

Roleplaying in GTA Preparation: Microteaching and Lab Simulation

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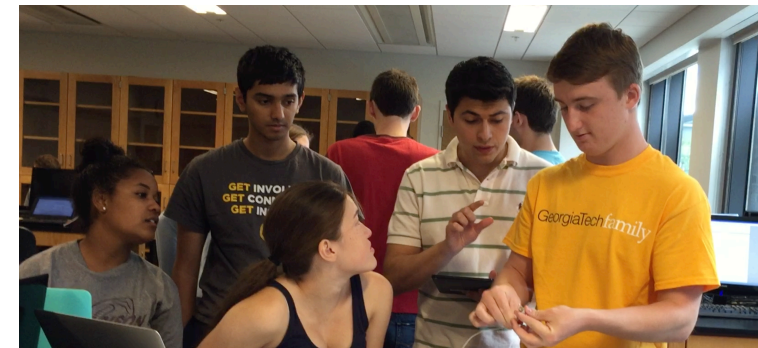
Georgia Institute of Technology

AAPT Summer 2020 Meeting

Invited Talk, ID# 10066

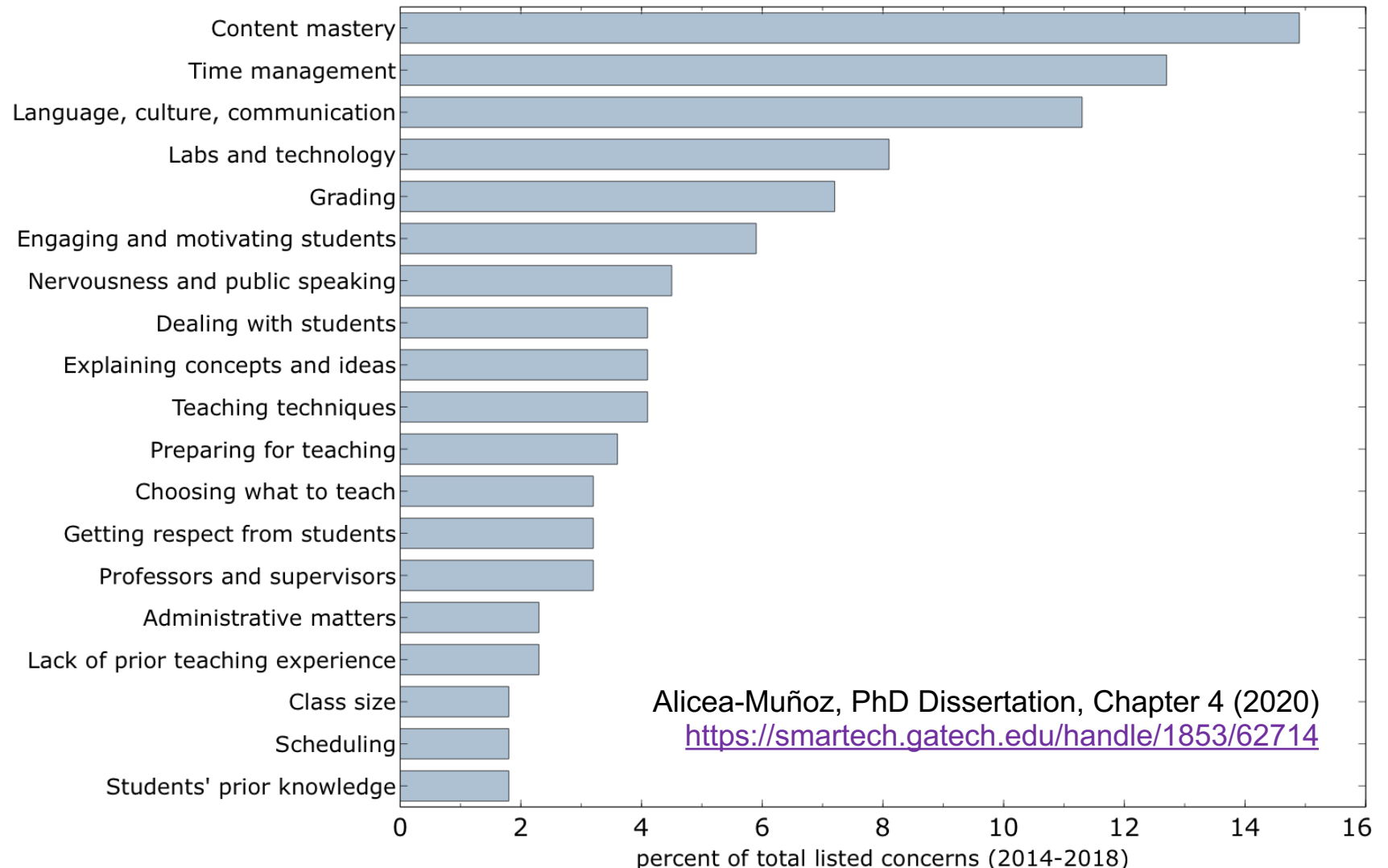
Background

- GTAs are key partners in the education of undergraduate students
- In many large-enrollment intro physics classes, undergrads spend $\sim 50\%$ of their in-class time supervised by GTAs (labs, recitations)
- Potential for large impact on student learning
- **GTAs need preparation for teaching**



Initial conditions of GTAs

