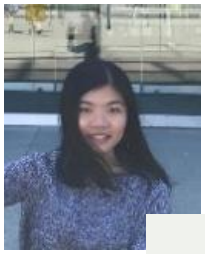
Four-way high-fives during exams:
Adding a group phase to provide immediate feedback and increase enjoyment


Joss Ives & Jared Stang
Department of Physics & Astronomy,
University of British Columbia

Joy Chen



Matias de Jong Van Lier

Nutifafa Kwaku Sumah

Analise Hofmann

Rosanne Persaud

Patrick Dubois

Laura Super

José Arias-Bustamente

+ Simmer Mand
& Nicolás Romualdi
& Katie Foote
& Maggie Wu

Funding: UBC Teaching & Learning Enhancement Fund

joss@phas.ubc.ca
jared@phas.ubc.ca

About you

1. Why do you use group work in your courses?

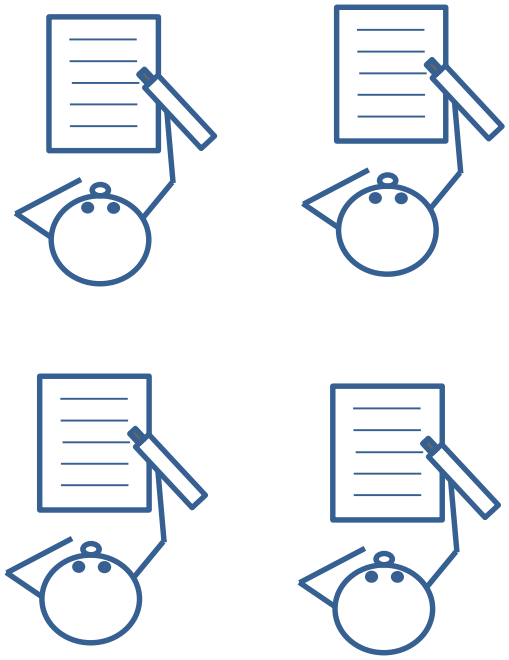
2. Why do you use tests in your courses?

3. What opportunities do you provide for students to receive feedback on their learning?

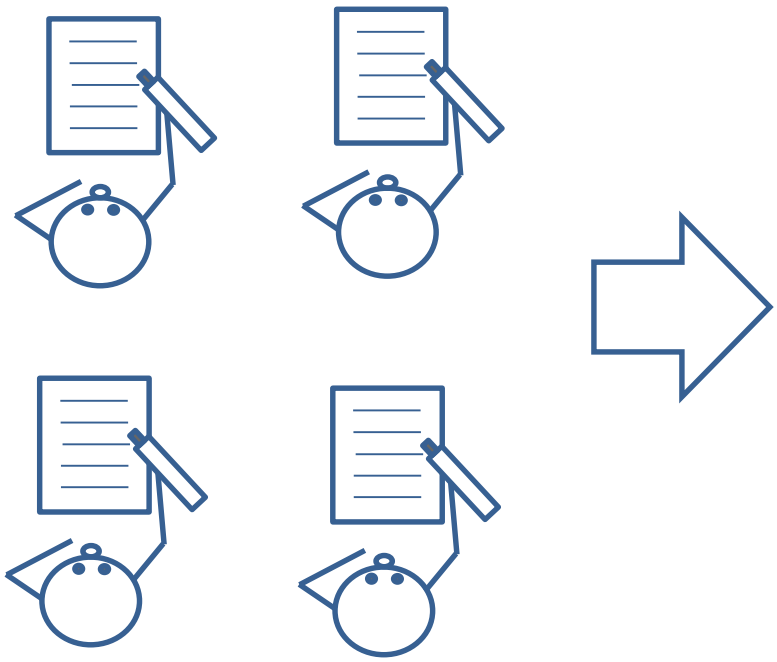
On your worksheet:

