

# *Course Management, Administration and Challenges in Teaching Large Classrooms in Active Learning Format*

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**Chesapeake Section of the  
American Association of Physics Teachers  
Spring 2025 Semi-Virtual Meeting  
April 5, 2025 @ George Mason University**

# Background

**Course:** Intro Physics 1 and 2 for Pre-health

**Enrollment:** 6 sections of 115 students each (690 students). I teach 3 sections!

**Classroom:** 15 round tables that can accommodate a max of 9 students

**Lecture format:**

- Traditional until Spring 2022
- Active Learning since Fall 2022



***4 UTAs per  
section  
1 GTA per  
instructor***

# Enrollment since Fall 2022

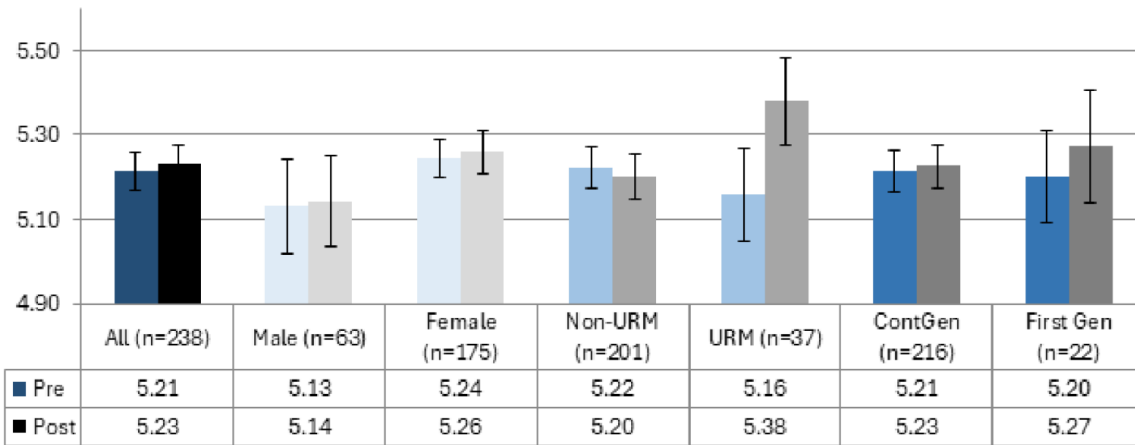
Year	Fall semester			Spring semester		
	<i>Sections</i>	<i>Students per section</i>	<i>Total number of students</i>	<i>Sections</i>	<i>Students per section</i>	<i>Total number of students</i>
<b><i>2022-23</i></b>	3	99	292	3	99	303
	1	54		1	63	
<b><i>2023-24</i></b>	4	99	424	4	99	411
	1	63		1	63	
<b><i>2024-25</i></b>	6	112	632	6	115	623
<b><i>2025-26</i></b>	6	120	-	TBD	TBD	-

# HHMI IE3 Fall 2024 Survey results

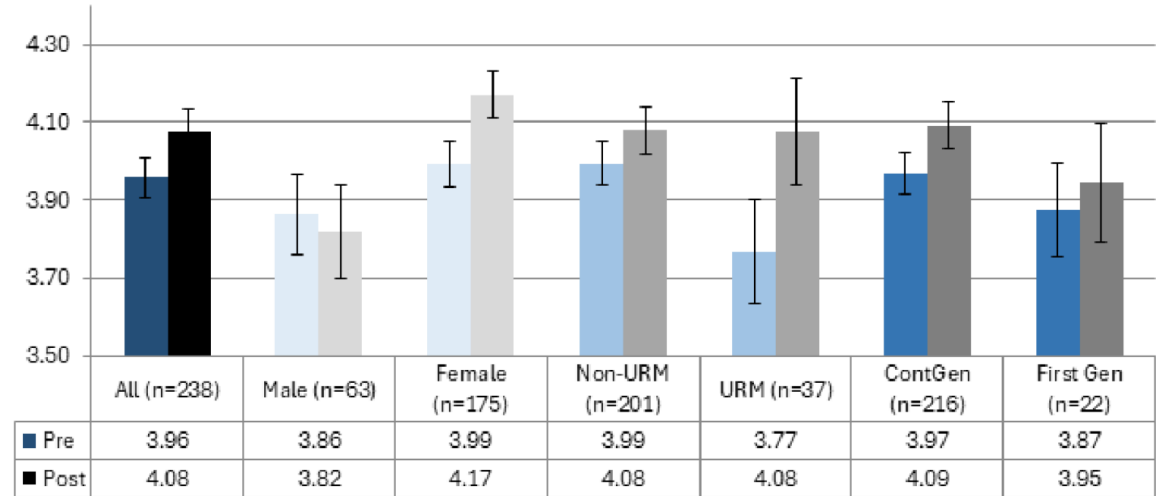
## Improved perceptions of support over time

URM students made significant positive gains in their perceptions of **instructor mindset** and **instructor support** over the semester.

