Students' shared experiences as inclusive learning opportunities

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Digital **Divisions,**
Digital **Multiplications**
SITT | 2024

Motivation

- Long-standing structural inequities in access to and achievements in higher education in the U.S.
  - **By race and ethnicity**, socio-economic status, gender identity

- COVID-19 pandemic has created new pedagogical **challenges** and opportunities in higher education (Kiesel et al. 2021, Brown et al. 2021, Bergtold et al. 2023)
  - Student engagement and **in-person lecture attendance**

Which course design and teaching methods can leverage students' diverse backgrounds and identities to increase student engagement and ensure our students' academic and professional success?

Students in ARE 136: Managerial Marketing during spring quarter 2024(Photos: Jael Mackendorf)

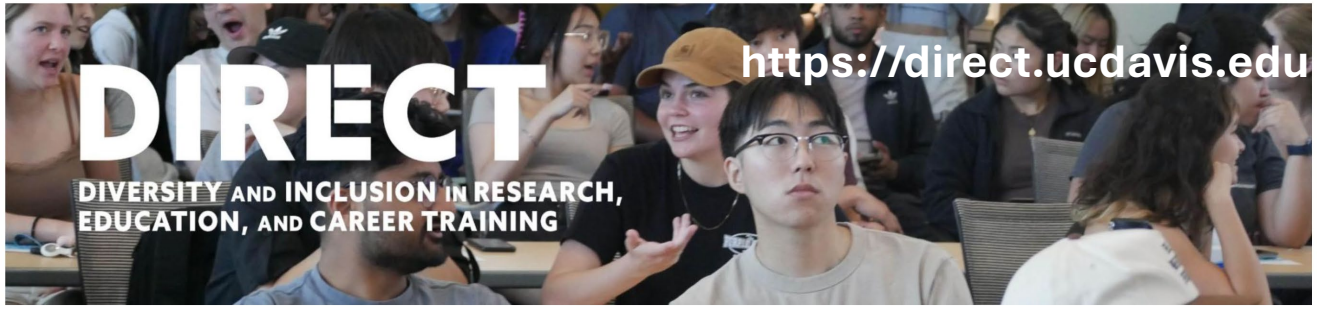



Discipline-Specific Context

- Employment in the U.S. agricultural sector is highly diverse
  - Technological advancements, demographic change and immigration policy reduced the supply of and demand for seasonal farm labor (Martin 2024)
  - Demand for recent college graduates in all other domains is steadily increasing (CDFA 2023)

- Covid pandemic exacerbated misperception that path to success is to eschew a career in agriculture, especially among historically minoritized students

Need to attract and retain new talent in agricultural economics as an academic discipline, accelerate innovation in the agricultural and food industry, and strengthen the economic resilience of local communities



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This Study

- Exploits exogenous variation in **penalized absence vs. incentivized participation** and aims to establish a causal link between students' shared learning experiences and metrics of academic success (e.g., exam performance and course grades)
  - ✓ *Effect on lecture attendance*
  - ✓ Effect on learning outcomes
    - Course grade
    - Grade improvements
- Informed by the emerging literature on experience effects and economic outcomes (Malmendier 2021, Malmendier and Shen 2024)
- Builds on pedagogy research documenting a strong recursive relation between academic performance, retention in STEM disciplines, and course-specific social belonging (Edwards et al. 2022a, 2022b)

Descriptive Statistics: Set Up and Main Variables of Interest

	Course A (fall 2023)*	Course B (spring 2024)*	Course C (spring 2024)	Course D (spring 2024)
Lecture attendance required		✓		
Participation incentivized			✓	✓
Lecture capture	✓	✓	✓	
Enrollment (# of students)	76	69	108	140
Course survey (response rate, %)	16.6	31.1	32.4	47.8
Covid survey (response rate, %)	17.6	13.0	13.9	18.1
Student records	✓	✓	✓	✓
Course records	✓	✓	✓	✓
Attendance (%)	**11.5**	**98.9**	**91.0**	**87.0**
Performance (Course overall, avg %)	**68.2**	**65.7**	**86.8**	**84.7**
Performance (1st midterm, avg %)	68.5	77.6	76.6	68.6

*We thank Prof. Colin Carter for his collaboration and sharing of course data
IRB approval (exemption) and FERPA compliant

Syllabus Language (Lecture attendance)

Attendance at lectures will be taken & you are permitted to miss 2 lectures without penalty. Absences beyond 2 lectures will result in 100 basis points per absence being deducted from your final numerical grade. If you are late for class, you will be marked absent. If you plan to skip lectures, this course is not for you.

