



EPE 2012 COMMUNITY SURVEY: ASSESSMENT OF THE USE OF DATA IN UNDERGRADUATE TEACHING

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EPE 2012 Community Survey: Assessment of the Use of Data in Undergraduate Teaching

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Community Survey: Assessment of the Use of Data in Undergraduate Teaching 2012

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1 Executive Summary

The Education and Public Engagement (EPE) Implementing Organization (IO) is dedicated to developing data visualization tools that will facilitate the use of data from Ocean Observing Initiative (OOI) to enhance undergraduate teaching. In 2011, we conducted a needs assessment with selected members of the undergraduate teaching community (n=14) using in-depth interviews. These interviews (see “EPE Front End Evaluation of the Use of Data in Undergraduate Classrooms”) allowed us to shape our initial conceptualization of the beta tools to be developed by EPE.

We have conducted this community survey to gather data on the practices and needs of the undergraduate oceanographic community. Our objective was to 1) to quantify the number of undergraduate professors teaching ocean science and using data in their teaching, 2) some information on their teaching practices (how they were using data in teaching), and 3) information about their needs related to teaching with data in the ocean sciences.

The EPE team created a database of undergraduate professors from 196 institutions across the U.S. and Canada who teach an introductory level ocean sciences course. We also partnered with the Center for Ocean Science Education Excellence Pacific Partnerships (COSEE PP) to reach out to their established email list of approximately 223 community college professors. We got a 14% response rate. We followed up with a random sample of five professors from the list who did not respond to the survey to ask why they did not respond. The most common response was lack of time to fill out the survey, lack of familiarity with the EPE project, and that they did not currently teach undergraduate students and therefore did not feel it was appropriate for them to participate.

Below are the highlights of the response to the survey.

Who responded to our survey?

Approximately 54.3% of the respondents were male (45.1% female). The majority of the respondents were white/Caucasian (89.2%). Approximately 40.7% were mid career (10-24 years), 31.5% advanced career (>25 years), and 26% early career (0-9 years). The majority of respondents teach at universities/colleges (57.4%) and community colleges (37.7%), with a smaller percentage teaching from a research institution (11.5%). Most are teaching a general oceanography undergraduate course (54.5%), geology (32.6%), or

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marine science (32%). Our survey produced unclear results about their class size or the frequency with which they teach.

What role does data play in their teaching? What kind of data do they use?

The majority of those surveyed indicated that they do use (or plan to use) data in their teaching. In general the use of data appears to be a significant priority for professors. All respondents rated on a Likert scale (1 not important, 5 somewhat important, and 10 very important) the importance of using data in undergraduate teaching. The average importance (8.75) was slightly higher for early career then mid (8.2) and late (8.2) career scientists. They are most commonly using data from peer reviewed literature, archived data (>30 days old), and data they have collected themselves in their teaching. They are using online real time data least often.

Professors are most commonly incorporating data in their lectures (76.7%), in-class activities (65.3%), homework assignments (64.2%), and in laboratory assignments (63.6%). Results indicate that professors were most likely to use a lecture (no inquiry) teaching strategy when using data in their classes. Early career professors were likely to use a confirmation style inquiry teaching strategy, where students are asked to confirm previously learned materials. Structured inquiry, where students are given a question and procedures and are asked to make their own conclusions based on data, was equally likely among all career phases. All career phases were equally likely to use guided inquiry, where students are given a question and then asked to conduct an investigation. All career phases were not very likely to use open inquiry in their teaching at the undergraduate level.

Professors are using static images from textbooks or from the published literature when using a no inquiry or lecture teaching technique. Professors are using data from online services (archives) when using a structured inquiry technique, where students are given a question and procedures, but make their own conclusions based on data. Professors in confirmation style inquiry commonly use static images from textbooks or the published literature, where students are asked to confirm previously learned material. Students are asked to use data they have collected themselves in guided and open inquiry style teaching styles.

What kinds of datasets work well in teaching? Which do not work well in teaching?

Professors are looking for simple clearly defined variables that are easy for students to understand. Interfaces that integrate data and variables also were identified as important. They want datasets that are rich in terms of metadata (we can determine what was collected and how) and also that include visualization tools allowing for easy downloading (for incorporating into spreadsheets). Data should be available in a visual format, displayed on maps and graphs and in a table format.

Professors indicate that they are interested in using datasets that have been compiled specifically for teaching and have been tested by their peers. Long-established datasets (updated quarterly or monthly) that support an underlying principle or benchmark for the class being taught are preferred. The data set can be small and student collected or

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textbook sets that demonstrate a concept. Archived datasets evaluated ahead of time for instrumental effects and missing data are useful in teaching.

Datasets that are not useful in teaching include online datasets that are difficult to download and manipulate, including difficult formats or large multivariate tables, or difficult access issues. Professors were clear that they did not want to work with data that requires sophisticated software or advanced knowledge. Professors are concerned about large and overwhelming datasets that take a long time to figure out, are in challenging formats, require extensive mathematical calculations, and ones that have data quality issues. Datasets that are not adaptable (flexible) to learning goals are not useful in teaching. The data must be applicable to learning objectives of the course.

