

# Homework administered 5 days after introducing new material benefits long-term retention more than homework administered after only 1 day



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## Abstract

In previous studies, temporally-spaced repetition of previously-presented material (practice) increased student retention of information. Our objective was to determine the effect of assigning online homework one or five days after introduction of material on short-term and long-term retention. Seventy-two students in an undergraduate anatomy and physiology course were presented new material in the laboratory portion of the course. Students then received online homework via the Blackboard portal either one or five days after introduction to material. In-class quizzes were given seven days later to gauge short-term retention. Long-term retention was determined from a comprehensive practical administered at semester's end. Corresponding assessment questions on respective practices and final practical covered the same concepts, followed the same format, and were similarly-phrased. Students were grouped by overall course performance (lecture and lab), and data were collected for four hallmark topics: Cells and Tissues, Muscular System, Immune System, and Digestive System. Short-term retention in high-performing and average-performing students was not affected by the timing of the mid-week practice, as students showed no difference in performance on the in-class quiz administered at seven days whether they completed the homework one or five days after lab. However, homework completed five days after introduction to material appeared to benefit long-term retention more so than homework completed one day afterward, as average-performing students received higher practical scores for three of the four topics when practices on those topics were completed at five days. High-performing students differed in only one topic, but the difference favored students who completed the homework at five days. Overall, these data indicate that a longer period of time between introduction to material and the first spaced retrieval was more beneficial. Furthermore, reduced effects in high-performing students could be explained by greater academic abilities or better study habits.

## Statement of Problem/Research Questions

- It has been well-established that repetition increases student retention of material
- Minimal studies identify the most beneficial time interval between initial presentation of material and repetition
- The idea of the spaced retrieval indicates that temporally-spaced practice leads to more durable learning than mass practice, such as "cramming" for an exam.
- In this study we administered homework (practice) 1 or 5 days after introduction to material in order to better understand the impacts different time intervals have on long-term retention
- We hypothesize that longer durations of time will be more beneficial to long-term retention than shorter periods of time

## Methods

**Participants:** 72 undergraduate students enrolled in Animal Science 240: Anatomy and Physiology of Domestic Animals (~70% female, 30% male)

### Procedure: Figure 1

1. Introduction to Material: during lab each week, students were given a lab assignment, covering new material, to be completed and turned in by the end of the lab period.
    - Lab topics/material were introduced, beginning with a short lecture followed by hands-on lab procedures
  2. Treatments: Students received online homework via Blackboard either 1 or 5 days after their lab
    - Assessment Variable: 10-question, open-note quizzes representing the major concepts presented in lab
  3. Short-Term Retention: Students completed an in-class, closed-note quiz at the beginning of lab the following week.
  4. Long-Term Retention: Students were assessed by a comprehensive lab practical at the end of the semester.
- Respective assessment questions presented on in-class assignments, online homework, in-class quizzes, and lab practical followed similar format, phrasing, and depth.

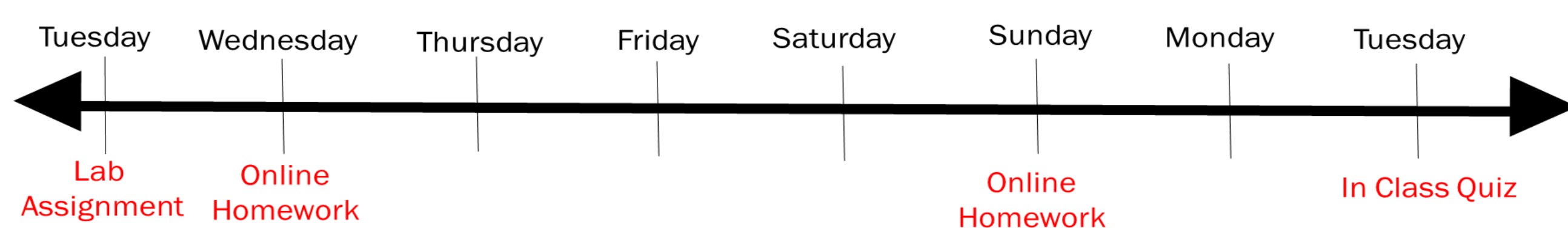


Figure 1: Weekly schematic showing administration times for assignments, homework, and quizzes.