- Little prior teaching experience
- Want to do a good job at teaching
- Have several worries about their first teaching job



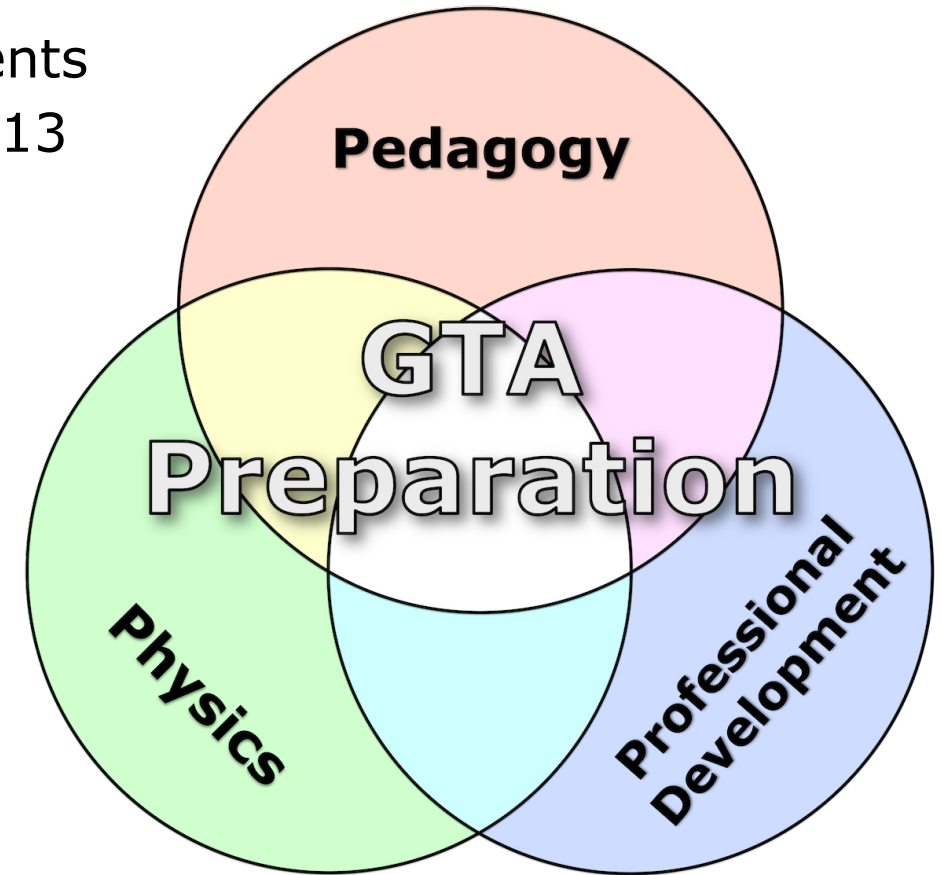
Practice makes perfect

- Research shows that training improves GTAs' teaching **confidence** and **self-efficacy**
- Best principles for GTA preparation suggest that GTAs need to have the opportunity to **practice** and receive **feedback** before they start teaching
- Therefore, a training program that increases GTAs' confidence should include **activities to practice teaching**, and have an experienced instructor provide the GTAs with **feedback** for reflection and improvement