What datasets would professors like to use in their courses? What's on their "wish list" for the future?

Professors asked for more real-time oceanography datasets, especially those that integrate physical and biological principals. Additionally professors requested long-term time series that relate to marine environmental issues. For example, they would like more basic abiotic measurements over time (temperature, salinity, dissolved O₂, pH, etc.) compared to biological measures (chlorophyll, or species abundance). They requested additional datasets to support laboratories and discussions on climate change and ocean acidification, data from the OOI, and imagery (eg. demersal fish/plankton) to help provide context and meaning for the measurements.

Professors responded to a series of questions related to improving the use of data in teaching, on a likert scale with 1 = don't need much help, 3= could use some help, and 5= could use a lot of help. Early career scientists noted they could use the most help with 1) helping students choosing data to use in research/hypotheses, and 2) helping students develop hypotheses/questions related to data forming questions. On the average, professors noted they could use help finding appropriate data for their students. Advanced career professors seemed to also value help with visualizing data and converting data into different formats.

The EPE IO was pleased that 74% of the respondents wanted to remain on our database list for future information about OOI EPE. Approximately 59% wanted to be beta testers of data visualization and educational tools developed by the EPE and 47% as a reviewer of content/materials on using data to teach.

2 Overview

The Ocean Observing Initiative Education and Public Engagement (OOI EPE) Implementing Organization (IO) conducted a community survey in October 2012. The objective was to take the pulse of the undergraduate teaching community on their use of data in teaching and learning and to use this information to inform the development of data tools for the OOI EPE. The survey was designed to get a broad community response to the question of

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how authentic data is being used in undergraduate teaching, what kind of data is being used, and what strategies are currently employed to use data in teaching and learning.

3 Methods

The EPE User Engagement team consisting of the EPE liaisons (Fundis, Risien, and Kilb) and team members from Rutgers (Lichtenwalner and McDonnell), and the University of Maine (Companion and deCharon) worked together to develop a database of professor names, institution and email address for those teaching a geoscience course. We utilized lists of marine science institutions in two published reports including the Ocean Blueprint for the 21st Century Final Report of the U.S. Commission on Ocean Policy (Appendix 4 – list of U.S. ocean science facilities http://www.oceancommission.gov/documents/full_color_rpt/append_4.pdf) and the Guide to Marine Science programs in Higher Education (<https://www.mtsociety.org/pdf/EducationGuide/MTSEdGuideWebFINAL5-28.pdf>).

These lists were used to compile a master list of institutions that have significant marine science programs and undergraduate teaching programs. The User Engagement team then manually went through the websites of each institution on the list searching for department course information. The names of professors teaching oceanography courses, particularly 101/introductory level courses were recorded on a Google doc. The names were sorted for duplicates and compiled into a comprehensive database. A total of 1,083 names were collected from 195 institutions. A total of 41 emails were eliminated from the list (bounced or invalid email addresses). Finally, we collaborated with COSEE Pacific Partnerships (COSEE PP) to send the survey to their internal list of community college faculty (n=223). The final list was compiled with 1,265 validated email addresses. We offered an incentive of a Visa Gift card (\$200) raffle to help encourage participation in the survey.

A set of potential questions (items) was created and vetted by the EPE User Engagement team in Survey Monkey (www.surveymonkey.com). A professional evaluator was consulted to review and edit the survey for clarity.

The survey was launched on October 8, 2012 and closed on November 19, 2012. A total of 179 responses (14%) were received.

4 Results

For most questions with closed response choices (i.e., multiple choice or rating scale), we are reporting frequencies and percentages. For questions requiring open-ended responses (which are noted), we have organized and tallied responses based on categories and are reporting only the top response categories. For some questions respondents were allowed to check several answers (eg. Question 4) which results is significantly more than 179 responses to the question. Conversely, respondents did not always answer all questions (eg. Question 6) resulting in less than 179 responses.

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Table 1. Career Stage of Survey Respondents

Career Stage	Frequency (n=162)	Percentage %
Advanced (25+ years)	51	31.5
Mid Career (10-24 years)	66	40.7
Early Career (5-10 years)	26	16
Early Career (>5 years) includes Post Docs	16	9.9

Approximately 54.3% of the respondents were male (45.1% female). The remainder of the total preferred not to respond. The majority of the respondents were white/Caucasian (89.2%).

Table 2. Race/National Origin of Survey Respondents

Race/National Origin	Frequency (n=158)	Percentage (%)
White/Caucasian	141	89.2
Asian	5	3.2
Mixed/Multiple Races	4	2.5
Prefer not to respond	4	2.5
Other (Filipino)	4	2.5
Latino/Hispanic	3	1.9
American Indian	2	1.3
Pacific Islander	1	0.6
Black/African American	0	0

Q1. Have you used data within the last year to teach marine science or oceanography to undergraduate students? Note: This question requires a response.