### Data Analysis:

Students were grouped based on overall class performance (lab and lecture)

- High Performing: Students who received an A+ to a B+ in the course overall
- Average Performing: Students who received a B or below in the course overall

Data were analyzed from four fundamental topics in the course, through a series of ANOVA's

## Findings

### Long-Term Retention in High-Performing Students

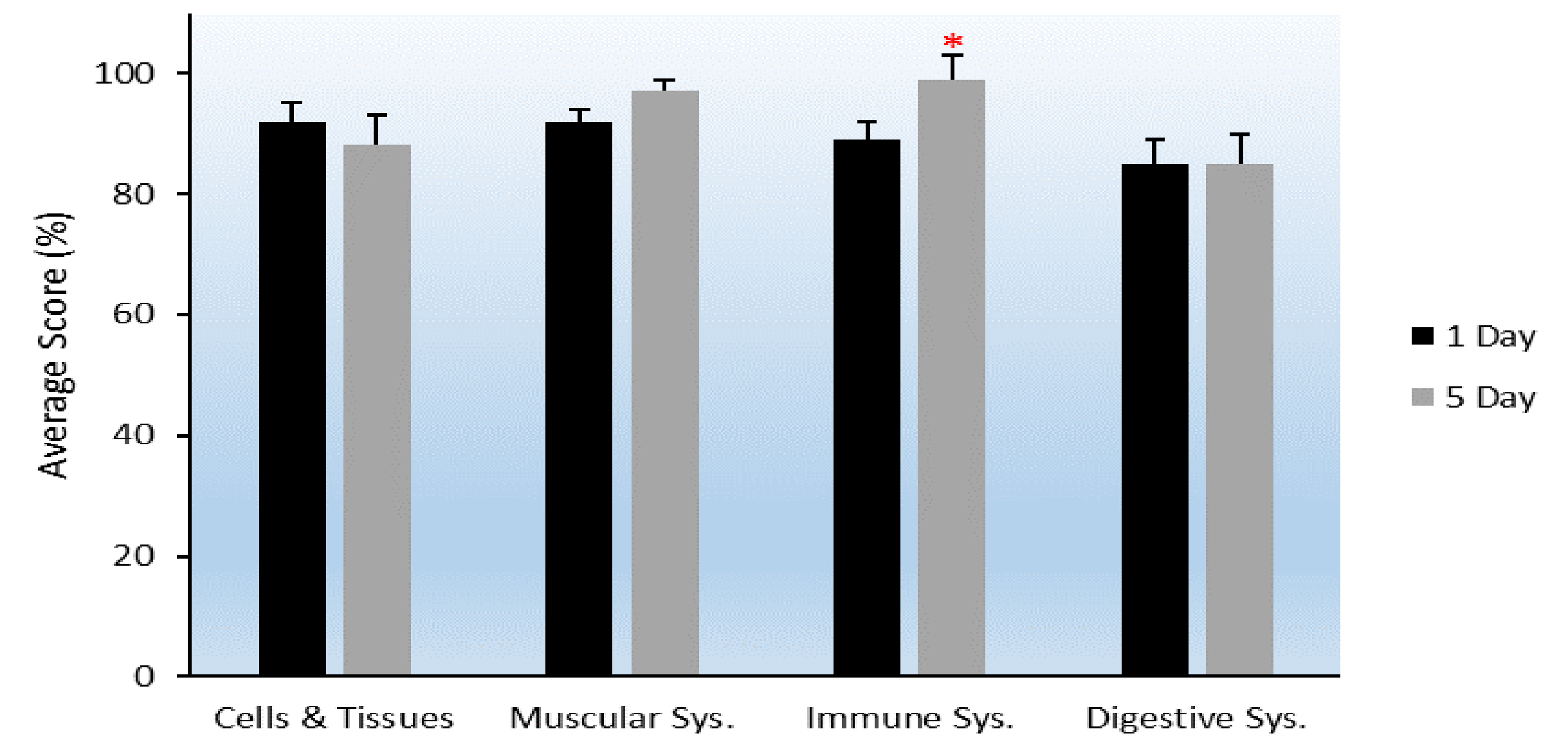


Figure 2: Performance on respective topics from the final practical in high-performing students given homework at either 1 or 5 days after introduction to material

