

Research into student learning

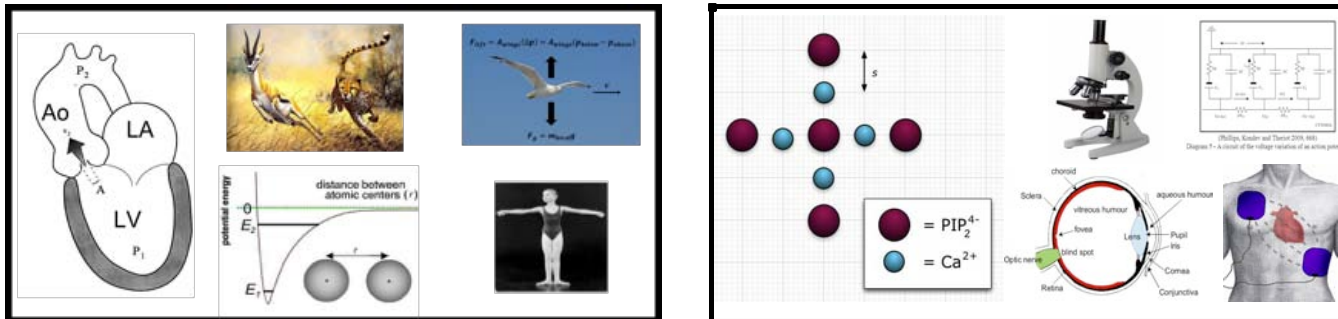
Catherine Crouch and Ben Geller
(two summer 2019 student positions)



Do life science students use what they learned in physics later on?

Catherine Crouch and Ben Geller

Collaboration with Sara Hiebert Burch (Biology), and colleagues at University of Maryland

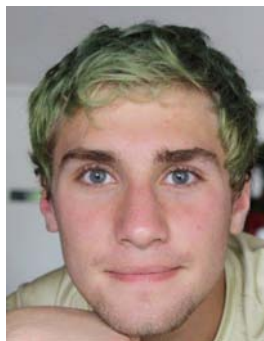




Tessa Williams
'17



Haley Gerardi
'17



Max Franklin '19



Fai
Wisittanawat '13



Jess Li '19



Kat Lima '20



Jonathan
Solomon '20



Nathaniel Peters '18

Research questions

- Do students in our physics for life sciences courses (Physics 3L-4L) successfully make use of what they learn in physics in later courses?
- What aspects of the courses support students to do so?

Physics education research

- Add to basic knowledge about how students learn
- Improve curricula and teaching methods

Research methods

- The best PER research combines **quantitative** (statistical) analysis of pre/post survey questions with more **qualitative** analysis (interviews, ethnographic classroom observation, open-ended survey questions)

Ben will tell you about specifics!

Condensed matter experiment

- ❑ I am not offering experimental projects for summer 2019
- ❑ You have great options here with Prof. Hillary Smith, Prof. Cacey Bester, and Prof. Eva-Maria Collins!
- ❑ If you're interested in nanoscale materials or biological experimental physics, I can recommend colleagues who supervise students at REUs



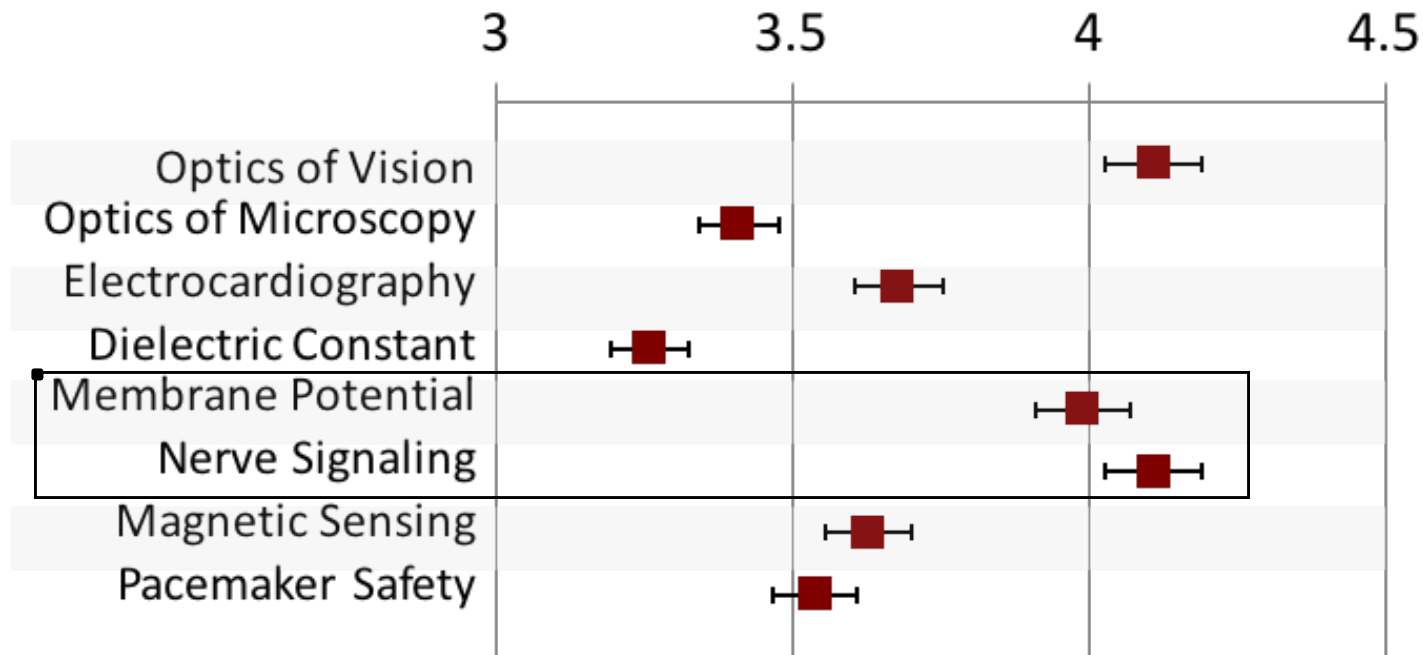
What would you do this summer?