Data Use	Frequency (n=179)	Percentage (%)
Yes, I have within the last year	148	72.9
No, but I have in the past (more than a year ago)	17	8.4
No, but I plan to in the near future	7	3.4
No, but would like to in the future	14	6.9
No, not recently and do not plan to	17	8.4

The majority of those surveyed indicated that they do use or plan to use data in their teaching. A total of 8.4% of the respondents did not intend to use data in teaching. The reasons cited in this group of respondents are: 1) they are not teaching oceanography or marine science course (teaching responsibilities in other fields) and 2) not important to the class. One respondent commented they do not foresee teaching an upper level course that would be enhanced by using available data sets.

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Q2. Where do you teach? Please check all that apply.

Response	Frequency (n=183)	Percentage (%)
College/University	105	57.4
Community College	69	37.7
Research Institution	21	11.5
Other	2	1.1

The majority of respondents teach at universities/colleges 57.4% and community colleges (37.7%). The other category included the SEA Education Association (undergraduate semester abroad). One other respondent commented their institution offered both 2 and 4 year degrees.

Q3. What subjects do you teach in which you use data? Please check all that apply.

Subject	Frequency (n=178)	Percentage (%)
Oceanography- general	97	54.5
Geology	58	32.6
Marine Science	57	32
Earth Science	41	23
Environmental Science	39	21.9
Biological Oceanography	32	18
Physical Oceanography	24	13.5
Chemical Oceanography	20	11.2
Geological Oceanography	19	10.7
Meteorology	17	9.6
Geography	9	5.1
Computer Science	1	0.6

Q4. What type of course(s) do you teach using data? Please check all that apply.

Course type	Frequency (n=183)	Percentage (%)
Undergraduate Introductory Course	138	75.4
Undergraduate Lab Course	105	57.4
Undergraduate Upper level Course	82	44.8
Graduate Courses/Workshops	59	32.2
Undergraduate Research or Field Course	49	26.8
Seminar/lecture	34	18.6
Online Courses	11	6
Informal Education Programs in Museums, Aquariums, Community Centers, etc.	11	6
Other	5	2.7

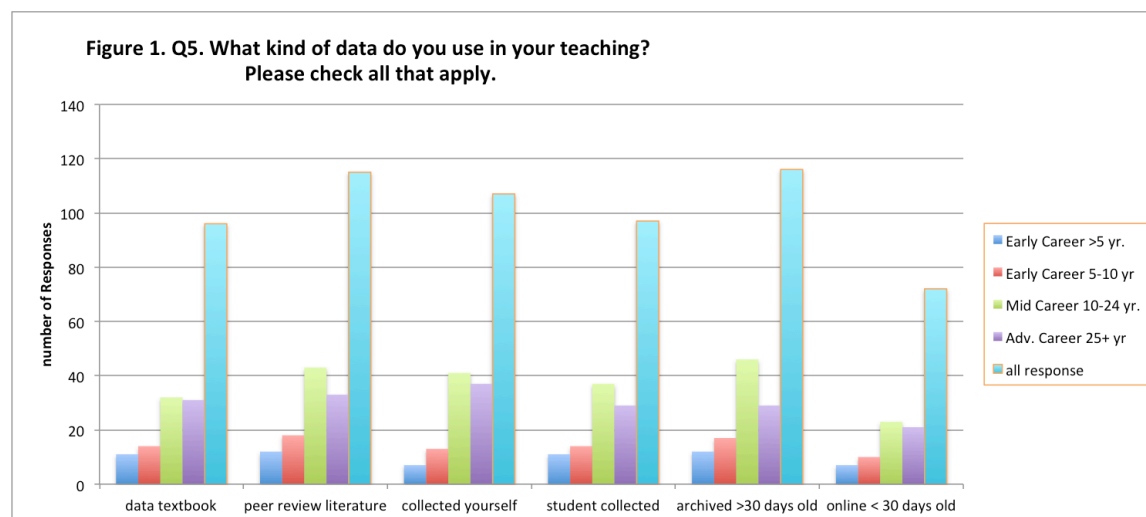
Respondents noted in the other category that they teach online hybrid courses that combining face-to-face and online teaching. Others commented that they teach courses for educators (teacher professional development).

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Q5. What kinds of data do you use in your teaching? Please check all that apply.

Data format	Frequency (n=176)	Percentage (%)
Archived Data from an online database (>30 days old)	116	65.9
Data from peer reviewed literature and/or articles	115	65.3
Data you have collected yourself	107	60.8
Data from a textbook, DVD, course materials	96	54.5
Online near real time or real time data (<30 days old)	72	40.9
Other	3	1.7

The results when broken down by career stage, do not show major differences in data type use (see Figure 1 below). The advanced career stage respondents were slightly more likely to use data that they have collected themselves. Early career respondents seem likely to use any kind of data type in their teaching. Overall, online near or real time data was the least used data type while data from peer reviewed literature and archived data (>30 days old) was the most commonly used data type.

