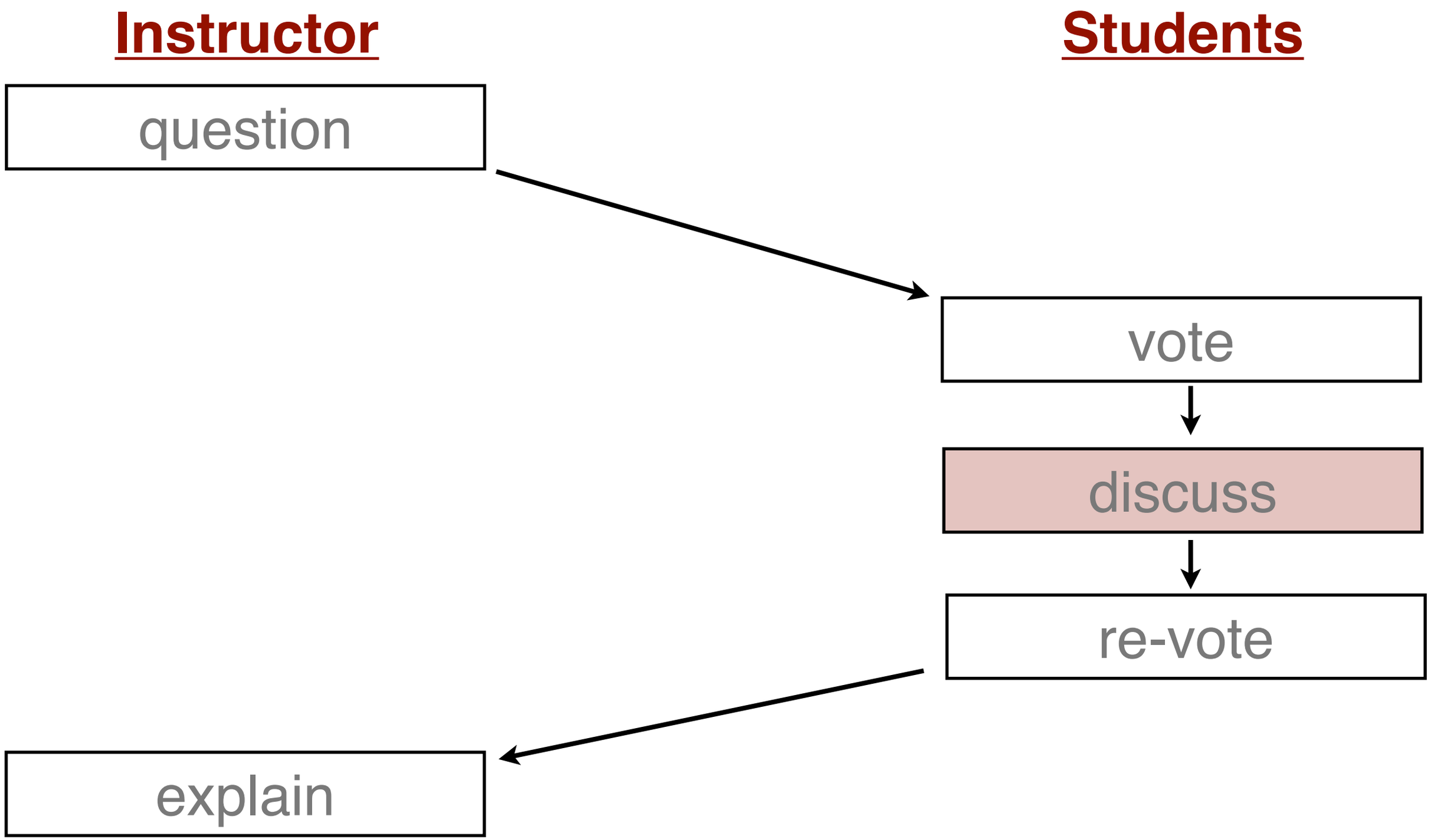
Lens To Learning

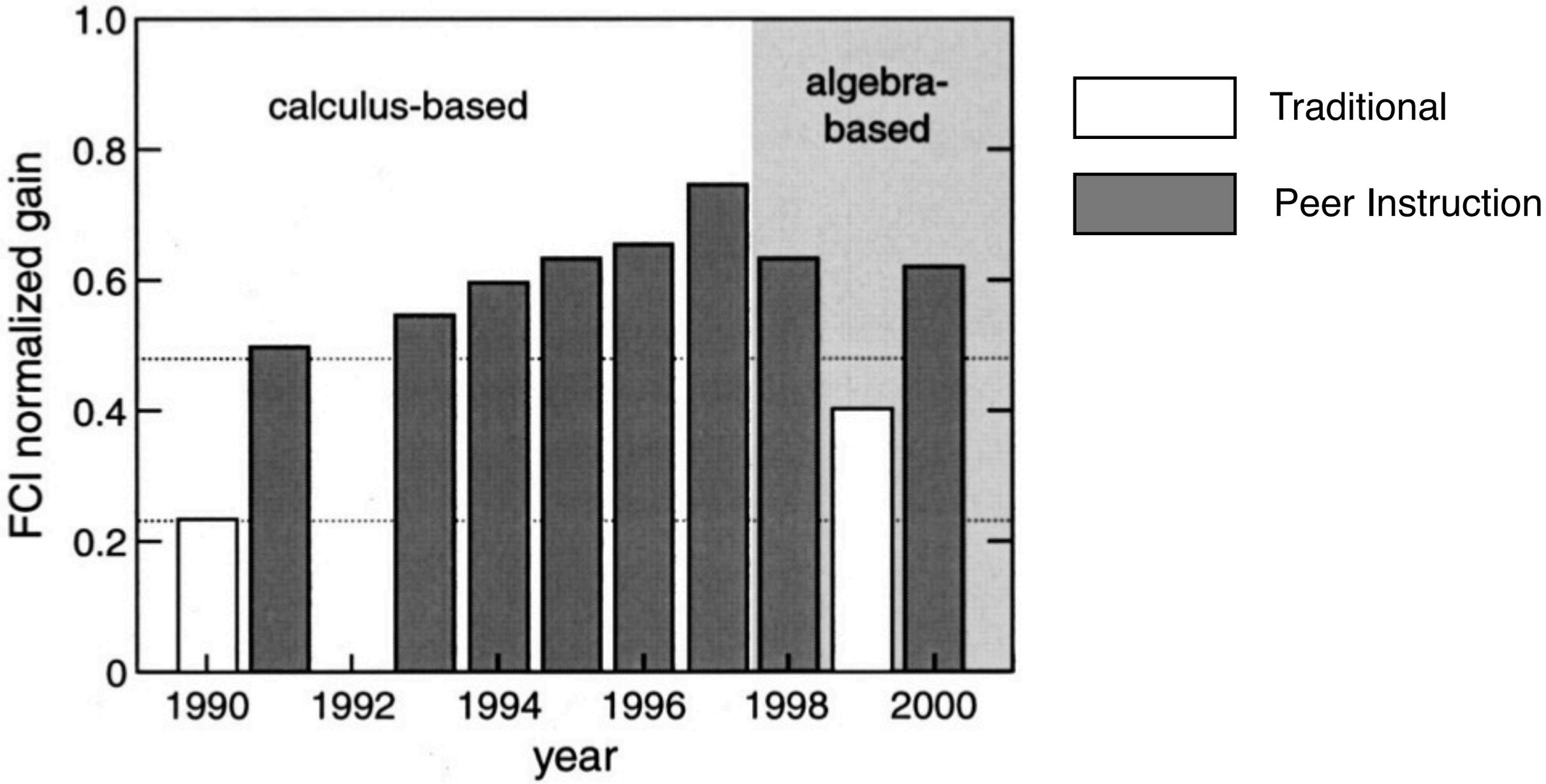
Using Video Analysis to Classify Student Discussions During Peer Instruction

Laura Tucker,
Rachel Scherr, and Eric Mazur

The Peer Instruction pedagogy centers on students individually answering then discussing conceptual questions



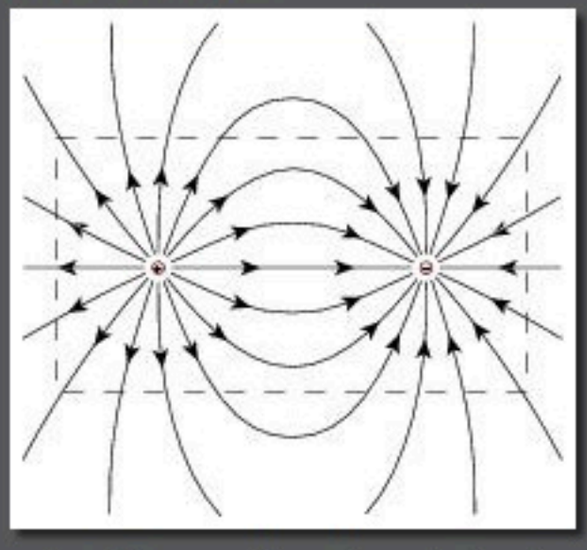
Courses taught with Peer Instruction often have significantly higher FCI gain than traditional courses



Crouch & Mazur, *Am. J. Phys.*, 2001

Significant class-wide gains in correct answer choice coincide with discussion

Consider a rectangular Gaussian surface surrounding a dipole that has 16 field lines emanating from its positively charged end.



If you move the Gaussian rectangle around (anywhere in the plane), the field line flux through the rectangle:

A. always remains zero.

B. varies between −32 and +32.

C. varies between −16 and +16.

D. is −16, zero, or 16.

E. Other.

Round 1	Round 2
76 responses, 45% correct	73 responses, 81% correct
A. 21%	A. 3%
B. 3%	B. 0%
C. 32%	C. 16%
D. 45%	D. 81%
E. 0%	E. 0%