1. What are 3-4 typical exam-question types that you use?

A typical exam



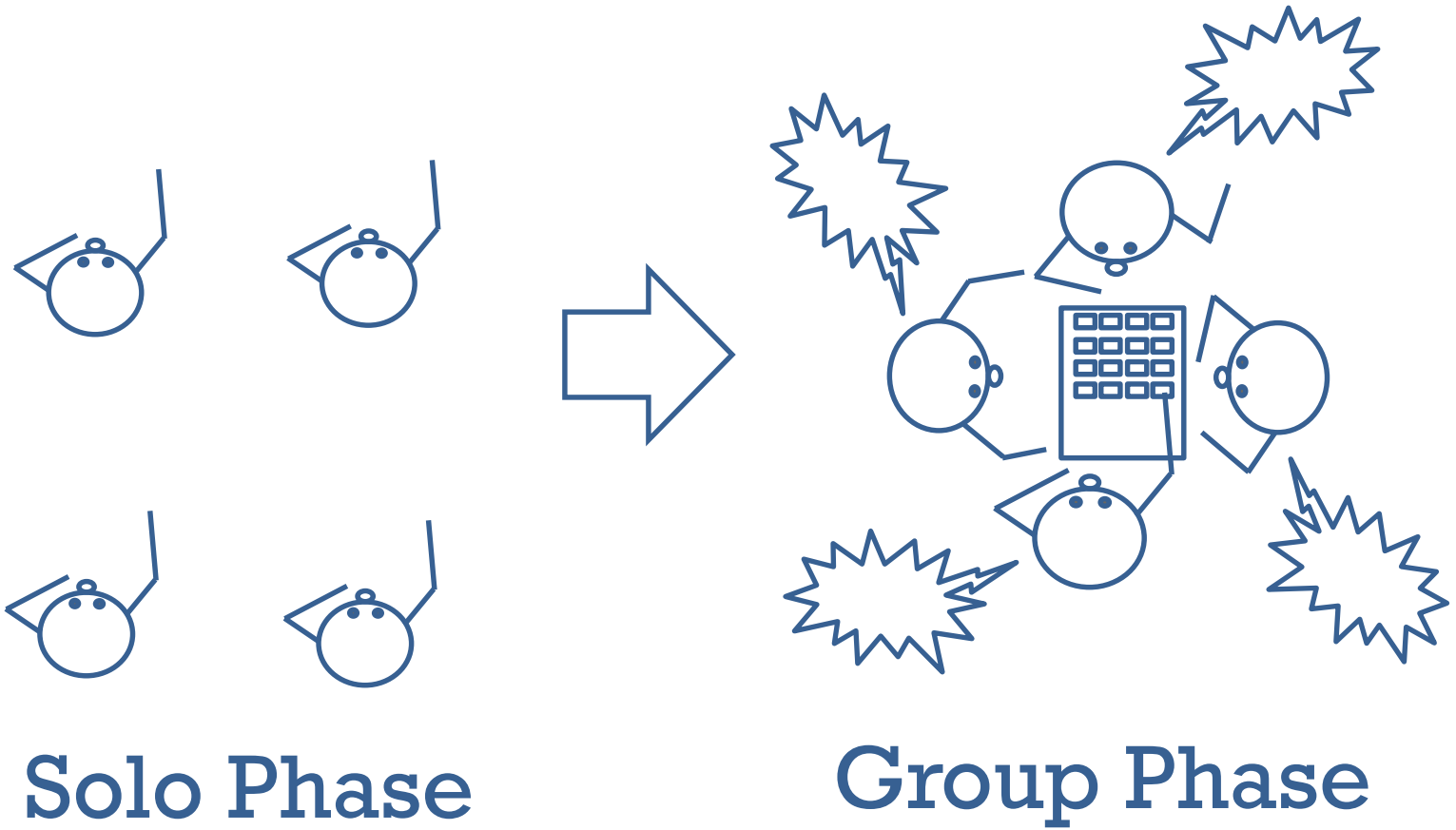
A typical two-phase collaborative group exam



Solo Phase

Group Phase

A typical two-phase collaborative group exam



Group exams provide feedback and learning through high engagement

"All had different ways of approaching the question. Very helpful to understand everyone's response and why they thought their answer was correct."

"I was able to instantly learn from my mistakes."