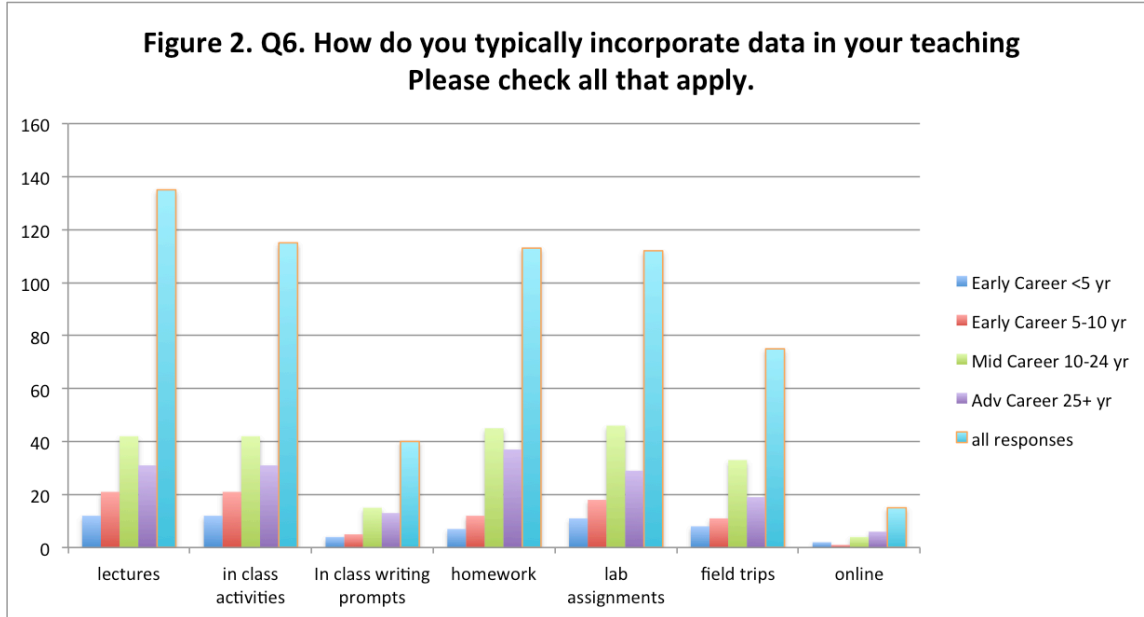


Q6. How do you typically incorporate data in your teaching? Please check all that apply.

Response	Frequency (n=176)	Percentage (%)
Lectures	135	76.7
In-class activities	115	65.3
Homework assignments	113	64.2
Lab assignments	112	63.6
Field trips	75	42.6
In-class writing or discussion prompts	40	22.7
Distance/online only classes	15	8.5
Other	5	2.8

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Other responses included independent studies/internships, exams, projects, and research papers/field studies publications. When sorted by career stage (Figure 2), we see a consistent trend of using data in lecture, in class assignments, homework and lab assignments.



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Q7. In your undergraduate teaching, please rank how likely you are to use the following teaching styles. Please choose one option for each row.

	Early professional (<5 years)	Early career professional (5-10 years)	Mid-career professional (10-24 years)	Advanced career professional (25+ years)
No Inquiry: Students listen to lecture, participate in discussions or activities				
1 will not use	0	7.7% (2)	6.3 (4)	6.1% (3)
2	6.3% (1)	7.7% (2)	9.4% (6)	12.2%(6)
3 somewhat likely to use	0.0% (0)	19.2% (5)	25% (16)	20.4% (10)
4	43.8% (7)	19.2% (5)	15.6% (10)	18.4% (9)
5 very likely to use	50% (8)	46.2% (12)	43.8%(28)	42.9%(21)
Confirmation Inquiry: Students are asked to confirm previously learned material				
1 will not use	0	0	0	2.1% (1)
2	0	15.4% (4)	6.2%(4)	16.7%(8)
3 somewhat likely to use	25%(4)	11.5%(3)	26.2%(17)	35.4%(17)
4	37.4%(6)	30.8%(8)	38.5%(25)	29.2%(14)
5 very likely to use	37.5%(6)	42.3%(11)	29.2%(19)	16.7%(8)
Structured Inquiry: Students are given a question and procedures, but make their own conclusions based on data				
1 will not use	0%(0)	4%(1)	3.1%(2)	0%(0)
2	0%(0)	4%(1)	9.4%(6)	10%(5)
3 somewhat likely to use	37.5%(6)	20%(5)	17.2%(11)	24%(12)
4	31.3% (5)	24%(6)	29.7%(19)	26%(13)
5 very likely to use	31.3%(5)	48%(12)	40.6%(26)	40%(20)
Guided Inquiry: Students are given a question, then plan the investigation, collect and organize their own data, and make evidence-based conclusions				
1 will not use	0%(0)	4%(1)	4.6%(3)	4.2%(2)
2	31.3%(5)	16%(4)	9.2%(6)	25%(12)
3 somewhat likely to use	2.5%(2)	12%(3)	16.9%(11)	27.1%(13)
4	37.5%(6)	32%(8)	33.8%(22)	16.7%(8)
5 very likely to use	18.8%(3)	36%(9)	35.4%(23)	27.1%(13)
Open Inquiry: Students generate their own questions, plan their investigations, collect and organize the data and make evidence-based conclusions				
1 will not use	6.3% (1)	12%(3)	10.9%(7)	20%(9)
2	31.3%(5)	32%(8)	29.7%(19)	26.7%(12)
3 somewhat likely to use	31.3%(5)	16%(4)	23.4%(15)	24.4%(11)
4	18.8%(3)	12%(3)	23.4%(15)	15.6%(7)
5 very likely to use	12.5%(2)	28%(7)	12.5%(8)	13.3%(6)