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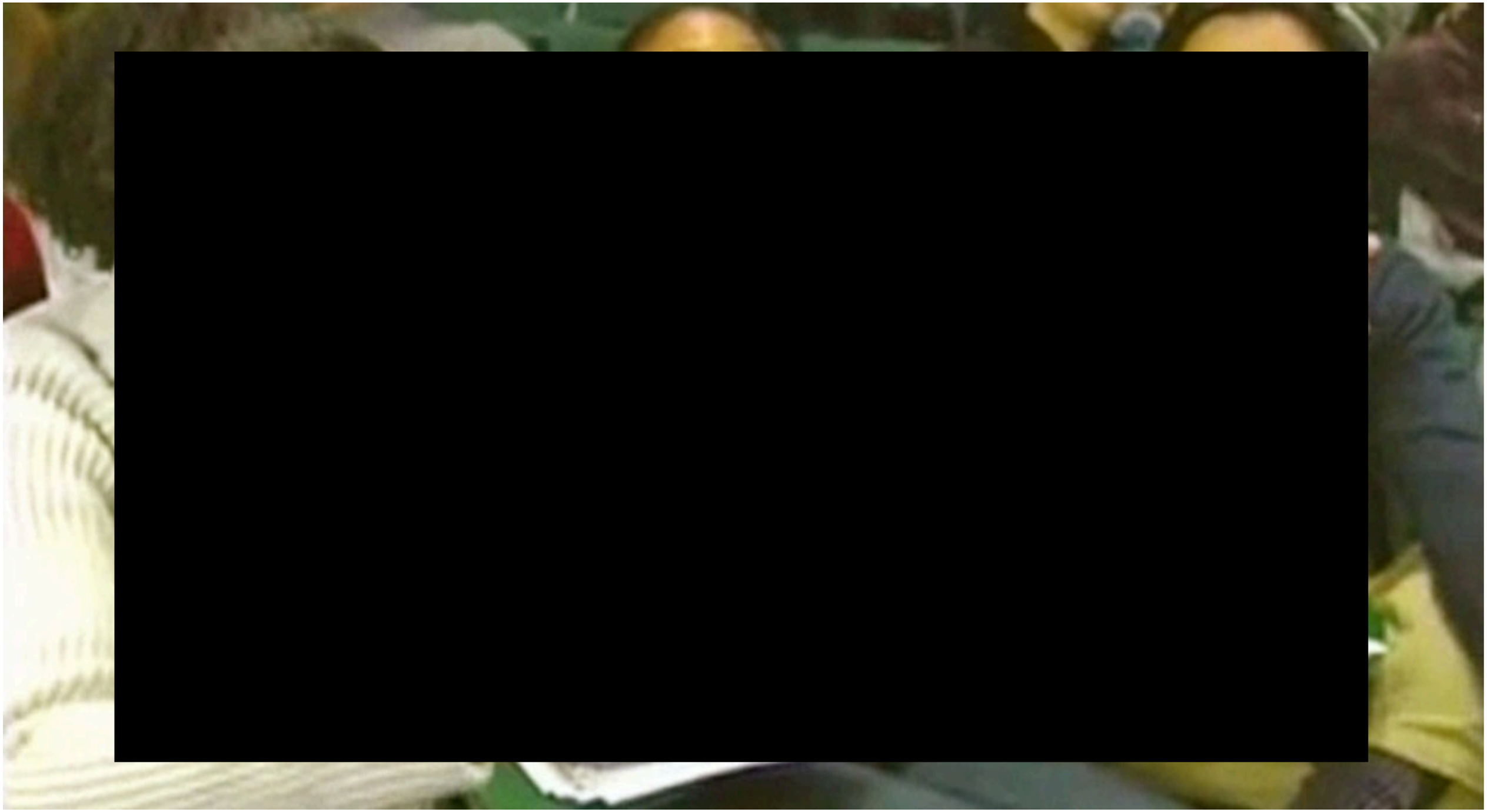

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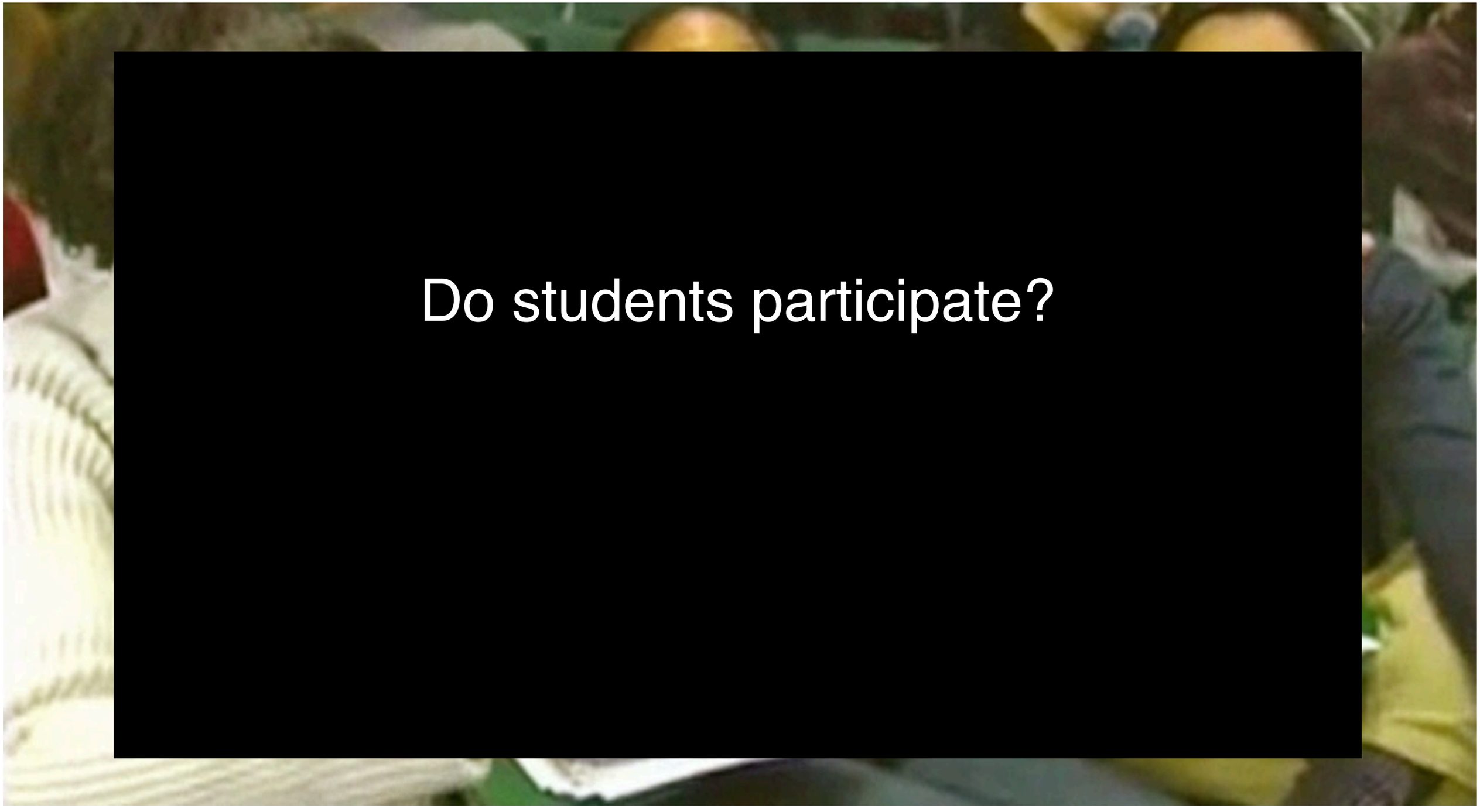

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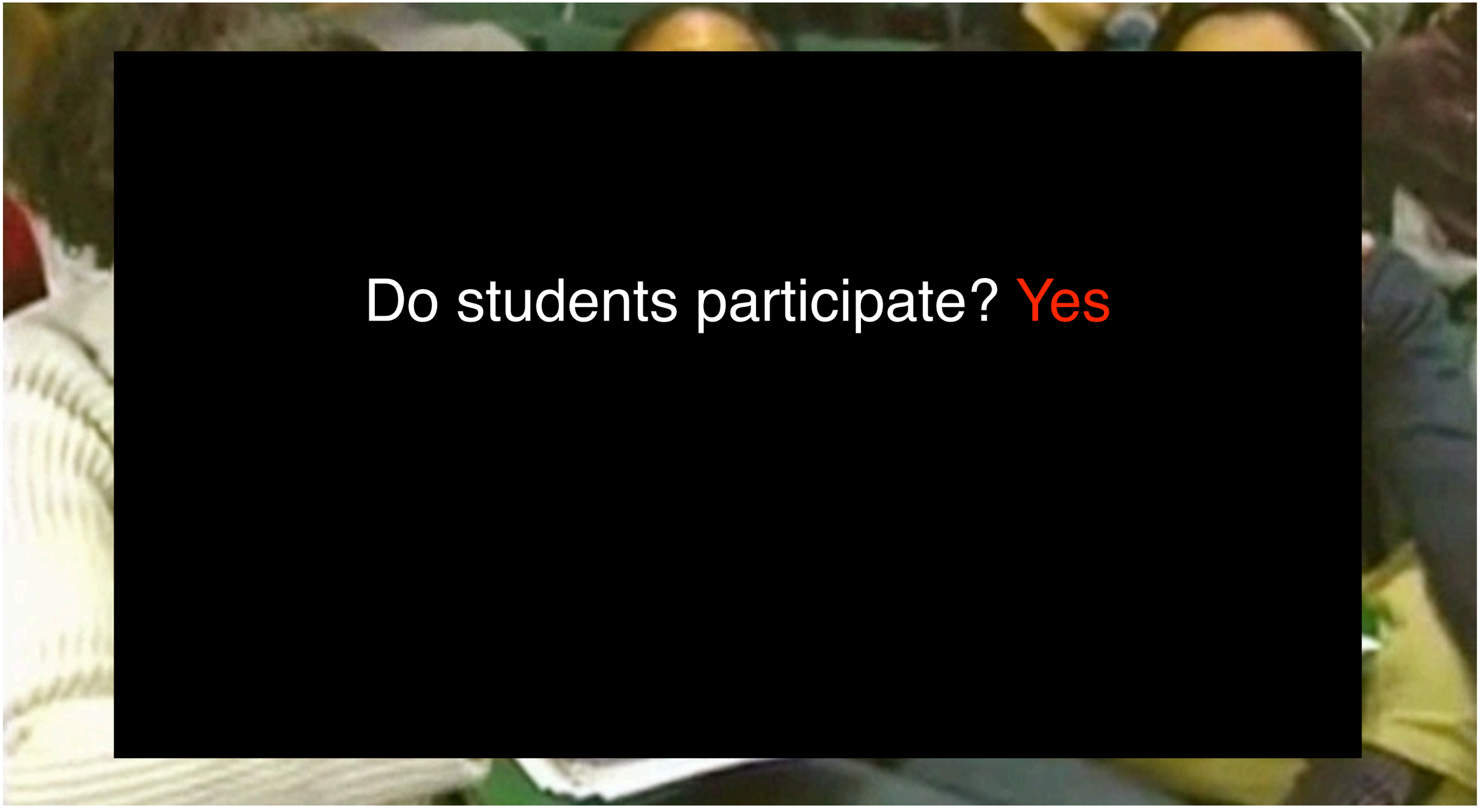