PHYS2010 (section 1-3) Perceived Instructor Growth Mindset



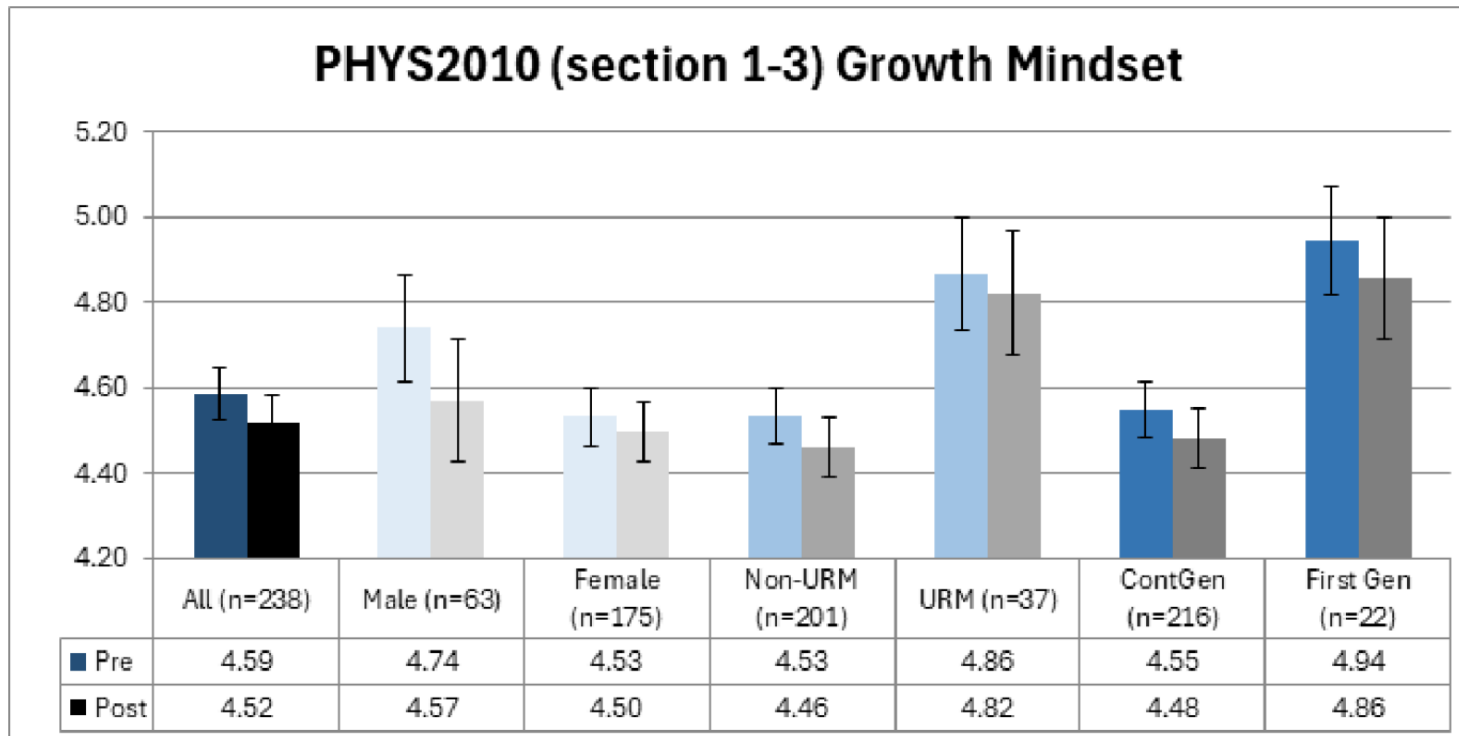
PHYS2010 (section 1-3) Instructor Support



# HHMI IE3 Fall 2024 Survey results

## Growth mindset

**URM and first-generation students** held growth minded beliefs that were significantly higher than their non-URM and continuing generation peers, respectively, at both beginning and end of the semester.

