



The influence of peer discussion and attendance modality on student success in remote courses



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Background

Peer instruction (PI) is an interactive class activity that requires students to answer challenging conceptual questions and discuss their thought processes with peers. There are significant benefits of PI given that students are able to interact face-to-face and engage in *peer discussion*¹⁻³. Due to COVID-19, many classrooms switched to remote instruction, demanding changes to classroom PI. Virtual peer discussion is possible in synchronous attendance, but this is not always feasible for students.

Objectives:

- Explore how the opportunity for virtual peer discussion influences success on quizzes and exams
- Evaluate how PI benefits are impacted by modality

Design & Materials

- 117 students in a remote Psychology research methods course
- 20 lectures across 10 weeks (one instructional quarter)
 - 2-5 embedded multiple-choice PI questions per lecture
 - Some questions were discussed with peers in breakout rooms while others were only discussed as a whole class

Students turned in their answers to these questions as well as information about how they engaged with the lecture after each class session (Modality):

When you answered the questions above, how did you engage with the lecture material?

- *Attended live & discussed with classmates* (Synchronous)
- *Watched recorded discussion* (Full Recording)
- *Watched recorded lecture but skipped discussion* (Partial Recording)
- *Did not watch or attend lecture* (No Recording)
- *Other:*

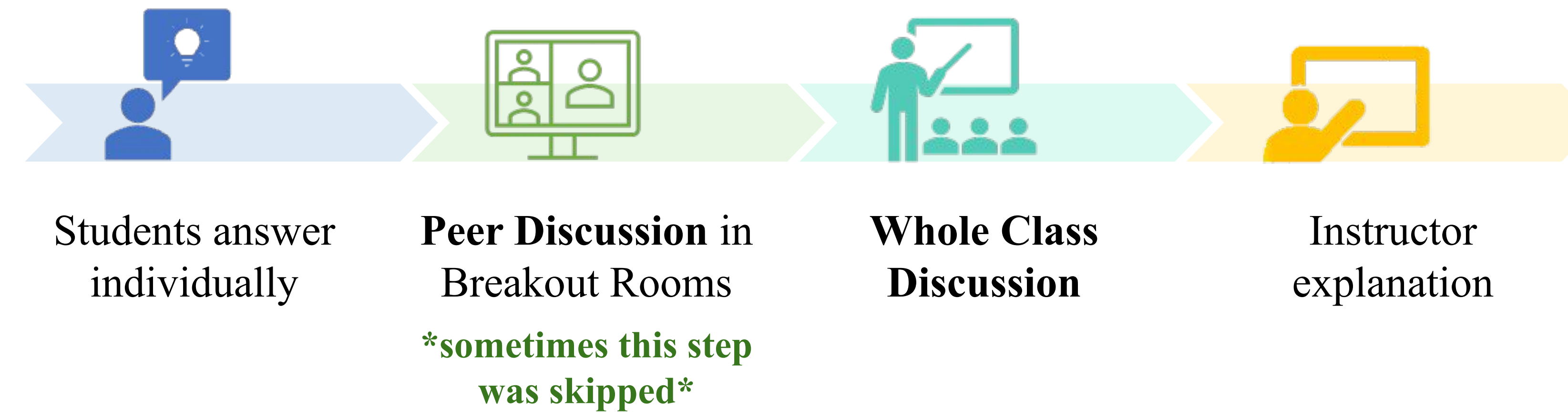
Manipulation

- First Half: instructor provided opportunity for peer discussion with almost every PI question (lectures 1-10)
- Second Half: half of PI questions received Peer Discussion, half only received Whole Class Discussion (lectures 11-20)