(Course B)

I designed the course with a certain engagement level in mind. **Your regular lecture and section attendance, coming prepared and being present are essential to making this course work and to having you succeed in it.**

[…]

You are encouraged to actively participate in lectures and sections and can test your understanding by responding to questions using the iClicker App throughout. Please make sure you are registered (using your UC Davis information). One of the questions asked throughout lectures will be randomly chosen to assign **up to two participation points for each lecture.** You receive one point if you submitted an answer to this question and an additional point if you submitted the correct answer. Receiving at least 30 points will count as a 100% participation score towards your final grade. Please note that it is possible to receive close to 40 points by the end of the quarter. This censored scoring allows you to learn from answering questions incorrectly, missing a lecture or two, or encountering occasional technical difficulties when submitting your answers. No additional adjustments are made to your iClicker score. [1]

[1]You can choose to opt out of the participation score altogether. If you decide to do so, you need to contact me via email before the midterm. In this case, all other assignments receive a higher weight when computing your overall grade.

(Course C, similar set up for course D)

Descriptive Statistics: Student Demographics and Records

	Course A (fall 2023)		Course B (spring 2024)		Course C (spring 2024)		Course D (spring 2024)	
	Mean	StdD	Mean	StdD	Mean	StdD	Mean	StdD
Starting year	2020.72	0.99	2020.97	0.91	2021.16	0.97	2020.71	0.91
Gender (% female identifying)	0.38	0.49	0.33	0.47	0.55	0.50	0.53	0.50
EOP (%)	0.14	0.35	0.12	0.32	0.16	0.37	0.18	0.38
International (%)	0.29	0.46	0.25	0.43	0.11	0.32	0.20	0.40
Transfer students (%)	0.32	0.47	0.23	0.43	0.27	0.45	0.24	0.43
Internal change of major (%)	0.50	0.50	0.57	0.50	0.47	0.50	0.56	0.50
GPA (through Fall 2023)	3.08	0.51	3.10	0.49	3.20	0.57	3.16	0.43
Grade ARE 100A	2.72	1.03	2.58	1.03	2.70	0.99	2.67	0.97

Descriptive Statistics: Survey Responses (Student Perceptions)

	Course A (fall 2023)		Course B (spring 2024)		Course C (spring 2024)		Course D (spring 2024)	
	Mean	StdD	Mean	StdD	Mean	StdD	Mean	StdD
Course it good fit	2.79	1.42	2.77	1.91	2.59	1.61	2.62	1.40
Comfortable with peers	**3.07**	1.21	2.90	1.78	**1.86**	0.79	2.41	1.41
Comfortable with TAs	2.36	1.55	2.68	1.80	**1.78**	0.95	2.41	1.40
Comfortable with instructor	2.57	1.28	2.65	1.74	2.24	1.36	2.47	1.38
Sense of Belonging (uncond.)	**3.36**	1.95	2.68	1.64	2.16	0.87	2.65	1.55
Belonging Uncertainty	**4.43**	1.87	5.07	1.71	4.89	1.68	4.78	1.61
Belonging (cond. on pos. performance)	3.07	1.21	3.00	1.56	2.84	1.26	3.29	1.50
Not belonging (cond. on neg. performance)	**3.86**	2.03	4.24	2.03	4.35	1.84	4.49	1.63
Learning (unconditional)	**2.93**	2.06	2.62	1.80	2.32	1.03	2.53	1.29
Learning uncertainty	3.93	1.82	4.59	1.66	4.38	1.62	4.35	1.48
Learning (cond. on pos. performance)	3.00	1.30	2.76	1.57	3.08	1.26	3.16	1.54
Not Learning (cond. on neg. performance)	4.43	1.95	4.59	1.74	**3.95**	1.63	**4.13**	1.74
TAs cared about my learning	**2.69**	**1.65**	**2.55**	**1.59**	**2.32**	**1.16**	**2.63**	**1.34**
Instructor cared about my learning	**2.64**	**1.55**	**2.14**	**1.43**	**1.97**	**0.87**	**2.28**	**1.26**
N	14				37		68	

Note: Seven-point likert scale responses are recorded (1=strongly agree)