GTA prep at GT Physics

- One credit hour course for first-year PhD students who are also first-time GTAs, established in 2013
 - ❖ Front-loaded: 9 contact hours before semester officially begins
 - ❖ 152 students have participated to date
- **3P Framework**: integration of **pedagogy**, **physics**, and **professional development**
- Goals: produce GTAs who are motivated and effective teachers, and help GTAs develop transferable professional skills they can use outside the classroom



Activities overview

Microteaching

- 8-10 GTAs in each session
- Teacher role: 10-minute facilitation using intro physics problems
- Student role: peers in two groups
- Feedback provided by peers and instructor
 - ❖ What did the teacher do well?
 - ❖ What does the teacher need to improve on?

Lab Simulation (“LabSim”)

- All GTAs in one two-part session
- Intro physics experiments set up in actual intro physics lab room
- Teacher role: two GTAs at a time, 10-minute lab facilitation
- Student role: two GTAs at each lab station, working on experiment
- Feedback provided by instructors

Microteaching

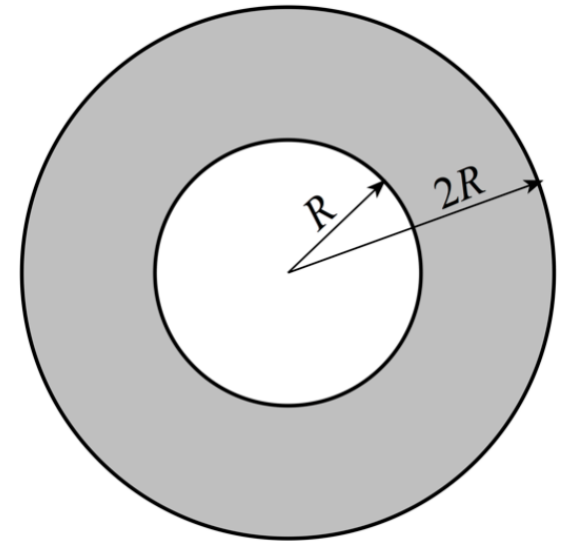
- GTAs select one intro physics problem to teach (Thursday before classes start)
- Solve problem and strategize how to facilitate (weekend)
- Microteaching sessions on ~Tuesday
- Solutions given to GTAs ***after*** full microteaching activity is over