Results indicate that professors were most likely to use a lecture (no inquiry) teaching strategy when using data in their classes. Early career professors were likely to use a confirmation style inquiry teaching strategy, where students are asked to confirm previously learned materials. Structured inquiry, where students are given a question and procedures and are asked to make their own conclusions based on data, was equally likely among all career phases. All career phases were equally likely to use guided inquiry, where students are given a question and then asked to conduct an investigation. All career phases were not very likely to use open inquiry in their teaching at the undergraduate level.

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Q8. Use the pull-down menu to indicate which data type you are most likely to use for each of the following teaching styles.

	I would not use data	static images (from textbooks, literature)	online real-time imagery	online real-time datasets	images from online archives	data from online archives	student-collected data	none of the above
No Inquiry	1.9% (3)	57.1% (89)	11.5% (18)	3.2% (5)	12.8% (12)	9.6% (15)	1.9% (3)	1.9% (3)
Confirmation Inquiry	7.1% (11)	27.9% (43)	10.4% (16)	8.4% (13)	13.6% (21)	17.5% (27)	11.0% (17)	3.9% (6)
Structured Inquiry	0.7% (1)	5.2% (8)	7.2% (11)	9.8% (15)	5.9% (9)	41.8% (64)	26.1% (40)	3.3% (5)
Guided Inquiry	3.3% (5)	2.0% (3)	4.6% (7)	11.8% (18)	3.3% (5)	25.0% (38)	45.4% (69)	4.6% (7)
Open Inquiry	4.2% (6)	1.4% (2)	1.4% (2)	7.6% (11)	2.8% (4)	13.2% (19)	56.3% (81)	13.2% (19)

Results show that professors are using static images from textbooks or from the published literature when using a no inquiry or lecture teaching technique. Professors are using data from online services (archives) when using a structured inquiry technique, where students are given a question and procedures, but make their own conclusions based on data. Professors in confirmation style inquiry commonly use static images from textbooks or the published literature, where students are asked to confirm previously learned material. Not surprisingly students are asked to use data they have collected themselves in guided and open inquiry style teaching styles.

Q9. What datasets work well for you?

Professors responded to this open ended question with a range of responses from general characteristics of quality data in teaching to mention of specific data sets, to finally examples of how data is used in teaching.

Professors noted that the use of data depends on your purpose. Sometime the use of a graph is enough while other times raw numbers are required. For example, one professor responded that he/she uses their own data and data from trusted colleagues in lecture and homework problem sets. Students collect their own data in laboratory course and often compare to previous class archived data.

Positive characteristics of datasets include:

- ***Simple clearly defined variables that are easy for students to understand.*** Survey respondents commented that data that is temporally based and easily manipulated is preferred. Professors prefer archived datasets that can be evaluated ahead of time for instrumental effects and missing data. Interfaces that integrate data and variables also was identified as important. Survey respondent noted that the *Is spring in bloom?* on the Bigelow website (see <http://www.bigelow.org/shipmates/overview.html>) is a positive, though not perfect example of data integration.

- **Datasets that are rich in terms of metadata (we can determine what was collected and how) and also include visualization tools that allows easy downloading (for incorporating into spreadsheets).** The survey respondents commented that metadata helps show how to tie the data into a student activity that support conceptual learning of the topics. The ability to easily download the data into spreadsheets (Excel) for analysis was highly valued by the professors. They also commented that visualization tools that are not proprietary (with cost) are very useful in teaching.
- **Tested in a class situation.** Professors indicate that they are interested in using datasets that have been compiled specifically for teaching and have been tested by their peers. Long-established datasets (updated quarterly or monthly) that support an underlying principle or benchmark for the class being taught are preferred. The data set can be small and student collected or textbook sets that demonstrate a concept. Specific comments by survey respondents include:
 - *“I have used datasets that have been presented in workshops (COSEE) so they have been vetted and massaged for student directed studies”.*
 - *“Those that are vetted to reveal clear relationships initially, working forward to more problematic or inverse question relationships”.*
- **Real and archived information that have the ability to produce graphics.** Data should be available in visual format, displayed on maps and graphs and in a table format. It should be easy to sort, select and download in CSV format. Specific comments include:
 - *“Google Earth embedded data is particularly useful in undergraduate courses”.*
 - *“GUI interface- simple instructions but students can explore further if desired”.*
 - *“Small scale sampling data that can be graphed or averaged easily but do not require statistical analysis. Compiled sets that can be used for comparison or to draw conclusions”.*

A few respondents specifically commented that datasets that are relevant to their local ecosystem (e.g. CTD profile data) or student collected data in a laboratory course, are most valuable in teaching a concept.