Analysis

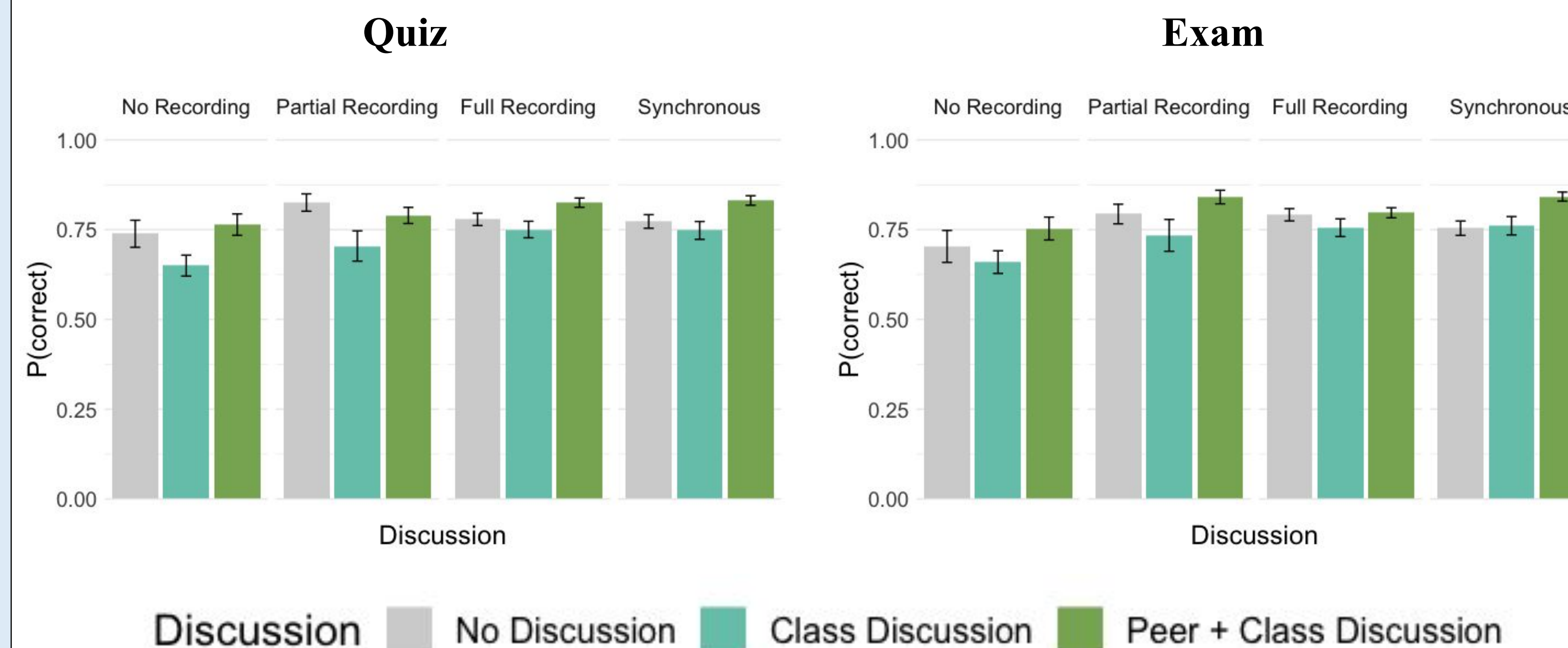
- Determine if individual accuracy on quiz and exam questions was dependent on:
 - assessment question similarity to a PI question from lecture
 - type of Discussion PI question received (Peer + Class Discussion, Whole Class Discussion, No Discussion)
 - If/how student attended lecture in which assessment question content was taught (Modality)