- ❑ Statistics on survey results
- ❑ Reading (anonymized) student work and categorizing (“coding”) the types of physical reasoning evident in these responses
- ❑ Analyzing and coding student interviews to look for prominent themes.

This research develops skills that are relevant to both teaching and research!

No biology experience necessary!

Interest in particular examples?



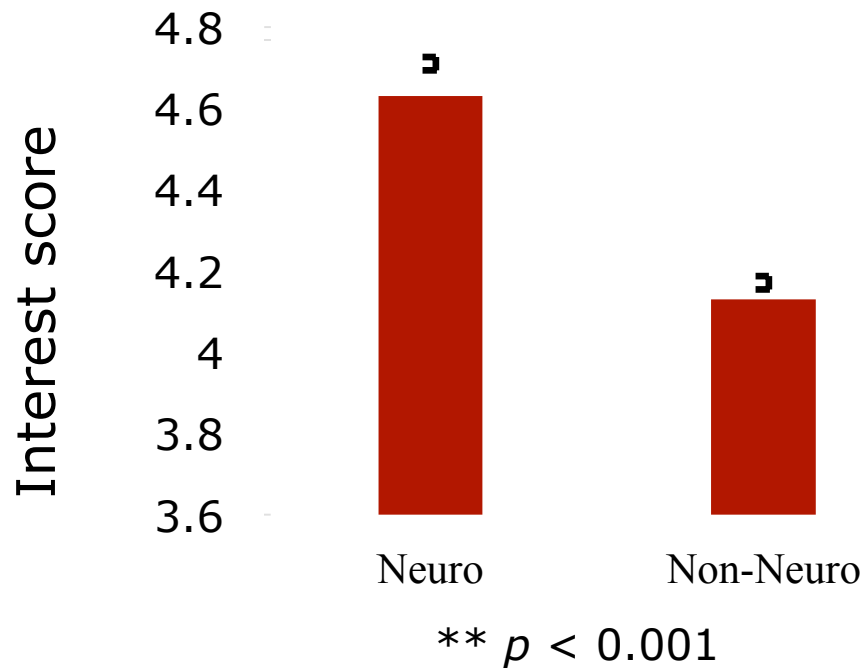
Level of Interest by Topic

Data analyzed over 4 years (2012 - 2015), $N = 194$

Geller et al. (2018)