Problem example →

Microteaching Problem 7: Gauss's Law

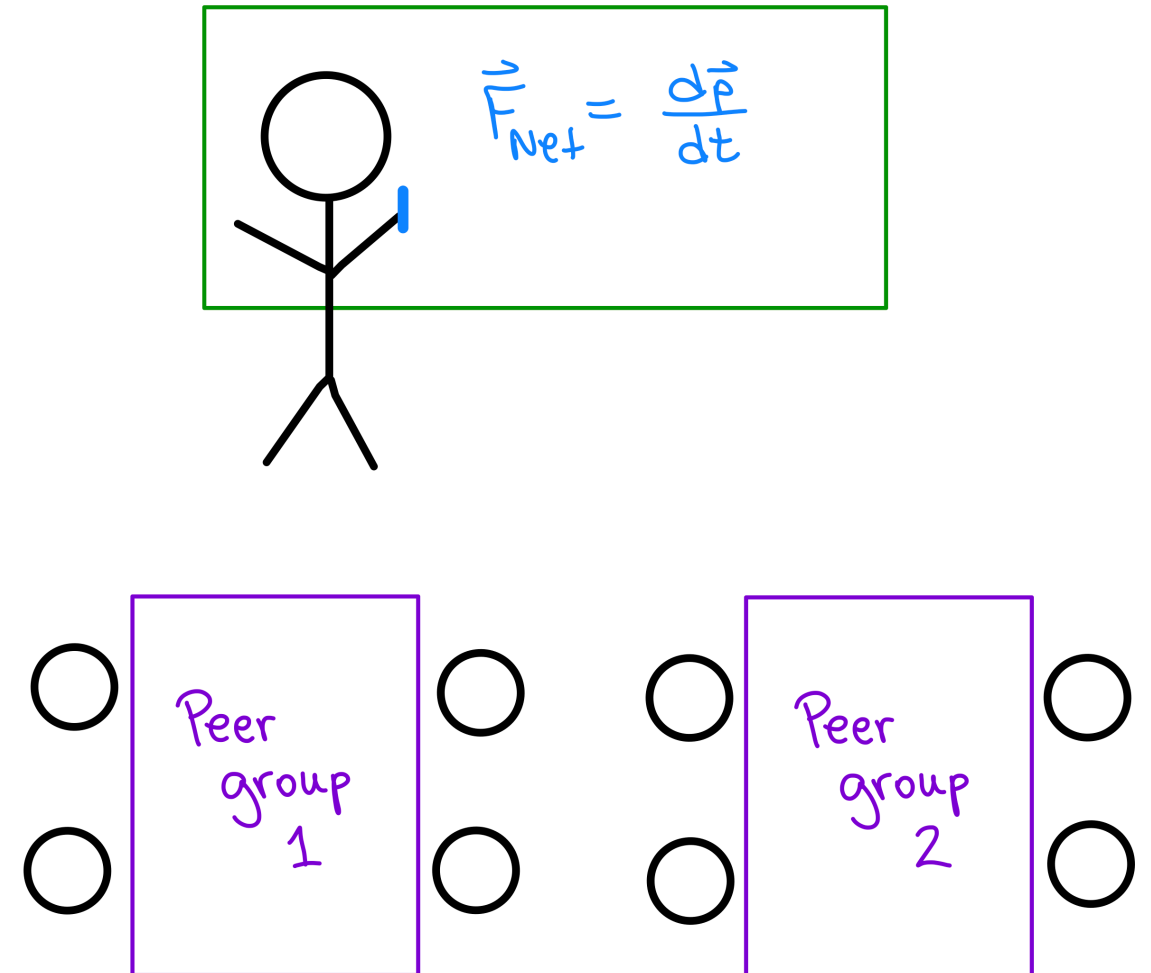
A thick spherical shell, with inner radius R and outer radius $2R$ contains a total charge Q uniformly distributed throughout its volume. Calculate the (vector) electric field as a function of distance r from the center for:

- the region inside the shell's inner radius
- the region of the shell itself
- outside of the shell's outer radius.



Microteaching

- Participants arranged into two groups
- GTAs take turns to facilitate problem-solving for 10 minutes
- No lecture! Interactive engagement!
- Teacher gets feedback from two peer groups and from instructor
- Repeat until everyone has a go



Microteaching

- Debrief essay (for reflection and improvement) due one week after microteaching activity