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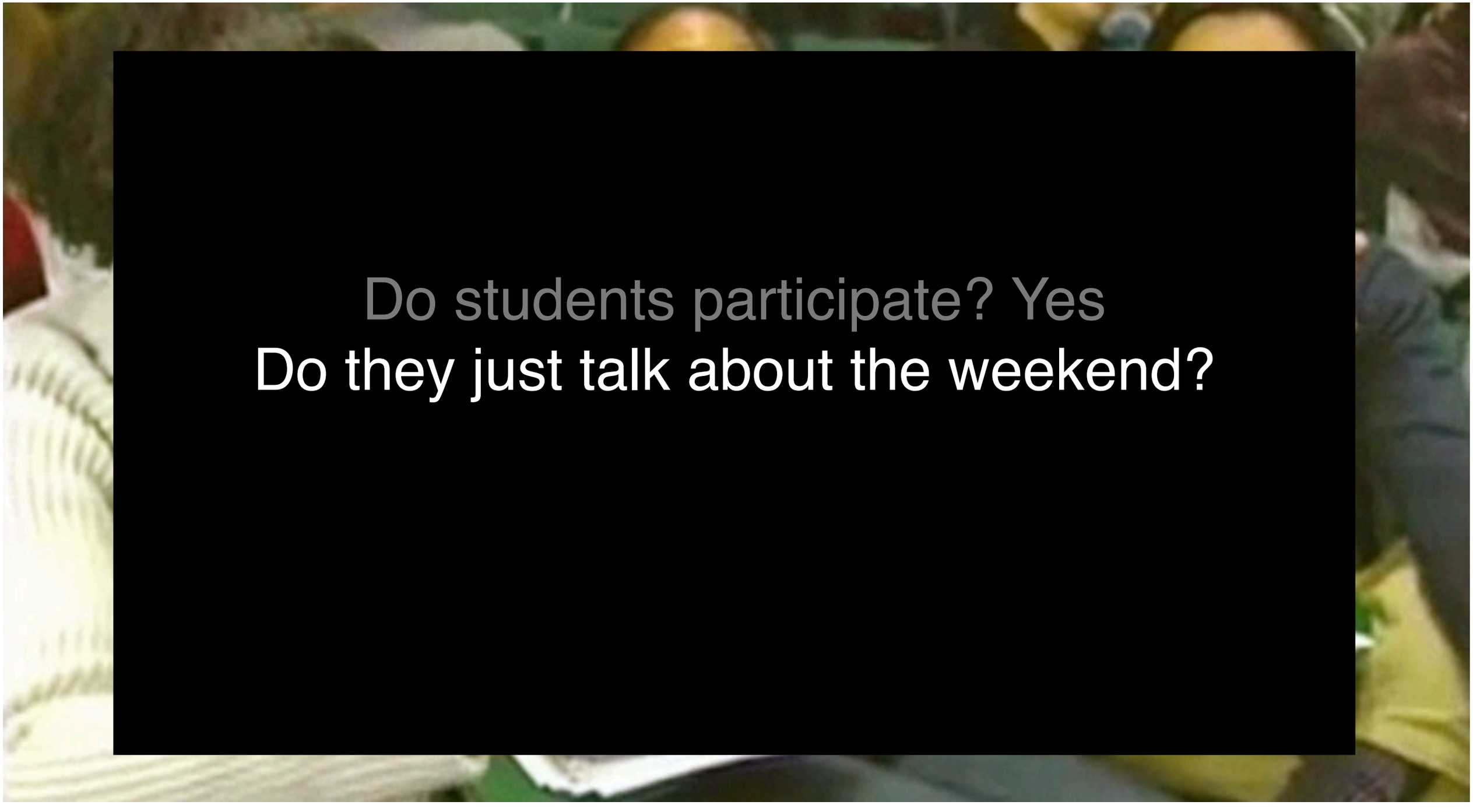
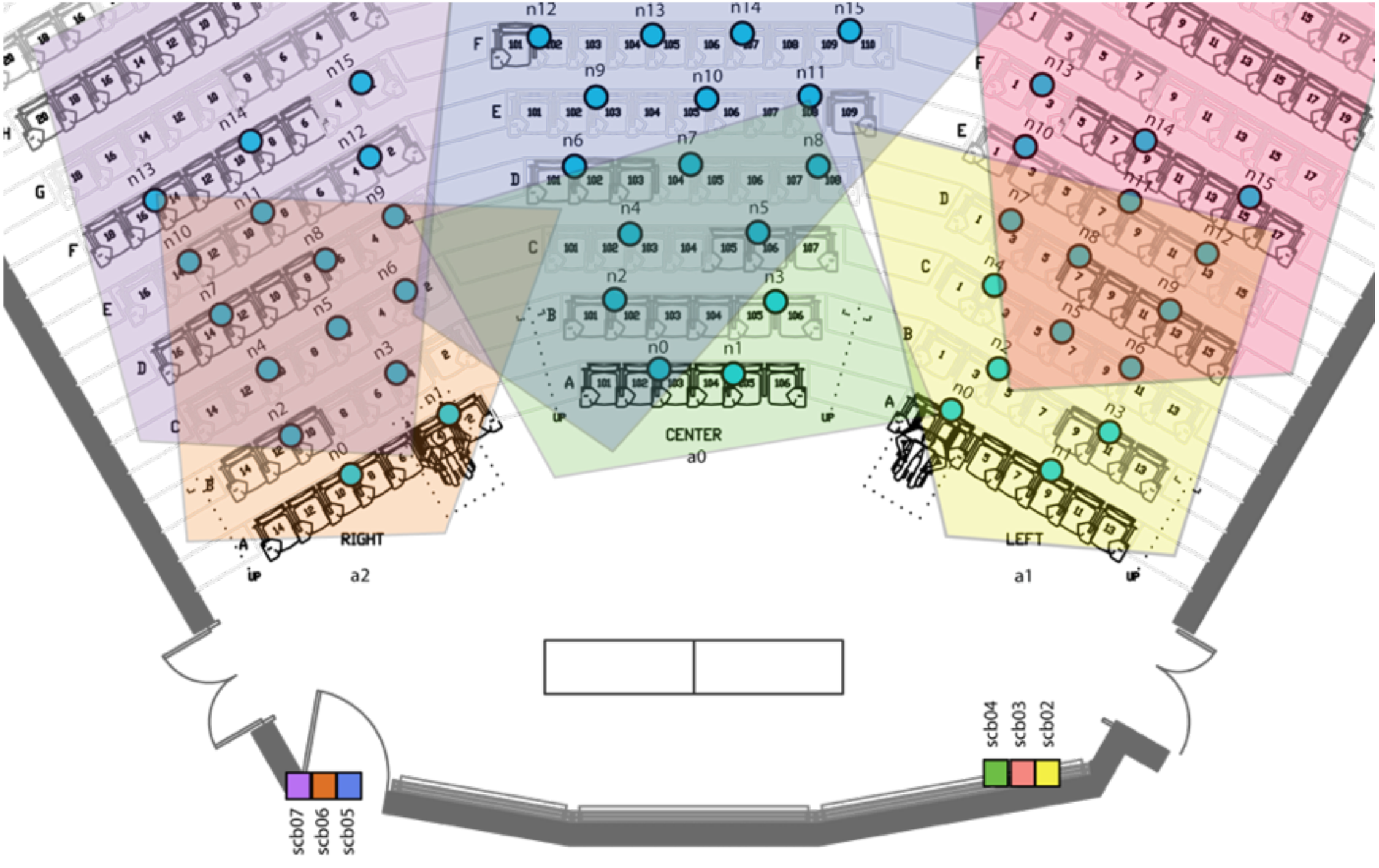


We don’t know how student discussions work in practice

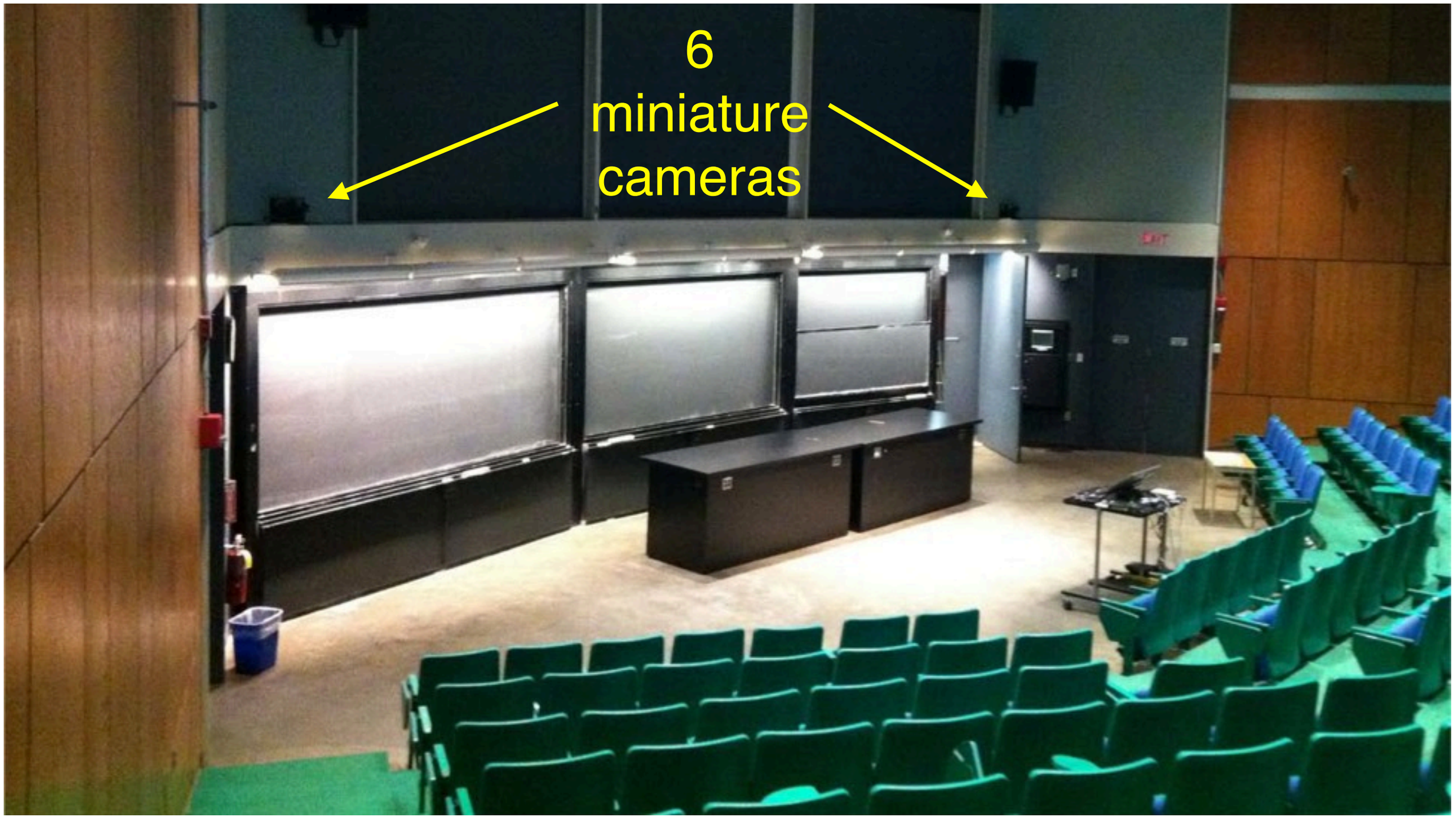
Our sample was one university course, using full-class video and audio recording

- Intro E&M
- Peer Instruction expert instructor
- N = 89
- 97% participation rate