Dependence on prior coursework

Example 1: Neural Signaling

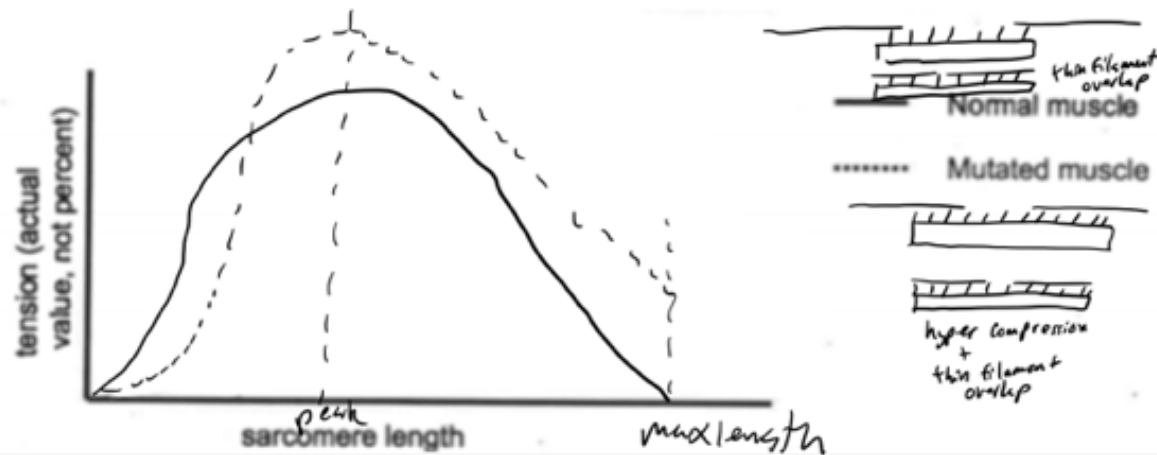
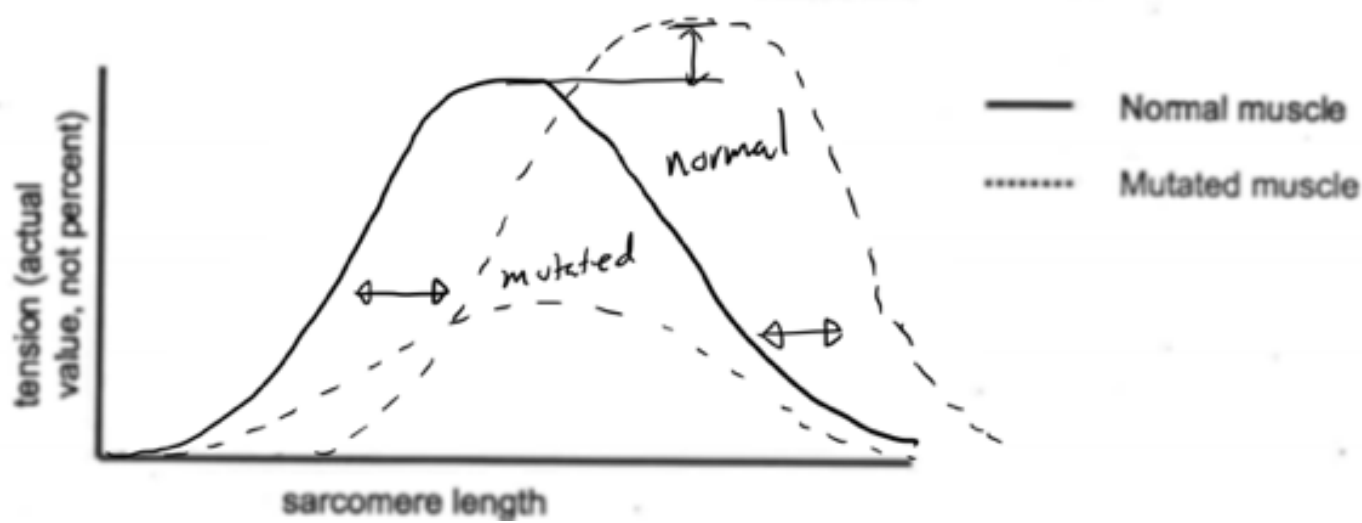


Data analyzed over 6 years (2012 - 2017), $N=256$

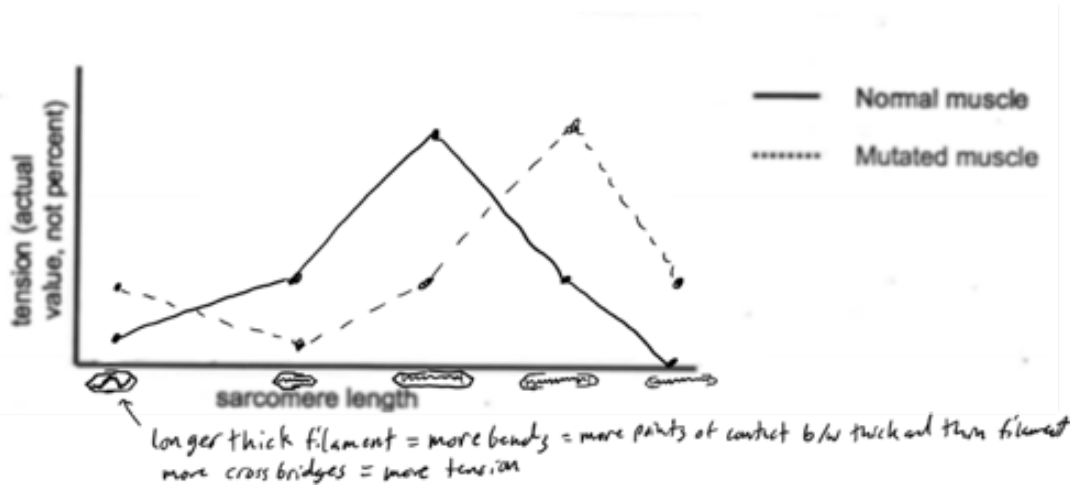
Geller et al. (2018)



