

OOI Data Labs Workshops: Equipping professors with the tools to tap into a fire hose of ocean data for undergraduate education



Anna Pfeiffer-Herbert, Dax Soule, Brooke Love, Ellen Altermatt, Janice McDonnell, Sage Lichtenwalner,
Catherine Halversen, Ellen Iverson, Kristin Hunter-Thomson, Denise Bristol

Ocean Sciences Meeting

February 18, 2020

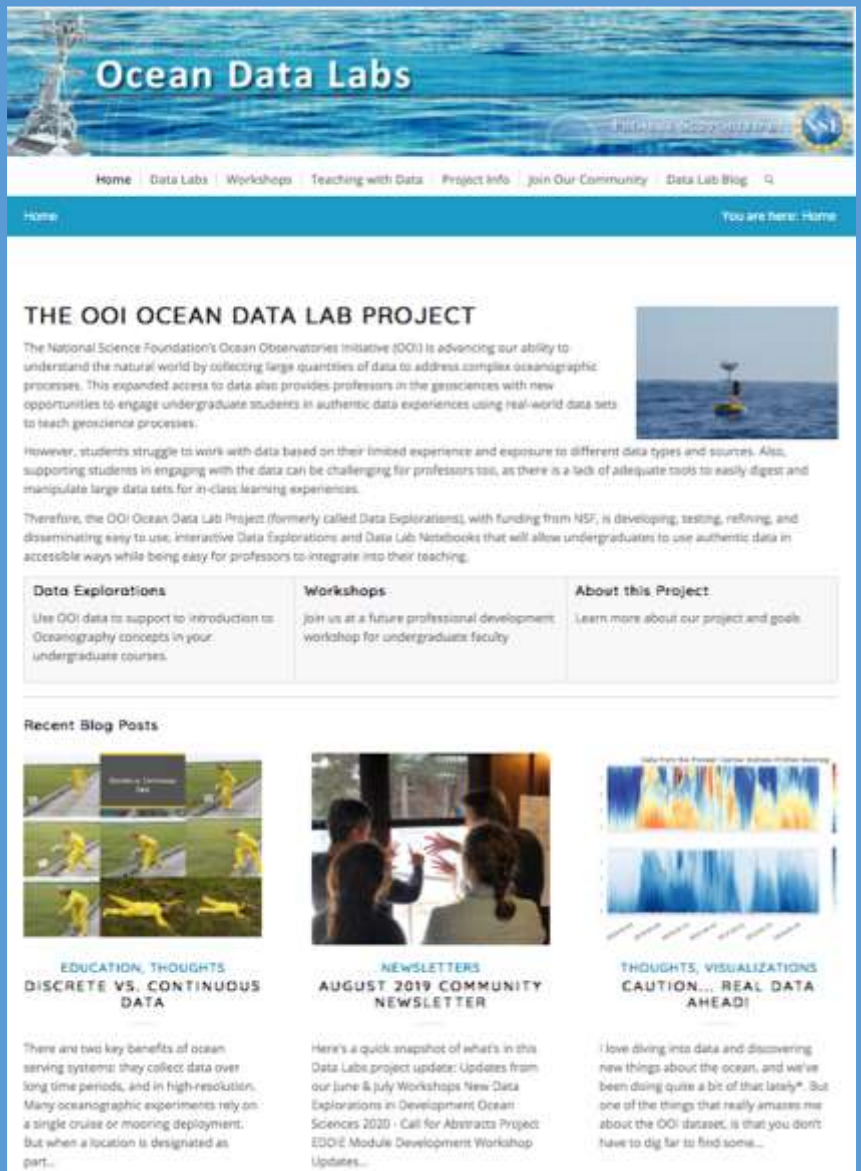
datalab.marine.rutgers.edu



OOI Data Labs Project Goals

- 1) Address the challenges of teaching with data & **support opportunities for professors and undergraduates to become more expert users of OOI data**
- 2) Increase **undergraduates' engagement** in and understanding of core oceanography concepts through use of OOI data

