

Student Interest in Introductory Geoscience Laboratories at three Universities

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Context, Research Questions

Geoscience students often attribute their decision to major in geoscience to positive experiences in introductory courses. We measured student interest in two geoscience labs that were offered online during the COVID-19 pandemic to see how interesting they were for introductory students. We then compared student interest to learning, hypothesizing increased interest in lab content would help online students learn more.

Questions

- How interested are students in labs focusing on plate tectonics and minerals? Does student interest vary across universities?
- How much do students at each university learn about plate tectonics and minerals after completing the labs?
- Is individual student interest related to learning?
- We hypothesize that students who are more interested within a particular subject would be more motivated, thus would be more likely to have higher learning.

Background

Student Interest

- Student interest is correlated to student motivation to learn and persist within a subject area (Van der Hoeven Kraft, 2017).
- Interest drives effort, self-regulation, goal setting, and self-efficacy, but is not necessarily correlated to academic achievement (Van der Hoeven Kraft, 2017).
- In an online learning environment, these traits may lead to higher learning (Xu & Jaggars, 2014).

Linking interest to learning

- Students with low grade point averages struggle disproportionately in online classes (D'Alessio et al., 2019).
- Students who are more successful in online classes often are highly motivated students and may have higher levels self-regulation, self-discipline and metacognitive skills (Xu & Jaggars, 2014).

Class Context

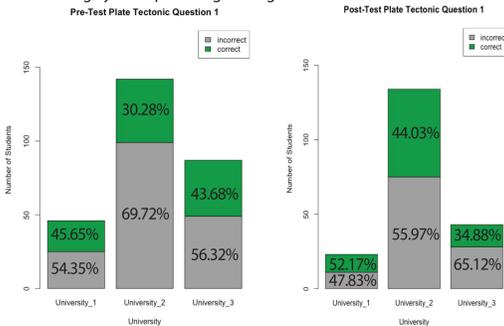
- Data from two introductory labs were included in this study:
 - Minerals labs required students to examine hand samples and focus on identification skills, which are difficult to replicate online.
 - Plate Tectonics labs required students to examine maps and analyze correlations between plate tectonic features, which is easier to do online.
- Data from three universities offering similar online labs were included in this study:
 - Two east coast public universities with similar demographics, Universities 1 and 2
 - One public Hispanic serving institution from the southwest, University 3

Methods

- Surveys measured students' perceived interest immediately after completing labs during Spring 2021.
- Pre- and Post- content surveys were used to determine student learning at the beginning and end of the semester.
- Interest and learning data was analyzed using R by computing Mann-Whitney and hedges' g tests.
- Pre- and post- content surveys were matched with interest and demographic data for individualized analyses.
- Labs were analyzed to identify similarities and difference likely to explain patterns in data

Results: Learning

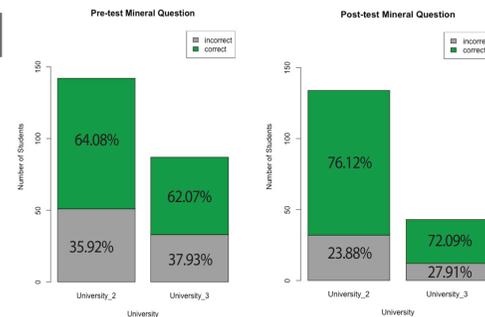
Percent in green box = percentage correct
Percent in gray box = percentage wrong



Mineral Learning

Question: Which of the following statements best reflects geoscientists' thinking about rocks and minerals?

- Both University 2 and 3 had around 10% more students get this question correct on the post-test compared to the pre-test
- Both University 2 and 3 had higher scores on the pre-test question for minerals than for tectonics.



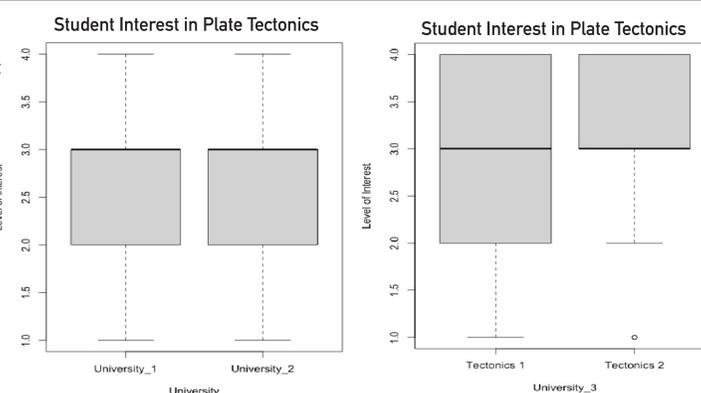
Results: Interest

Interest in Plate Tectonics Labs

Tectonics labs at University 1 and 2, and Tectonics lab 1 at University 3 had similar activities. In each, students analyzed maps with various plate tectonic data sets to find patterns and infer plate boundaries. Tectonics lab 2 at University 3 used Lab 1 knowledge to answer questions about real world examples.