Feel relative less comfortable with peers

Feel a relatively less strong sense of belonging

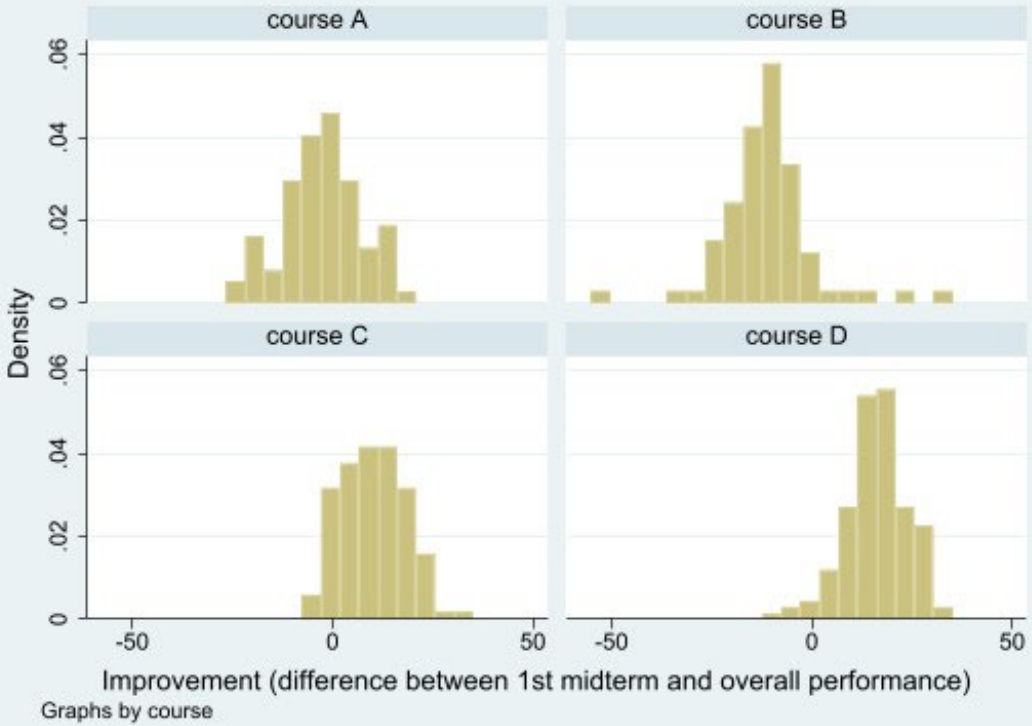
Agree relatively less that they learned a lot (uncond.)

Feel relative more comfortable with peers and TAs

Relatively more receptive to critical feedback (cond.)

Improvements in Student Performance

	Course A (fall 2023)	Course B (spring 2024)	Course C (spring 2024)	Course D (spring 2024)
Lecture attendance required		✓		
Participation incentivized			✓	✓
Lecture capture	✓	✓	✓	
Attendance (%)	**11.5**	**98.9**	**91.0**	**87.0**
1st midterm (avg %)	**68.5**	**77.6**	**76.6**	**68.6**
Course overall (avg %)	**68.2**	**65.7**	**86.8**	**84.7**



Regression Results: Survey Responses (Student Perceptions)

Female identifying students feel a relatively stronger sense of belonging

Change of major students feel relatively stronger sense of belonging

Students attending more lectures feel relatively stronger sense of belonging

Dependent variable: Sense of Belonging (Seven-point Likert Scale; 1=strongly agree)

	Model 1	Model 2	Model 3	Model 4
Independent variables				
Gender (1=female)	**-0.777****	**-0.780****	**-0.777****	**-0.777****
	(0.27)	(0.28)	(0.27)	(0.28)
EOP (1=EOP)	-0.043	-0.045	-0.005	-0.001
	(0.29)	(0.28)	(0.78)	(0.78)
Int (1=Int)	0.088	0.092	0.088	0.093
	(0.50)	(0.51)	(0.51)	(0.51)
Transfer (1=transfer)	-0.719	-0.716	-0.721	-0.722
	(0.43)	(0.44)	(0.43)	(0.45)
Change of Major	**-0.703***	**-0.702***	**-0.703***	**-0.702***
	(0.31)	(0.31)	(0.31)	(0.31)
GPA (fall 23)	-0.374	-0.374	-0.374	-0.376
	(0.37)	(0.37)	(0.37)	(0.38)
Attendance	**-0.009***	**-0.009***	**-0.009***	**-0.009***
	(0.00)	(0.00)	(0.00)	(0.00)
Att*incentivized participation		0.001		0.001
		(0.00)		(0.00)
Att*EOP			0.002	0.003
			(0.01)	(0.01)
Att*incentivized participation*EOP				-0.002
				(0.01)
Constant	5.460***	5.459***	5.453***	5.458***
	-1.33	-1.33	-1.34	-1.36
R2	0.162	0.162	0.162	0.162
Deg of Freedom	111	111	111	111
BIC	546.24	551.234	551.236	561.219