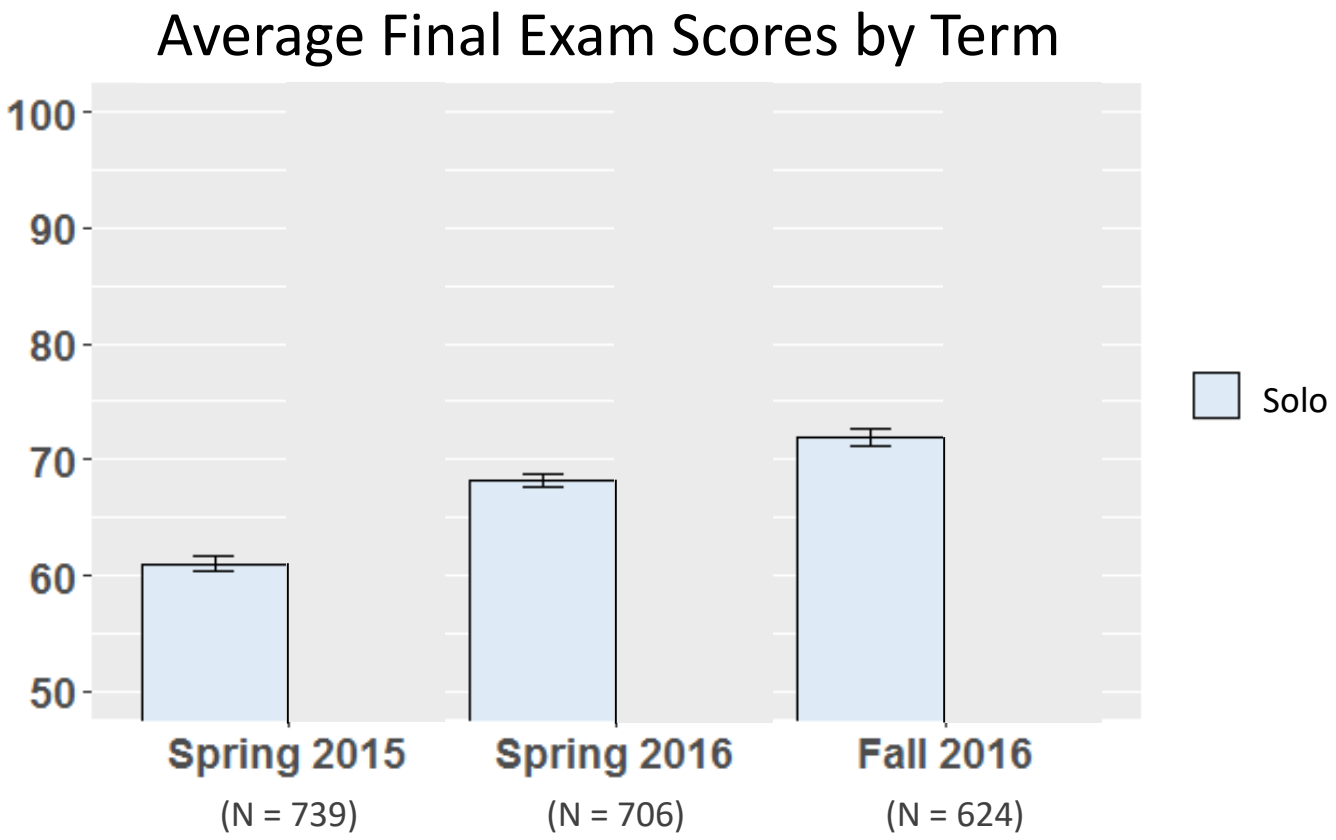
"It was sort of depressing to know what you got wrong right after writing the exam… I think it ends up being worth it, though, because you learn from your mistakes."

87% of students recommended continued use of two-stage exams.

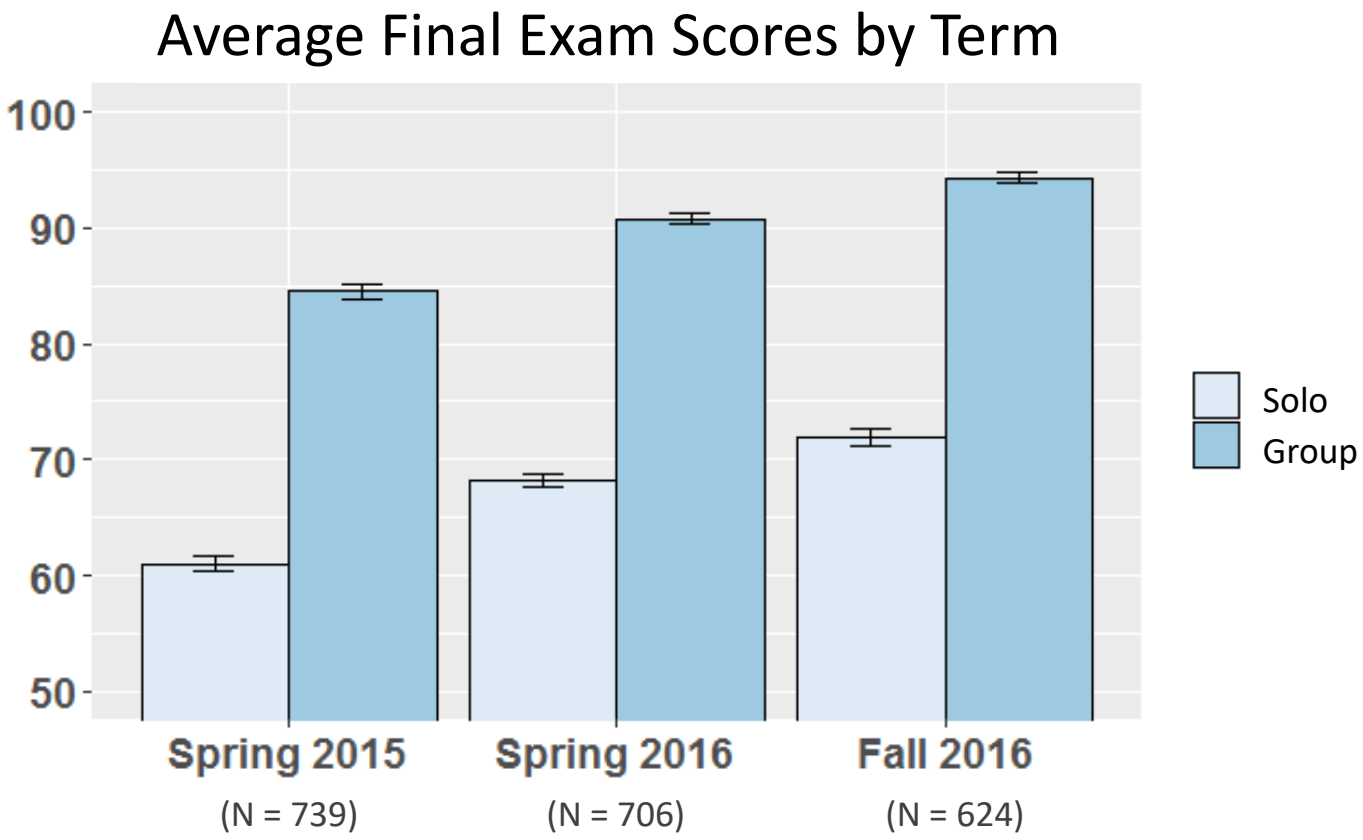
(In our own surveys, students recommend continued use two-stage exams: 98% midterms; 91% final exams)