Peer Instruction Routine

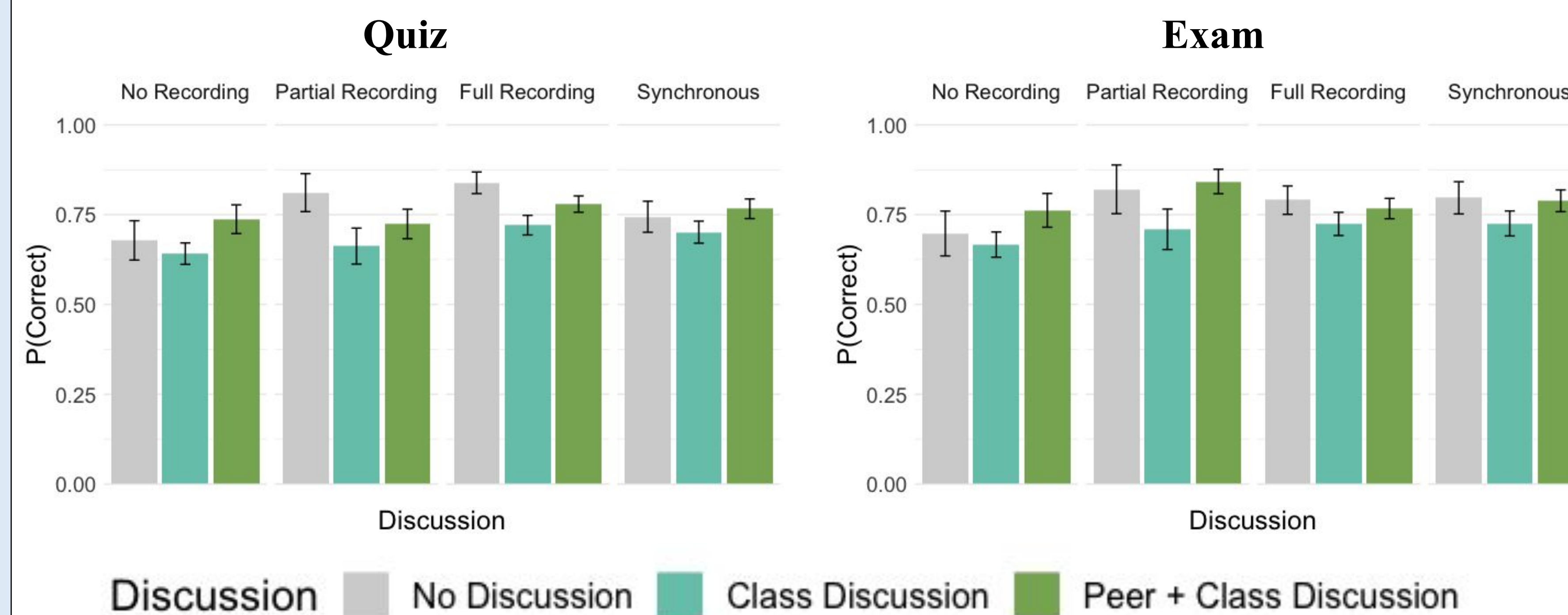


Results

Full Quarter - Correlational Analysis



Second Half - Manipulation of Discussion



- Peer + Class Discussion > Class Discussion alone
- Main effect of Modality for quizzes but not exams
- No interaction between Discussion and Modality for quizzes and Second Half Exam
- Benefit of Peer + Class Discussion and Synchronous attendance on Full Quarter Exam

Conclusions and Discussion

- Significant benefit of providing the opportunity for peer discussion
- For quiz performance, there is a benefit of attending synchronously or watching the full recording of the lecture
- Students performed better on Second Half Exam (Final) questions if they attended synchronously and discussed content with peers

Limitations:

- The questions that receive PI are not random
 - questions that received PI are typically challenging conceptually
 - PI is used to strengthen knowledge of challenging concepts
- Exams and quizzes were open-note, so students may have relied on this advantage
- The levels of discussion and participation modality were not evenly balanced
- Student opportunity for peer discussion does not equal student engagement in peer discussion

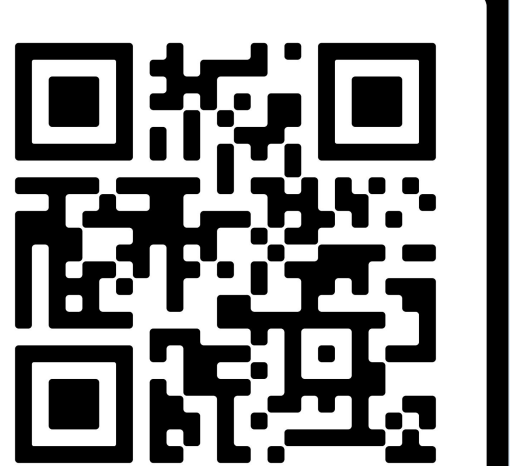
Future Directions

- Replicate study in an in-person classroom
- Examine student performance based on actual engagement—not just opportunity for peer discussion
- Balance PI questions and peer discussion opportunities across topics of varying difficulty

References

1. Dancy, M., Henderson, C., & Turpen, C. (2016). How faculty learn about and implement research-based instructional strategies: The case of peer instruction. *Physical Review Physics Education Research*, 12(1), 010110.
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3. Schell, J. A., & Butler, A. C. (2018, May). Insights from the science of learning can inform evidence-based implementation of peer instruction. In *Frontiers in Education* (Vol. 3, p. 33). Frontiers.