<http://datalab.marine.rutgers.edu>



The screenshot shows the homepage of the OOI Ocean Data Labs project. The header features the title "Ocean Data Labs" and a navigation menu with links for Home, Data Labs, Workshops, Teaching with Data, Project Info, Join Our Community, and Data Lab Blog. Below the header, the main content area is titled "THE OOI OCEAN DATA LAB PROJECT" and includes a brief description of the project's goals and challenges. A small image of a buoy is visible on the right. Below the main text, there are three columns of content: "Data Explorations" (describing the use of OOI data in undergraduate courses), "Workshops" (inviting participation in a professional development workshop), and "About this Project" (providing more information). A "Recent Blog Posts" section follows, featuring three articles with images and titles: "EDUCATION, THOUGHTS DISCRETE VS. CONTINUOUS DATA", "NEWSLETTERS AUGUST 2019 COMMUNITY NEWSLETTER", and "THOUGHTS, VISUALIZATIONS CAUTION... REAL DATA AHEAD!". The bottom of the page shows a large image of a research vessel at sea, with the OOI logo on the left and the NSF logo on the right.

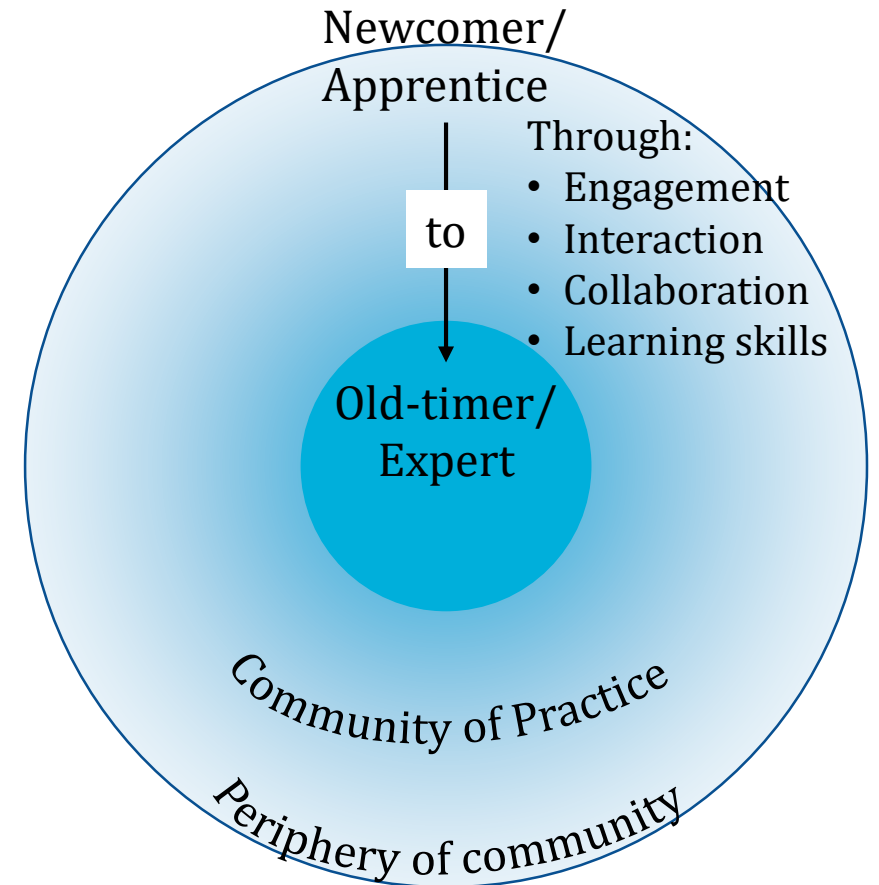
Our professional development model is grounded in educational theory



Community of Practice (CoP)

Learning defined as ...growth in one's ability to participate meaningfully and centrally in communities of practice [Lave, 1991]

- Novices begin by taking on simple but valued tasks
- As novices continue to participate and learn, they move towards the center of the community



Building a CoP Using OOI Data in Teaching

Sustained professional development opportunities

Facilitating sharing of ideas and teaching practice



OOI Data Explorations Collections - Project Info- Data Labs Home

Primary Production Chlorophyll-a Across the Year Exploration

Chlorophyll-a Across the Year Exploration

Challenge Question

What can we observe about chlorophyll over a year?

