Investigating the impact of post-exam grade-adjustment practices in introductory physics

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Background

- We know there are grade inequities in introductory STEM courses, including physics [1, 2].
- Other works suggest that these differences in grades are due to high-stakes assignments like exams, which typically make up the majority of the final grade, and not lower stakes assignments like homework or labs [3,4]

- Current PER scholarship suggests that these grade gaps are the result of course structures, not differences in prior preparation [5].
- Previous studies have examined changes to course design that could reduce these grade gaps:
  - Reducing the weight of exams in the final grade reduces the D, F, withdrawal rate, especially among women and underrepresented minorities [6]
  - Grading directly on the 4.0 scale instead of the percent scale could close grade gaps up to 25% [7]

- **What about other changes to the course like how individual exams are counted towards the final grade?**

Methods

- Exam grades from 2,290 students enrolled in Physics 1 from Winter 2017 until Fall 2019 via the ECoach platform [8].
- Typical grading scheme in this course: each of the three exams counts for 12% of final grade

Let's consider alternatives and see what effect they would have on the final grades:*

1. Drop the lowest exam score (each remaining exam score counts for 18% of the final grade)
2. Replace the lowest exam score with the final exam score if the student does better on the final
3. Have the best exam score count for 50% more (18% of final grade) and have the worst exam score count for 50% less (6% of final grade)

*We assume that student behavior is unchanged, which may not happen in practice.

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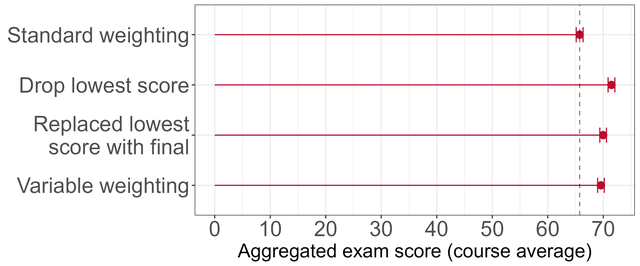
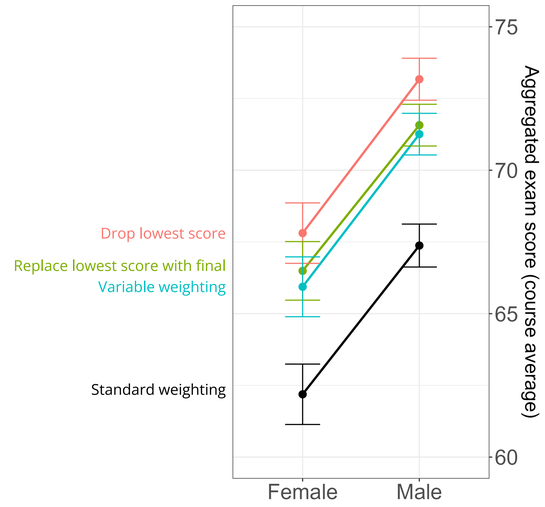
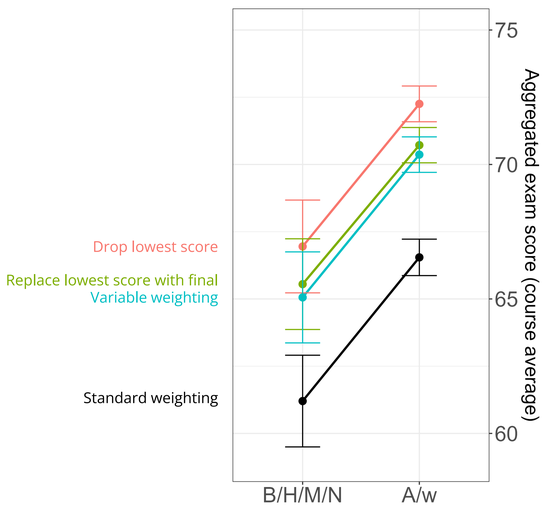
All three alternative methods to incorporate exam grades into the final grade increase students' grades…







but none of them reduced grade gaps on exams.

Dropping the lowest exam score resulted the greatest increase in score, ~5.7 points or ~ 2 percentage points in the final course grade.

Replacing the lowest exam score with the final exam grade or weighing the best exam score more than the other exam scores also increased student's exam scores, but to a lesser degree.

Grade gaps between female and male students on exams are nearly the same, ~5 points, regardless of how we incorporate individual exam grades into the final grade.

If there were a differential effect, we would expect the slopes of the lines to be different and not parallel.

We find the same result for grade gaps between Black, Hispanic, multi-racial, and Native American students and Asian and white students, also with a grade gap of ~5 points.

Taken together, these results suggest that these practices are not useful for addressing grade gaps.

Acknowledgements & References

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