Questions
to address
in debrief
essay →

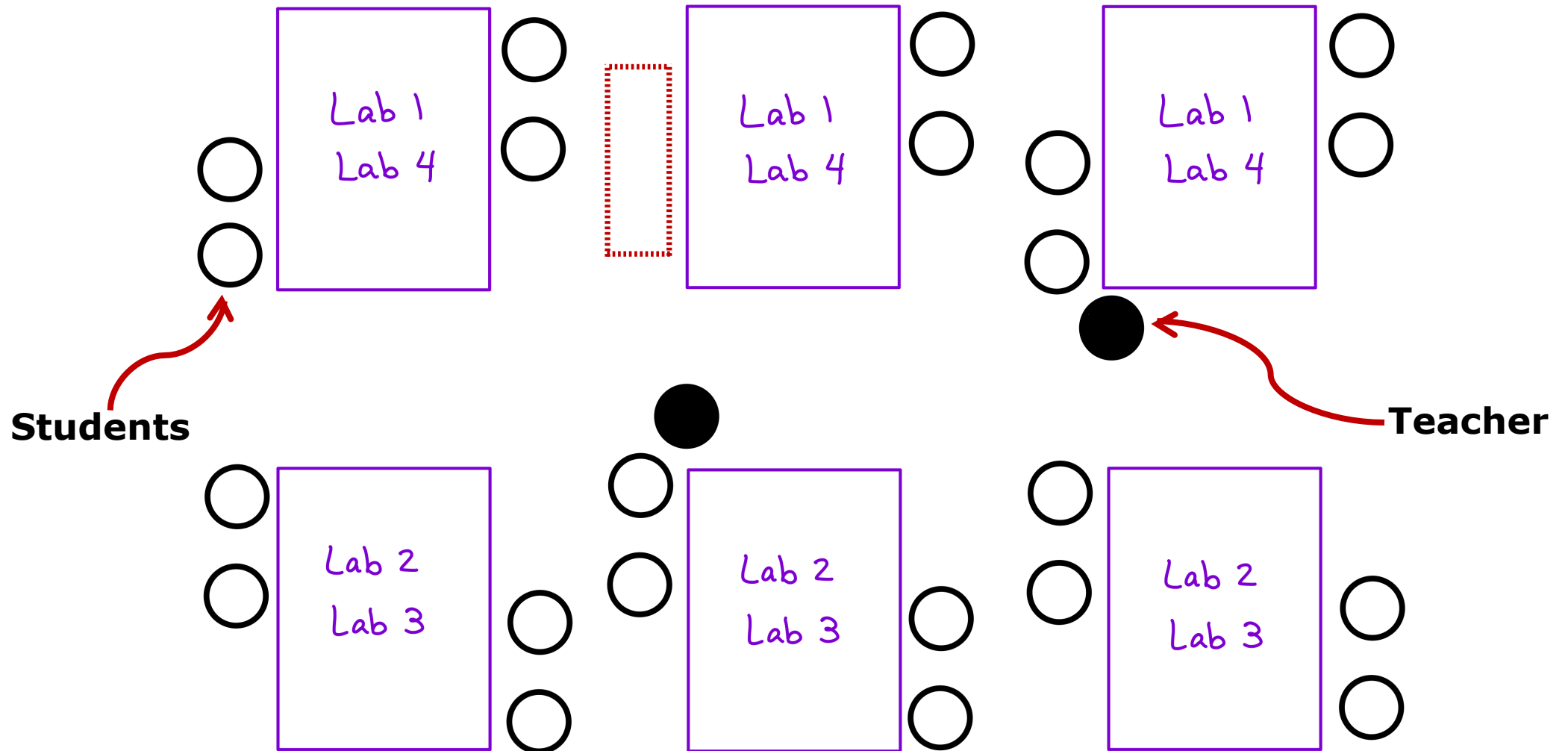
1. What problem did you select, and why? How did you prepare for teaching?
2. What feedback did you receive from your peers and instructor? Do you agree, or was it surprising? Include at least one item of positive feedback and one area for improvement.
3. What do you think about your peers' approaches to teaching? Did anything good or bad stand out? Don't mention names when answering this question!
4. What effect will this activity have on your teaching this semester? In other words, how do you think your teaching will improve after going through the Microteaching Practice?