Select a season to zoom to see: [Full Year](#) [Summer](#) [Fall](#) [Winter](#) [Spring](#)

[Download this Dataset](#)

Your Objective

Chlorophyll-a Concentration data among the seasons in the Temperate Pacific Ocean ([Coastal Endurance Array](#)) to see what you can observe.

Data Tip: Select different seasons to explore the data in ways that interest you. Zoom in and out of the data to look at different time scales that interest you.

Interpretation and Analysis Questions

1. What did you find interesting about what you observed in the data about chlorophyll-a concentration over a year?
2. Did you observe any patterns? If so, what were the patterns and for which variables?
3. What questions do you still have about chlorophyll-a concentration over a year?

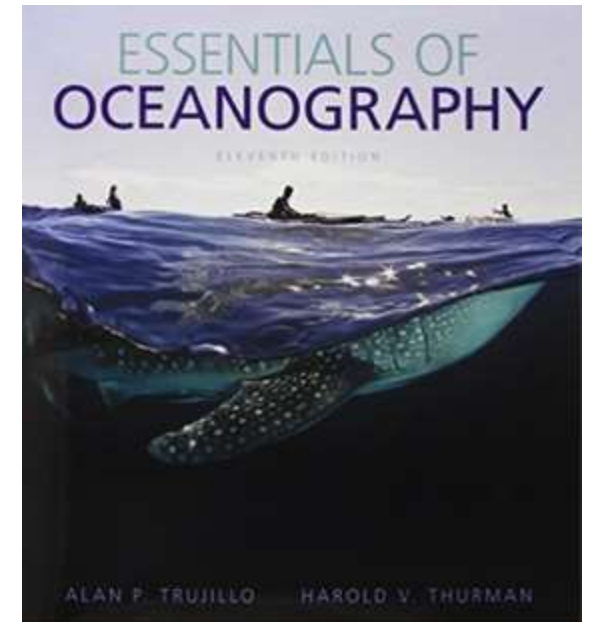
Background Information

Click on the images below to learn more about where and how the dataset above was collected.

OOI Data Labs: Integration of OOI data into Introductory Oceanography courses

← Online interactive data activities

Connected to core concepts →



Data Labs are structured in learning science theory

Example Data Interactive from The OOI Data Explorations Project

Seasonal Variation of Surface Salinity

Explore and analyze patterns in how surface salinity changes over time.

This activity has the following variations:

- Exploration**
Use salinity data across different periods of time from the North Pacific Ocean to look if there are patterns over a year.
- Application**
Use salinity data across different time periods to determine if there are relationships over time across different regions of the ocean.

Exploration
The exploration phase focuses on exploring data to see what you can observe.

Application
The application phase focuses on comparing patterns to determine relationships in the data in time and space.

Concept Maps
Concept maps can be used to support the learning cycle—especially invitation and reflection phases.

```
graph TD; Invitation((Invitation)) --> Exploration((Exploration)); Exploration --> ConceptInvention((Concept Invention)); ConceptInvention --> Application((Application)); Application --> Reflection((Reflection)); Reflection --> Invitation;
```

Learning Cycle:
Invitation – Exploration –
Concept Invention –
Application – Reflection

[Lawrence Hall of Science, UC Berkeley]

Data Labs Development Workshops Offered

- ✓ Princeton, NJ – March 8-13, 2019
- ✓ Rutgers University, New Brunswick, NJ
June 1-6, 2019
- ✓ Asilomar Conference Center, Monterey, CA
July 22-26, 2019
- ✓ Western Washington University, Bellingham, WA
August 19-23, 2019



