# Patterns of Student Interest and Engagement in Introductory Geology Labs: A Guide Towards Lab Improvement

UNIVERSITY OF South Carolina

03.20.25
Southeastern GSA
Harrisonburg, VA

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School of the Earth, Ocean and Environment (SEOE)

The SEOE encompasses research and education in geology and geophysics, marine sciences, and environment. Academic areas span from the natural and social sciences to the environmental humanities.

Labs are taught by graduate teaching assistants (TAs), who cover 2-3 sections of 2-hour labs per week in geology, marine science, and environmental science.

Large, multi-section courses are assigned a lab coordinator for support.

Introductory geoscience courses are prime places for recruitment and engagement.

TAs play a critical role in teaching these courses.

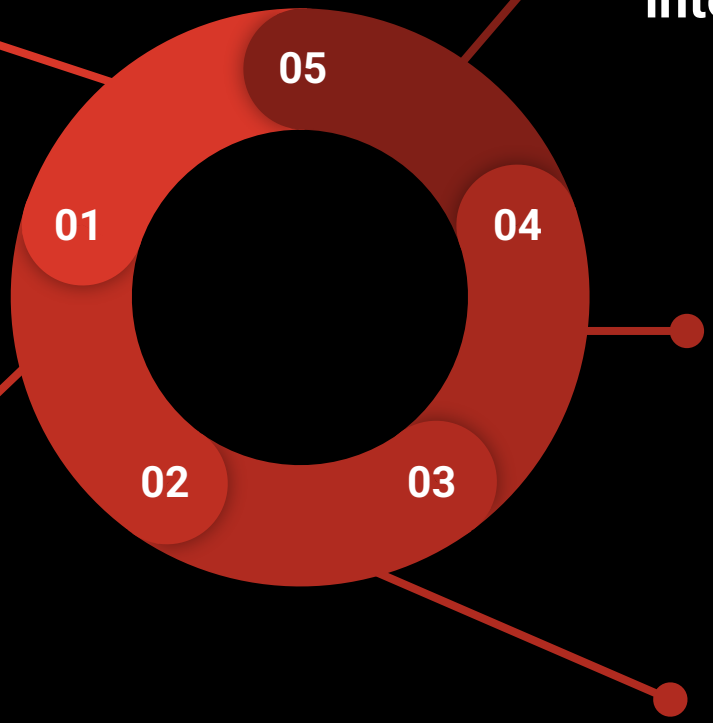
However, pedagogical training is lacking and there is a perception of intro students as uninterested.

Kendall & Schussler, 2013; Gardner & Jones, 2011; Rushton et al., 2011; Sandi-Urena et al., 2011; Hoisch & Bowie, 2010; Pugh et al., 2019; Stokes et al., 2015; Gilbert et al., 2012; Teasdale et al., 2019

*The SEOE was in need of a quick, low stakes method to collect and analyze formative evaluation data on our introductory geology labs.*

TAs identify relevant constructs between semesters

Labs are revised by the lab coordinator, the assigned faculty member, or a TA interested in the topic.