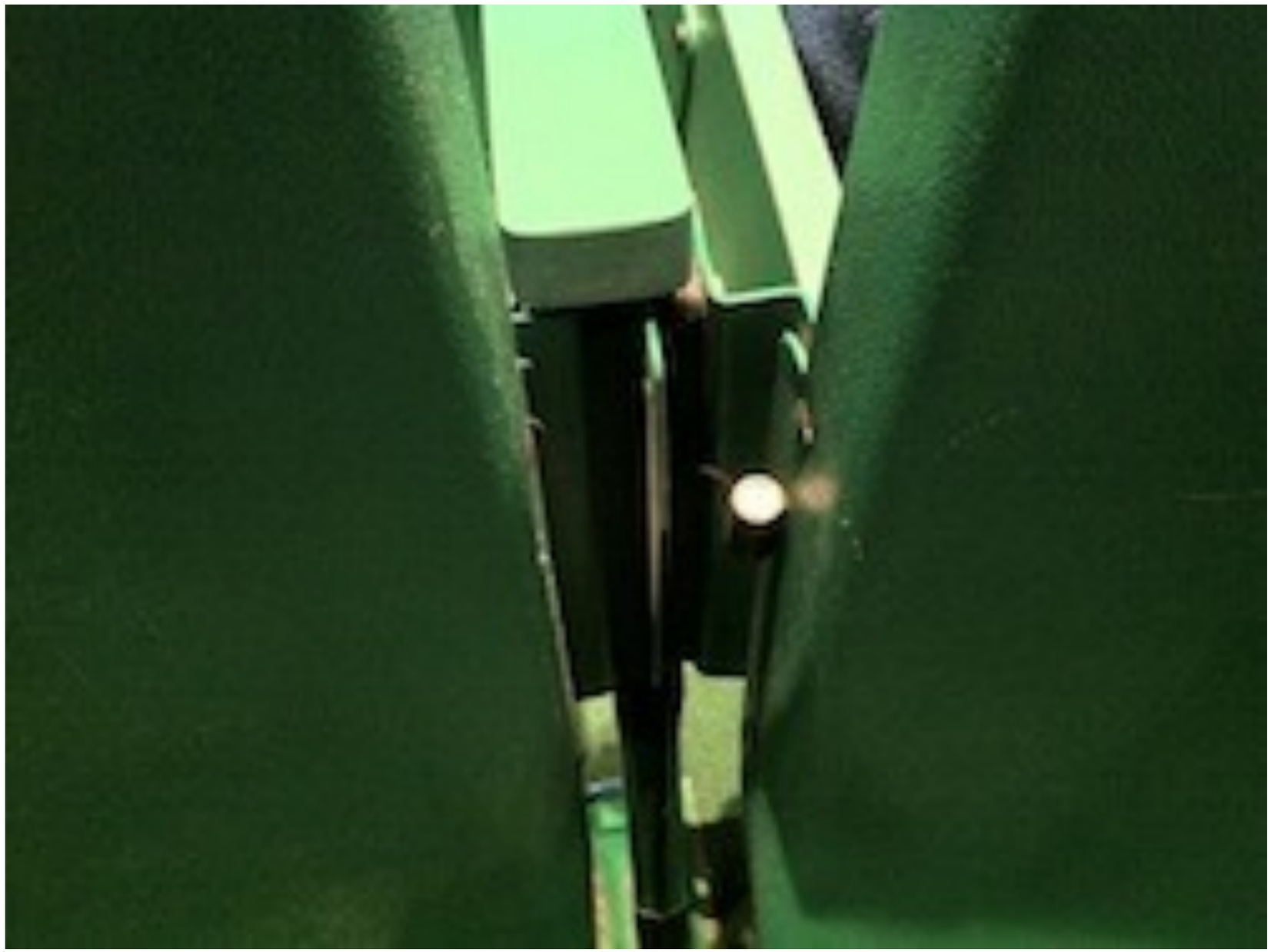
Using a comprehensive recording system, we have audio and video of every student over one term



Our recording system is discreet



Our 48 miniature microphones collect full-class audio discreetly



For <u>each</u> student, we note if the student discusses during each 5-second interval, and if discussions are on-topic

Time	Interaction type	ON/OFF-topic	Partners	Notes
0:01:00	NONE			
0:01:05	NONE			Looks
0:01:10	NONE			
0:01:15	PEER	ON	D104,D105	She attempts
0:01:20	PEER	ON	D104,D105	Pays
0:01:25	PEER	ON	D104,D105	Difficult to tell
0:01:30	PEER	ON	D104,D105	
0:01:35	PEER	ON	D104,D105	
0:01:40	PEER	ON	D104,D105	
0:01:45	INSTRUCTOR	ON	D104,D105	
0:01:50	INSTRUCTOR	ON	D104,D105	
0:01:55	PEER	ON	D104,D105	
0:02:00	PEER	ON	D104,D105	
0:02:05	PEER	OFF	D104,D105	
0:02:10	PEER	OFF	D104,D105	
0:02:15	PEER	ON	D104,D105	
0:02:20	PEER	ON	D104,D105	
0:02:25	NONE			
0:02:30	NONE			

For each student, we add up the time spent in each interaction type

Time	Interaction type	ON/OFF-topic
0:01:00	NONE	
0:01:05	NONE	
0:01:10	NONE	
0:01:15	PEER	ON
0:01:20	PEER	ON
0:01:25	PEER	ON
0:01:30	PEER	ON
0:01:35	PEER	ON
0:01:40	PEER	ON
0:01:45	INSTRUCTOR	ON
0:01:50	INSTRUCTOR	ON
0:01:55	PEER	ON
0:02:00	PEER	ON
0:02:05	PEER	OFF
0:02:10	PEER	OFF
0:02:15	PEER	ON
0:02:20	PEER	ON
0:02:25	NONE	
0:02:30	NONE	