Lab Simulation

- GTAs are individually assigned one lab to teach, and in pairs are assigned two labs to be students
- All lab materials available for all on class website
- Two rounds, with a 10-min break in between
- Round 1: Mechanics
 - ❖ Labs 1 and 2
- Round 2: E&M
 - ❖ Labs 3 and 4

	Last Name	First Name	TA Role	Student Role
1	Bell	Jocelyn	Lab1	Round 1: Lab1 Round 2: Lab4
2	Curie	Marie	Lab2	
3	Eddington	Arthur	Lab1	Round 1: Lab2 Round 2: Lab3
4	Einstein	Albert	Lab2	
5	Feynman	Richard	Lab1	Round 1: Lab1 Round 2: Lab4
6	Hubble	Edwin	Lab2	
7	Meitner	Lise	Lab1	Round 1: Lab2 Round 2: Lab3
8	Rubin	Vera	Lab2	

Lab Simulation



Lab Simulation

- Feedback on five classroom observation rubric items, rated 1 (needs improvement) to 3 (excellent)

	Last Name	First Name	TA Role	Enthusiasm	Asks questions	Everyone works	Visits groups	Thinks on feet	Comments
1	Bell	Jocelyn	Lab1						
2	Curie	Marie	Lab2						
3	Eddington	Arthur	Lab1						
4	Einstein	Albert	Lab2						
5	Feynman	Richard	Lab1						

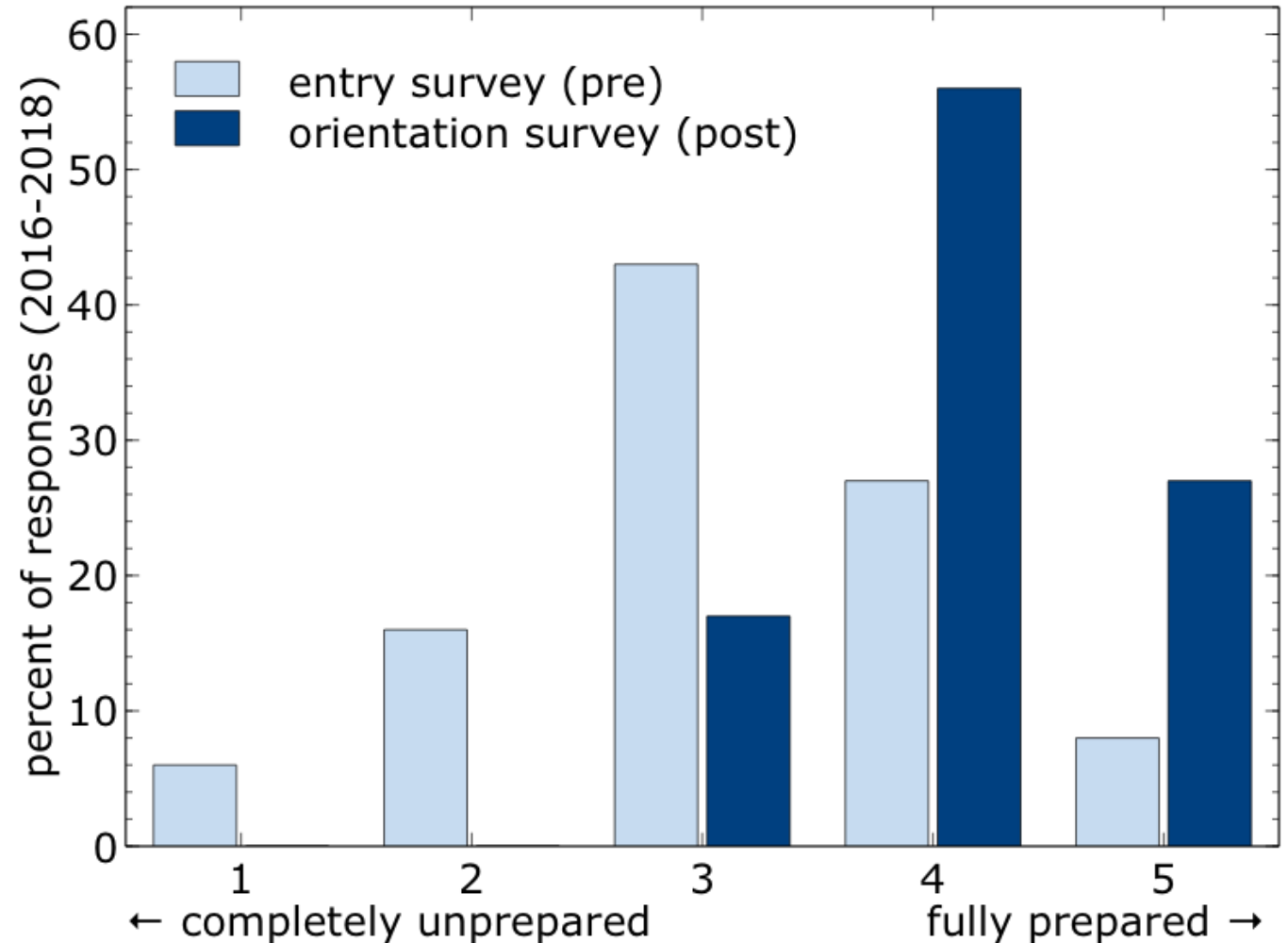
Sabotage!