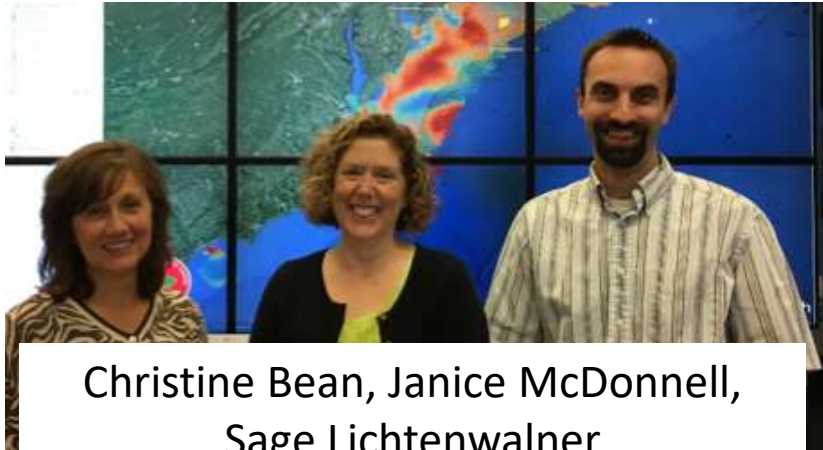
Building an Ocean Data Lab

A workbook for the
OOI Ocean Data Labs Workshop
March 8-13, 2019, Princeton, NJ
Hosted by Rutgers University

This notebook and workshop were developed with the support of the National Science Foundation under Grant No. OCE-1831625. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.



Workshop Team



Christine Bean, Janice McDonnell,
Sage Lichtenwalner
Rutgers University



Catherine Halversen
UC Berkeley



Dax Soule
Queens College CUNY



Anna Pfeiffer-Herbert
Stockton University



Brooke Love
Western Washington Univ



Denise Bristol
Hillsborough CC



Data Labs Workshop Goals

- Learn about the OOI program and key science questions
- Access existing tools and resources designed to integrate OOI data into undergraduate teaching
- Introduction to Python as a tool for working with OOI data
- Learn how to effectively incorporate data into undergraduate teaching
- Create a customized new resource to bring OOI data into their classes
- Network with other professors interested in using oceanographic data in undergraduate teaching



Data Lab Workshop Agenda

Goal: Participants develop a customized resource to bring OOI data into their classrooms.



Day One: OOI Background

Engage in hands on investigations of our collection of classroom ready Data Labs that use real time data from the OOI.



Day Two: Exploring Python

Build pedagogical skills and discuss data literacy for students. Generate ideas for how to bring OOI into an oceanography course.



Day Three: Creating a Plan

Provide a chance to step back and think about pedagogy & strategies for creating an on ramp for student success with data exploration.



Day Four: Develop & Refine Data Lab

Engage in Backwards Design planning and work with the Data Lab team to develop a customized product.



Day Five: Reflection & Presentations

Participants present their progress and receive feedback from the group on improvements and next steps for their Data Lab.

Outcomes from Development Workshops

- 56 professors from 2-year, primarily undergraduate, and research institutions participated
- Five new data labs developed, several more in development
- Idea to develop an online OER lab manual → implemented