Note: Standard errors clustered by student, reported in parentheses, * p<0.05, ** p<0.01,***p<0.001

Dependent variable: Learning exp. (Seven-point Likert Scale; 1=strongly agree)

	Model 1	Model 2	Model 3	Model 4
Independent variables				
Gender (1=female)	**-0.479**	**-0.479***	**-0.498***	**-0.464***
	(0.25)	(0.24)	(0.24)	(0.23)
EOP (1=EOP)	0.322	0.326	-0.13	-0.09
	(0.54)	(0.55)	(1.29)	(1.36)
Int (1=Int)	-0.551	-0.567	-0.551	-0.557
	(0.32)	(0.33)	(0.32)	(0.33)
Transfer (1=transfer)	0.451	0.44	0.473	0.424
	(0.44)	(0.44)	(0.43)	(0.39)
Change of Major	-0.384	-0.385	-0.38	-0.379
	(0.31)	(0.31)	(0.31)	(0.31)
GPA (fall 23)	**0.527***	**0.527***	**0.528***	**0.508***
	(0.22)	(0.22)	(0.22)	(0.23)
Attendance	-0.007	-0.006	**-0.008***	-0.008
	(0.00)	(0.00)	(0.00)	(0.00)
Att*incentivized participation		-0.001		-0.001
		(0.00)		(0.00)
Att*EOP			0.006	0.011
			(0.01)	(0.01)
Att*incentivized participation*EOP				-0.007
				(0.02)
Constant	1.818*	1.824*	1.889*	1.943*
	-0.87	-0.88	-0.87	-0.89
R2	0.155	0.155	0.157	0.161
Deg of Freedom	109	109	109	109
BIC	523.97	528.87	528.563	537.887

Note: Standard errors clustered by student, reported in parentheses, * p<0.05, ** p<0.01,***p<0.001

Female identifying students agree relatively more that they learned a lot

Students with higher GPA agree relatively less that they learned a lot

Students attending more lectures agree relatively more that they learned a lot

Regression Results: Learning Outcomes (Final Grades)

Students with greater sense of belonging receive higher final grades

Change of major students receive a relatively lower final grade

Student with higher GPA receive a relatively higher final grade

Students attending lectures more frequently receive relatively higher final grade; **effect more pronounced with incentivized participation**

Dependent variable: Overall course performance (%)	Model 1	Model 2	Model 3	Model 4
Independent variables				
Sense of Belonging	**-1.123**	**-1.151****	**-1.122**	**-1.149****
	(0.58)	(0.41)	(0.59)	(0.41)
Gender (1=female)	0.974	-1.33	0.941	-1.463
	(1.70)	(1.23)	(1.72)	(1.25)
EOP (1=EOP)	0.039	-1.211	-1.862	-2.092
	(1.97)	(1.19)	(3.83)	(4.00)
Int (1=Int)	-1.156	2.058	-1.155	2.007
	(2.19)	(1.89)	(2.20)	(1.91)
Transfer (1=transfer)	-3.988	-1.276	-3.898	-1.05
	(2.50)	(1.91)	(2.56)	(2.03)
Change of Major	**-4.682***	**-4.189****	**-4.663***	**-4.193****
	(2.09)	(1.37)	(2.11)	(1.39)
GPA (fall 23)	**6.365****	**6.090*****	**6.370****	**6.203*****
	(1.97)	(1.66)	(1.99)	(1.74)
Attendance	**0.094****	**-0.018**	**0.090***	**-0.018**
	(0.03)	(0.03)	(0.04)	(0.04)
Att*incentivized participation		**0.177*****		**0.174*****
		(0.02)		(0.02)
Att*EOP			0.023	-0.019
			(0.05)	(0.04)
Att*incentivized participation*EOP				0.036
				(0.03)
Constant	59.460***	59.116***	59.758***	58.941***
	(8.08)	(6.39)	(8.20)	(6.79)
R2	0.265	0.638	0.266	0.64
Deg of Freedom	111	111	111	111
BIC	1130.204	1030.42	1135.076	1039.793