Wieman, Rieger, and Heiner. *The Physics Teacher* 52.1 (2014): 51-53.
Rieger and Heiner. *Journal of College Science Teaching* 43.4 (2014): 41-47.

Group exams provide feedback and learning through high engagement



Group exams provide feedback and learning through high engagement

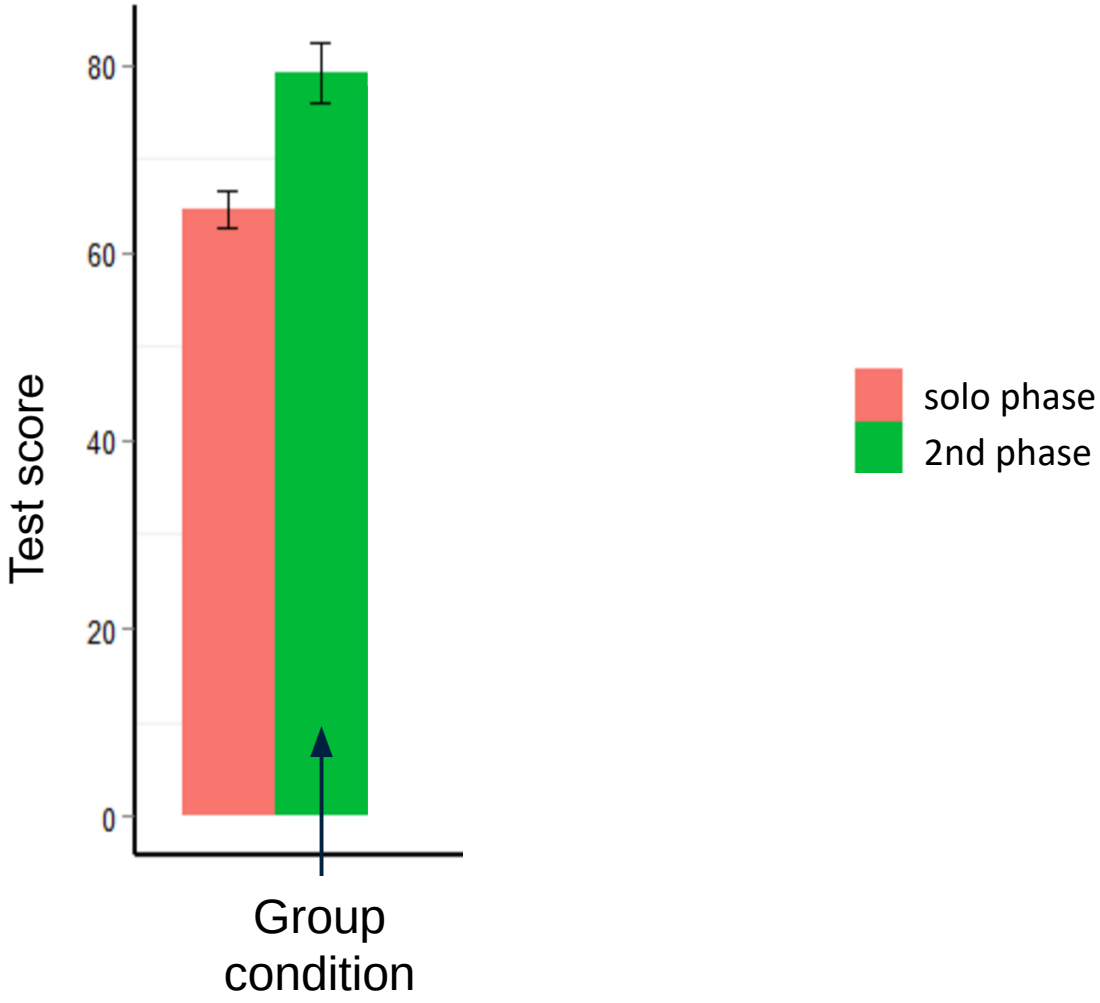


Group exams provide feedback and learning through high engagement

"I remember all the mistakes I made in the group exam, and nothing from ~~tutorial~~ recitation at all"