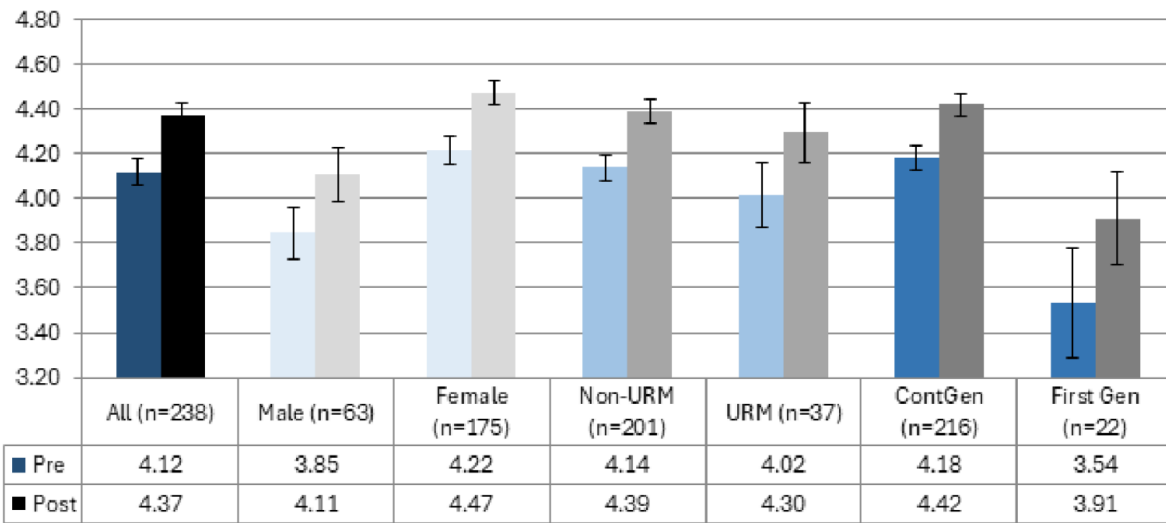


# HHMI IE3 Fall 2024 Survey results

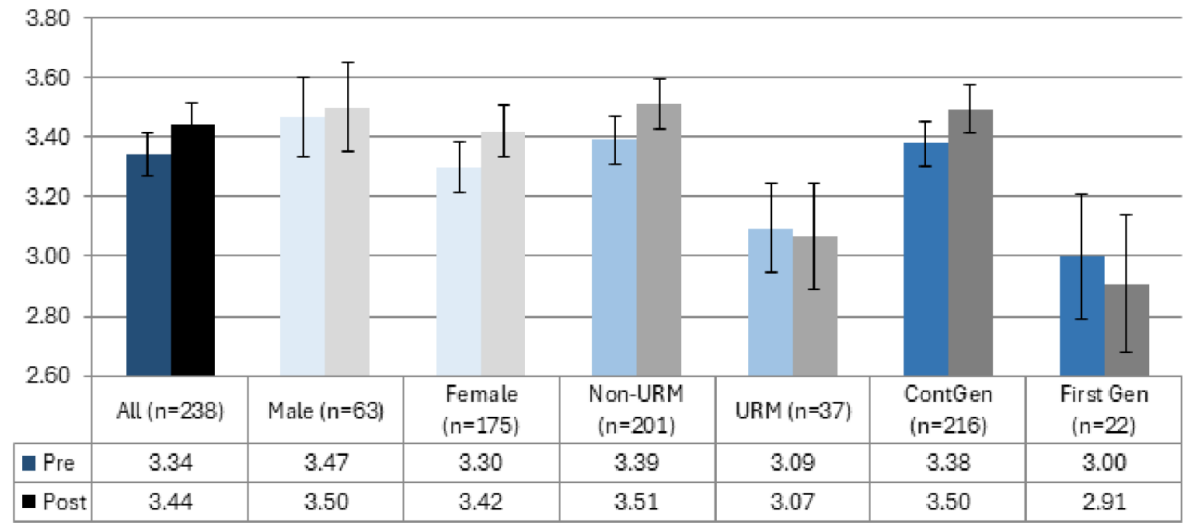
## Peer and Classroom support

All students recognize the **support from peers and the classroom environment** being beneficial in improving their learning.

PHYS2010 (section 1-3) Peer Support



PHYS2010 (section 1-3) Classroom Support

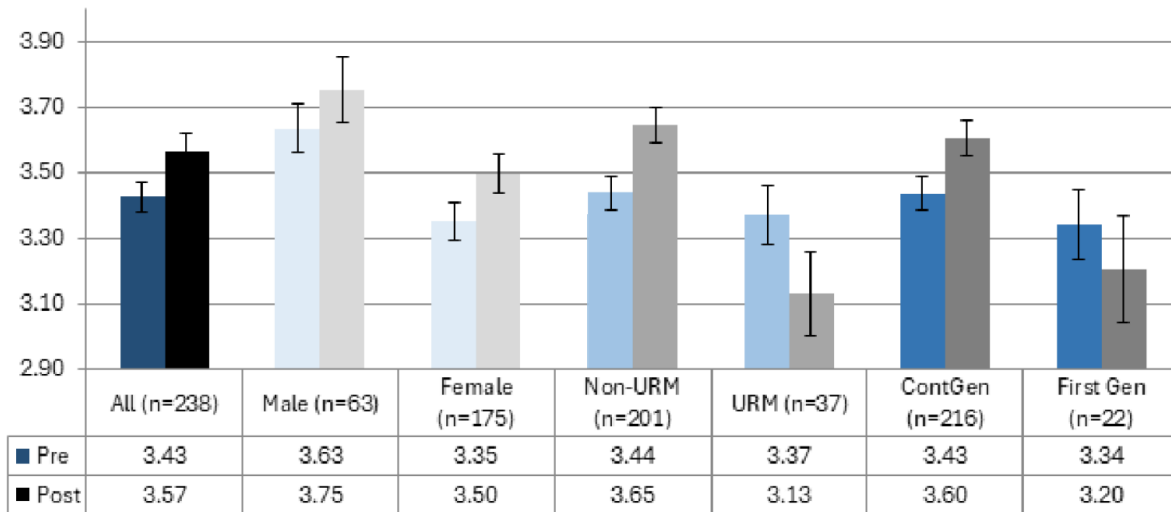


# HHMI IE3 Fall 2024 Survey results

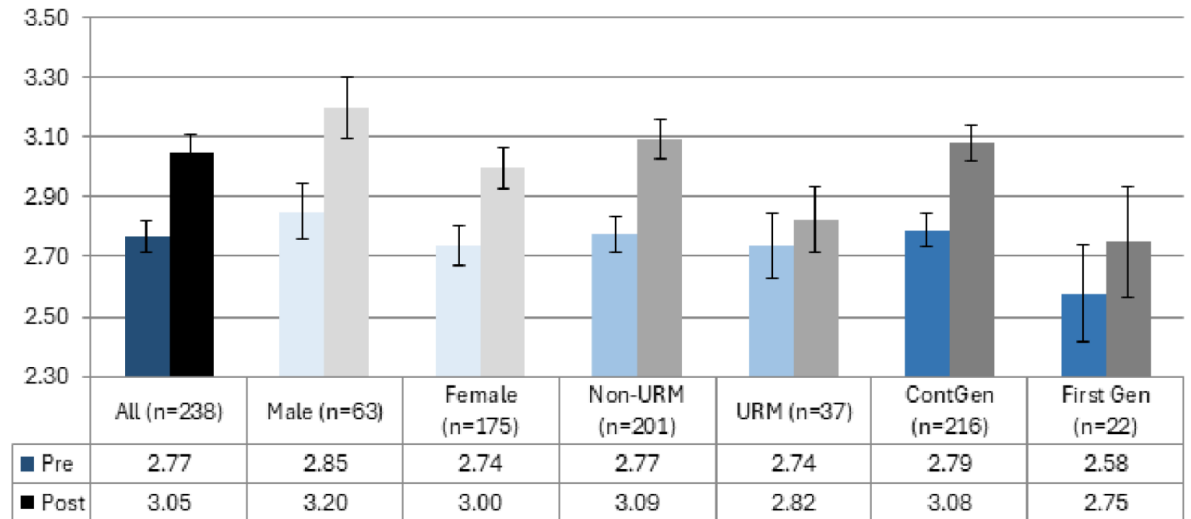
## Parity in outcomes

All students significantly **increased content knowledge** over time, with the highest gains being for women and first-generation students, which led to closing the gaps with their male and continuing generation peers.