Note: Standard errors clustered by student, reported in parentheses, * p<0.05, ** p<0.01,***p<0.001

Dependent variable: Overall course performance (%)	Model 1	Model 2	Model 3	Model 4
Independent variables				
Gender (1=female)	0.703	-1.207	0.78	-1.28
	(1.20)	(0.88)	(1.19)	(0.86)
EOP (1=EOP)	-1.114	-1.978	-4.275	-2.368
	(1.71)	(1.24)	(2.37)	(2.35)
Int (1=Int)	**-4.049****	**-2.887****	**-4.143****	**-2.958****
	(1.36)	(1.01)	(1.37)	(1.02)
Transfer (1=transfer)	0.685	0.248	0.738	0.367
	(1.45)	(1.15)	(1.45)	(1.17)
Change of Major	-0.493	-0.577	-0.44	-0.49
	(1.20)	(0.84)	(1.21)	(0.83)
GPA (fall 23)	**9.592*****	**8.960*****	**9.642*****	**8.882*****
	(1.70)	(1.40)	(1.71)	(1.38)
Attendance	**0.128*****	**-0.001**	**0.121*****	**0.006**
	(0.01)	(0.02)	(0.02)	(0.02)
Att*incentivized participation		**0.201*****		**0.190*****
		(0.02)		(0.01)
Att*EOP			0.043	-0.067
			(0.03)	(0.08)
Att*incentivized participation*EOP				0.089
				(0.07)
Constant	39.413***	41.005***	39.745***	41.294***
	(5.48)	(4.54)	(5.54)	(4.51)
R2	0.329	0.635	0.331	0.642
Deg of Freedom	312	312	312	312
BIC	3042.04	2808.216	3046.78	2813.317

Note: Standard errors clustered by student, reported in parentheses, * p<0.05, ** p<0.01,***p<0.001

Student with relatively greater sense of belonging receive a higher final grade

International Student receive a relatively lower final grade

Student with higher GPA receive a relatively higher final grade

Students attending lectures more frequently receive relatively higher final grade; **effect more pronounced with incentivized participation**

Regression Results: Grade Improvements

International students improve by relatively more

Student with higher GPA improve by relatively less

Students attending lectures more frequently improve relatively more; **effect more pronounced for incentivized participation, and EOP students**

Dependent variable: Grade Improvement (Course overall-midterm 1)				
	Model 1	Model 2	Model 3	Model 4
Independent variables				
Gender (1=female)	2.454	-0.024	2.643	-0.042
	(1.48)	(1.01)	(1.47)	(0.99)
EOP (1=EOP)	2.172	1.054	-5.248*	-2.855
	(2.07)	(1.38)	(2.37)	(2.34)
Int (1=Int)	**1.91**	**3.376****	**1.693**	**3.157***
	(1.80)	(1.25)	(1.80)	(1.25)
Transfer (1=transfer)	2.104	1.433	2.228	1.698
	(1.71)	(1.22)	(1.70)	(1.22)
Change of Major	1.009	0.948	1.134	1.145
	(1.46)	(1.06)	(1.46)	(1.06)
GPA (fall 23)	**-1.402**	**-2.252***	**-1.288**	**-2.319***
	(1.56)	(0.98)	(1.56)	(0.94)
Attendance	**0.064*****	**-0.102*****	**0.047***	**-0.098*****
	(0.02)	**(0.02)**	**(0.02)**	**(0.02)**
Att*incentivized participation		**0.259*****		**0.241*****
		(0.01)		**(0.01)**
Att*EOP			**0.100****	**-0.063**
			(0.03)	**(0.06)**
Att*incentivized participation*EOP				**0.143***
				(0.06)
Constant	2.783	4.957	3.566	5.743
	(5.09)	(3.37)	(5.13)	(3.36)
R2	0.047	0.528	0.058	0.546
Deg of Freedom	310	310	310	310
BIC	3176.795	2908.283	3178.21	2905.098

Note: Standard errors clustered by student, reported in parentheses, * p<0.05, ** p<0.01,***p<0.001

How this course works:

[...]

