ideas from today's talk

---

- Efforts to support learning in K-12 classrooms should reflect good science teaching
- Outreach with K-12 classrooms benefits from sustained collaboration
- Identify what special skills, tools, resources, and knowledge you have to share

# Acknowledgements

---

- Roberts Lab
- Maritime High School Staff and Students
- Northwest Maritime Center
- Funding: Sea Grant and NOAA



**Roberts Lab**

School of Aquatic and Fishery Sciences  
University of Washington



**MARITIME**  
**HIGH SCHOOL**





**What questions do you have?**