PHYS2010 (section 1-3) Self-Efficacy (Mastery)



PHYS2010 (section 1-3) Self-Efficacy (Persuasion)

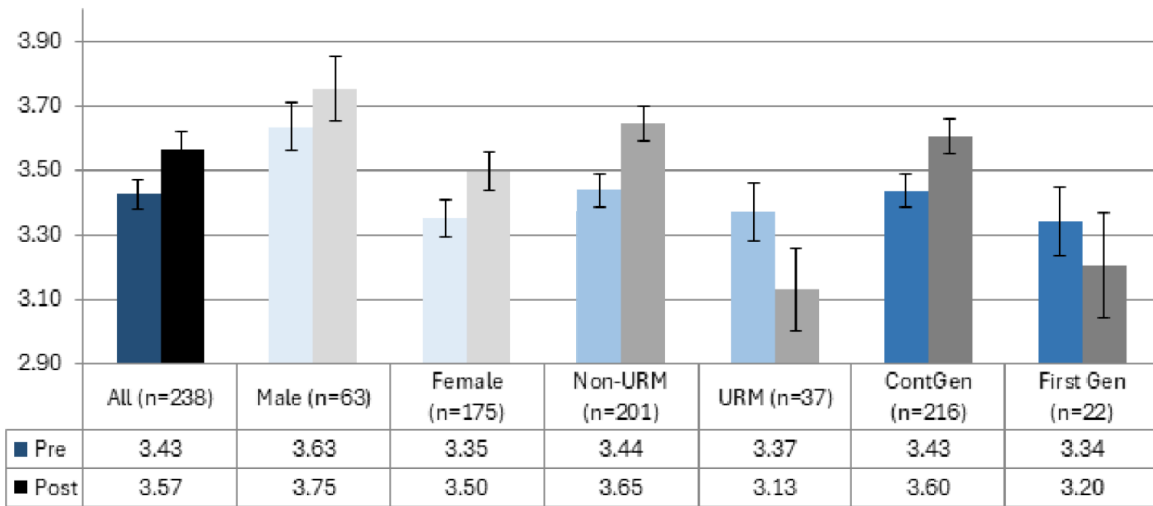


# Areas for Growth

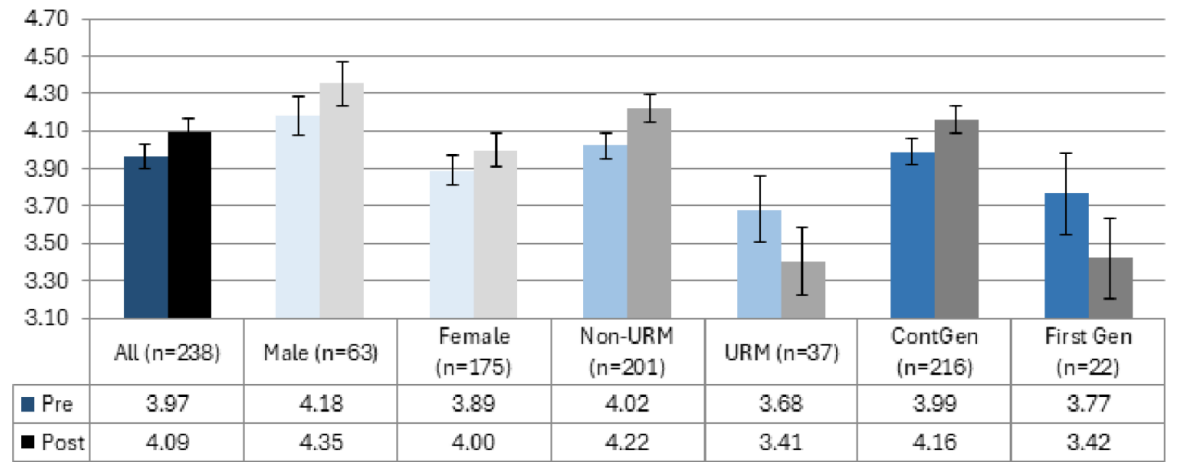
## Differences over time

Disciplinary belonging and self-efficacy (mastery) for URM and first-generation students' perceptions declined slightly over time.