Peer - 60 s

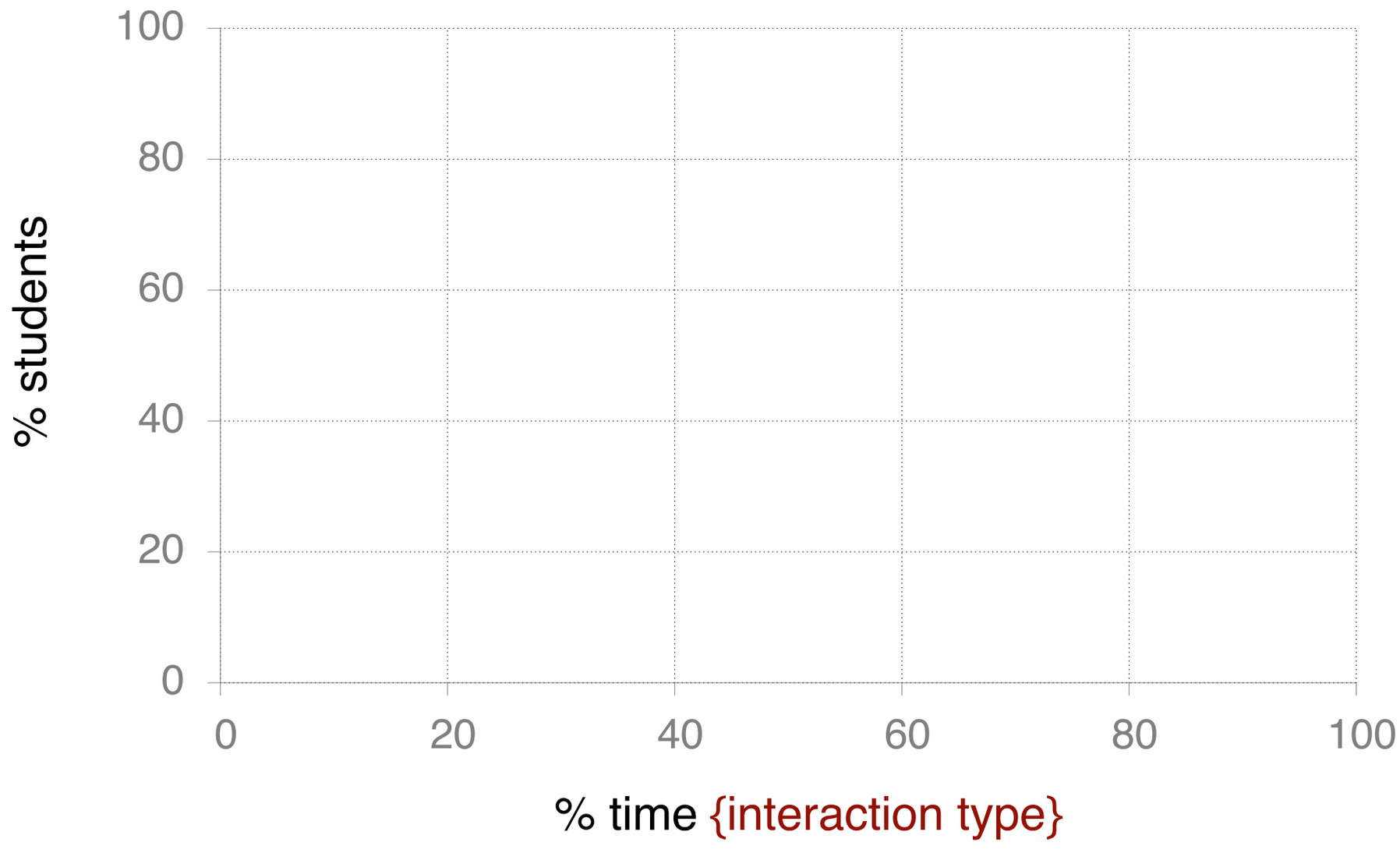
None - 25 s

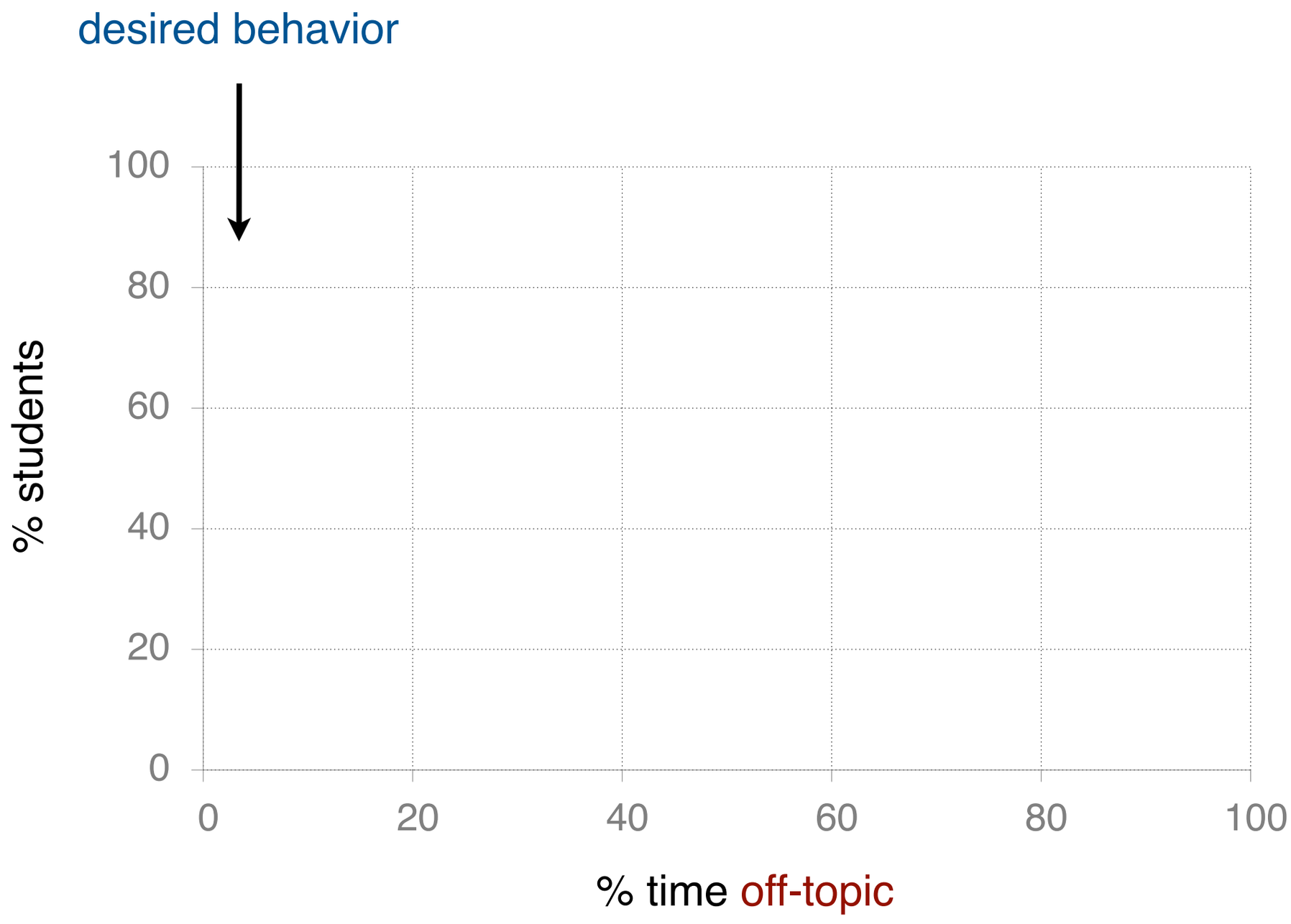
Instructor - 10 s

On-topic - 60 s

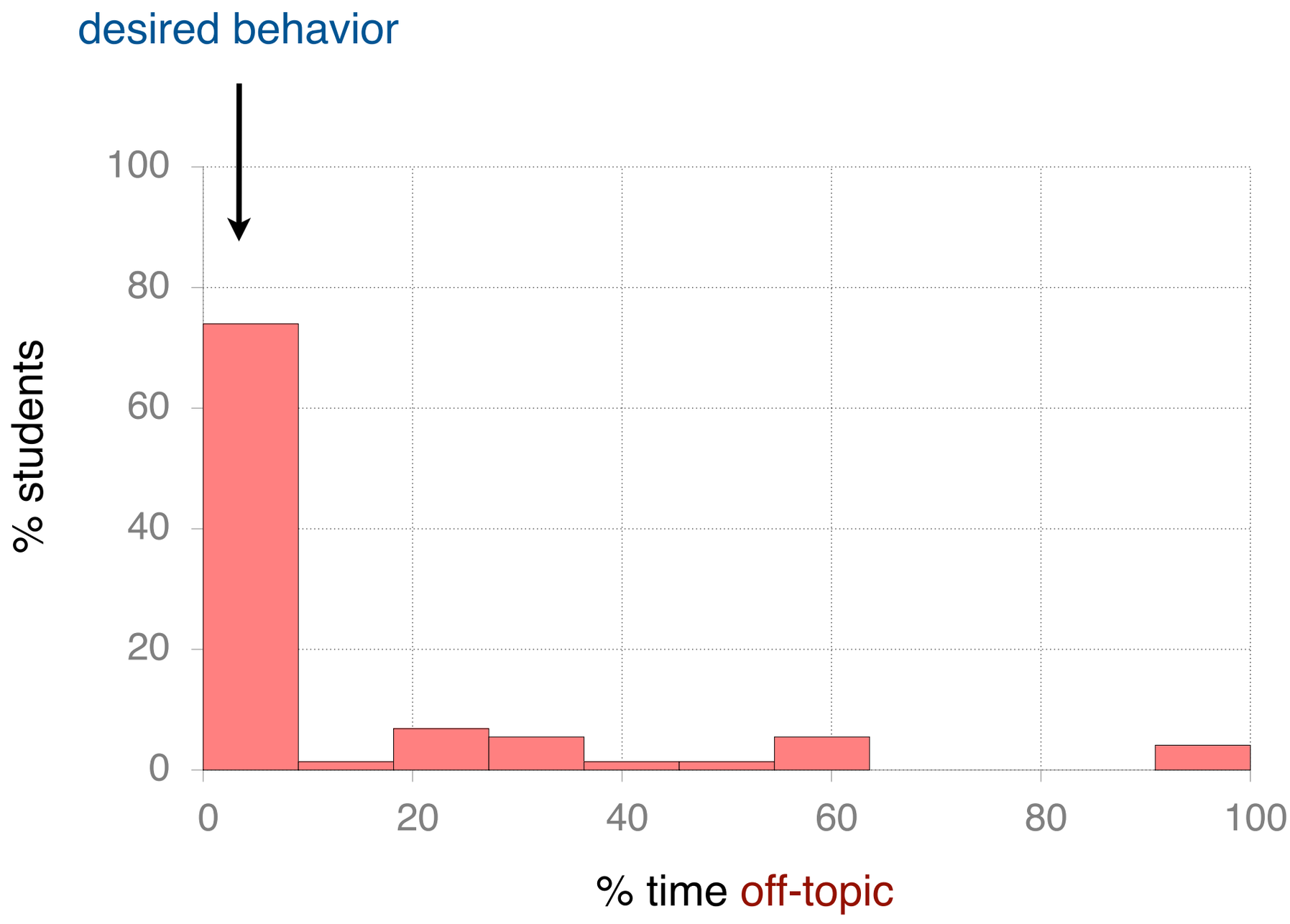
Off-topic - 10 s

We plot histograms for each question: percentage of students vs. percentage of time in the interaction type




desired behavior
100
80
60
40
20
0
% students
0
20
40
60
80
100
% time off-topic

Conclusion #1: Off-topic interactions are a small fraction of total discussion time allotted



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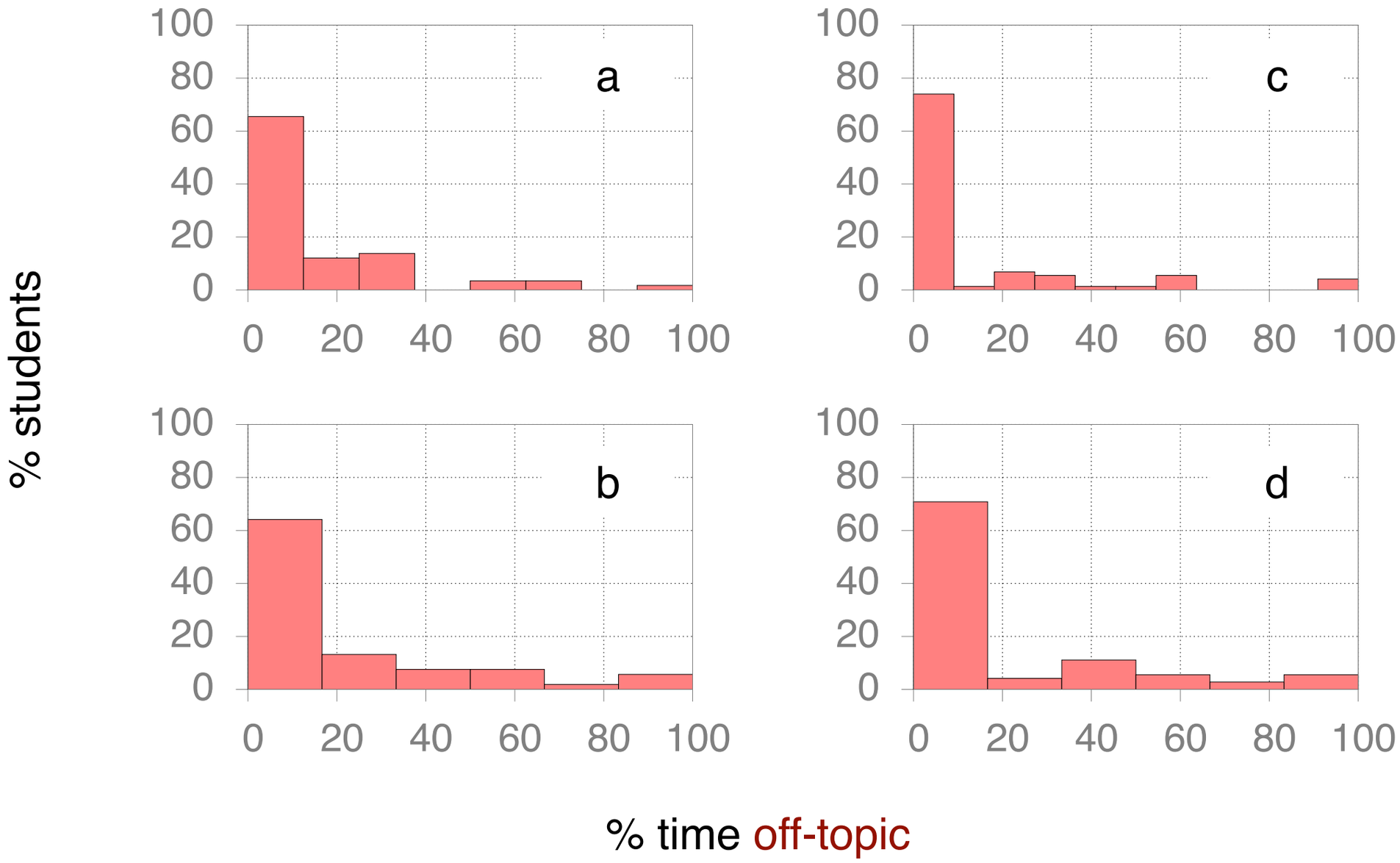
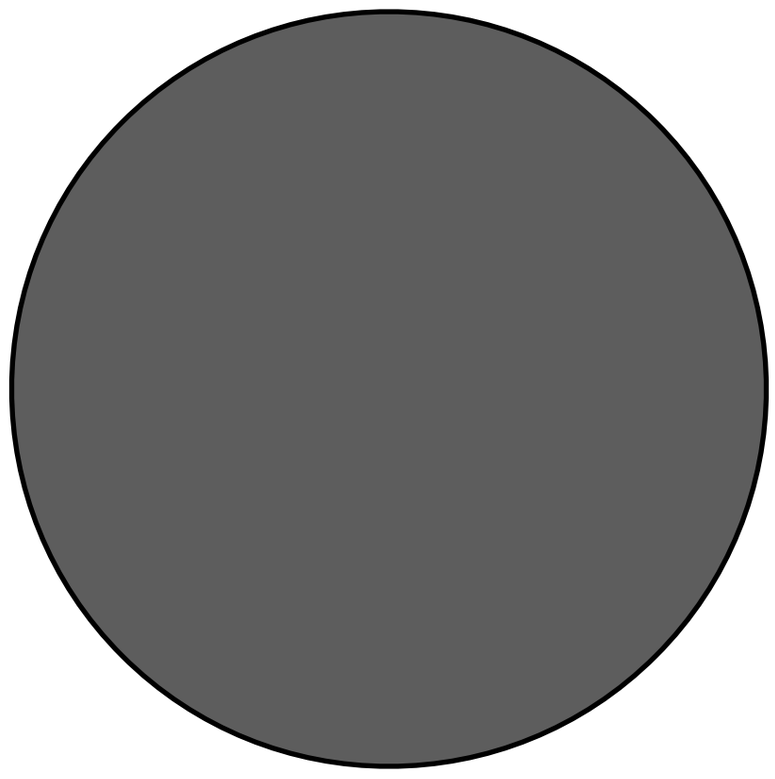


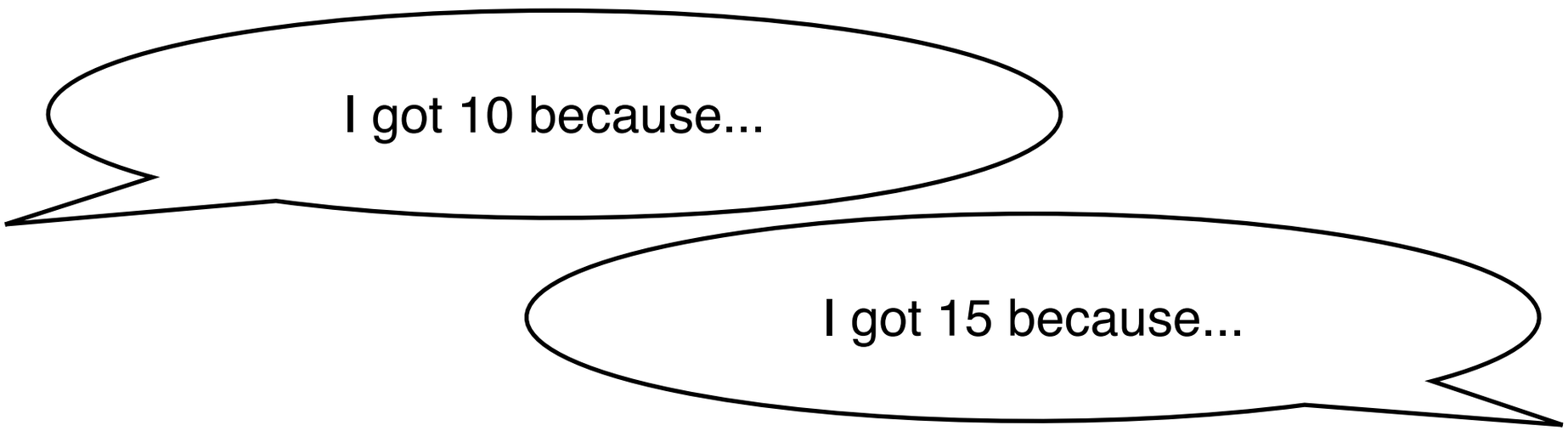
Conclusion #1: The fraction of discussion time in off-topic conversation is minimal

