

## Abstract

**Introduction:** Flipgrid is a free, online, social education platform that utilizes asynchronous video-based discussion to support social learning. While the qualitative effects of using Flipgrid in the classroom have been examined in previous studies, to our knowledge, this is the first study to analyze the quantitative effects of employing Flipgrid in a large-enrollment, undergraduate STEM course.

**Methods:** In the present study, we combined four semesters (n = 1,100 students) of Flipgrid and examination data and analyzed the effects that Flipgrid had on student examination performance. Specifically, we first analyzed how students performed on exam questions correlated with their assigned Flipgrid prompts in comparison to students not assigned those prompts. Second, we analyzed how students scored on their Flipgrid prompts compared to their performance on exam questions correlated with their prompts. Finally, we analyzed the students' cumulative Flipgrid score compared with their performance on unit exam questions.

**Results:** 26/44 (59%) of the prompts showed a statistically significant difference when analyzing performance on exam questions correlated to the assigned Flipgrid prompt. All prompts (n = 44) showed a positive correlation when comparing how students scored on their Flipgrid prompt to performance on the correlated exam questions. There was a positive correlation ( $R^2 = 0.29$ ) when cumulative Flipgrid score was compared to averaged unit exam performance.

**Conclusions:** Taken together, our data demonstrate that actively participating in Flipgrid can improve student examination performance in a large-enrollment, undergraduate human physiology course

## Introduction

- Organ system-based undergraduate physiology courses have inherently comprehensive curricula and therefore present a rigorous and challenging learning experience for many college students. These courses generally have very large student enrollment as well, which poses further challenges to student learning.<sup>1</sup>
- Specifically, large-enrollment courses are often taught in theater-style lecture halls and, consequently, are typically delivered via a traditional lecture-style approach.<sup>1</sup> These structural limitations additionally hamper active learning by creating functional barriers to student engagement and collaboration.<sup>1</sup>
- Owing to this teacher-centered approach, students are more likely to rely on memorization of material presented by the instructor, rather than seeking a deeper, meaningful understanding of the content<sup>2</sup>
- Physiology courses, on the other hand, are conceptual, process-based, and integrative, and therefore necessitate the synthesis of an in-depth and comprehensive understanding of the material. Unfortunately, the vastly disproportionate student-to-professor ratio in these courses constrains the scope of learning and the resources that can be offered to the students.<sup>3</sup>
- At Michigan State University, Introductory Physiology is a single-semester, large-enrollment (~400 students) organ-system based course that is offered in the spring and fall semesters in person, and online in the summer
- In the present study, Flipgrid (a free, online, social education platform that utilizes asynchronous video-based discussion to support social learning) was implemented along with other formative assessments to assist students in modeling their understanding of major physiological concepts. The primary objective of this study was to assess the quantitative effects of utilizing Flipgrid as a learning tool in a large enrollment STEM course.
- Students were assigned to groups and encouraged to collaborate with their peers during the preparation for their videos. Additionally, students had the opportunity to watch their colleagues' video submissions for the chance to be presented the information through a different lens. Individual student videos were ultimately assessed by trained teaching assistants and model videos were posted that provided the student with an accurate representation of the topic.

## Methods

### Subjects

- Data from 1,100 undergraduate physiology students, gathered from four separate semesters, were retrospectively analyzed in the present study
- Student data was excluded from the study if the student did not participate in Flipgrid and/or the student did not take the final exam (i.e., did not complete the course)

### Flipgrid Assessment Protocol

- The major physiological concepts covered in the course were distilled into a list of 50 major concepts, from which 50 Flipgrid prompts were generated
- Each prompt was a series of brief questions designed to charge the student with explaining a major physiological concept in their own words in the form of a short (3-4 min) video
- Each of the five units of the course were designated 10 prompts. Each student within a group was assigned two of the 10 prompts for that unit. Prompt assignments were randomly generated.
- Students were expected to explain the physiological concepts of their prompts, logically and accurately, from their own interpretation and acquired knowledge (reading from a script/PowerPoint was not allowed)
- Both presentation and understanding components were assessed (each worth three points), and therefore each video assessed was worth a maximum of six points. Since the students submitted two separate videos per unit, a maximum of 12 points could be earned per unit.
- The numerical grades the students received in Flipgrid corresponded to: 1 = Poor, 2 = Fair, and 3 = Great. Additionally, there were circumstances (e.g., cheating, late/no submission, etc.) where a grade of zero (0) was assigned. Along with the numerical grades, the students also received written feedback on the Flipgrid platform.
- In an effort to reduce subjectivity in grading, teaching assistants were rotated to different groups each unit. Moreover, to standardize grading, teaching assistants were instructed to strictly adhere to the Flipgrid grading rubric that was provided to the students. Ultimately, student Flipgrid scores were assigned based on a consensus reached by the teaching assistants, the lead teaching assistant for the course, and the course instructor.
- Flipgrid training sessions were held by senior Flipgrid graders approximately one week prior to the Flipgrid video submission deadline to help identify common issues leading to score reductions