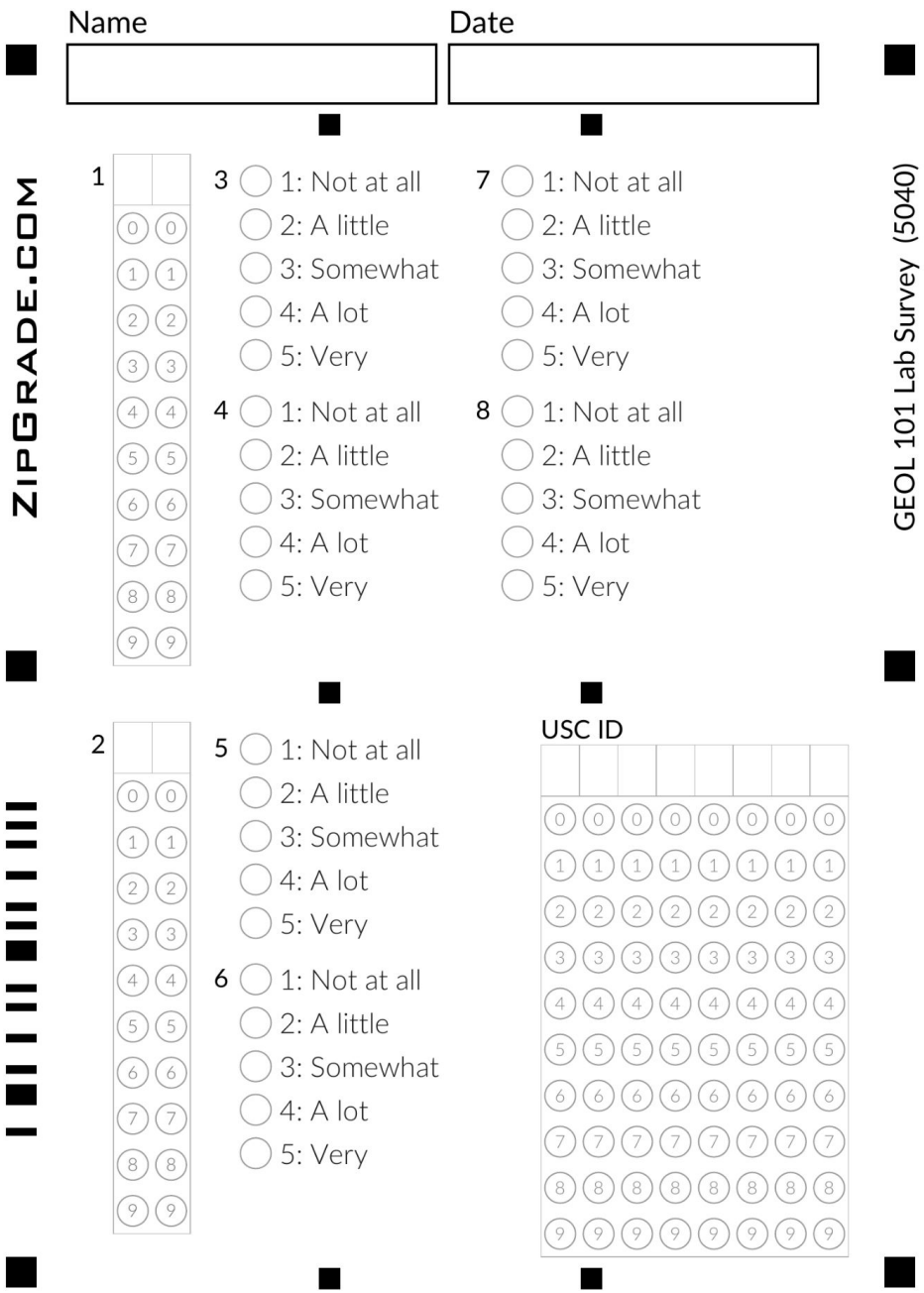



TAs review feedback weekly and discuss what changes may need to be made.

ZipGrade is used to develop a paper survey. Each construct is made into a Likert-style item.

Undergraduate students are asked to complete the forms each week. Identifying information is optional. Labs are scanned regularly and data is added to a shared spreadsheet.

Survey text




# Fall 2024 form, items of interest

1. Section number
2. Lab number
3. Interest
4. Impact on understanding
5. Relevance to your life
6. Level of difficulty
7. Level of engagement in authentic scientific processes
8. Level of hands-on engagement

General comments/feedback can be written on the bottom or back of the bubble paper.