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Background

Peer instruction (PI): interactive class activity that requires students to answer challenging conceptual questions and discuss their thought processes with peers

- **Peer discussion:** component of PI that enables students to discuss their reasoning and answer with peers
- **Remote Instruction:** Limited face-to-face interaction due to COVID-19; **Virtual peer discussion** is possible in synchronous attendance, but not always feasible

Objectives:

- Examine whether opportunity for virtual peer discussion influences quiz and exam performance
- Evaluate benefits of PI across modalities of attendance

Design & Materials

Remote Psychology research methods course

- 3 x 4 within-subjects design
 - 3 levels of discussion (no discussion, peer discussion, class discussion)
 - 4 levels of participation modality (synchronous attendance, partial recording, full recording, none)
- 20 lectures across 10 weeks
- 2-5 embedded multiple-choice PI questions each lecture
 - Some PI questions discussed with peers in breakout rooms
 - Other PI questions only discussed as a whole class

Students submitted answers to PI questions and information about type of engagement with lecture after each class session

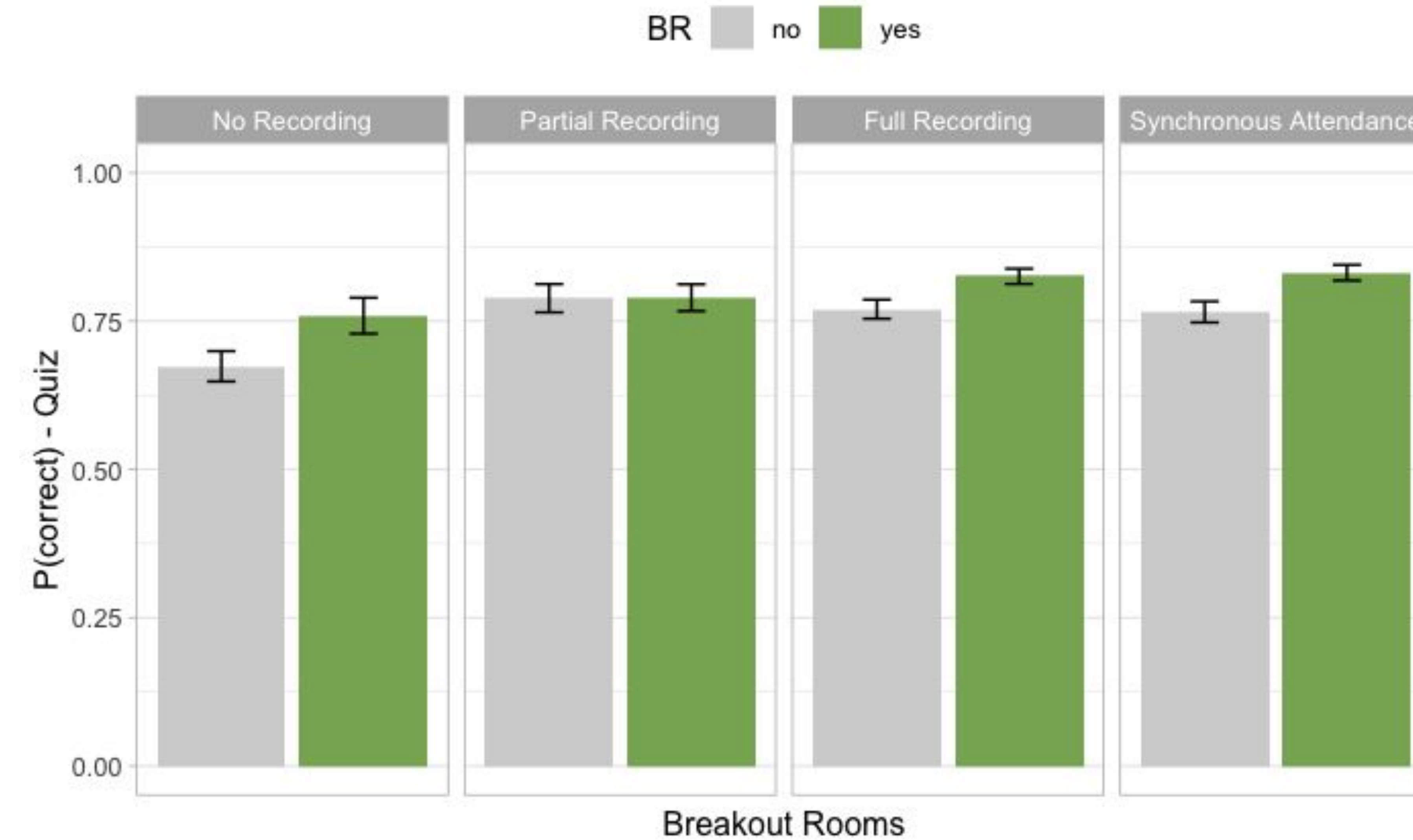
When you answered the questions above, how did you engage with the lecture material?

