



ULAB: An Accessible, Peer-Led Framework for Facilitating Undergraduate Research Experiences

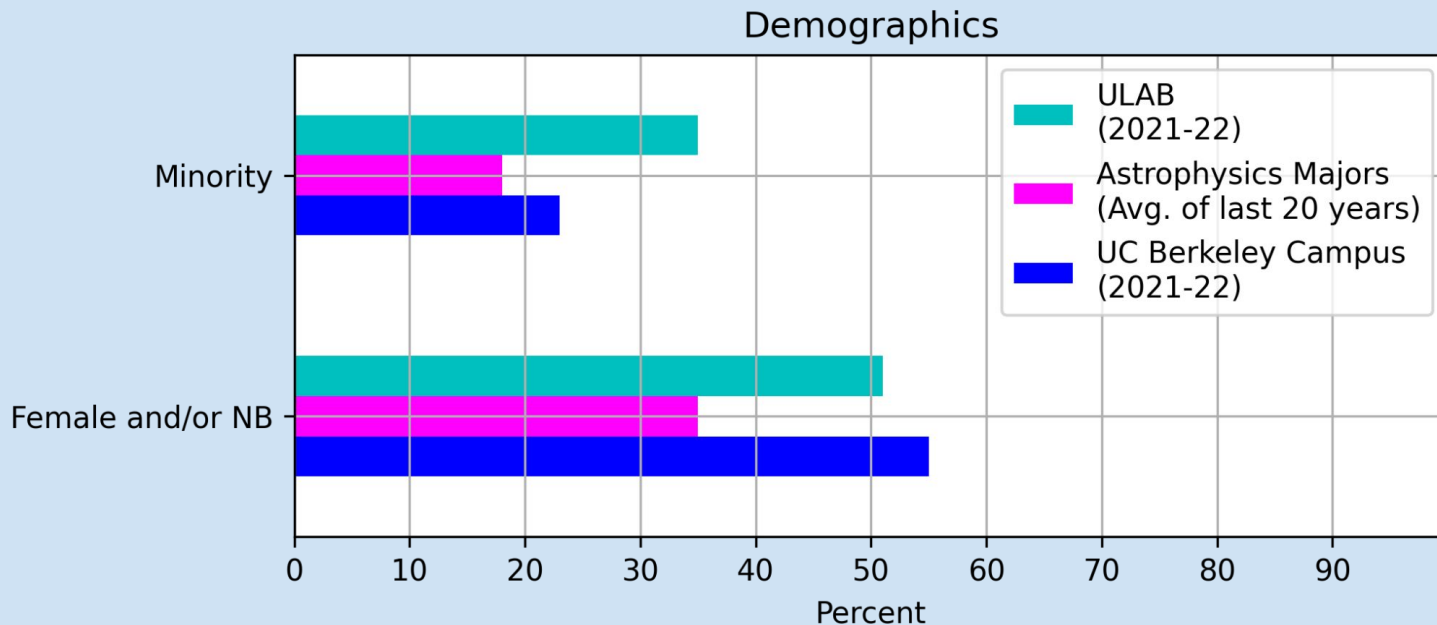
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Motivation