**PHYS2010 (section 1-3) Self-Efficacy (Mastery)**

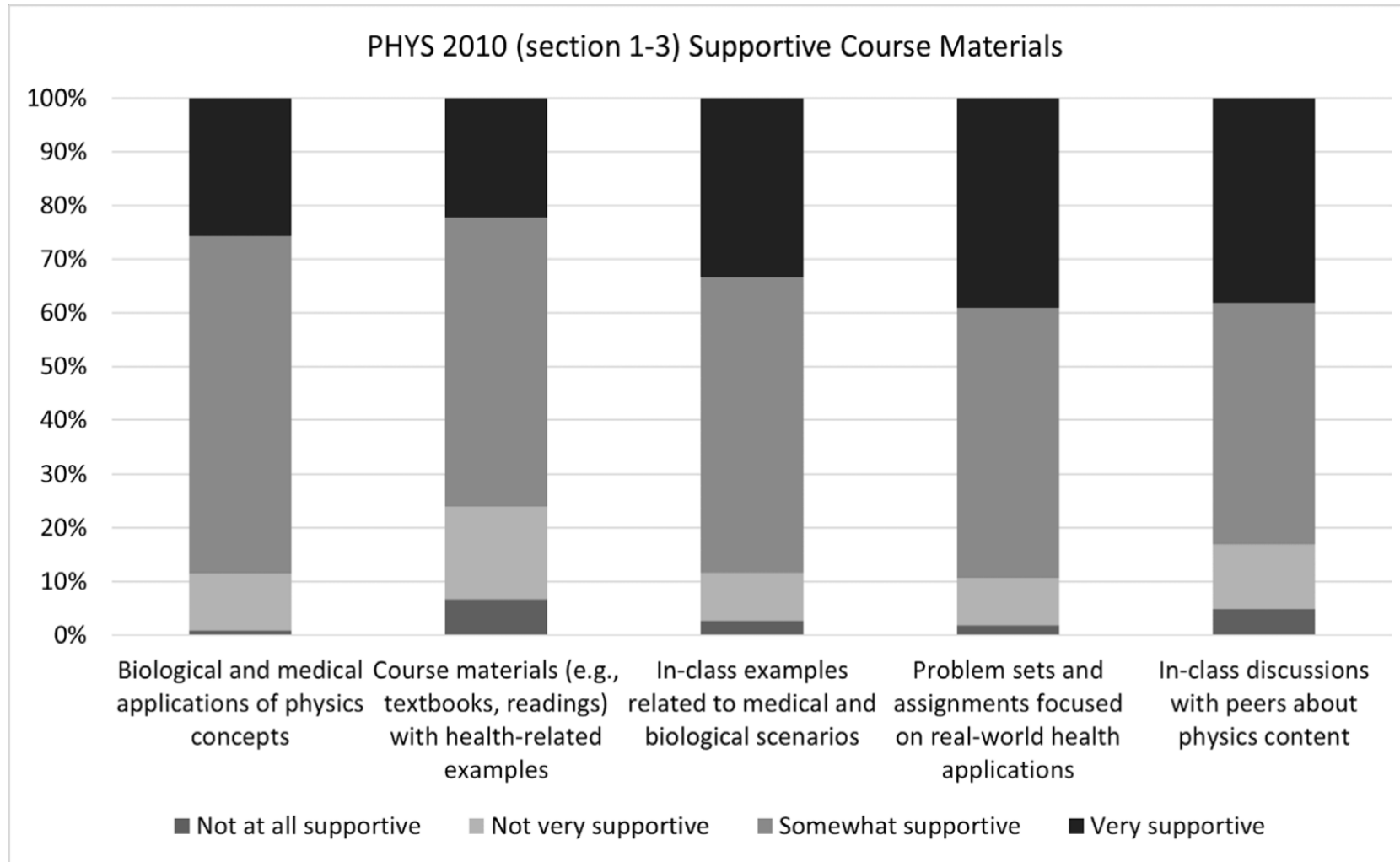


**PHYS2010 (section 1-3) Disciplinary Sense of Belonging**





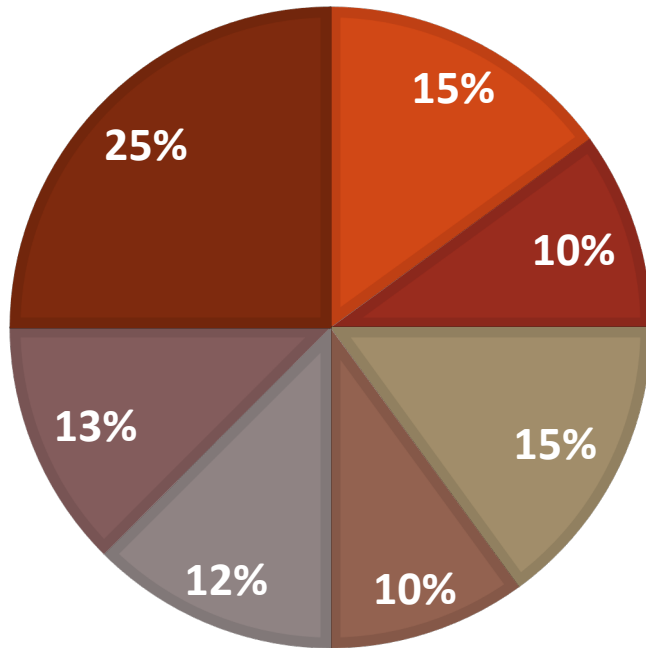
# LTI Summer 2024 Grant - Outcomes



# Course Activities and Management

## COURSE ACTIVITIES

- In-class quizzes   ■ Weekly quizzes   ■ Homework
- Weekly report   ■ Midterm 1   ■ Midterm 2
- Final Exam



### Exams 50%

- Midterms (12.5% each) – 25%
- Final Exam – 25%

In-class (15%)	Outside the class (35%)
Poll Ev Quizzes (BOL/EOL)	Weekly quizzes/report
Problems/concepts	Homework

# Course Activities and Management

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In-class (15%)	Outside the class (35%)
<p><b><u>Poll Ev Quizzes (BOL/EOL)</u></b> <b><u>(Autograded)</u></b> BOL – 4 MC - (based on pre-lecture) EOL – 1 MC - (based on the worksheet)</p>	<p><b><u>Weekly quizzes (Autograded)</u></b> 10 MC – mostly conceptual</p> <p><b><u>Weekly report (Graded by TAs)</u></b> 4 pages of conceptual questions/ranking</p>
<p><b><u>Problems/concepts (Not graded)</u></b> 2-3 problems</p>	<p><b><u>Homework (Graded by TAs)</u></b> 5 problems per week</p>