### Long-Term Retention in Average-Performing Students

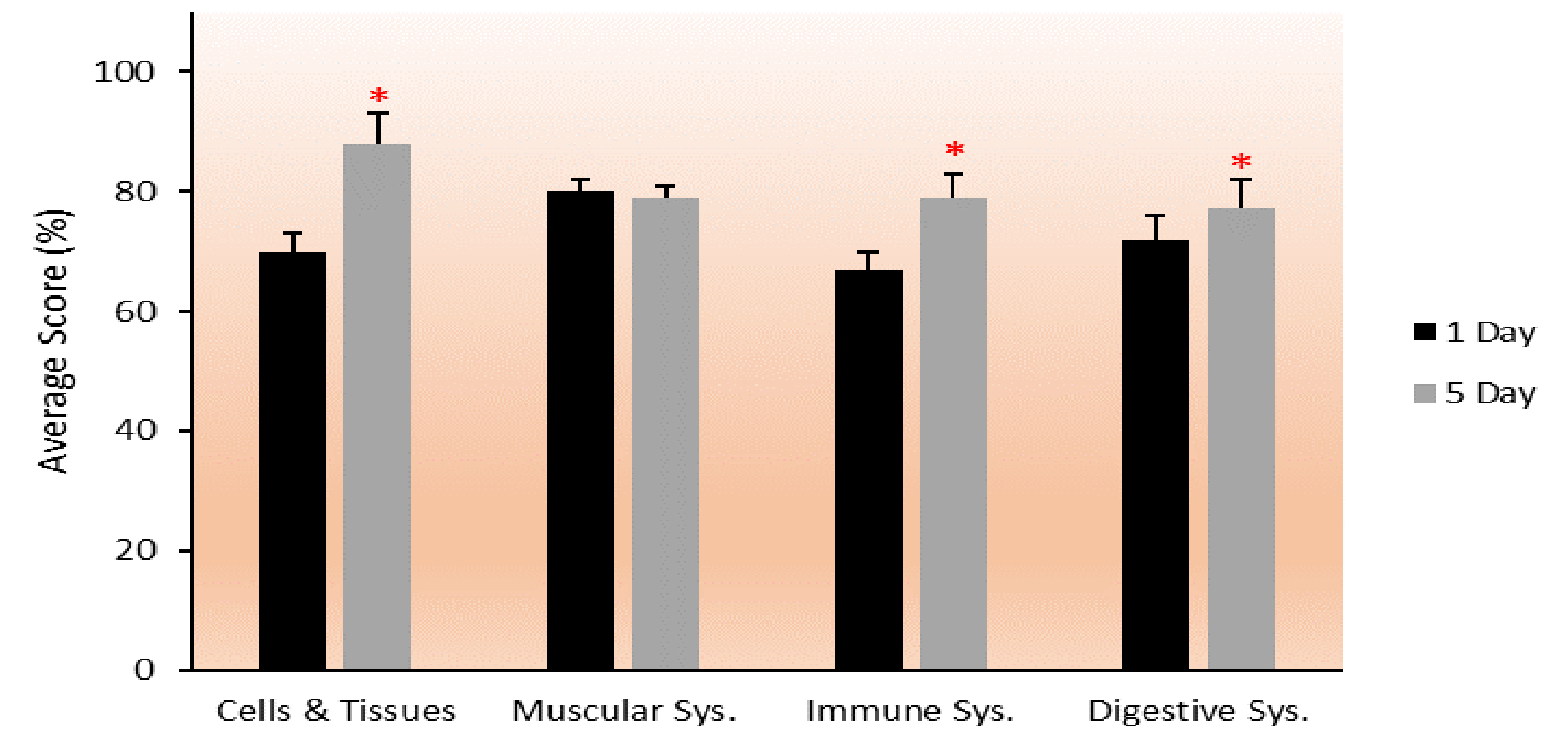


Figure 3: Performance on respective topics from the final practical in average-performing students given homework at either 1 or 5 days after introduction to material

- ❖ Homework performance 1 day after did not differ from homework performance 5 days after, in either performance group (not shown)
- ❖ Timing of homework had no effect on short term retention at one week (not shown)
- ❖ High-performing students performed better in 1 out of 4 topics when homework was completed at 5 days after introduction of material (Figure 2)
- ❖ Average-performing students had higher average scores on the practical in 3 out of 4 topics when homework was completed at 5 days (Figure 3)

## Implications

- Timing of practice/repetition is important in enhancing long term retention
- Longer periods of time between initial introduction to material and retrieval are more beneficial to information retention than shorter periods of time
- In the future this knowledge can be implemented in the classroom to improve both student outcomes and individual teaching strategies.

## Acknowledgements

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