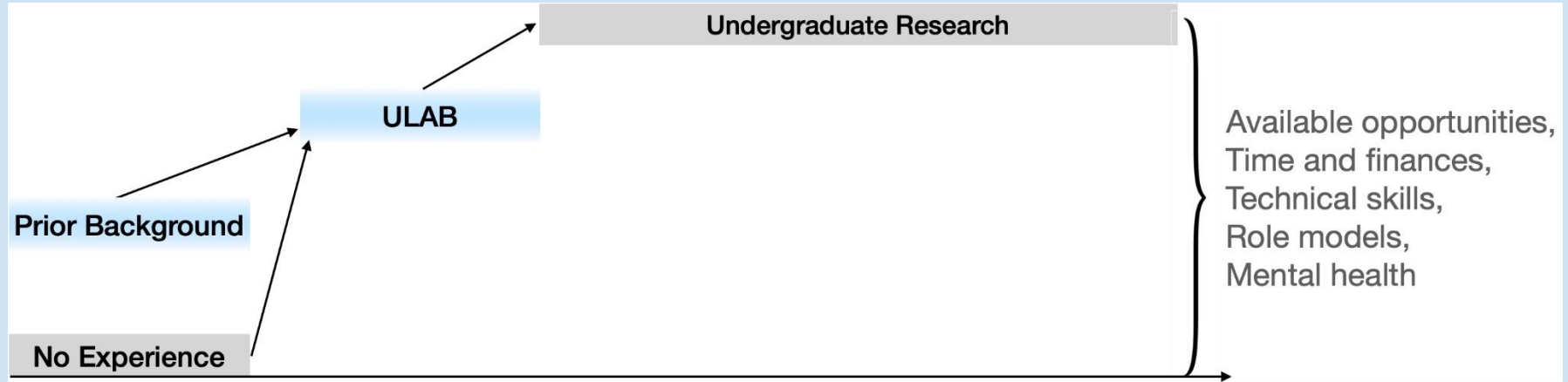


- UC Berkeley has on average a 19:1 student-faculty ratio
 - Above national average and much greater than private universities
- Various research opportunities, but they tend to favor experienced students



Motivation: how ULAB bridges the gap

- Undergraduates teach and support each other to bridge this gap
- Introduce basic, necessary research skills
- Provide structure for year-long research projects
- Mentorship and community through undergraduate mentors



Structure of ULAB

- 2 semester, undergraduate-run class for academic credit (P/NP)
 - 2 units or ~90 hrs/sem
- ~50 students divided into groups of 5-6 under an undergraduate mentor
- Other divisions in data science, cognitive science, etc.

Lectures

- 1 hr/week
- Given by directors & lab managers
- Cover topics on Python, Statistics, Latex, & other technical skills

Group Meetings

- 1 hr/week
- Led by undergraduate mentor
- Work on project proposal, learning background material, & research

Structure of ULAB

Overall structure of class:

- Fall semester: project proposal & presentation
- Spring: conduct project & poster symposium
- Mentees present to faculty, postdocs, & grad students
- Focus on learning skills, not publishable result

What we provide:

- Bi-weekly socials: mentees get to know students in other groups
- Workshops on mental wellness, professional development
- Grad, post-doc, & faculty advisors for projects

Past project examples:

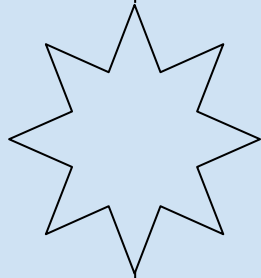
- Measuring cosmic distances with gravitational waves
- Cosmic ray predictions with a homemade muon detector
- Observing and obtaining a light curve from a potential transiting exoplanet

Sample Schedule

Week	Monday Date	MONDAY	WEDNESDAY	HW	SOCIALS!
1	8/22		Instructions Starts		
2	8/29				
3	9/5	Labor Day	Kickoff!		
4	9/12	Intro. Topics	Mentor Intros		
5	9/19	Research Literacy	GM		
6	9/26	Python I	GM	Module 1 or Advanced 1	
7	10/3	Python II	GM	Module 2 or Advanced 2	Social (star party)
8	10/10	Mental Health I	Mid-Semester Discussion	Mid-Sem Check-In	
9	10/17	Latex	GM	Latex	Social
10	10/24	Python III	GM	Module 3 or Advanced 3	
11	10/31	Python IV	GM	Module 4 or Advanced 4	Social (star party)
12	11/7	Python V (Numpy)	GM	Module 5 or Advanced 5	
13	11/14	Mental Health II	Mock Presentations		Thanksgiving Social
14	11/21	Mock Presentations	Thanksgiving		
15	11/28	GM	GM	Project Proposal Document	
16 RRR	12/5			Project Proposal Presentation (Week)	
17 Finals	12/12				

Funding

- Prior to 2021-22 academic year: \$2k funding from department
 - experimental projects & equipment
- 2021-22 academic year: Berkeley Discover Grant (PI: Eugene Chiang) funding (\$18k), with a total of (\$20k)
 - Mentor Stipends (\$600/semester, \$1200 total for the year)
 - Invested in equipment (soldering tools, optics equipment)
 - Food for socials
 - Experimental projects
- Mentor stipends make mentoring more accessible
- Berkeley Discover will only last through 2023-24 academic year
- Searching for future funding to support ULAB