Posters on OOI Data Labs Today

Poster Hall C-D
4-6 pm

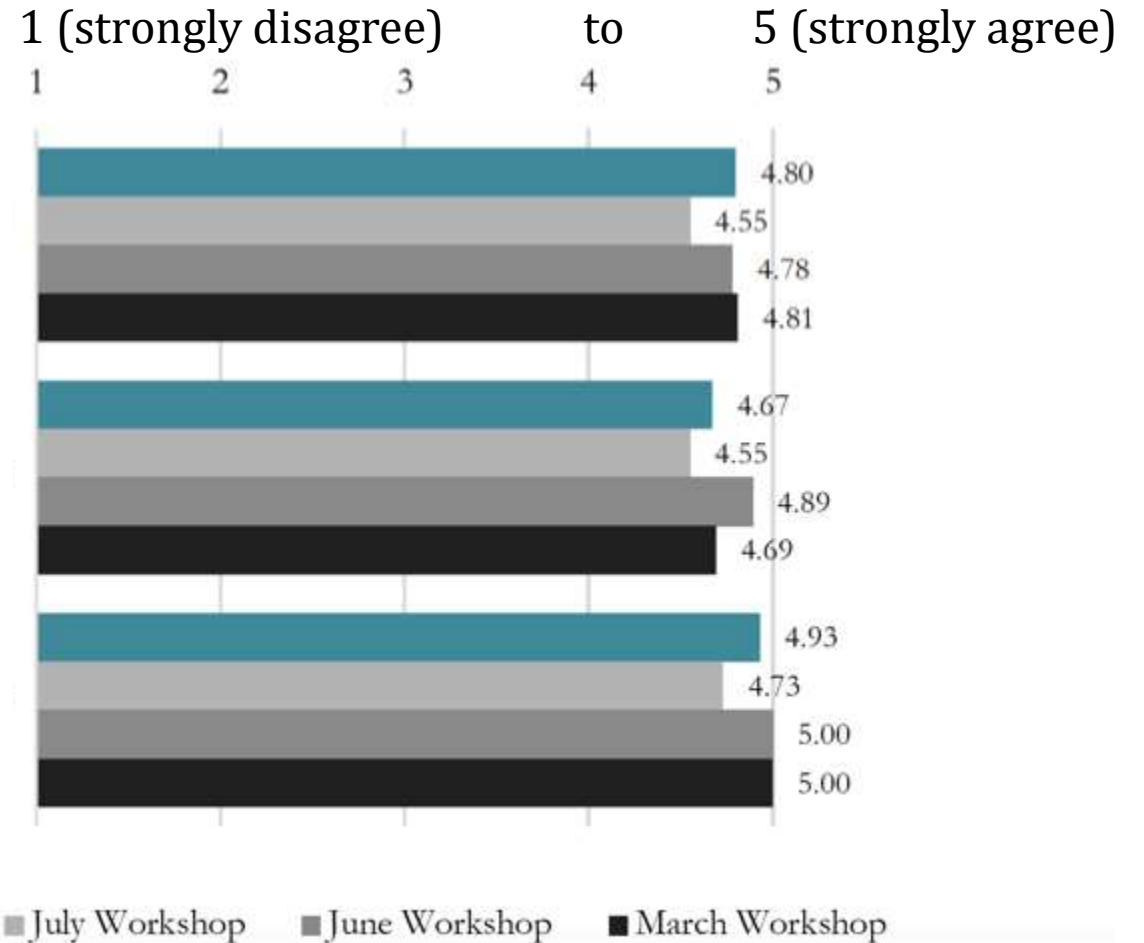
- Exploring seasonal variability in mixed layer depth (Eveleth)
- Oceans and the Carbon Cycle: What drives air-sea exchange of CO₂? (Rhew)
- Factors affecting primary production in the southern hemisphere polar Pacific Ocean (DiSantis)
- Oceans of data: Enhancing data literacy by bringing real data into introductory oceanography courses (Nuwer)
- Solving challenges of integrating large datasets into community college asynchronous online science classes by using a scaffolded-learning-cycle approach (Bristol)
- *And more!*

Outcomes from Development Workshops

Learn about the key scientific questions the OOI program seeks to address

Develop the skills and knowledge to use OOI data effectively to help students to be more expert users of data

Network with other professors interested in using oceanographic data in undergraduate teaching



