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Three Terms of E-CLASS Data for an Introductory E&M Lab

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Introduction

We have revised our second introductory lab course with a goal of creating amore authentic lab experience.

About the Course

- An introductory-level calculus-based laboratory physics class
- The second of two intro lab courses
- A 1-credit-hour class that meets for two hours once a week
- Taught by faculty (professors and lecturers) from the physics department

Research Motivation

To assess the course transformation of our PHYS-225 electricity and magnetism lab.

Research Questions

- Do students' perceptions of experimental physics change when they take our lab?
- Do students' perceptions become more expertlike with a new version of the course?

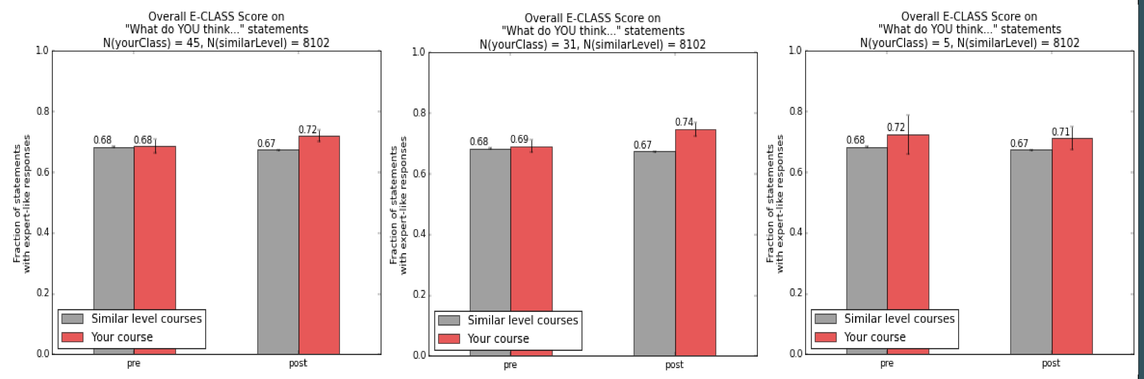
Methods

Our research instrument is the well-established Colorado Learning Attitudes about Science Survey for Experimental Physics (E-CLASS).[1] The E-CLASS asks students how they think about experimenting at the beginning (pre) and end (post) of a term and compares it to the expert consensus. We have taken three terms of baseline data before implementing a new version of the course.

Sample:

Term	Matched n	Response rate
Fall 2018	45	39%
Winter 2019	31	52%
Spring 2019	5	8%

Results – Overall Gain in Expert-like Responses[2]



Percentage of expertlike E-CLASS responses at the beginning and end of the term.
Left to right: Fall 2018, Winter 2019, Spring 2019.

Results – By Statement (2 examples out of 40 statements)

Spring term omitted for low n

"The primary purpose of doing a physics experiment is to confirm previously known results"

		Fall	Win
% of students think	pre	70%	50%
	change	+10%	+20%
% of students say experts think	pre	55%	45%
	change	+15%	+0%
% of students say important for grade	post	60%	60%

- Many students think it is important to "verify" known info
- More students thought so after our lab

"If I am communicating results from an experiment, my main goal is to create a report with the correct sections and formatting"

		Fall	Win
% of students think	pre	80%	50%
	change	-10%	+20%
% of students say experts think	pre	80%	60%
	change	-5%	+20%
% of students say important for grade	post	50%	65%

- Students thought the main goal of communicating was organization
- Mixed results for terms on how it changed

Summary

Overall

In our original course, we see a slight gain on the E-CLASS.

Aggregate data from other unis shows no gain or a slight drop is normal from pre to post.

By Question

Many of our students think verification is important and sections and formatting are the main goal of communicating.

Looking Forward

We are continuing to collect E-CLASS data for three more terms (Fall, Winter, Spring) with the new version of the course.

We will look for changes—for example, do students still think verification is important after a different version of the course?

References

1. The E-CLASS is available at https://jila.colorado.edu/lewandowski/
Wilcox et al. (2016). "Alternative model for administration and analysis of research-based assessments" Physical Review Physics Education Research 12, 010139. https://doi.org/10.1103/PhysRevPhysEducRes.12.010139

Poster and slides available at bit.ly/HelenAAPT (case sensitive)