BURET Survey

- BURET: Berkeley Undergraduate Research Evaluation Tools (PI: Anne Baranger & Elisa Stone)
- Pilot survey with n=47
- Determine effectiveness of ULAB in improving
 - Confidence in research skills
 - Understanding of research + long term plans
 - Sense of belonging
- Understand how structure and curriculum can be improved
- Pre-survey in beginning of fall, post-survey at end of spring to measure change in students' answers



Example Questions

Q142



Do Not Relate

☐

Rarely Relate

☐

Sometimes Relate

☐

Often Relate

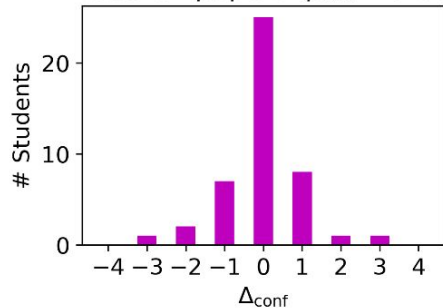
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Always Relate

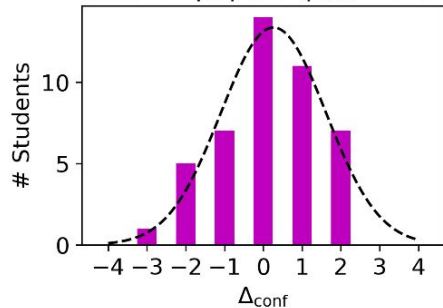
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Results: Research Skills

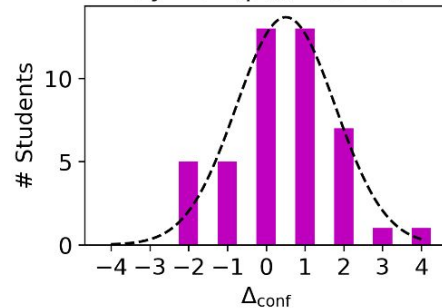
Confidence finding research papers ($p_{SW} = 0.00$)



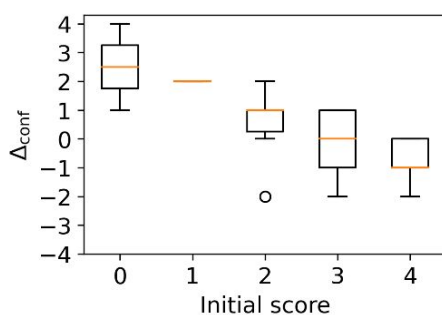
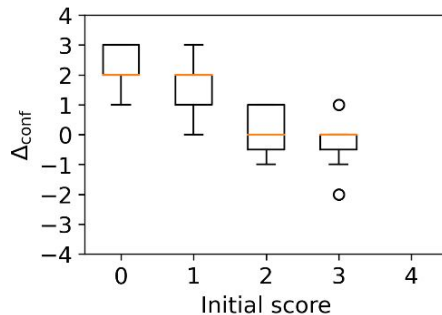
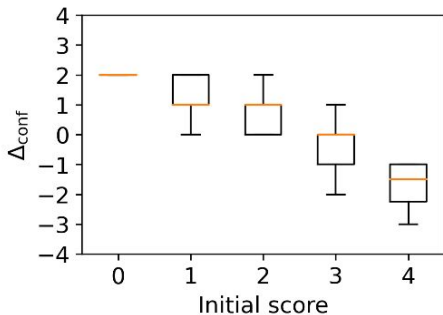
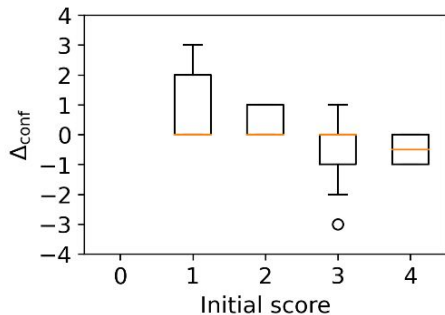
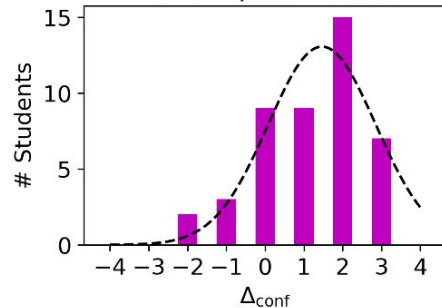
Confidence comprehending research papers ($p_{SW} = 0.01$)