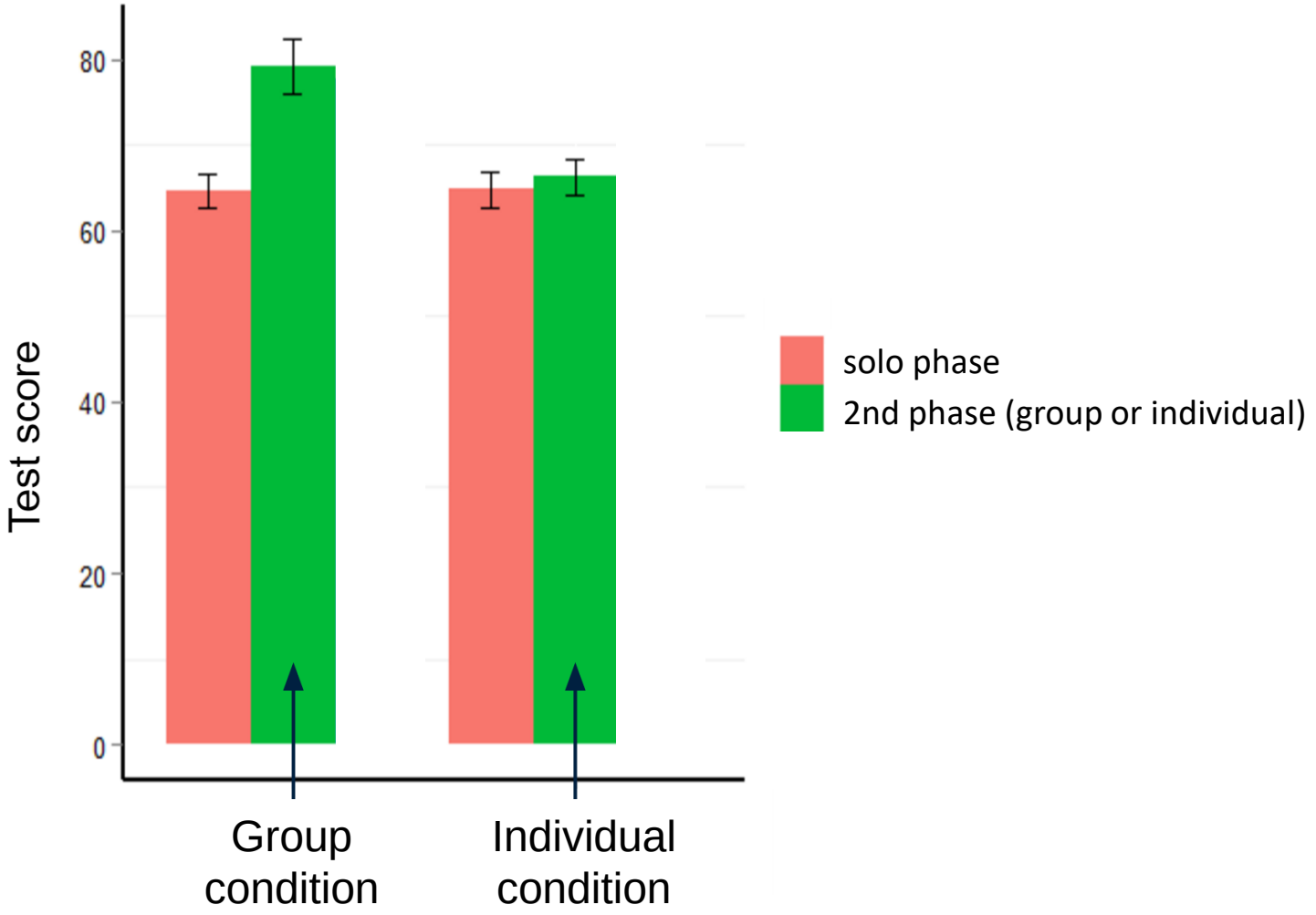
- student from Jared's Physics 101

Group exams provide feedback and learning through high engagement



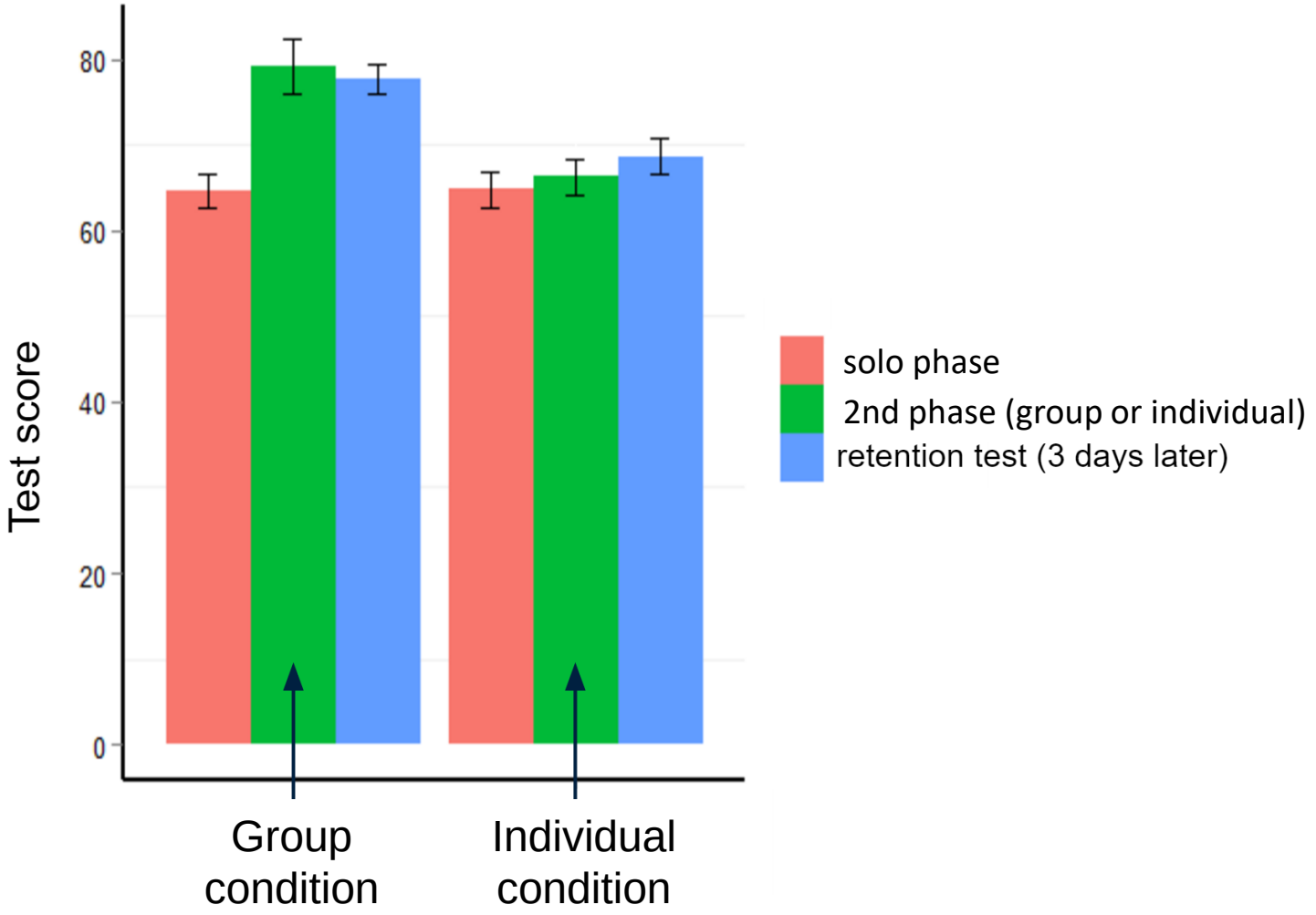
Gilley and Clarkston. *Journal of College Science Teaching* 43.3 (2014): 83-91.

Group exams provide feedback and learning through high engagement



Gilley and Clarkston. *Journal of College Science Teaching* 43.3 (2014): 83-91.

Group exams provide feedback and learning through high engagement



Gilley and Clarkston. *Journal of College Science Teaching* 43.3 (2014): 83-91.