# Course Activities and Management

	Midterm 1 (50 points)		Midterm 2 (50 points)		Final Exam (100 points) – 3 hours	
	Versions	Format	Versions	Format	Versions	Format
<i>Fall 2022</i> (50 minutes)	9	5 Part A 4 Part B 2 Part C	6	3 Part C	6	15 Part A 5 Part B 6 Part C
<i>Fall 2023</i> (50 minutes)	9	5 Part A 2 Part B 2 Part C	9	5 Part A 2 Part B 2 Part C	9	30 Part A 2 Part B 2 Part C
<i>Fall 2024</i> (50 minutes)	5	15 Part A 1 Part B 1 Part C	5	15 Part A 1 Part B 1 Part C	5	40 Part A 1 Part C
<i>Spring 2023</i> (75 minutes)	6	5 Part A 3 Part B 2 Part C	6	5 Part A 2 Part B 2 Part C	6	20 Part A 4 Part B 4 Part C
<i>Spring 2024</i> (75 minutes)	6	5 Part A 2 Part B 2 Part C	6	5 Part A 2 Part B 2 Part C	5	35 Part A 2 Part C
<i>Spring 2025</i> (75 minutes)	5	15 Part A 1 Part B	5	15 Part A 1 Part B	5	40 Part A 1 Part C

Part A – Multiple Choice

Part B – Conceptual Question

Part C – Multi-section problem

Part A – AI graded

Part B & C – Grad TA and the Instructor

**Major Issues:** Time allocation, Variation in difficulty levels, Weightage to each part

# **TA Assistance in Course Management**

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## **HEAD TA**

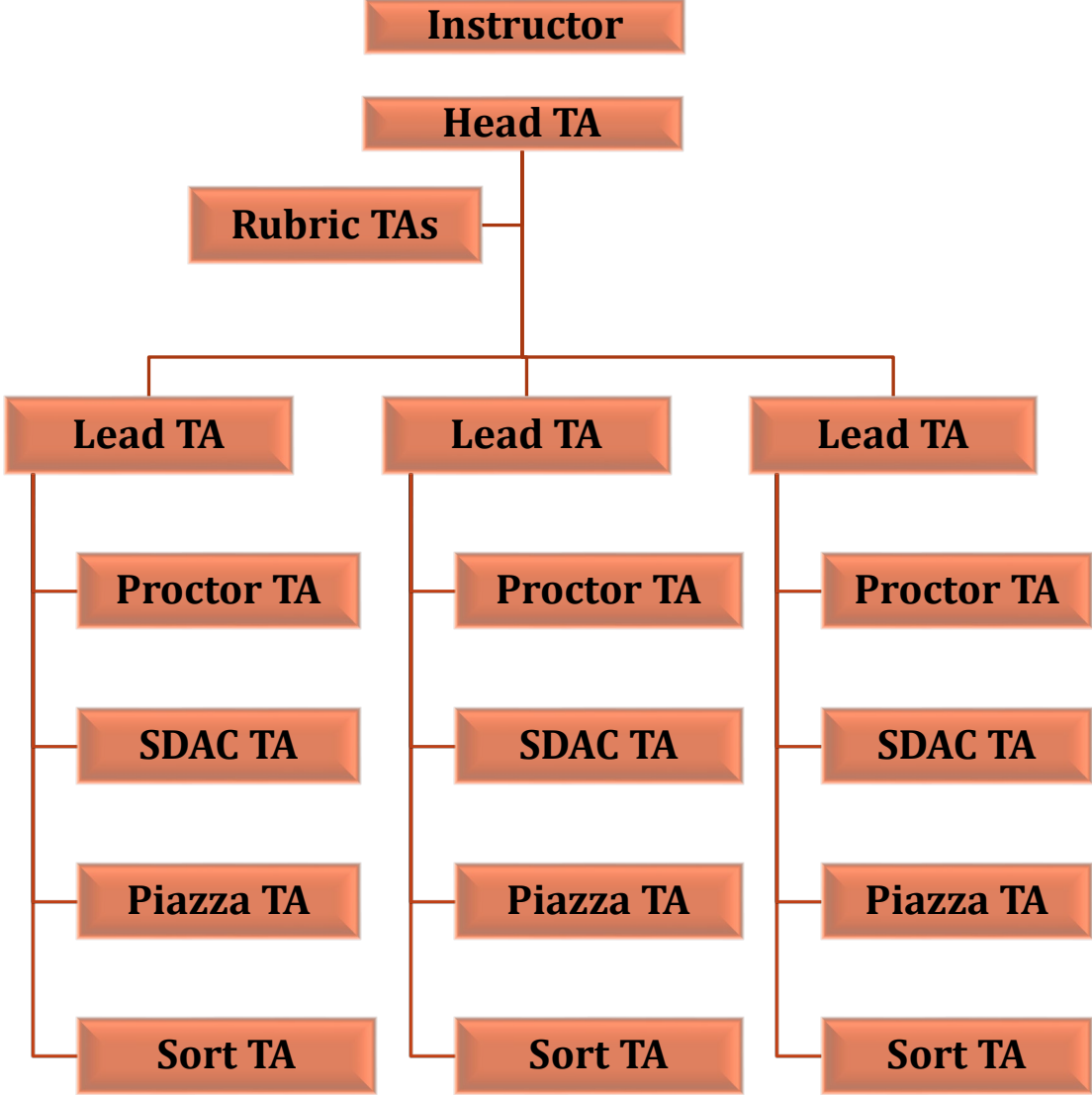
- Meets with Lead TAs from each section regularly to discuss and maintain course management
- Creating and managing a Phys 2020-Spring 2025 TA Groupme page (15 UTAs and 1 GTA)
- Creating and managing a spreadsheet for TA OH for all 3 sections.
- Oversee grading

## **LEAD TA**

- Work closely with "Rubric TA" and instructor, finalize the rubrics every week
- Work closely with "Proctor TA" and instructor, to monitor midterms, make-up exams and the final exam.
- Make sure the exams are sorted/scanned within a week from the scheduled exam day.
- Work closely with "SDAC/Piazza representatives".