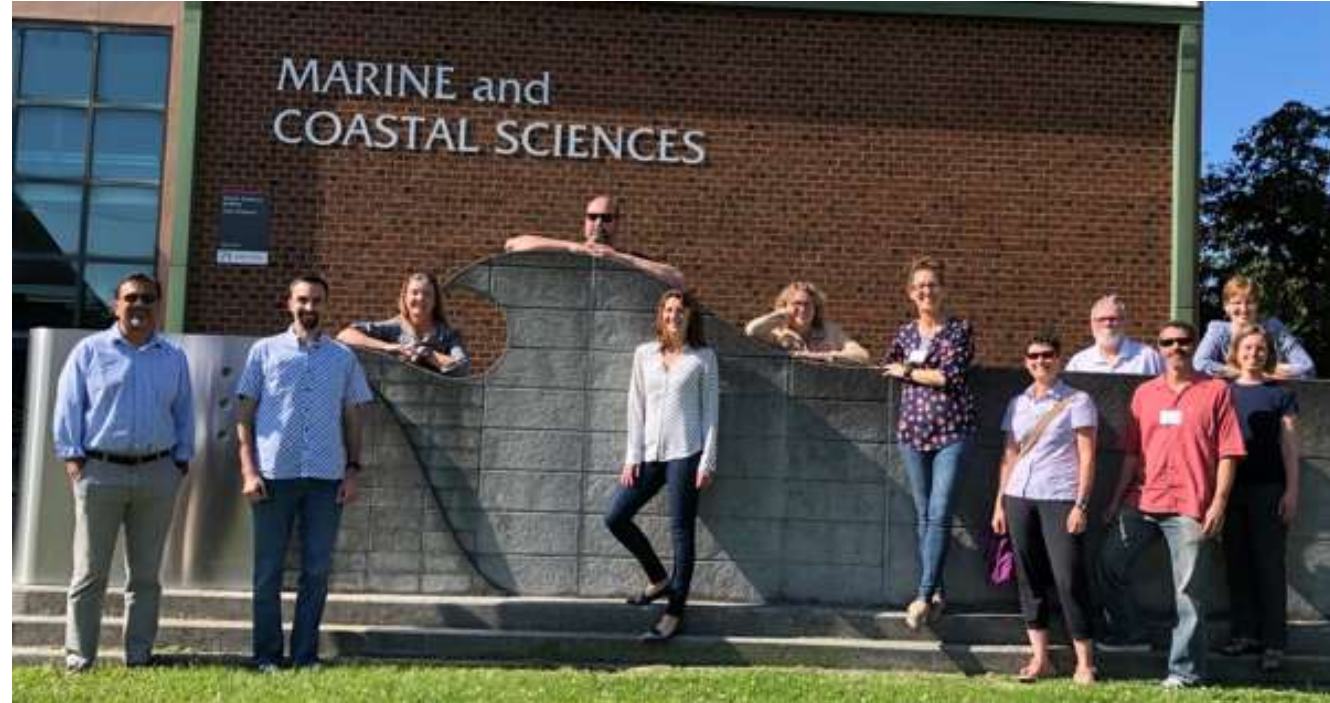
Participant Interviews: Evidence of sustained engagement

- **5 of 6** interviewees reported that they had already **introduced OOI materials into their classrooms** (3-6 months post workshop).
- **5 of 6** interviewees indicated a **desire for continued involvement** with the OOI Data Labs project, beyond continuing to use OOI materials in their classrooms
- **All 6** interviewees indicated that they **found value in their involvement** with the OOI Data Labs project and expressed appreciation for the efforts of projects leaders to create a **welcoming, supportive environment** and support to faculty following the workshop.



Constructing a Path for OOI Data Labs CoP

- Mentorship: Follow up conference calls post-workshop
- Newsletter: Celebration of successes, sharing ideas
- Webinars by workshop participants and project team
- 2020 OOI Data Lab Fellows
- Scholarly presentations at conferences/meetings



The growing Ocean Data Labs community



- Data Exploration pilot testers (27)
- Data Lab developers (56)
- 2020 Data Lab Fellows (11)
- Data Lab project team leaders

<https://datalab.marine.rutgers.edu/community-map/>



Resources

- Data Lab collections and news on website
- New video added to *Tools of Science* series on YouTube
- Open source Data Lab Manual (coming Fall 2020)

Sign up for the Data Labs newsletter:

<http://datalab.marine.rutgers.edu>