Specific datasets mentioned include:

- Federally sponsored data– NOAA, NASA, NWS, National Estuarine Research Reserve (NERR- specifically mentioned - Mission-Aransas National Estuarine Research Reserve SWMP data, Integrated Ocean Observing System (IOOS – specifically NANOOS), USGS, NSIDC, NEIC, and NMFS.
- Earthscope, Google Earth, ARGO floats
- Weather Underground
- Earthquake data (USGS), isotope, tree ring measurements, sea surface temperature, ice cover, sea level, tidal data, water chemistry (chlorophyll, salinity), stream gauge data (USGS), paleoclimate data, chemical analysis of rocks and fluids, biogeochemical data.

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- Time series (temperature, pH, salinity).
- Information published on CD, DVD from reliable online sources.
- Earth science publications.
- Ocean color via Giovanni self collected data sets.
- World Ocean Atlas NOAA El Nino-La Nina info USGS river discharge AGAGE atmospheric trace gas monitoring NOAA atmospheric CO2 monitoring Texas Coastal Ocean Observing Network (TCOON), NGDC bathymetry, GEOSECS, CLIMAP, ODP/IODP, WOA, WOCE bottle data, JGOFFS , Bering Sea Research program (BEST).
- Data from major events and natural disasters (Super Storm Sandy, BP oil spill)
- BATS and HOT data
- LDEO Ingrid tool and CalCofi data from primary literature

Q10. What datasets **do not** work well for you?

Professors offered a variety of responses to what does not work about using data in teaching including:

- **Online datasets that are difficult to download and manipulate, including difficult formats or large multivariate tables, or difficult access issues.** Professors were clear that they did not want to work with data that requires sophisticated software or advanced knowledge. Specific example quotes include:
 - “Some of satellite imagery and real time data is very difficult to use”.
 - “Incomplete data sets create confusion for the students or those without clearly defined, and easy to understand variables. Most of my students do not have a science background”.Universities do not have the capability in many cases to pay for access or proprietary software. Professors also noted sites that have real time data with slow server download time in class also do not work well for teaching.
- **Very large datasets.** Professors are concerned about large and overwhelming datasets that take a long time to figure out, are in challenging formats, require extensive mathematical calculations, and ones that have data quality issues.
 - For example, “CTD cast profiles with too much information (too many variables and high sampling rate) and raw numbers with errors (such as bubble spikes) that students don't know how to interpret. This can overwhelm introductory students”.
- **Datasets that are not adaptable (flexible) to learning goals. The data must be applicable to learning objectives of the course.** It is very important that the data “show” a theme or concept that is being taught in class. This is especially important for introductory classes.

Q11. What datasets would you like to use in your courses? What's on your wish list?

- **More real-time oceanography datasets, especially those that integrate physical and biological principles.** Additionally professors requested long-term time series

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that relate to marine environmental issues. Basic abiotic factors over time (temperature, salinity, dissolved O₂, pH, etc.) compared to biological measures (chlorophyll, or species abundance) would be useful features for teaching. Additional datasets to support labs and discussions on climate change and ocean acidification also would be useful. Data from the OOI data including real time NO₃, pH, O₂, salinity, temperature, etc, was requested by respondents. Images of gelatinous plankton, or demersal fauna also would be of interest to many teaching professors. Specific requests of interest include:

- *“I would love to be able to incorporate recent fisheries catch data, coastal chemical oceanography, near real-time currents and winds. Generally, I know the data exists but the effort required to get it into a useable form, or guidance necessary if I ask students to interact with the datasets/sources directly themselves is a major obstacle”.*
- *“I’d like to do more with Argo profiles. Current meter data and buoy data are also good. And I find that students who surf are excited by anything that gives them a better sense of local conditions.”*
- *“Data sets from deep sea cores would be useful, as well as data sets showing a variety of parameter change with ocean depth (temp, conductivity, gas partial pressure, pH, etc.)”*
- ***Spatial datasets available in Google Earth.*** Datasets that include satellite imagery including sea surface temperature (SST), salinity or solar energy flux datasets accessible in Google Earth were requested.
- ***More user-friendly graphics.*** A respondent used the example of wishing he had additional El Nino graphics. NOAA's dataintheclassroom.org was cited as a great example of a site with user-friendly graphics. The respondent pointed out that the site is only updated through 2009, making it less usable overall in teaching.
- ***Small datasets to be plotted and analyzed in laboratory courses.*** Data that has been pre-selected for (example - NANOOS site within the educational resources) was mentioned as a valuable time saving tool. Simple data sets that clearly illustrate a concept without distracting (interesting to scientists, distracting to students) details.
- ***Real-time mapping, where students can change the variable of interest and see changes in patterns (distribution, diversity, temperature, etc).*** Professors requested mapping tools/functions that allow students to manipulate the data to observe patterns and trends.
- ***Student collected, local data sets.*** A number of respondents commented that student data that can be posted and shared online would be useful. A specific comment is:
 - *“In oceanography -- I have the students do an extensive laboratory report on the water mixing patterns in an estuary -- namely the salinity-Depth and temperature-Depth profiles -- It would be interesting for the students to compare their results with other similar studies”.*