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- *Other:*

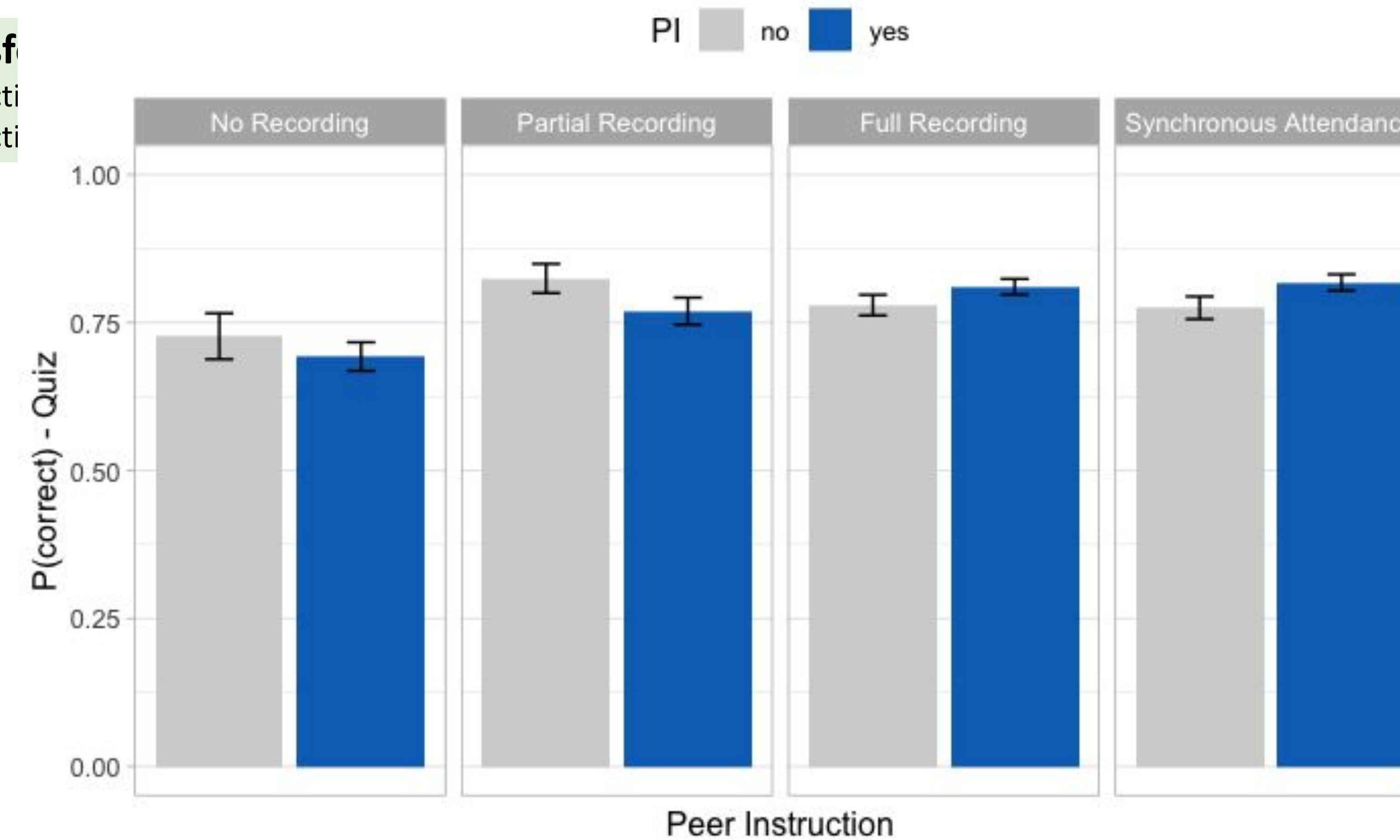
Study 2 Results (1 min RI)

Free Recall

Interaction between type and placement ($p=0.028$)
Interaction between type and prior knowledge ($n=0.018$)



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Conclusions and Discussion

Across two studies we have found conflicting results. In Study 1, we found a significant main effect of placement where questions asked after the answer was addressed lead to both greater free recall and transfer. However, in Study 2, we found cross-over interactions where multiple choice questions were more effective when asked before the answer was addressed, and open response questions were more effective when asked after the answer was addressed (though this effect was smaller for free recall than transfer). These differences may be due to the addition of a short retention interval in study 2, during which participants played Tetris for 1 minute. Follow-up studies will test this possibility by directly comparing immediate and delayed posttests (and longer retention intervals).