- About 1/3 of GTAs individually contacted and sworn to secrecy
- Examples:
 - ❖ “Bring your laptop and insist on working on your own”
 - ❖ “Be clumsy with the equipment, repeatedly”
 - ❖ “Dominate the discussion every time a TA comes by”
 - ❖ “Do your quantum homework instead of the lab”
 - ❖ “Play on your phone the whole time”
 - ❖ “Be belligerent towards the TA”
 - ❖ “Flirt with the TA (regardless of gender)”
- Some GTAs notice and act accordingly, but others don't!



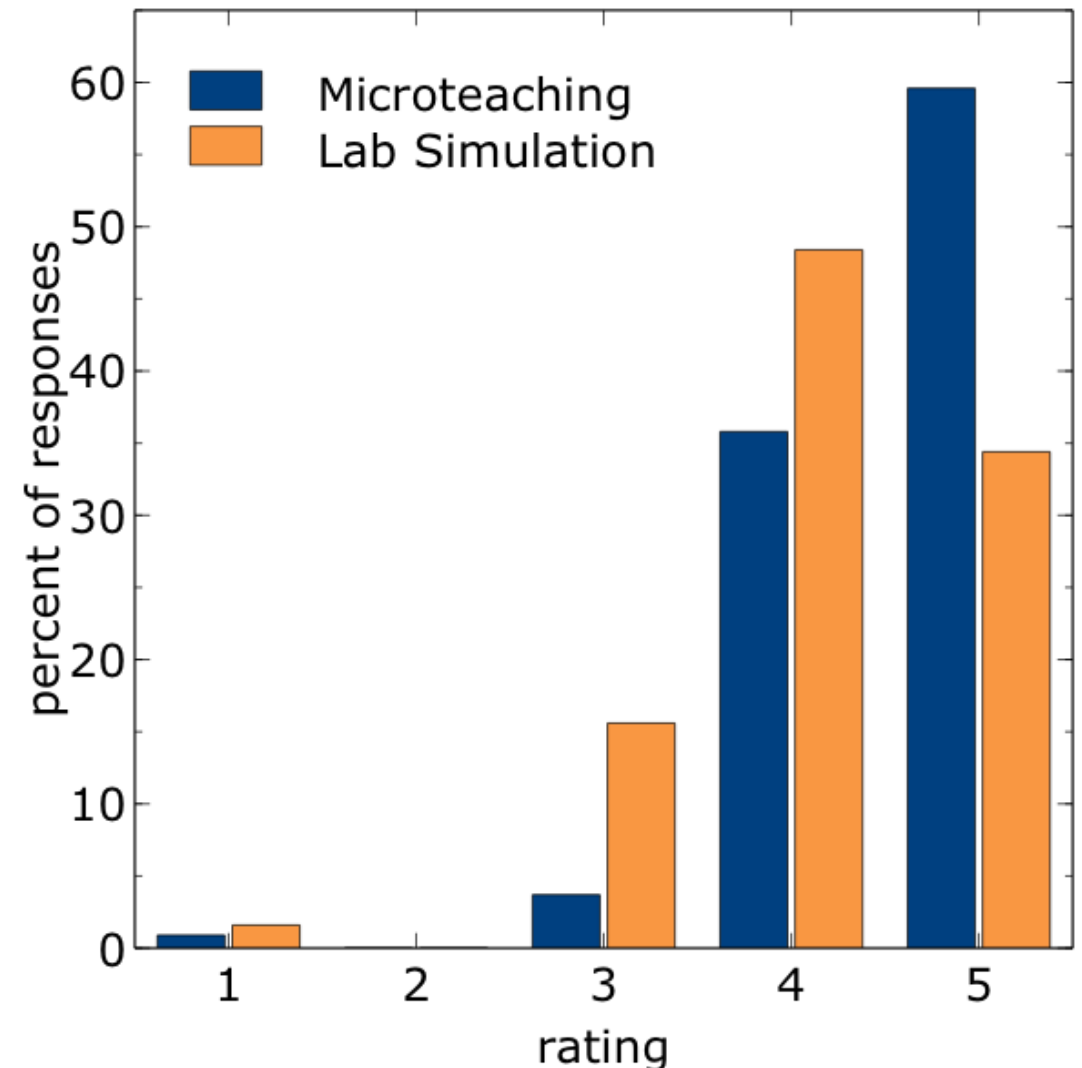
The activities are useful!