# TA Assistance in Course Management

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# TA Assistance in Course Management

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Position	Section 4	Section 5	Section 6
<i>Head TA</i>	Monitor workload, Answer emails, Manage spreadsheet		
<i>Proctor TA</i>	Schedule and proctor make-up exams		
<i>Exam sort/scan TA</i>	Help with sorting and scanning midterms and final exam		
<i>SDAC/ Piazza TA</i>	Keep track of SDAC accommodations and answer all piazza questions		
<i>WR Rubric TA</i>	Write and upload rubric to Gradescope		
<i>HW Rubric TA</i>			

# Spreadsheet Management

Week	Date	Day	Topic	Finish Reading Prior to class	Pearson DEMO videos with explanation	SIMULATIONS	Pre-lecture videos Check CANVAS - FILES Pre-lecture videos	BLANK Handout for pre-lecture and Jamboard PDF	Blank Worksheets	Worksheet solutions	In-class activities/ Recorded Lecture	Post lecture Jamboard PDF	Homework (Gradescope) Due Sunday 11:59 pm	Weekly report (Gradescope) Due Sunday 11:59 pm	Weekly Quiz (Canvas) Due Sunday 11:59 pm		
1	1/14	Tuesday	Welcome and Introduction to Physics 2						Intro PPT								
	1/16	Thursday	Coulomb's Law and Electric Field	Chapter 20: Section 1, 2, 3, 4	Charges and Forces Coulomb's Law	Static charges balloons and electricity	Pre-lecture 1	Pre-lecture 1 Instructor Notes PDF PL1	Worksheet 1	WS 1 - Solutions	Electric force and field LY556/Bp	WS 1 - Instructor Notes					
2	1/21	Tuesday	Applications of EF, Force and Torques	Chapter 20: Section 5, 6, 7	Electric field	Charges and electric field	Pre-lecture 2	Pre-lecture 2 Instructor Notes PDF PL2	Worksheet 2	WS 2 - Solutions	Electric field - Parallel plate 9u=^Dmi	WS 2 - Instructor Notes					
	1/23	Thursday	Electric Potential, EPE and energy conservation	Chapter 21: Section 1, 2, 3	Electric Potential	Charges and electric field	Pre-lecture 3	Pre-lecture 3 Instructor Notes PDF PL3	Worksheet 3	WS 3 - Solutions	Electric Potential ^1hKLC#	WS 3 - Instructor Notes	HW 1 solutions Homework 1 Due	WR 1 solutions Weekly Report 1 Due	Quiz 1		
3	1/28	Tuesday	Electric field and Electric potential	Chapter 21: Section 4, 5	Connecting EF and EP	Electric field and electric potential	Pre-lecture 4	Pre-lecture 4 Instructor Notes PDF PL4	Worksheet 4	WS 4 - Solutions	Electric Flux Ru@9xKp4	WS 4 - Instructor Notes					
	1/30	Thursday	ECG, Capacitance and Capacitors	Chapter 21: Section 6, 7, 8	Capacitors and Capacitance	Capacitors	Pre-lecture 5	Pre-lecture 5 Instructor Notes PDF PL5	Worksheet 5	WS 5 - Solutions	Capacitors #0j*8lr	WS 5 - Instructor Notes	HW 2 solutions Homework 2 Due	WR 2 solutions Weekly Report 2 Due	Quiz 2		
4	2/4	Tuesday	Current, EMF, Ohm's Law and Power	Chapter 22: Section 2, 3, 5, 6	Current and Resistance	Electric Current	Pre-lecture 6	Pre-lecture 6 Instructor Notes PDF PL6	Worksheet 6	WS 6 - Solutions	Current and Resistance &bjqy8n%	WS 6 - Instructor Notes					
	2/6	Thursday	Problems on capacitor and circuits	Chapter 21 and 22	Series and parallel circuit	DC Circuit construction	No Pre-lecture	No Pre-lecture	Chapter 21 and 22 review	SOLUTIONS - Chapter 21 and 22 review Solutions - Chap 21 22 UPDATED			HW 3 solutions Homework 3 Due	WR 3 solutions Weekly Report 3 Due	Quiz 3		
5	2/11	Tuesday	MIDTERM 1 Review	Chapters 20, 21, 22	No Pre-lecture	No Pre-lecture		Midterm 1 - Equation sheet Practice Midterm 1	Midterm 1 REVIEW Practice M1 - SOLUTIONS	SOLUTIONS - Midterm 1 REVIEW DIRT 1	Updated Equation sheet DIRT 2		DIRT 4	DIRT 5			
	2/13	Thursday	MIDTERM 1 - Chapters 20, 21, 22 (In class - 9:30 to 10:45 am)														
6	2/18	Tuesday	Resistivity, Kirchhoff's laws	Chap 23: 1, 2, 3	Current and Resistance - 1 Current and Resistance - 2	Ohms law	Pre-lecture 7	Pre-lecture 7 Instructor Notes PDF PL7	Worksheet 7 Today's OH Video	WS 7 - Solutions SqVNI6RP	Resistors and Kirchhoff's laws D3Ppa2&C	WS 7 - Instructor Notes					
	2/20	Thursday	Complex circuits: Electricity in Nervous system	Chapter 23: Section 4, 5, 6, 7, 8	Series and parallel circuit	DC Circuit construction	Pre-lecture 8	Pre-lecture 8 Instructor Notes PDF PL8	Worksheet 8 Feb 20 OH video	WS 8 - Solutions ae77maw.	Multi-loop circuits %7Uu24yd	WS 8 - Instructor Notes	HW 4 solutions Homework 4 Due	WR 4 Solutions Weekly Report 4 Due	Quiz 4		