| *Lab* | COUNT of Interest | AVERAGE of Interest | AVERAGE of Impact on understanding of the topic | AVERAGE of Relevance to your life | AVERAGE of Level of difficulty | AVERAGE of Level of engagement in authentic scientific processes | AVERAGE of Level of hands-on engagement | | Overall Rating |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 178 | 2.9 | 3.3 | 2.1 | 2.6 | 3.5 | 3.9 | Sci Method & Density | 3.1 |
| 2 | 162 | 3.1 | 3.4 | 2.5 | 2.7 | 3.4 | 3.7 | Plate Tectonics | 3.1 |
| 3 | 165 | 3.4 | 3.4 | 2.7 | 2.4 | 3.4 | 3.3 | Earthquakes | 3.1 |
| 4 | 107 | 3.6 | 3.3 | 2.7 | 2.8 | 3.6 | 4.2 | Minerals | 3.4 |
| 5 | 167 | 3.4 | 3.6 | 2.7 | 2.6 | 3.7 | 4.0 | Igneous Rocks & Volcanoes | 3.3 |
| 6 | 134 | 3.1 | 3.3 | 2.6 | 2.9 | 3.5 | 3.7 | Sedimentary Rocks | 3.2 |
| 7 | 114 | 3.1 | 3.3 | 2.5 | 3.1 | 3.4 | 3.6 | Metamorphic Rocks & Tectonic Settings | 3.2 |
| 8 | 119 | 3.1 | 3.2 | 2.6 | 2.8 | 3.3 | 2.8 | Geologic Time | 3.0 |
| 9 | 58 | 3.4 | 3.6 | 2.8 | 2.6 | 4.0 | 4.4 | Streams | 3.5 |
| 10 | 149 | 3.1 | 3.4 | 2.7 | 2.7 | 3.5 | 3.7 | Contour & Topographic Maps | 3.2 |
| 11 | 119 | 2.8 | 3.3 | 2.7 | 3.1 | 3.3 | 3.2 | Groundwater | 3.1 |
| 12 | 33 | 3.6 | 3.6 | 4.0 | 2.6 | 3.4 | 3.2 | Climate Change & Carbon Cycle | 3.4 |
| **Grand Total** | **1505** | **3.2** | **3.4** | **2.6** | **2.7** | **3.5** | **3.7** | Overall | |

- 12 labs with 1,505 responses ($\bar{x}$ = 125), from 33 (climate change) to 178 (scientific method & density). Not a linear drop-off over time.
- Ratings range from 2.5 to 4.4, with at least a 0.4 separating min and max values - students are reporting variation across labs.
- Ratings vary across a lab - students generally aren't "straightlining" responses (Reuning et al., 2020).
- Overall highest rated labs were streams (field trip), climate change, and minerals.
- Highest average ratings: hands-on engagement, engagement in authentic scientific processes and impact on understanding.

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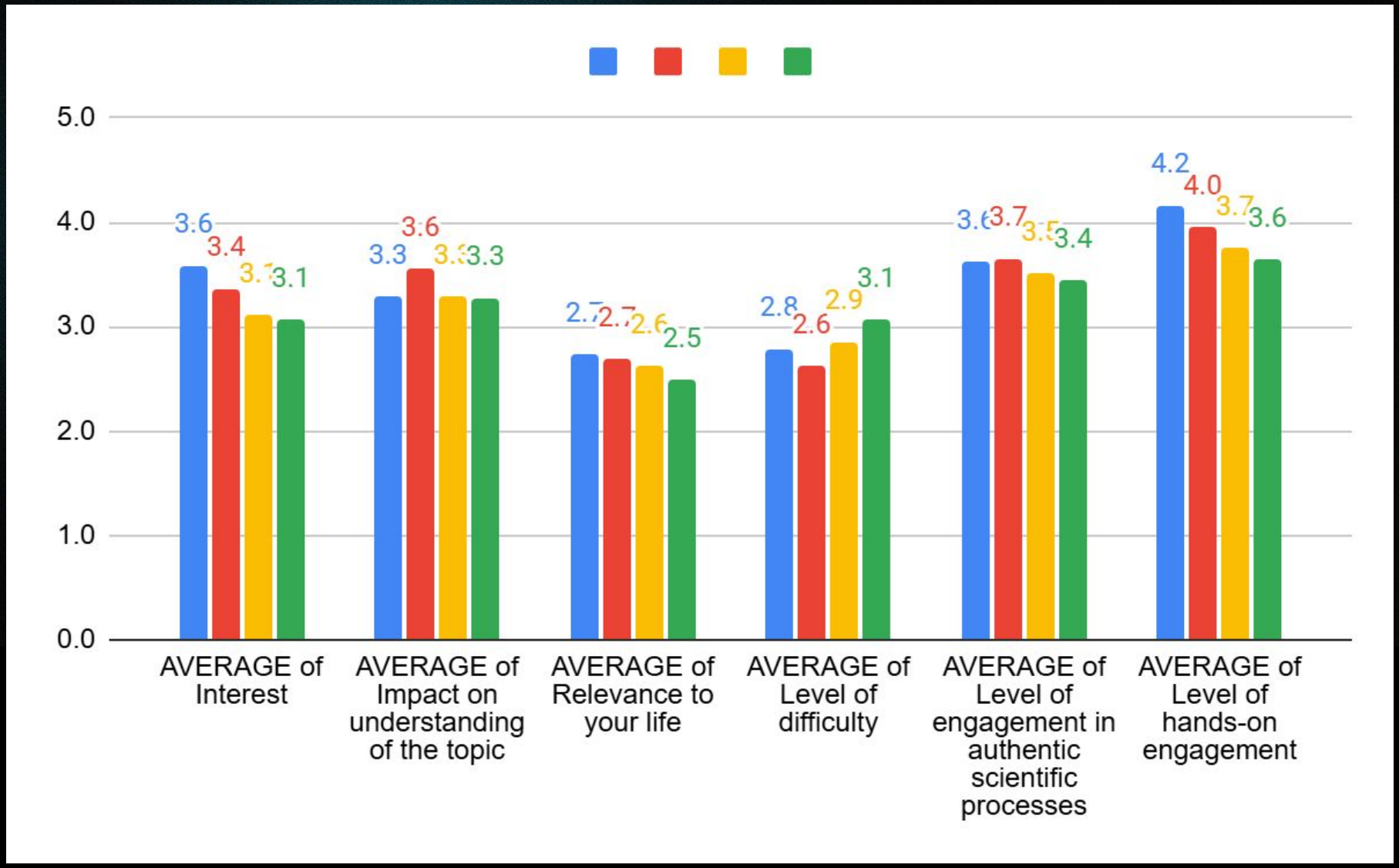
| **Grand Total** | **1505** | **3.2** | **3.4** | **2.6** | **2.7** | **3.5** | **3.7** | Overall | |