Our coding scheme for on-topic student conversations: check-in or disciplinary engagement

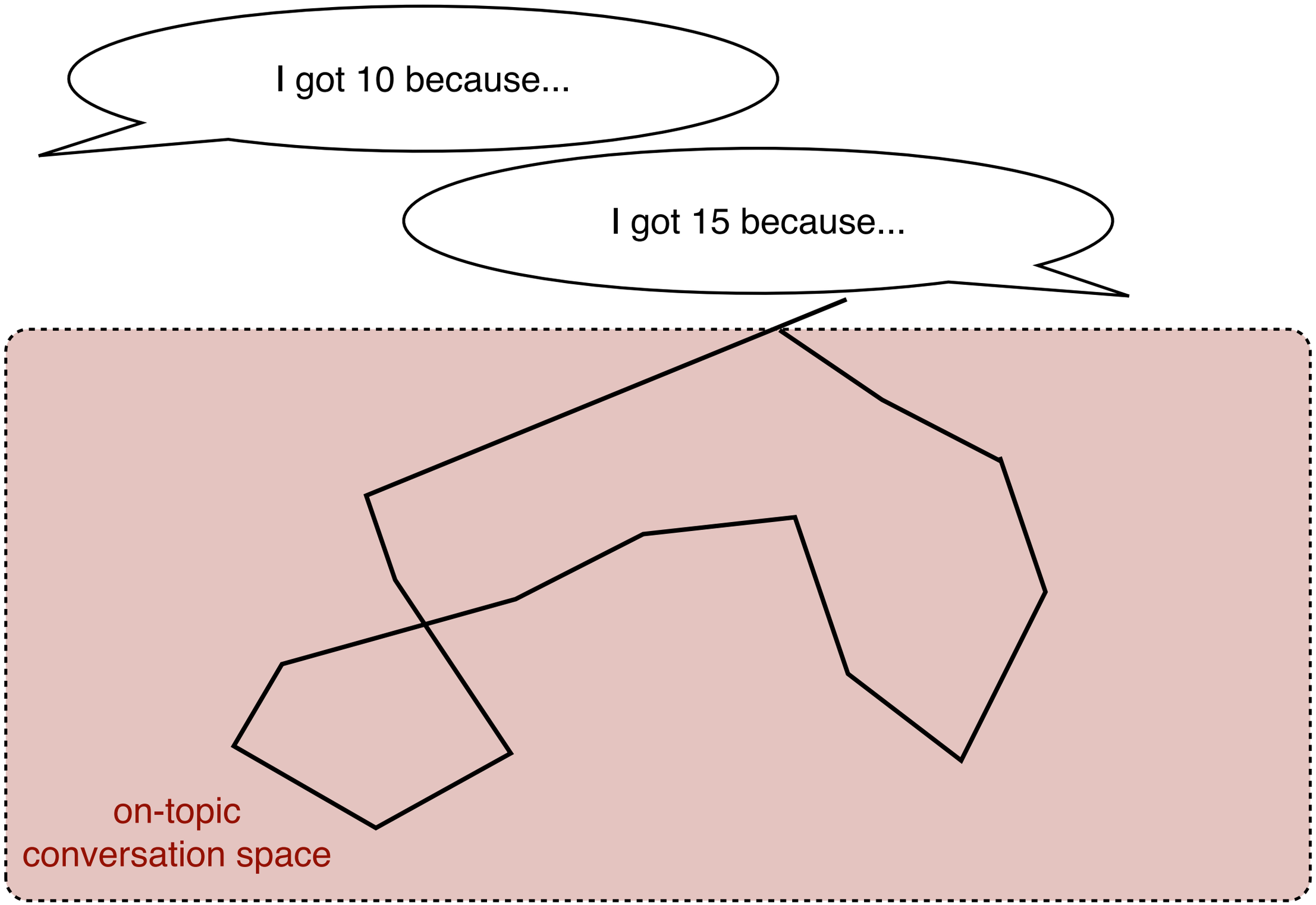


on-topic student conversations

In a check-in conversation, students exchange answers and possibly initial reasoning



In a disciplinary engagement conversation, students continue talking after exchanging initial reasoning



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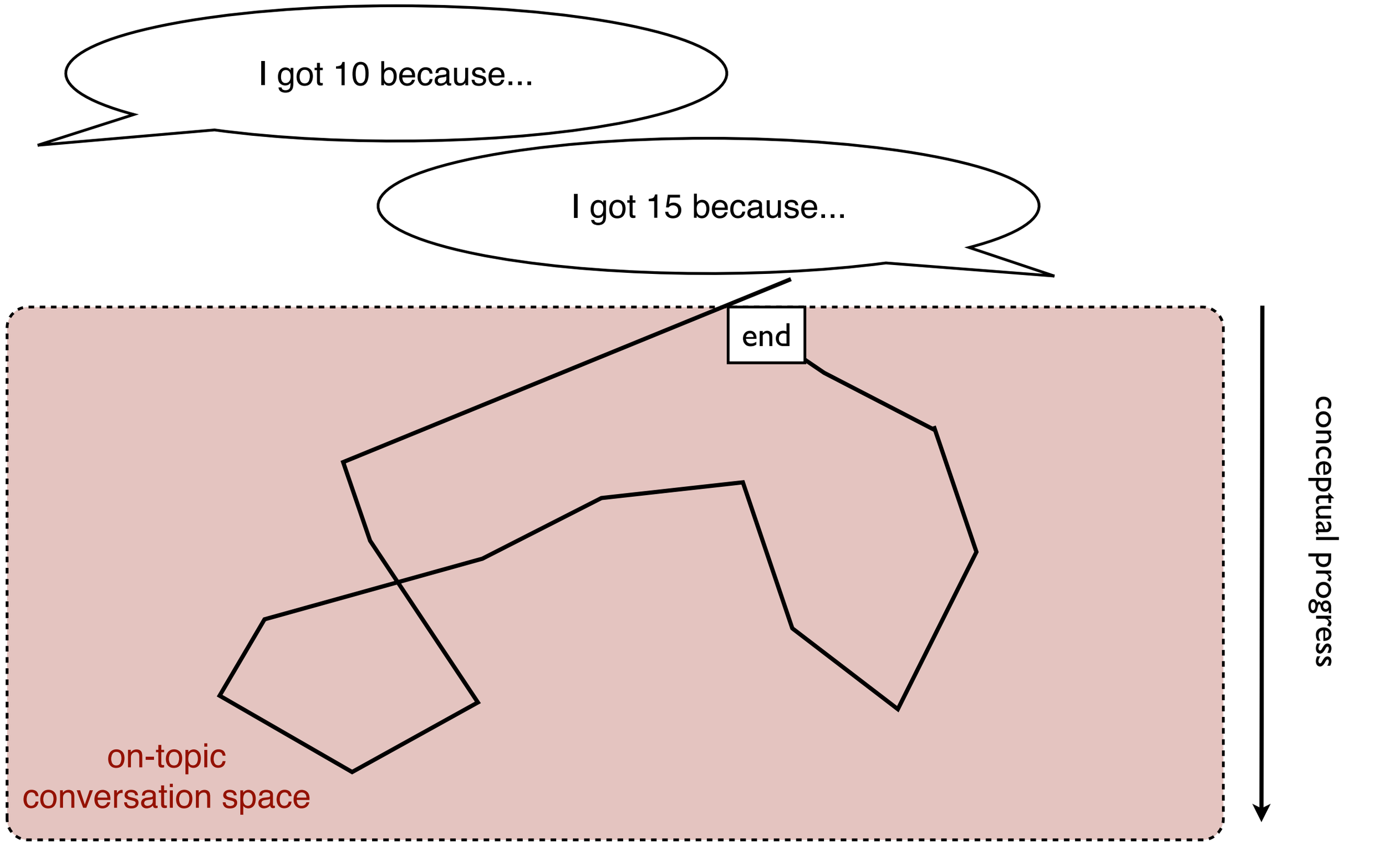
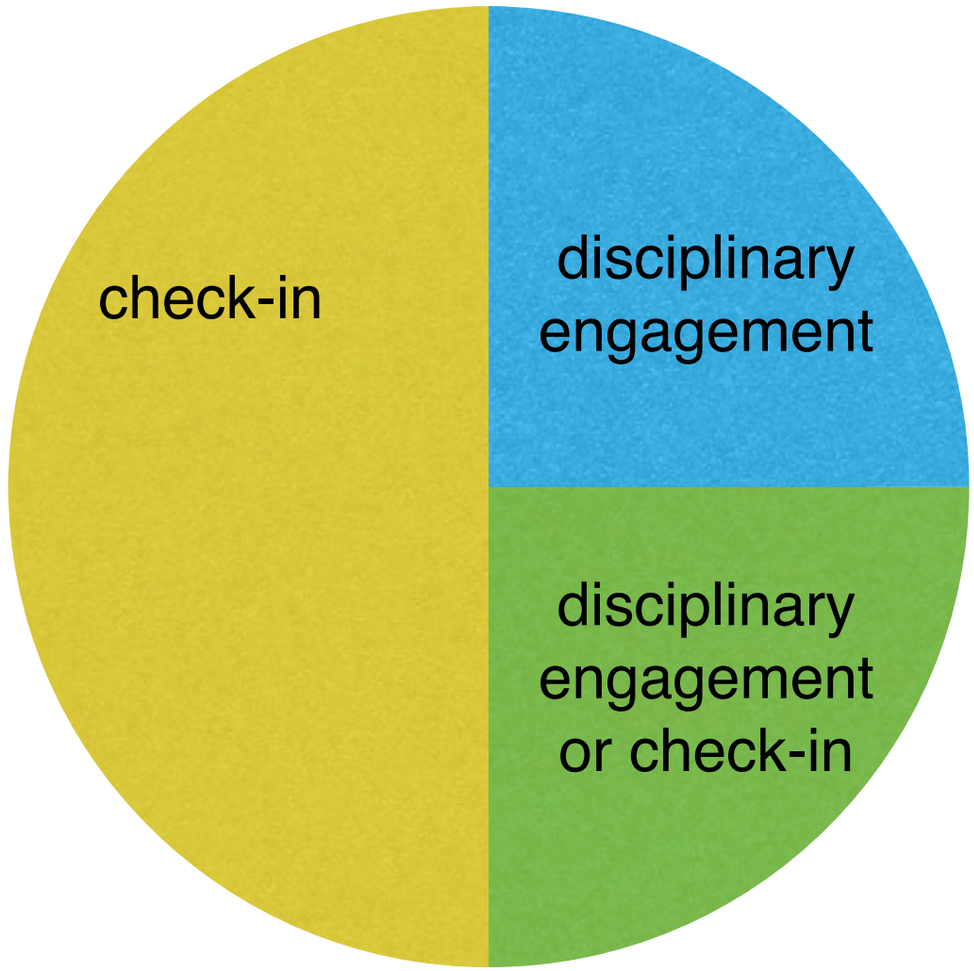


