An Update on the OOI Data Explorations/Data Labs
Presentation to the OOI FB
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Janice McDonnell and Sage Lichtenwalner
data_lab.marine.rutgers.edu
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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

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OOI Data Labs Project

Key Goals

• Build a **Community of Practice (CoP)** of undergraduate educators, interested in using OOI data with their students

• Make OOI data more **accessible** to educators and students
Our Professional Development Model
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

Diagram:
- Newcomer/Apprentice
- Through: Engagement, Interaction, Collaboration, Learning skills
- Old-timer/Expert
- Community of Practice
- Periphery of community
Building a CoP Using OOI Data in Teaching

Sustained professional development opportunities

Facilitating sharing of ideas and teaching practice
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

Data Labs combine current learning science theory (learning cycle), data visualization user design, and effective teaching practices to provide easy-to-use interactive experiences with real data.
OOI Data Labs
A Summary of our project milestones

590 scientists
2 undergraduates built a database of professors from around the country teaching Oceanography 101 like courses.

56 professors
4 week long workshops.
- Chauncey Center - Princeton, NJ.
- Rutgers University - New Brunswick, NJ.
- Asilomar- Monterey, CA.
- Western Washington University - Bellingham, WA.

60 professors
2 workshops focused on using OOI Data Labs in the classroom.
- Earth Science Teachers Rendezvous in Nashville, TN July 2019
- Ocean Science Meeting in San Diego, CA in February 2020.

11 professors
4 webinars featuring data labs developed by workshop participants.
11 professors led these webinars.

11 professors
1 design workshop to develop an open source and online laboratory notebook that will serve as a companion online lab manual for oceanography courses.

11 fellows
7 professors are collecting data and feedback from students on the efficacy of the Data Labs.
4 are creating new Python notebooks with OOI data.

13 professors
13 professors volunteered to be mentors in a virtual REU using OOI data in an online REU program.

Comprehensive Database
Development Workshops
Implementation Workshops
Webinar Series
Open Source Lab Notebook
Fellowship Program
REU Program

Fall 2018
Spring 2019
Summer 2019
Fall 2019
Winter 2020
Winter 2020
Summer 2020
Evaluating our Success

• Led by Dr. Ellen Altermatt, Carleton College
• Formative and Summative surveys
• Interviews

Development Workshop Evaluation Results

1 (strongly disagree) to 5 (strongly agree)

- Learn about the key scientific questions the OOI program seeks to address
  - August Workshop: 4.80
  - July Workshop: 4.78
  - June Workshop: 4.81
  - March Workshop: 4.78

- Develop the skills and knowledge to use OOI data effectively in undergraduate teaching to help students to be more expert users of data
  - August Workshop: 4.67
  - July Workshop: 4.55
  - June Workshop: 4.89
  - March Workshop: 4.69

- Network with other professors interested in using oceanographic data in undergraduate teaching
  - August Workshop: 4.93
  - July Workshop: 4.73
  - June Workshop: 5.00
  - March Workshop: 5.00
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/
What is Data Labs trying to accomplish?

OOI
Data + Science

Education

Data Explorations

Data Workshops

Data Science
Coding/Python

Data Sci Bootcamps
Development Workshops–Interactive Widgets

• 18 Pilot Data Explorations (from 2016-2017)
• 13 New Data Explorations from 2019 Workshops
  • Many have 2-3 variants

Development Tools:
• dygraphs.js – Used for most time-series widgets
• d3.js – More complex widgets, including profiles
• Leaflet.js - Spatial maps
Exploring Data

Chlorophyll-a in Upwelling and Stratified Temperate Regions

- Karen Baker, Orange Coast College
- Claire Condie, Middlesex County College
- Robert Ellis, Orange Coast College
- Colleen Petrik, Texas A&M University
Focus + Context

Thermohaline Circulation

- Rich Dixon, Texas State University
- Nicholas Beaird, Rutgers University
Compare Variables and Locations

Changes in Salinity

- Michael Phillips, Illinois Valley Community College
- Karen Helgers, SUNY Ulster
- Jessica Olney, Hillsborough Community College
- Matthew Semcheski, Florida Keys Community College
Guided Learning

Anoxic Events

• Kathy Browne, Rider University
• Lauren Sahl, Maine Maritime Academy
• Rebecca Freeman, University of Kentucky
• Gabriella Smalley, Rider University
• Carol White, Southern Maine Community College

Finally, we’ve highlighted the periods of Northward and Southward winds on all of the graphs. Take a look again at the other variables to see how they change during the periods of N or S winds. What relationships do you see?
Student Predictions