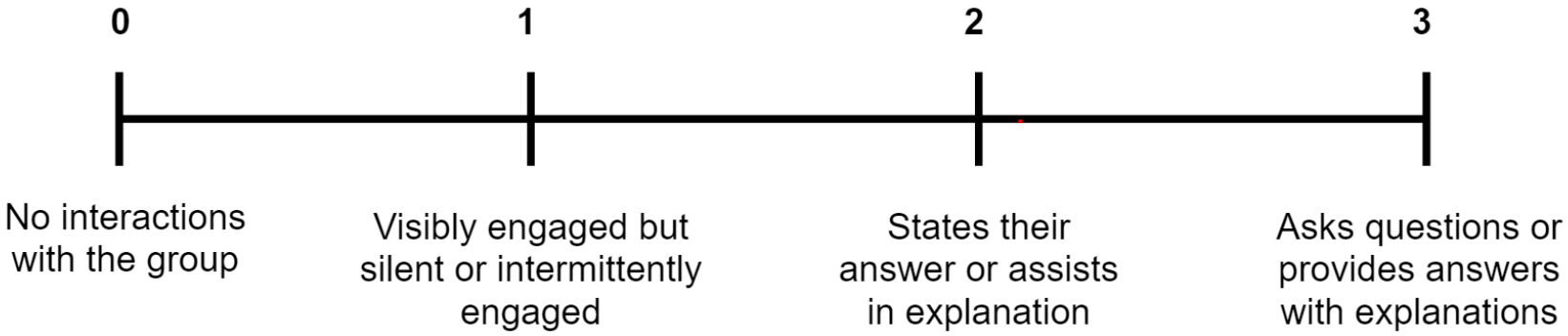
Our experiment in Physics was similar, but used isomorphic questions instead of identical ones

For retest given within 2 weeks of the midterm (N>1300)
[95% Confidence Interval]:

Odds ratio = 1.32 [1.18, 1.48]
Cohen's *d* = 0.15 [0.09, 0.21]

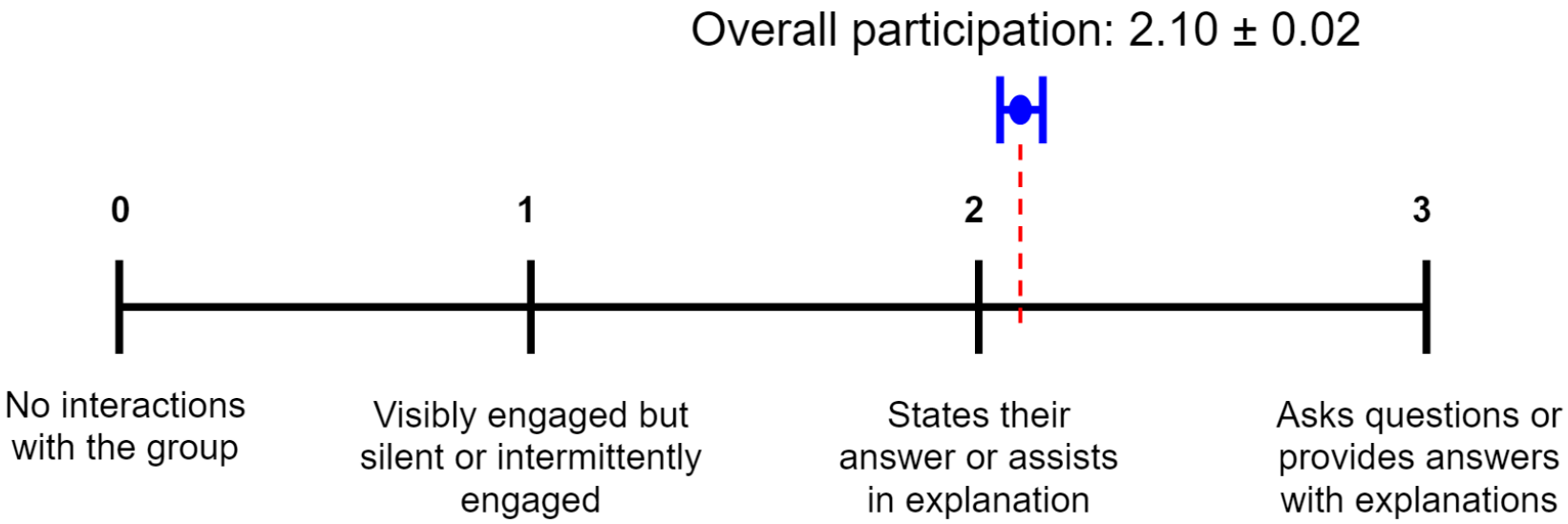
No evidence of learning/retention for retest given
4-7 weeks after the midterm

Group exams provide feedback and learning through high engagement



Ives, de Jong Van Lier, Sumah, and Stang. *Physics Education Research Conference 2016*: 172-175.