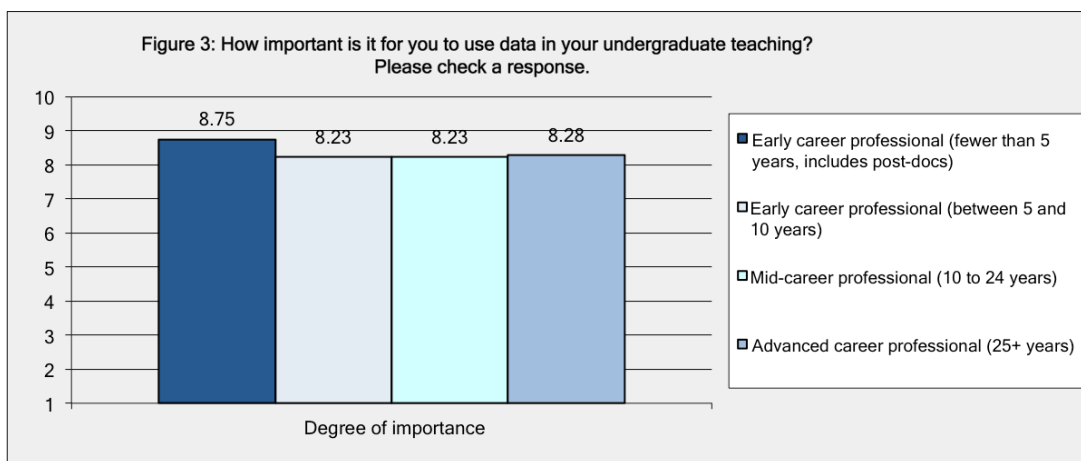
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Finally, many professors noted they wished they had time to develop existing data set examples. A number of respondents commented that there was certainly data available online but they do not have the time to turn the datasets into viable teaching tools. Some comments include:

- *“Mainly I wish I could replot more data series so that my public online course notes were not as restricted by copyright. But it would take too much time!”*

Q12. How important is it for you to use data in your undergraduate teaching? Please check a response.

All respondents rated on a liker scale (1 not important, 5 somewhat important, and 10 very important) the importance of using data in undergraduate teaching. The average importance was higher for early career then mid and late career scientists. In general the use of data appears to be a significant priority for professors.