7	2/25	Tuesday	C in Series and Parallel: Charging/Discharging	Chapter 23: Section 6, 7, 8	Capacitor Circuits	Multiple capacitors	Pre-lecture 9	Pre-lecture 9 Instructor Notes PDF PL9	Worksheet 9	WS 9 - Solutions	RC Circuits PN74Np#%	WS 9 - Instructor Notes					
	2/27	Thursday	Magnetic field due to current	Chapter 24: Section 1, 2, 3, 4	Magnetic fields	Magnets and Electromagnets	No pre-lecture	No pre-lecture	Feb 28 OH Video Worksheet 10	WS 10 - Solutions	Magnetic Field & Current 5zoZ+8X9	WS 10 - Instructor Notes	HW 5 solutions Homework 5 Due	WR 5 Solutions Weekly Report 5 Due	Quiz 5		
8	3/4	Tuesday	Magnetic force, fields and torque	Chapter 24: Section 5, 6, 7, 8	Magnetic field and forces Magnetic field sources	Charged particle in B DC Motor	Pre-lecture 10	Pre-lecture 10 Instructor Notes PDF PL10	Worksheet 11	WS 11 - Solutions	Magnetic Force C752G?C	WS 11 - Instructor Notes					
	3/6	Thursday	Induced current, EMF, Faraday-Lenz law	Chapter 25: Section 1, 2, 3, 4	Faraday's and Lenz	Faraday's law	Pre-lecture 11	Pre-lecture 11 Instructor Notes PDF PL11	Worksheet 12	WS 12 - Solutions	Induced Current +f34@BDN	WS 12 - Instructor Notes	HW 6 solutions Homework 6 Due	WR 6 Solutions Weekly Report 6 Due	Quiz 6		
9	3/11	Tuesday	SPRING RECESS														
	3/13	Thursday															
10	3/18	Tuesday	Electromagnetic Waves	Chapter 26: Section 5, 6, 7	Electromagnetic Waves	Electromagnetic waves	Pre-lecture 12	Pre-lecture 12 Instructor Notes PDF PL 12	Worksheet 13	WS 13 - Solutions	Lenz Law x21Jj6#&	WS 13 - Instructor Notes					
	3/20	Thursday	AC electricity, Inductors and Oscillators	Chapter 28: 1, 3, 5, 6, 7	Inductance and Inductors	AC Electricity	Pre-lecture 13	Pre-lecture 13 Instructor Notes PDF PL 13	Worksheet 14	WS 14 - Solutions	AC Electricity rc00@217	WS 14 Instructor Notes	HW 7 solutions Homework 7 Due	WR 7 Solutions Weekly Report 7 Due	Quiz 7		
11	3/25	Tuesday	MIDTERM 2 Review	Chapters 23, 24, 25, 26	No Pre-lecture	No Pre-lecture		AC Inductor r#wBYJH AC Inductor PDF	Practice Midterm 2 SOLUTIONS - Practice M2	Midterm 2 - Equation sheet M2 Review SOLUTIONS	Practice problems SOLUTIONS - Practice problems	DIRT 6 DIRT 7	DIRT 8 DIRT 9				
	3/27	Thursday	MIDTERM 2 - Chapters 23, 24, 25, 26 (In class - 9:30 to 10:45 am)														
12	4/1	Tuesday	Wave optics: Interference and Diffraction	Chapter 17: 1, 2, 3	Diffraction and Interference	Wave interference	No pre-lecture		Worksheet 15	WS 15 - Solutions	Double slit and Grating 9^vOjPTy	WS 15 Instructor Notes					
	4/3	Thursday	Single-slit and Circular aperture diffraction	Chapter 17: Section 4, 5, 6	Thin film Interference	Wave interference	No pre-lecture		Worksheet 16				Homework 8 Due	Weekly Report 8 Due	Quiz 8		
13	4/8	Tuesday	Reflection and Refraction - Image formation	Chapter 18: Section 1, 2, 3, 4	Mirrors and Reflection Refraction	Bending light	Pre-lecture 14	Pre-lecture 14 Instructor Notes PDF PL 14									
	4/10	Thursday	Thin lenses and spherical mirrors	Chapter 18: Section 5, 6, 7	Lenses and Images	Lenses and Mirrors	Pre-lecture 15	Pre-lecture 15 Instructor Notes PDF PL 15					Homework 9 Due	Weekly Report 9 Due	Quiz 9		
14	4/15	Tuesday	Problems on lenses and mirrors	Chapter 18: Section 5, 6, 7		Lenses and Mirrors	No pre-lecture										
	4/17	Thursday	Camera, Human eye, Magnifier	Chapter 19: Section 1, 2, 3	Camera and Eye Optical Instruments		Pre-lecture 16	Pre-lecture 16 Instructor Notes PDF PL 16					Homework 10 Due	Weekly Report 10 Due	Quiz 10		
15	4/22	Tuesday	Microscope, Telescope and optical instruments	Chapter 19: Section 4, 5, 6, 7	Resolution and Dispersion		Pre-lecture 17	Pre-lecture 17 Instructor Notes PDF PL 17									
	4/24	Thursday	Chapter 11, 18, 19 review	Chapter 17, 18, 19	Optics REVIEW												
16	4/29	Tuesday	FINAL Review	Chapters 17 - 26	FINAL REVIEW												
17	5/1	Thursday	FINAL EXAM - Comprehensive - 2:00 pm - 5:00 pm - Physics 238														



# Conclusions

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- Active learning teaching methods are found to be effective, cultivates a sense of belonging in classroom, supports peer learning, and facilitates better performance.
- Classroom management and administration could be improved with support from teaching assistants and by setting clear course policies.

# Acknowledgement

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**UVA LEARNING TECHNOLOGY INCUBATOR GRANT**  
**UVA INCLUSIVE EXCELLENCE GRANT**