Group exams provide feedback and learning through high engagement



Ives, de Jong Van Lier, Sumah, and Stang. *Physics Education Research Conference 2016*: 172-175.

On your worksheet:

2. Which of the above question types would work well for a *feedback* (group) phase? Which would work poorly for this type of group phase? Why?

On your worksheet:

3. Develop your implementation plan for a feedback (group) phase.

a) How will the group phase questions be similar to or different from the solo phase questions?

Recommendations for good ***feedback***:

- Keep most questions the same
- Questions with shorter answers are better for group participation
- Include one or two additional difficult questions at most

b) How will you allocate the exam time to the solo and group phases?

- If all of the questions are the same in both phases, 2:1 (solo:group) works well
- If new questions or extensions on questions are introduced in the group phase, more time will be needed.

c) How will you allocate points between the solo and group phases?

Recommendation to maintain solo assessment:

- Most common is 15-25% for the group phase, but there are examples in the 10-50%.

d) Students tend to prefer student-formed groups

1. Our students tend to **prefer student-formed groups**
    - When working with friends, engagement is better[1] and female students see more value in the work.[2]

[1] Eddy, S. L., Brownell, S. E., Thummaphan, P., Lan, M. C., & Wenderoth, M. P. (2015). Caution, student experience may vary: Social identities impact a student's experience in peer discussions. CBE Life Sciences Education, 14(4), 1–17. http://doi.org/10.1187/cbe.15-05-0108

[2] Azmitia, M., & Montgomery, R. (1993). Friendship, transactive dialogues, and the development of scientific reasoning. Social Development, 2(3), 202–221. http://doi.org/10.1111/j.1467-9507.1993.tb00014.x

(d continued) If you create your own groups…

2. If you choose the groups, avoid isolated female or minority students
   - Group dysfunction is higher in groups with isolated female students[1,2]

3. For heterogeneous vs homogeneous groups based on performance, the literature is inconsistent.

[1] Heller, P., & Hollabaugh, M. (1992). Teaching problem solving through cooperative grouping. Part 2: Designing problems and structuring groups. American Journal of Physics.
[2] Dasgupta, N., McManus Scircle, M., & Hunsinger, M. (2015). Female peers in small work groups enhance women's motivation, verbal participation, and career aspirations in engineering. Proceedings of the National Academy of Sciences, 112(16), 4988–4993.

e) What size of groups will you allow or create?

- Many examples for **group sizes of 2-5** can be found throughout the literature
- Groups of 3 or 4 do better than pairs[1], but larger groups may hurt participation[2]

[1] Heller, P., & Hollabaugh, M. (1992). Teaching problem solving through cooperative grouping. Part 2: Designing problems and structuring groups. American Journal of Physics.
[2] Fengler, M., & Ostafichuk, P. M. (2015). Successes with Two-Stage Exams in Mechanical Engineering. 2015 Canadian Engineering Education Association (CEEA15) Conf., 1–5.

4. What other implementation decisions would you encounter when designing a group phase for feedback on an exam?

Practical tips for implementation

From our experience:

- Given them a task orientation activity / have them practice the group exam protocol ahead of time.
  - Two-stage review at the start of the course
  - A review session before the test

- For your first try, start with a lower stakes assessment & use mostly the same test for the solo and group phases

- If you change things on the group phase exam, draw attention to those changes

Advice to a future student to get the most out of their group exam experience (from our surveys).

- "Discuss each answer in depth, to make sure all group members understand why they reached that decision."
- "Don't be afraid to share contrasting opinions or bring up new possibilities, that's what makes group exams beneficial!"
- "Listen to and respect everyone's opinions, even if you don't agree with them."
- "Get to know your group members before the exam."
  (from exam with instructor-formed groups)

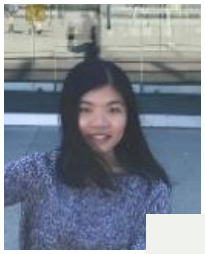
Help students get the most they can out of the group phase (from survey results and focus groups)

- Provide info about the group exam in the syllabus, online, and in class
- Help students sit together in ways to facilitate discussion
- Use scratchcards for "more benefits, because they get partial marks, and instant feedback"

Thank you!
Workshop resources at osf.io/g4bj2/


Joss Ives & Jared Stang
Department of Physics & Astronomy,
University of British Columbia

Joy Chen



Matias de Jong Van Lier

Nutifafa Kwaku Sumah

Analise Hofmann

Rosanne Persaud

Patrick Dubois

Laura Super

José Arias-Bustamente

+ Simmer Mand
& Nicolás Romualdi
& Katie Foote
& Maggie Wu

Funding: UBC Teaching & Learning Enhancement Fund

joss@phas.ubc.ca
jared@phas.ubc.ca