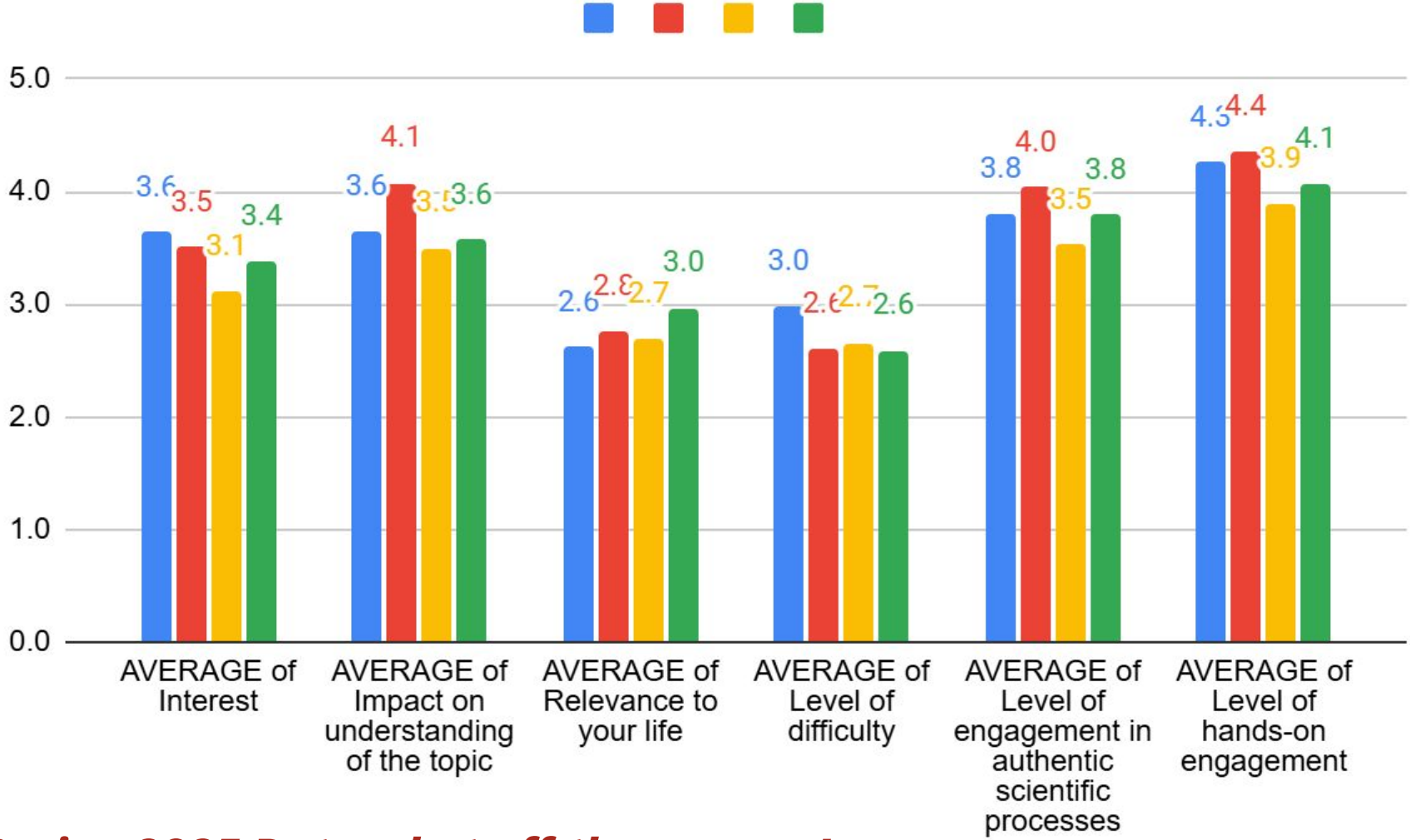
- Relationships were found between some variables
  - hands-on engagement correlated with interest, impact, and authentic scientific engagement at small to medium effect sizes.
  - impact and interest (small effect size)
  - impact and authentic engagement (small effect size)
  - difficulty and relevance (small effect size)
- The highest levels of hands-on engagement was reported for streams (field trip) and minerals.