Nonetheless, some effects seem fairly consistent – although contradictory to our predictions – including:

- 1) Adjunct questions do not always lead to more learning
- 2) Participants with less prior knowledge seem to benefit more from open response questions
- 3) Participants with more prior knowledge seem to benefit more from multiple choice questions

This finding is limited by our small range of prior knowledge and the fact that we are relying on self-report. Future studies may require recruitment of less-naive participants and a more objective pretest to effectively measure learning.

Surprisingly, no effects of placement, type, prior knowledge, or any of their interactions were found for performance on the multiple choice test.

Future Directions

Replicate study in an in-person classroom

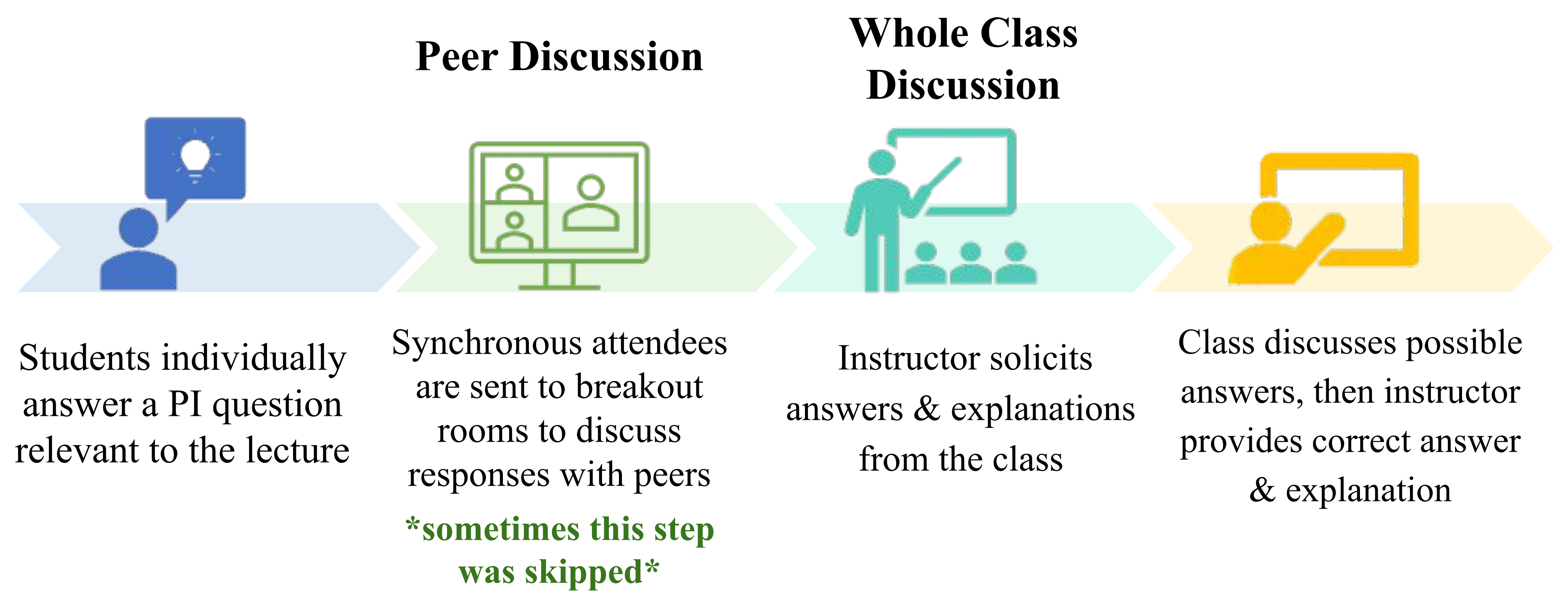
Examine student performance based on actual engagement—not just opportunity—for peer discussion

Balance PI questions and peer discussion opportunities across topics of varying difficulty

References

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