Coding student written work



Coding student written work



$$\dot{H} = \frac{KA(t_2 - t_1)}{d}$$

d = thickness of boundary between thermal zones

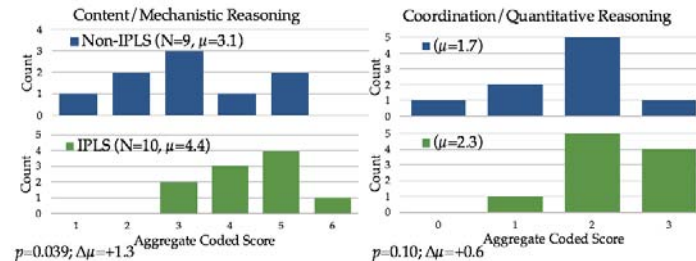
\dot{H} = Heat exchange
 K = conductivity coefficient
 [measure of a substance's ability to conduct heat]
 T_2 = temperature of thermal zone 2

A = Surf. betw them
 T_1 = Temp zone

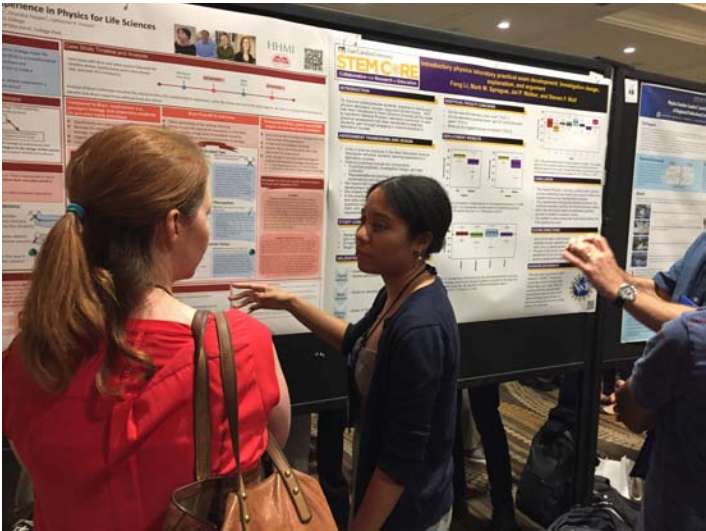
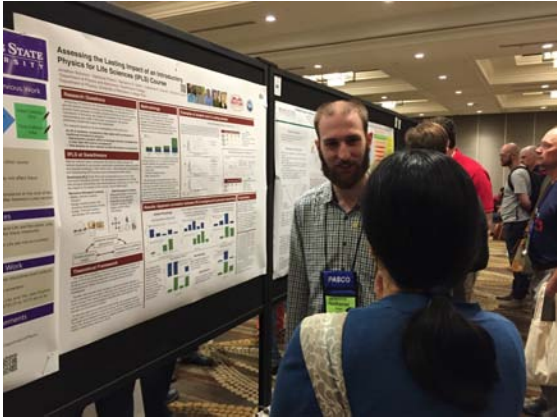
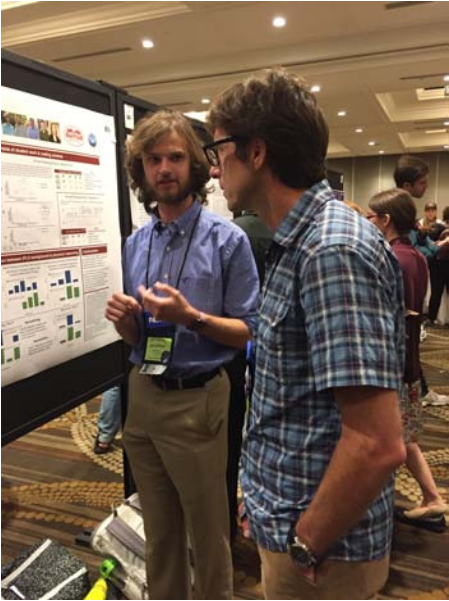
CODE

	Description	Diagram	Buckling	Label
STUDENT	A (None)	X	X	X
	B (Trad.)	X	✓	✓
	C (IPLS)	✓	✓	✓

Grouping Codes by Skill



National AAPT/PERC conference



To learn more

Catherine and I are always happy to talk about these projects and opportunities!

If you would like to do research with us during Summer 2019, please make an appointment to discuss this further with one or both of us

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