Using Authentic Data from the Ocean Observatories Initiative in undergraduate teaching

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Greengrove et al., 2020, Oceanography
A team effort:
Leaders in using OOI data in education

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Why use authentic data in undergraduate teaching?

• Modeling the scientific process using real-world data is a high-impact educational practice
  (e.g. Rubin and Abrams, 2015; O’Reilly et al., 2017; Soule et. al., 2018; Deslauriers et al., 2019)

➢ Facilitates knowledge retention
➢ Development of more sophisticated cognitive skills

Bloom’s Taxonomy
The Ocean Observatories Initiative

- NSF-funded source of open access, continuous, long-term digital data
- Co-located measurements of physical, chemical, geological, and biological properties

7 different arrays
- Regional Cabled Array
- 2 Coastal Arrays
- 4 Global Arrays (2 still ongoing)

Over 800 different instruments
Over 200 unique data products
The Ocean Observatories Initiative

• NSF-funded source of open access, continuous, long-term digital data
• Co-located measurements of physical, chemical, geological, and biological properties

Many other presentations on OOI data & use in research & teaching throughout this week!
https://oceanobservatories.org/2020/02/ooi-at-ocean-sciences-meeting/

• 2 Coastal Arrays
• 4 Global Arrays (2 still ongoing)
Over 800 different instruments
Over 200 unique data products
OOI as an educational resource: Opportunities and challenges

Wealth of data illustrating core oceanographic concepts included in undergraduate curricula!

...however, finding & curating data poses a significant barrier for instructors.

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<th>OCEAN REGION (OOI SITE) SHOWCASING THE CONCEPT</th>
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See Greengrove et al., 2020 for the full table of resources!
# OOI as an educational resource: Opportunities and challenges

## Our goal: Summarize and share existing resources – and invite YOU to use what has already been created, and to develop new resources for the community.

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- **Well Developed Activities**
- **Some Teaching Materials Developed**
- **Opportunity to Develop Teaching Activities, Resources, and Best Practices**

Greengrove et al., 2020, *Oceanography*
Example Applications: Classroom activities

- Primary productivity
- Submarine volcanism
- Salinity/stratification

Activities interacting with online OOI data visualizations
Lectures or textbook information

All lesson plans and student worksheets: https://datalab.marine.rutgers.edu/tos-lesson-plans/

More in the OOI Data Explorations in the next talk, by Sage Lichtenwalner

Greengrove et al., 2020, Oceanography
Classroom Activities: Primary productivity

Textbook example:
Phytoplankton biomass seasonal cycle

Interactive Data Exploration:
OOI chlorophyll-a data from three different arrays

Greengrove et al., 2020, *Oceanography*
Classroom Activities: Primary productivity

- Student engagement with data through guided worksheets
- Pilot tested in Intro Oceanography courses at a regional public university, research-focused university, & small liberal arts college

Student learning goals spanning a range of cognitive skill levels:

- Formulate hypotheses about factors controlling primary production in different ocean regions
- Identify relationships among different parameters
- Analyze and interpret “messy” real data
- Identify, describe, and explain controls on primary production

Greengrove et al., 2020, *Oceanography*
Adapting Classroom Activities for Different Course Levels:

Data Exploration extension: chlorophyll and nitrate

Jigsaw activity comparing trends in temperature, chlorophyll, and dissolved oxygen

Greengrove et al., 2020, *Oceanography*
# OOI-driven teaching activities: Resources and opportunities

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Greengrove et al., 2020, *Oceanography*
Beyond the Classroom: Using OOI data in undergraduate research projects

- Reach top levels of Bloom’s Taxonomy
- Free online data enables authentic research experiences even without resources of a large research institution

Key challenge: Students need data science skills to process and interpret data

Opportunity to develop transferable materials for teaching data science skills

Greengrove et al., 2020, Oceanography
Beyond the Classroom: Using OOI data in undergraduate research projects

Opportunities for research students to go to sea with OOI:
Our invitation to you:
Use existing resources & join us in creating new ones!

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