- GTAs feel better prepared for teaching after going through the first part of the GTA prep class (Orientation), which includes both the Microteaching and LabSim activities



The activities are useful!

- Orientation Survey: five-point Likert, strongly disagree to strongly agree
 - ❖ “Microteaching was a valuable practical experience”
(N=109, 2014-2018),
 $M \pm SD = 4.54 \pm 0.66$
 - ❖ “The Lab Simulation was a valuable practical experience”
(N=64, 2016-2018),
 $M \pm SD = 4.15 \pm 0.80$



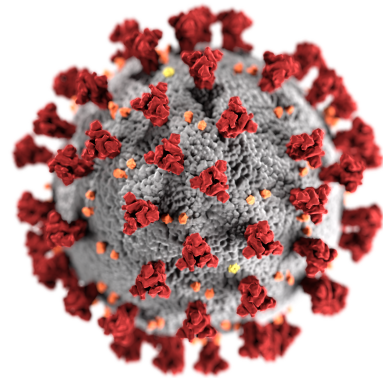
The activities are useful!

- Final Survey: rate usefulness of lessons and activities
- Overall top 3 most useful
 1. Microteaching (4.40 ± 0.95)
 2. Lab Simulation (4.30 ± 1.09)
 3. Teaching Physics (4.10 ± 1.05)
- Yearly top 3 most useful →

Rank	Item	Score ($M \pm SD$)
2015		
1	Microteaching	4.38 ± 1.07
2	Individual Classroom Observations	3.79 ± 1.29
3	Teaching Physics	3.76 ± 1.06
2016		
1	Microteaching	4.32 ± 0.72
2	Teaching Physics	4.23 ± 0.69
3	Individual Classroom Observations	4.09 ± 1.11
2017		
1	Intro & Georgia Tech Policies	4.38 ± 0.82
2	Microteaching	4.35 ± 1.07
3	Teaching Physics	4.29 ± 1.20
2018		
1	Lab Simulation	4.80 ± 0.41
2	Microteaching	4.67 ± 0.82
3	Teaching Physics	4.33 ± 1.11

Challenges for Fall 2020

- Microteaching: started in 2013; Lab Simulation: started in 2016
- Fall 2020...



- Remote labs → different kind of classroom management for new GTAs
- How to practice teaching if we can't meet in person?
- How do new GTAs learn classroom management for future in-person teaching?

Thanks for watching!

More information:

- **AAPT Contributed Talk, ID #10426:**
“Research Results and Best Practices for GTA Preparation” (summary of literature results and recommendations for GTA training)
- **PERC Juried Talk, ID #8024:** “Transforming the Preparation of Physics GTAs” (research results from GT Physics GTA training since 2013)

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