Confidence with Python ($p_{SW} = 0.02$)



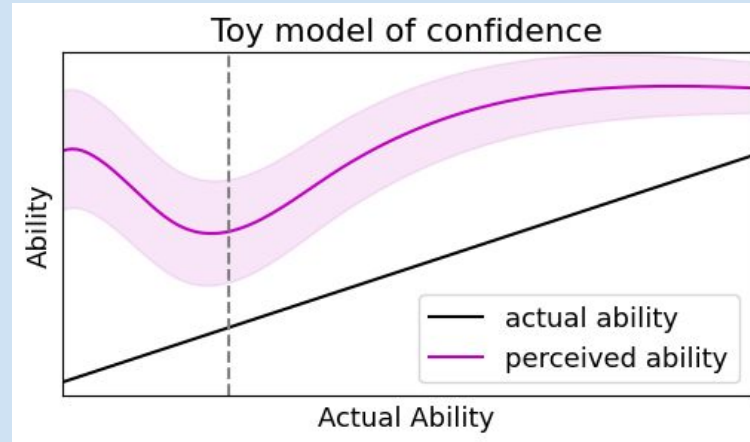
Confidence with LaTeX ($p_{SW} = 0.00$)



Dunning-Kruger effect + open responses



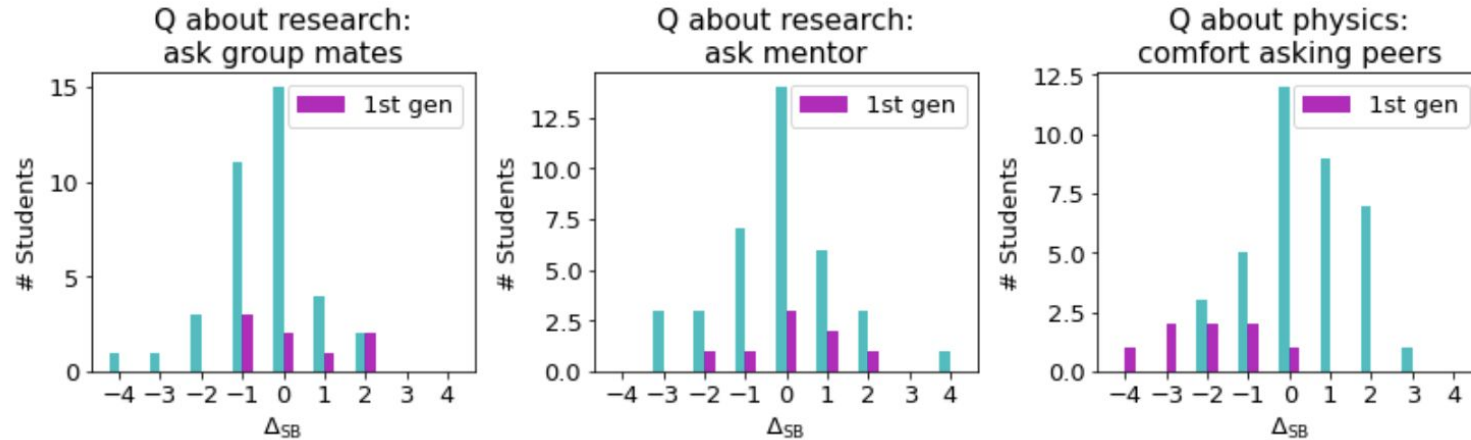
- Dunning-Kruger effect might explain changes in students' responses to levels of confidence questions
- Use interviews in future to check for this



- Open responses proved to be very insightful
 - "I have become significantly more comfortable within ULAB with the above, except less comfortable with python since I've had more trouble than I thought I would with the assignments"

Results: Sense of Belonging

- Important distinction: “peers” are students in other classes, “group mates” are fellow ULAB mentees
- First gen students are more uncomfortable asking questions to peers than non-first gen, but there is no notable difference for asking group mates



Future Steps

BURET Survey

- Interviewing students post-survey to gain insight on their responses
- Continue working with Elisa Stone and BURET
- Adjust survey questions to instead ask how students think they have changed

ULAB

- Adjust lectures to provide more time for collaboration
- Collaborate more closely with physics and astro departments (e.g. MPS program)
- Introduce structure to other universities to encourage accessibility in research

Thank you!



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