Conclusion #2: 25 - 50% of on-topic conversations between students are disciplinary engagement



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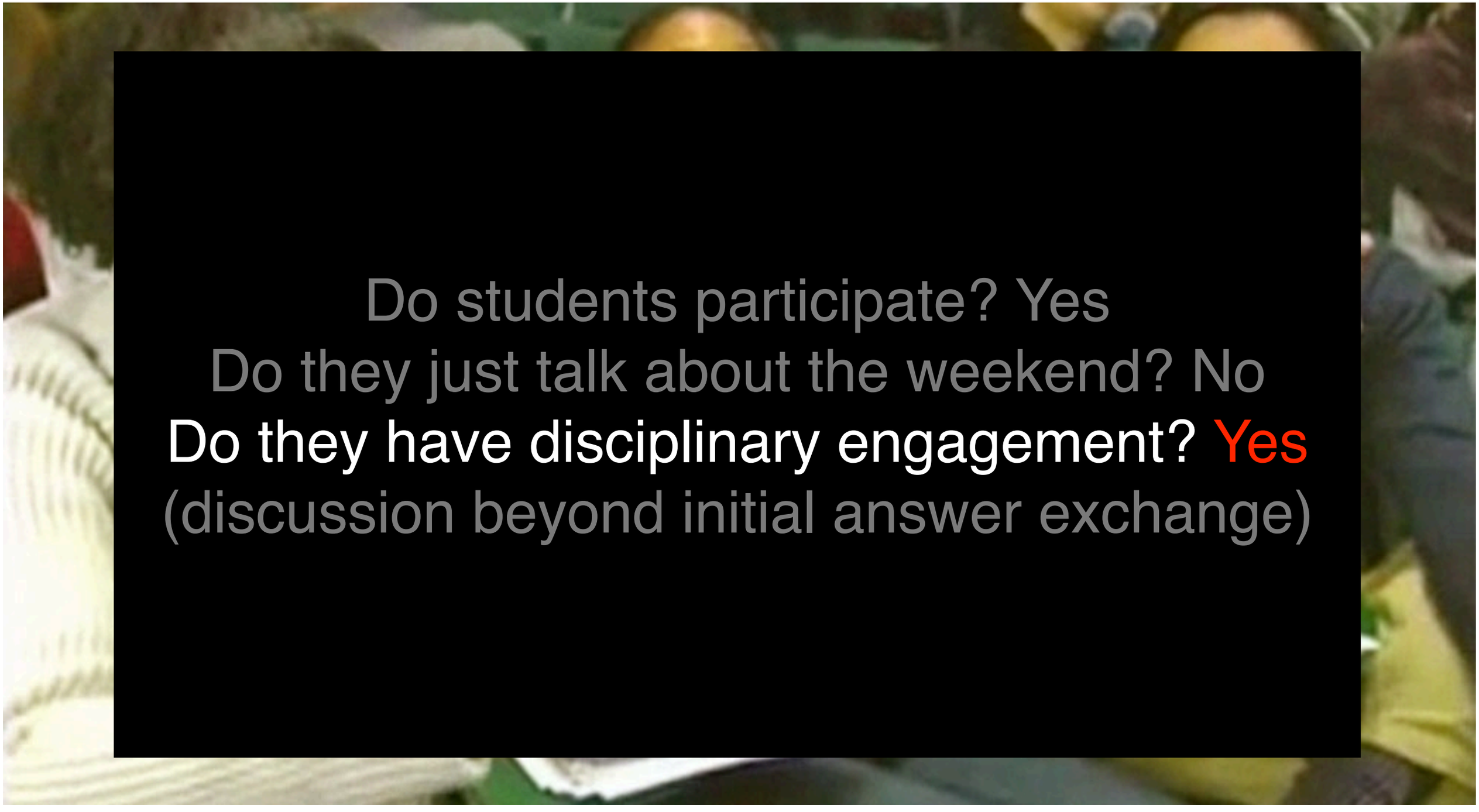
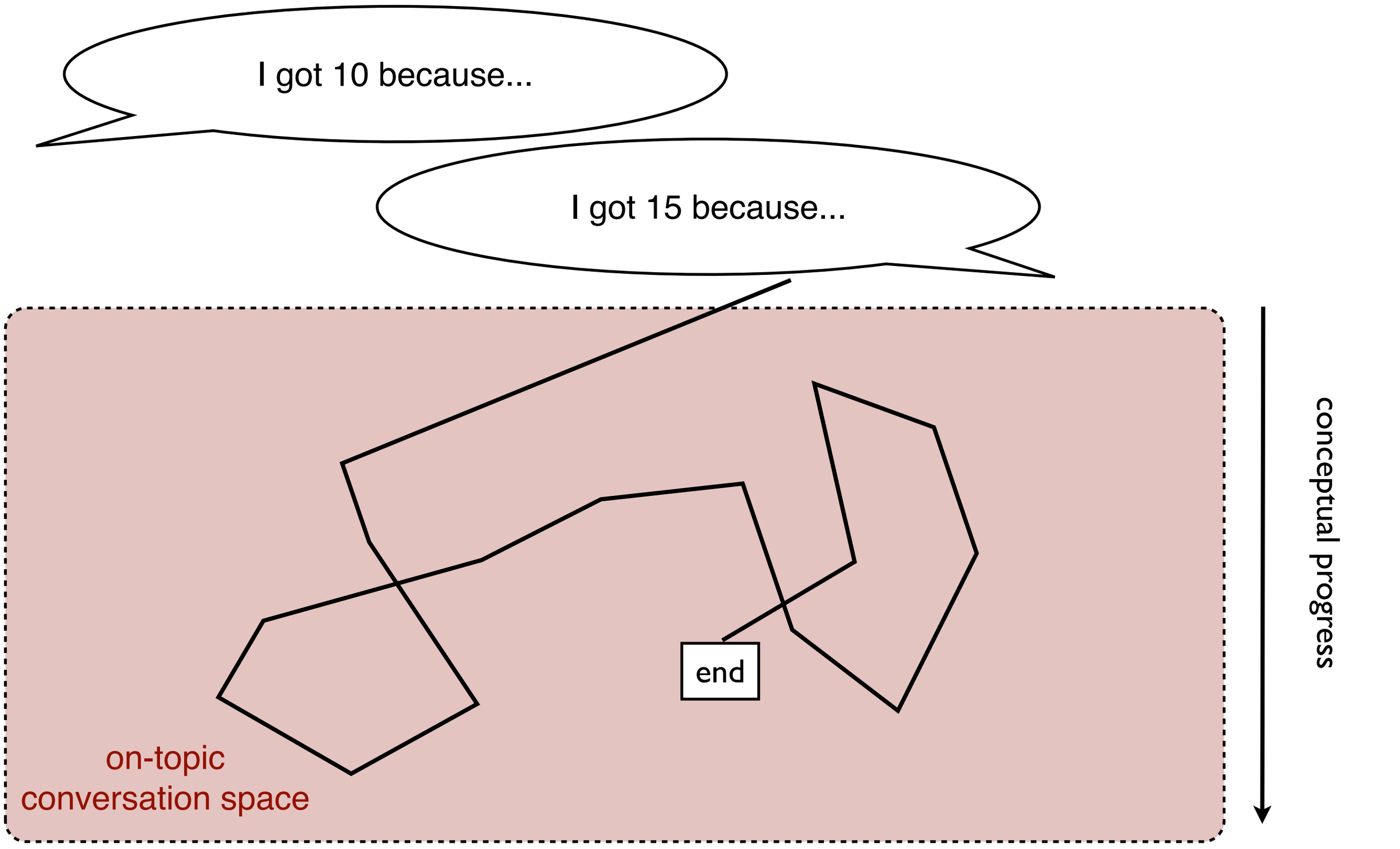
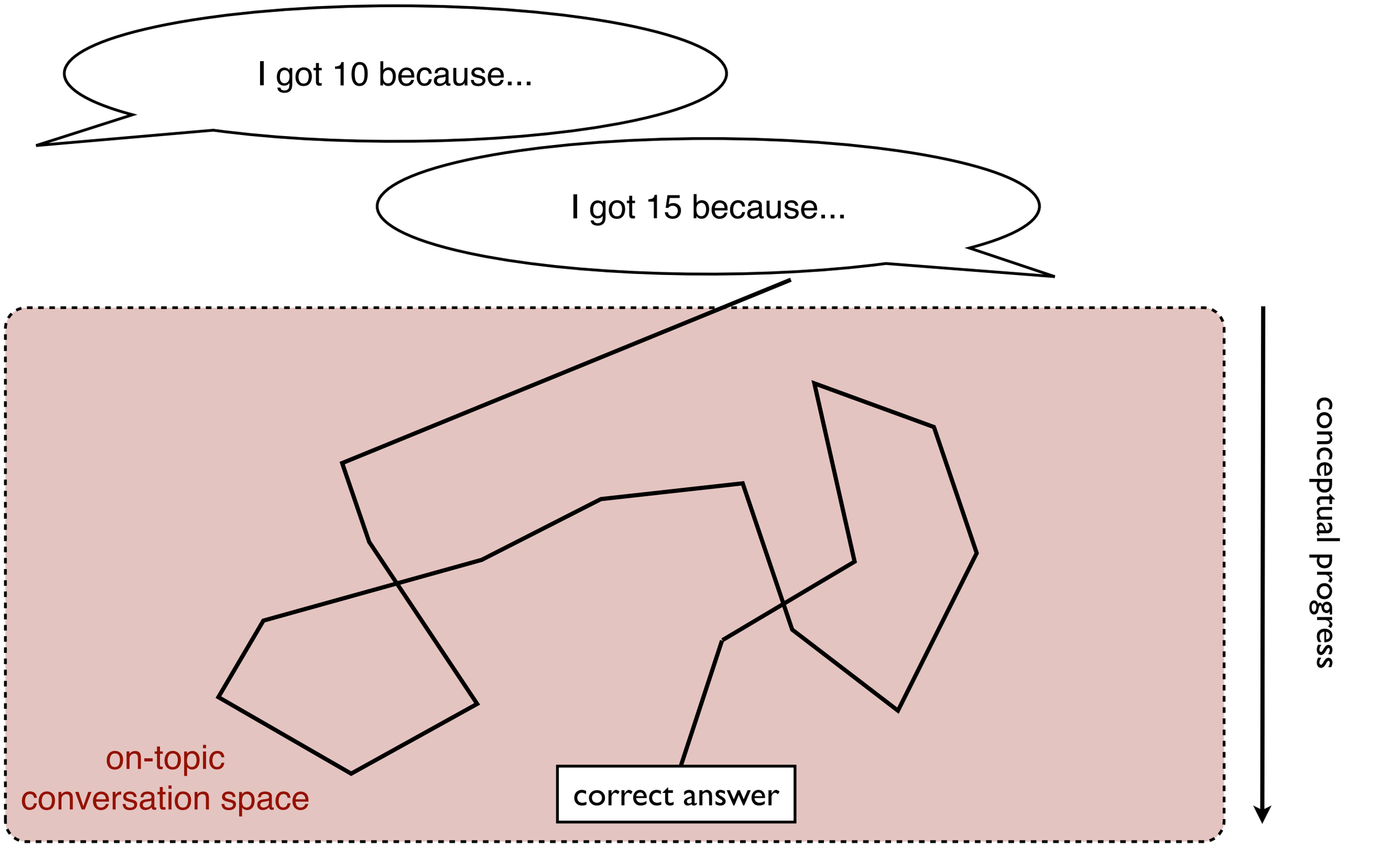