Dynamic Air-Sea Interactions

• Jacqui Degan, Cape Fear Community College
• Melissa Hicks, Onondaga Community College
• Siddhartha Mitra, East Carolina University
• Paul Webb, Roger Williams University
Development Workshop– Python/Matlab/R Notebooks

Notebooks can be used for:
• Tutorials
• Exercises/practice (in-class or out)
• Guided discovery
• Self-directed inquiry (aka research projects)

Enables Community Driven interactive datasets, lessons and research

• 31 Example OOI Data Processing Notebooks to date

• 4 “Data Labs Fellows” working on Educational notebooks

New visualization libraries enable interactive exploration
• Altair
• HoloViz
Fellowship Program

• 7 fellows are IRB approved to test DL in their classrooms
• Impacted by COVID-19

12:24pm Janie J. commented on OOI Virtual Field Trip Resources
You folks are the BEST! I like to provide background information to my students as how certain ideas/concepts/theories evolved when we are studying them. In fact, sometimes the history is more interesting than the theory. This is exactly what I needed to "set the scene" for them. Thanks a bunch!

5:00pm Tracy Q. answered: Very briefly, what have you been working on or accomplished during the past 2 weeks?
In the way of programming, I've been knocking off one challenge only to find another. As Tom said, we've been doing a lot of communal problem solving, for which I am very grateful. On a more general note, I may be finally getting into a good work from home routine.

• 4 fellows are working on Python Notebooks
Evaluating our Community of Practice
Case Study #1 Kathy Browne, Rider University

- Participated in March Development Workshop (2019)
- Peer mentor in EER Implementation Workshop (July 2020)
- Lab Notebook Designer (January 2020)
- PI IUSE grant studying OOI data and learning
Case Study #2 Melissa Hicks, SUNY Onondega

Development workshop (June 2019)

Peer trainer/leader in a webinar (2020)

Data Lab Fellow (2020)
Case Study #3: Sean Crosby, Western Washington University

- Not on any of our original lists!
- Networked into project by WWU faculty
- Attended webinars as a participant
- Became a Data Lab Fellow (2020)
Case Study #4:
Anna Pfeiffer-Herbert
Stockton University

- 2016-17 - attended 2.5 day workshop
- Regional Facilitator and project team
- Peer presenter at 3 of 4 development workshops
- Co-facilitated OSM mini workshop
- Presented at OSM
- Co-editor / co-leader of DL Notebook cohort
- Volunteered to be a mentor
Building a CoP: Moving to the Center of the Community

Of the 116 we worked intensively with in workshops:

• 11 delivered OOI DL webinars, presenting the DL they had developed during workshop
• 11 became DL Fellows
• 11 are designing and building the DL Notebook
• 8 became peer presenters at mini workshops
• 10 presented on OOI at Ocean Sciences Meeting in San Diego, CA
• 13 volunteered to be an OOI Virtual REU mentor
Notable Professor Quotes

• “When I asked the students if they wanted to continue this; they overwhelmingly said ‘yes.’”

• “I was so excited about the data portal and the new data labs that my students and I look at either OOI data or some other data portal every single day in class.”

• “The data set is fantastic. One thing I would like to tell [project leaders] is that this gives the oceanography students the kind of skills which they can take even if they don't want to continue in the oceanography field.”

• “We had some really good discussions. It was one of the best weeks of the semester where students were engaged, they put the work in, and they really thought about the questions I was asking them.”
Summary

- 13 new Data Explorations/Interactives
- Building a promising CoP
- Reach Survey to be released May 15th
- Active Blog and mailing list
- Webinar series planned for Fall 2020
- New Video on Teaching with Data
- DL Online Manual for Oceanography 101
- Fellows program in Fall 2020
- REU with DL Alumni as mentors!
The Data Explorations – Design Process

- Identify Target Scientific Concepts & Skills
- Match with Research Results
- Find Available Instrument Data
- Cleanup the Dataset
- Make Interactives & Visualizations
- Add Educational Surrounds (Context)

Faculty Development Workshops
Science Papers e.g. OOI Special Issue

“Nuggets” from OOI 1.0 Data Review
https://datareview.marine.rutgers.edu/nuggets

Guidance from the Lawrence Hall of Science
- Active Learning
- The Learning Cycle
Constructing a Path

• Follow up ZOOM calls
• Lots of mentorship
• Celebration & recognition of success
• Scholarly presentations at conferences/meetings