Interpreting box plots:

- Bold horizontal line: median student interest (middle of dataset).
- Quartile 1- box below median: (middle of minimum and median)
- Quartile 3- box above median: (middle of maximum and median)
- Size of quartile box indicates where most interest values lie.
- Larger box = more values

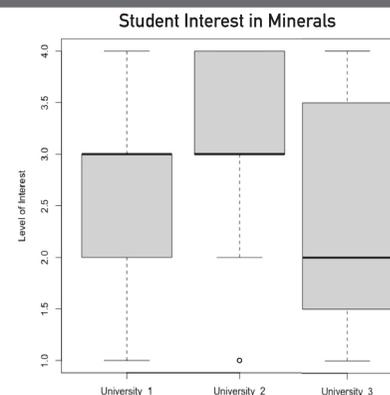


Interest in Mineral Labs

Interpreting this data:

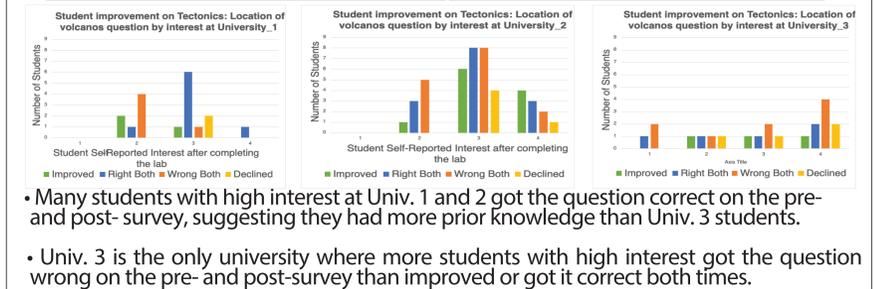
- Tectonics: Quartile 3 is equivalent to the median for Univ.1 and 2, indicating a large number of identical, high values. The Tectonics 2 lab at Univ. 3 had the highest interest.
- Minerals: Univ.1 and 2 have the same median, but more students at Univ.1 had lower interest than at Univ. 2. There was more diversity in student interest at Univ. 3.

University 1 and 3 had similar activities focusing on mineral characteristics, and University 2 and 3 had similar activities focusing on learning mineral identification techniques using house-hold items. All labs included an activity where student filled out a table of mineral characteristics of a given mineral.

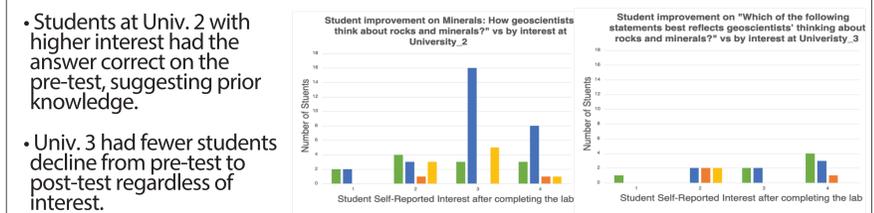


Results: Individual Learning

Interest vs. Learning: Tectonics Labs



Interest vs. Learning: Minerals Labs



Implications/Future Work

- Interest does not correlate to learning for these labs:
 - The plate tectonics labs have similar interest levels across universities. However, student learning differed, with University 1 and 2 students improving on the plate tectonics question while University 3's student scores declined.
 - University 3's students had a lower overall interest in the minerals lab, but had a higher percentage of individuals (36.80%) improve on the post-test.
- Differences across universities:
 - Universities 1 and 2 had more students who answered questions correctly on pre- and post-tests, indicating students were exposed to concepts prior to the labs.
 - University 3, the Hispanic-serving institution, showed higher interest in tectonics and lower interest in minerals than the other institutions.
 - Students at University 3 were more interested in Tectonics than Minerals, but learned more from the Minerals lab.
- Factors other than interest, e.g., other variables related to self-regulated learning, may explain observed patterns. Identifying these factors may help instructors design online labs that help students succeed and continue their education within geosciences.

Next Steps:

- Analyze individual demographic data to determine if these variables influence interest and learning.
- Analyze the inquiry level of lab activities to determine if this influences interest and learning.
- Examine changes in student interest for every lab over the course of the semester.

References

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Acknowledgments

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