Some conversations reach <u>productive disciplinary engagement</u> (conceptual progress is made)



Some conversations reach productive disciplinary engagement, and some are discovery conversations



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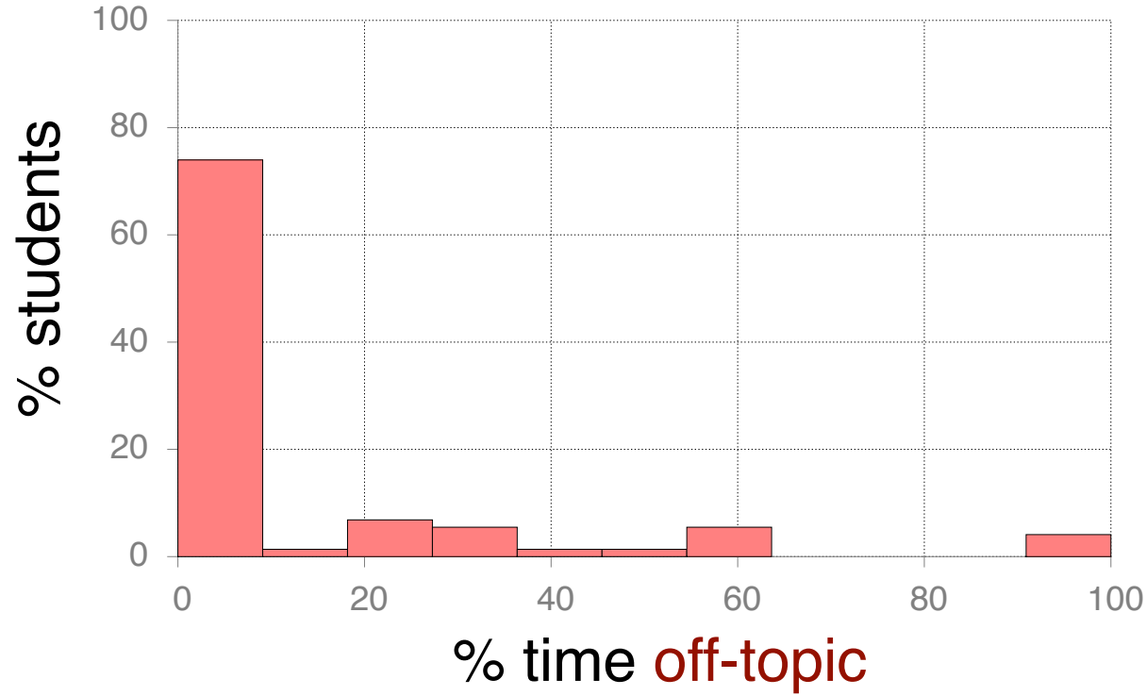

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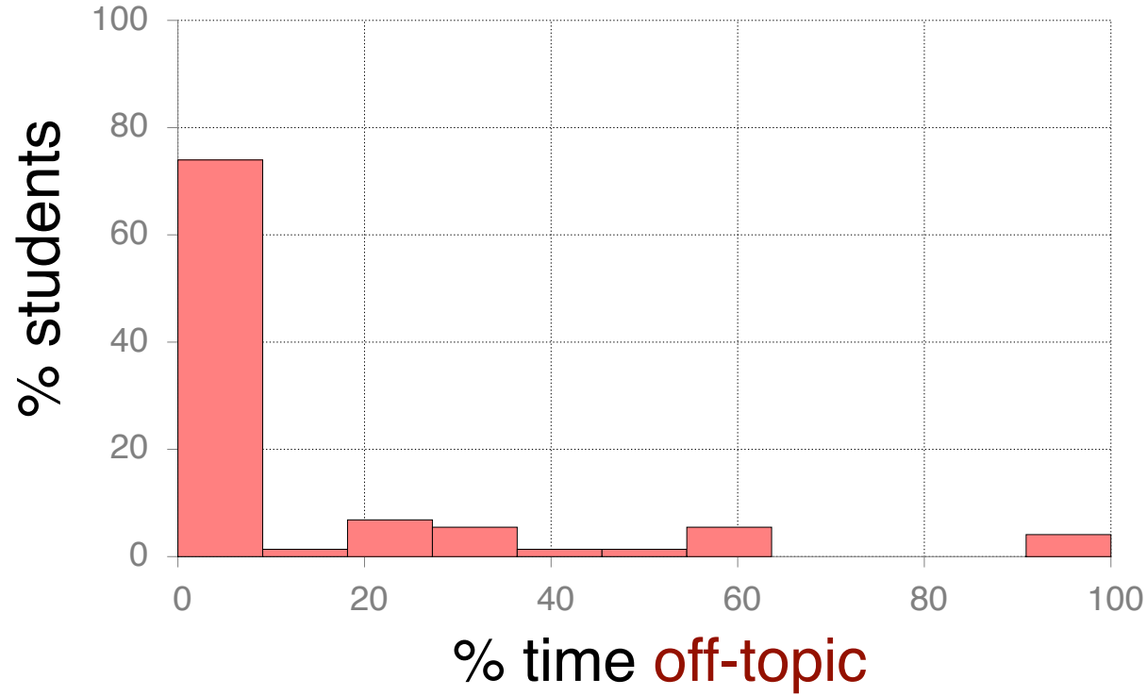

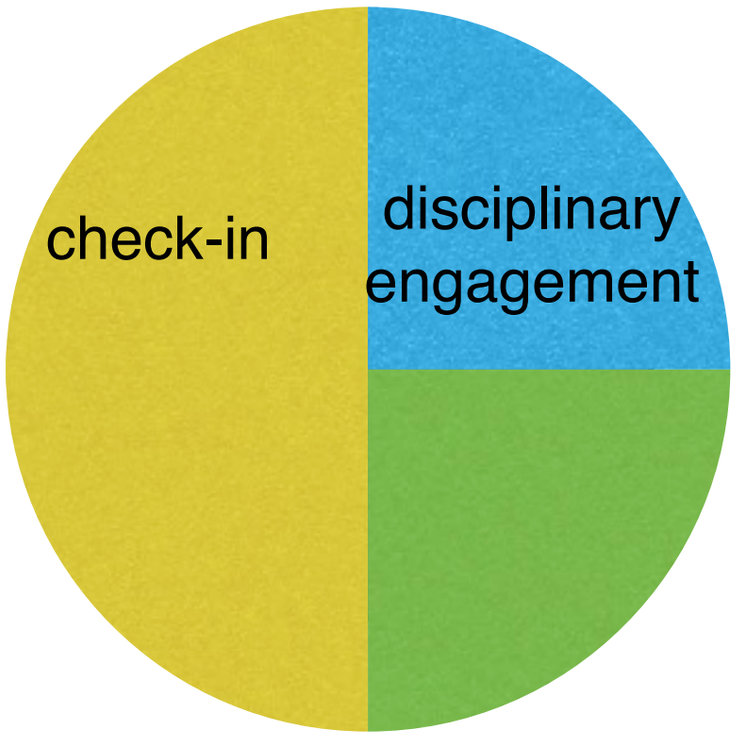

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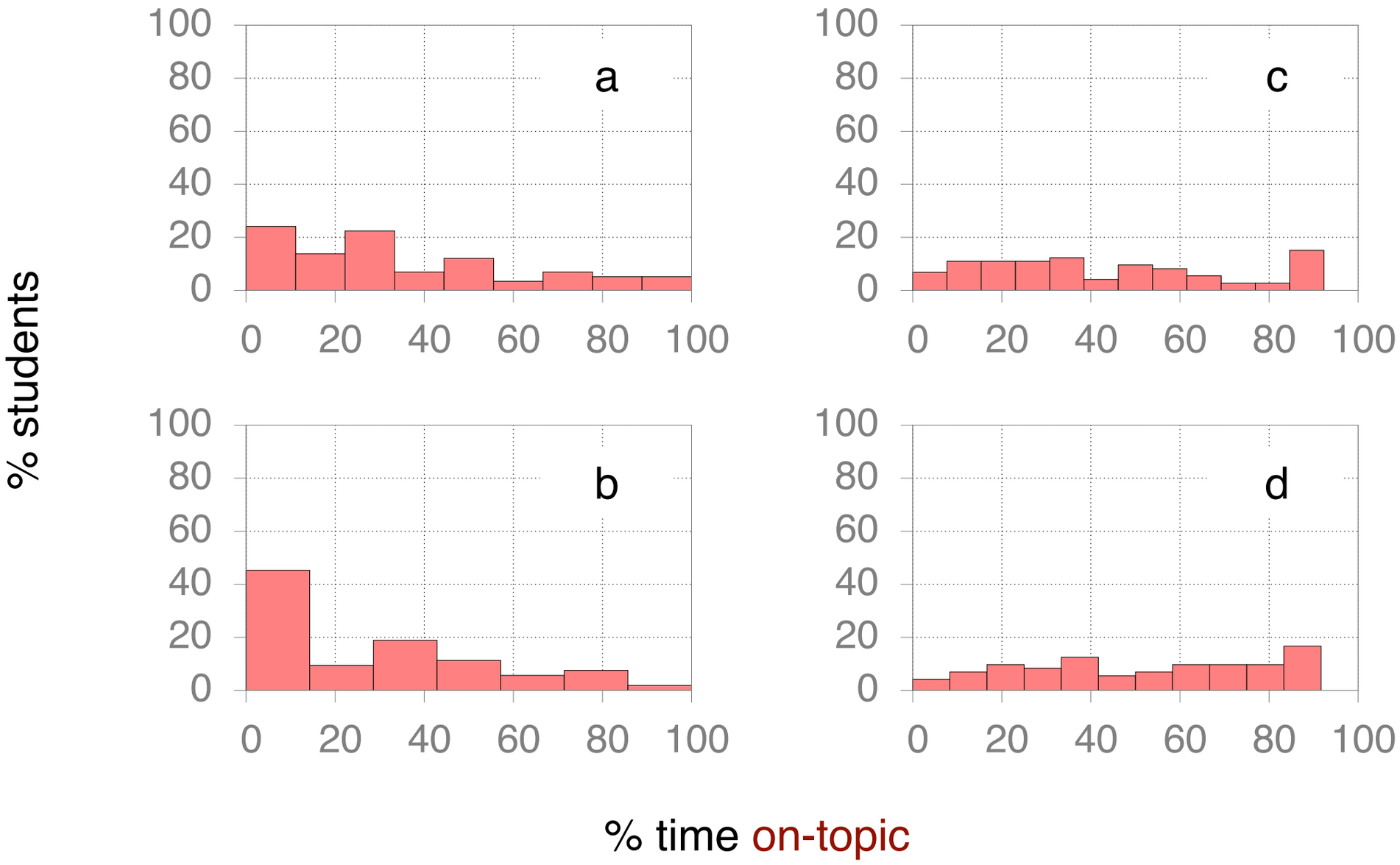
The future: This kind of analysis can highlight similarities in successful and unsuccessful questions and delivery



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