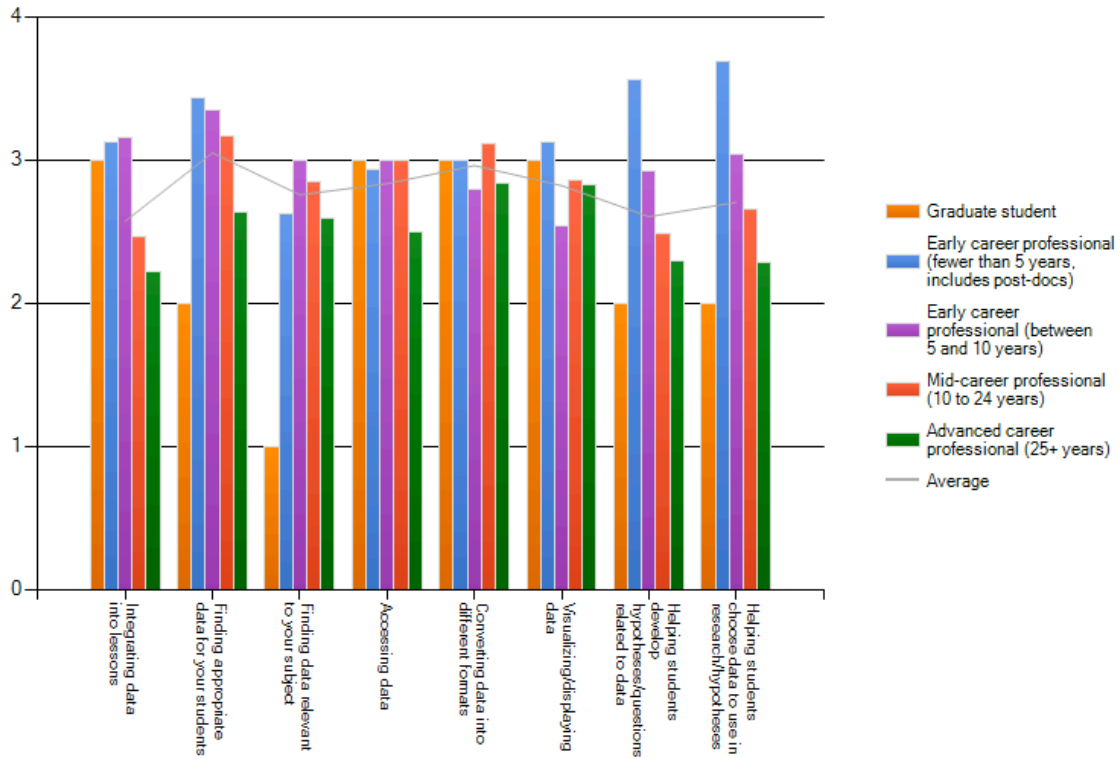


Q13. What kind of help do you need to use more data in your teaching? Please check a response for each.

Professors responded to a series of questions related to improving the use of data in teaching, on a likert scale with 1 = don't need much help, 3= could use some help, and 5= could use a lot of help. Early career scientists noted they could use the most help with 1) helping students choosing data to use in research/hypotheses, and 2) helping students develop hypotheses/questions related to data forming questions. On the average, professors noted they could use help finding appropriate data for their students. Advanced career professors seemed to also value help with visualizing data and converting data into different formats.

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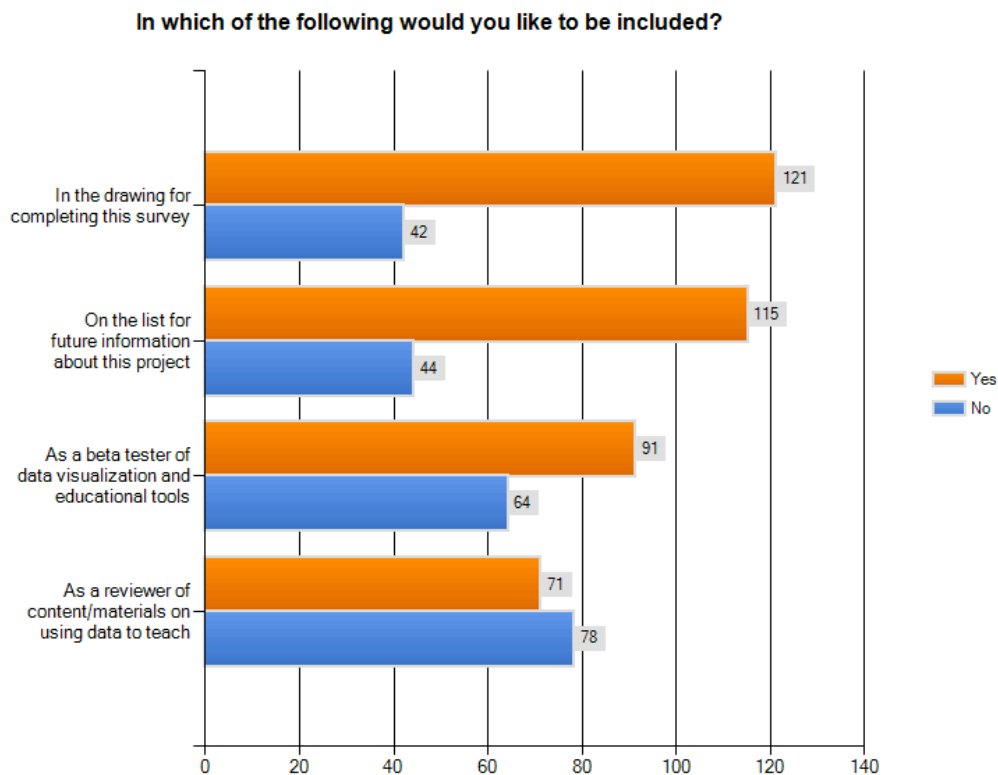
**What kind of help do you need to use more data in your teaching?
Please check a response for each.**



Q20. In which of the following would you like to be included?

In this final question, we asked professors to comment on their future involvement in the OOI EPE project. Approximately 74% of those surveyed wanted to participate in the gift card drawing and remain on our database list for future information about OOI EPE. Approximately 59% wanted to be beta testers of data visualization and educational tools developed by the EPE and 47% as a reviewer of content/materials on using data to teach.

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5 Conclusions

Overall, the results of the survey were helpful in shaping the future development of the EPE data visualization tools. The majority of professors surveyed were interested in using data in teaching, and improving access through visualization, to datasets that can connect to important themes and concepts in an introductory oceanography course. EPE, through the Lesson Lab Builder, data visualization tools, and concept map builder will strive to provide access to OOI data that meet the data practices outlined by respondents to the survey. We look forward to involving these identified users to further test the usability of the suite of EPE tools. We look forward to testing how the tools can be integrated for improved development of teaching resources (datasets, lesson plans, etc) and teaching practices (how data is used to explain concepts and ask questions of students) for undergraduate professors.