I designed this course to incentivize the development of effective study habits and to utilize peer-and project-based learning techniques. Some of the assignments serve as low-stakes, formative assessments and learning opportunities (e.g., quizzes, iclicker questions, weekly reflections), while others are used as high-stakes, summative assessments (e.g., exams and final projects) that are intended to evaluate your competency at a given point in time. Importantly, your performance on assessments (e.g., scores and grades received and feedback provided) are at best an imperfect measure of your ability and potential, and I encourage you to frequently reflect and share what worked and did not work in supporting your learning.

(Course C: syllabus)

Additional course features (courses C and D):

- ✓ Pre- and post- lecture quizzes
- ✓ Student reflections
- ✓ Experiments/case studies in sections
- ✓ Group project
- ✓ Guest Lectures

Survey Responses (Comments): Penalized Absence

"This was a great class with engaging lecture. It was unfortunate that very few students showed up to lecture but I am glad I did because the learning experience was much better through live in-person lectures. The instructor is amazing and answered student questions well in class and provided more than enough resources for us to utilize to succeed in the class."

"I thought the instructor had an incomplete grasp of the subject material. Sometimes when he talked about topics it seemed like he misunderstood or didn't grasp the full picture. His thoughts on several subjects in finance reflect an out of date viewpoint not back by modern data or conventional thought. For instance, once he said an etf was a derivative which is not true. ETFs may contain derivatives, but they are not actually derivatives themselves."

Course A

"The instructor and TAs were fantastic."

"The professor did a good job of making the lectures interesting and engaging. He encouraged questions and conversation. I have one class left to take until I graduate and this was the first class that I actually felt like I learned something."

"One of the best professors I have had. Made learning fun by introducing real world things."

"I really like this class, the instructor shared lots of interesting latest news to help us learn instead of something that happened in the past."

"I like the course in person. It provides time for open discussion. It is an efficient way to learn new concepts especially when I hear something that I don't know."

"The recorded lectures helped me retain a lot more info than I could just by going to class."

"Enjoyed the mandatory class. Forced participation made me enjoy the course even more."

"The quiz for Liar's poker can be focused more on financial related points instead of just testing whether we read the book or not.

Course B

Survey Responses (Comments): Incentivized Participation

"Thank you and the TA team for such a fun quarter! I will always remember this class! Great way to end my college career!"

"I learned a lot about my own behavior and expect to use the knowledge obtained in the course to make better decisions from here forward."

"The concepts taught really are valuable and have aided me in my self-reflection moments."

"I really enjoyed the material and wish that more classes like this one were offered at Davis for undergrad students."

"I thought this course was very interesting and well taught!"

"Had a great experience. Learned new topics related to economics. Great class!"

"I really enjoyed this class, it was very interesting information and there wasn't too much work that I felt was unnecessary."

"Death by powerpoint. Professor tangents made it hard to follow teachings. Was hard to connect lecture content to the broader course content."

Course C

"Best class I ever took in Davis."

"I enjoyed discussions! This was the first time I've had one that was very interactive and informative. Never felt uncomfortable asking questions in class."

"I loved this course and I recommend it to all students who are interested in marketing."

"The group project was a very helpful experience for my career!"

"I learned a lot from this course. The marketing plan assignment gives me a chance to apply the knowledge, and helps me gain a deeper understanding to the course material."

"Overall, I didn't think I was going to be "good" at marketing, but I ended up really enjoying the class. The TA's and professor were really helpful with providing feedback. Would highly recommend to student to take this course."

"This course was enjoyable, however the exams (written questions) were difficult and graded hard."

"There's needs to be a shift in the way this class is taught. The teachings and lecture was all over the place making the learning experience not very cohesive. I learned more from the textbook than lecture."

Course D

Summary and Next Steps

- ✓ **Increased lecture attendance** positively affects all student's sense of belonging and learning experience
- ✓ **More frequent lecture attendance** improves individual learning outcomes (e.g., final grades)

- ✓ **Incentivizing participation** (compared to requiring attendance) can offer additional benefits
  - More frequent attendance has relatively larger effect on individual learning outcomes
  - More frequent lecture attendance contributes to grade improvements (student growth), especially among minoritized students

Innovative course design supported by technology offers more inclusive learning opportunities

Next Steps:

- Disaggregated (by first generation status, race and ethnicity) analysis *framing* effects (penalized absence vs. incentivized participation)
- Analysis of richer student survey and record data and longer time periods and

Thank you

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