## Results

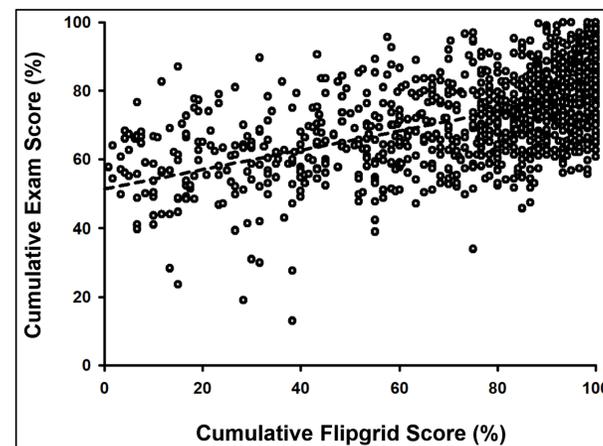


Figure 1. Comparison of cumulative Flipgrid scores with the averaged unit exam percentages for Units 1-5 ( $R^2 = 0.29$ )

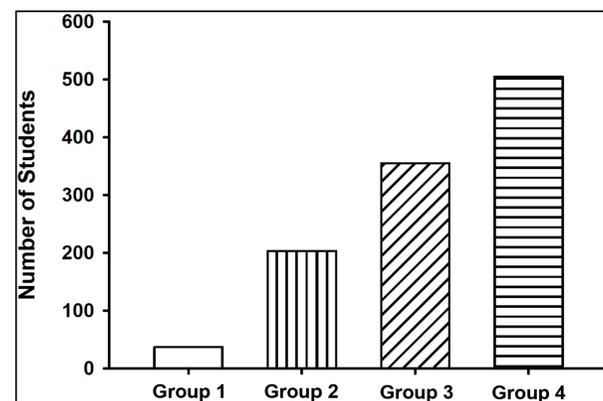


Figure 2. Comparison of cumulative Flipgrid scores with the averaged unit exam percentages for Units 1-5. Group 1 (open bar): students with >cumulative exam average and <50% cumulative Flipgrid score (37/1100; 3%). Group 2 (vertical-striped bar): students with <cumulative exam average and <50% cumulative Flipgrid score (203/1100; 19%). Group 3 (diagonal-striped bar): students with <cumulative exam average and >50% cumulative Flipgrid score (355/1100; 32%). Group 4 (horizontal-striped bar): students with >cumulative exam average and >50% cumulative Flipgrid score (505/1100; 46%).  $\chi^2 = 440.47$  > the critical value of 7.81 (df = 3;  $\alpha = 0.05$ ).

## Discussion/Conclusion

- Many undergraduate STEM courses, such as human physiology, are particularly challenging for students due to the sheer volume and conceptual nature of the content covered, and the pedagogical constraints imposed by the very large class size and setting<sup>1</sup>
- Success in human physiology courses is not generally realized via rote memorization of the content, but rather through employment of study skills that result in the development of a fundamental, process-based understanding of the information that can be applied to novel situations such as disease states<sup>4</sup>
- In PSL 250 – Introductory Physiology, we employed Flipgrid as a learning and assessment tool to maximize the number of students actively using recommended study skills to aid them in synthesizing a deep understanding of the course content
- In the present study, we investigated the effect that Flipgrid had on student examination performance throughout the semester. We hypothesized that students actively participating in Flipgrid would improve their understanding of physiological concepts and ultimately increase their performance on course examinations.
- Our findings support our hypothesis and demonstrate that Flipgrid can improve student examination performance in a large-enrollment, undergraduate human physiology course

## Limitations

- Given the retrospective nature of the data analysis, Flipgrid was not initially employed with the intent of performing a study. Therefore, Flipgrid prompts were written based on content covered in lecture and not tailored to the examination.
- Individuals who completed Flipgrid may have performed better on correlated exam questions merely due to the increased amount of time spent reviewing the material related to the prompt
- Since Flipgrid held only a small weight on the students' final grade, it can be contended that individuals who were performing well on course examinations did not put in as much effort when completing the prompts, potentially skewing the collected data
- With the large enrollment of undergraduate STEM courses, Flipgrid requires a substantial amount of time and support in order to utilize the platform successfully as a learning tool throughout the semester

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