| Key |
|---|
| 1: Not at all |
| 2: A little |
| 3: Somewhat |
| 4: A lot |
| 5: Very |

# Minerals → Igneous Rocks & Volcanoes → Sedimentary Rocks → Metamorphic Rocks & Tectonic Settings



# Minerals → Igneous Rocks → Sedimentary Rocks → Metamorphic Rocks & Campus FT



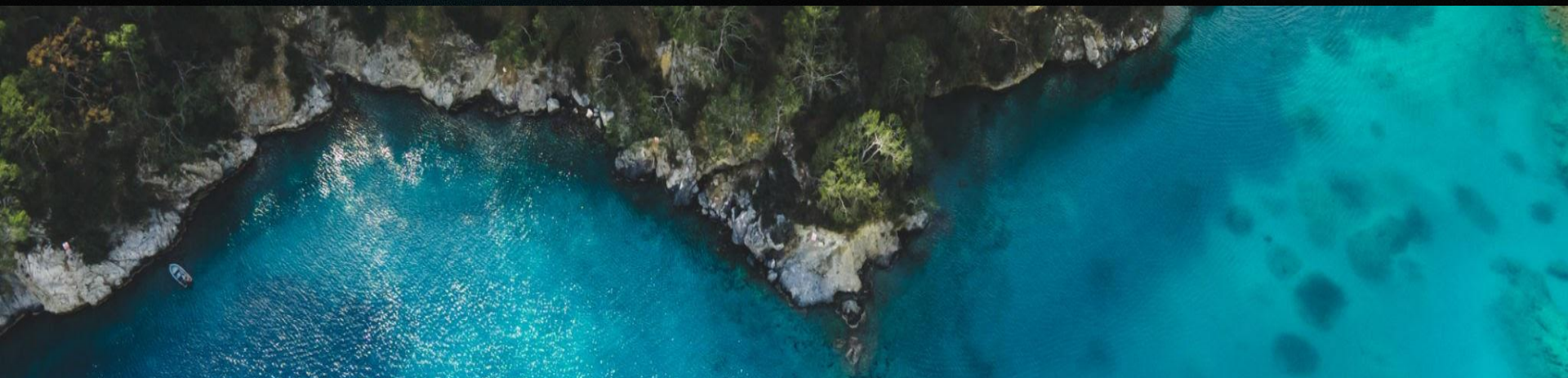

***Spring 2025 Data - hot off the presses!***

Results of these surveys are being used to inform iterative improvements to labs and engage students in the revision process.

Enjoyment, accessibility added as constructs in Spring 2025.

Changes made to labs are having an impact on student ratings.

Process for lab improvement based on formative feedback is easy, cheap, effective, modular, and engaging for both undergraduates and their graduate TAs.



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Survey text

***Questions?***

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