The effects of the flipped teaching method on student attitude and performance in a high school Biology classroom

Montana State University
Master of Science in Science Education

Background

I have noticed that students are often disengaged in school including my science classroom. Science is supposed to be a great opportunity to do labs and hands on activities just like scientists. However getting through all the content often results in less time devoted to labs. Studies show that students perform better with active learning techniques compared to a lecture based course (Freeman et al, 2014). While there are many approaches to increase the active learning happening in the classroom, the flipped classroom is one method that frees up more class time to increase these activities (Fulton, 2012). Students received Chromebooks for the first time this year and I tried to utilize this new technology. This project compares student attitudes and performance between units that are taught with flipped instruction and a units with in-class, lecture based instruction.

Research Questions

What are the effects of implementing flipped units on…

- student performance?
- student attitude?
- student assignment completion?
- parent-teacher and student-teacher interactions?
- me as a teacher?

Methods

The flipped teaching method was implemented in the Biology classroom for two units and compared to a traditionally taught unit and a mixed methods unit. All lectures were through video and assigned to the students in the flipped units. The mixed unit had a mixture of both in-class lecture and video lecture. The Traditional unit had all lectures during class with no videos assigned to the students.

Unit	Treatment Type
Cells	Traditional
Microbiology	Mixed
Protists and Fungi	Flipped
Plants	Flipped

Results

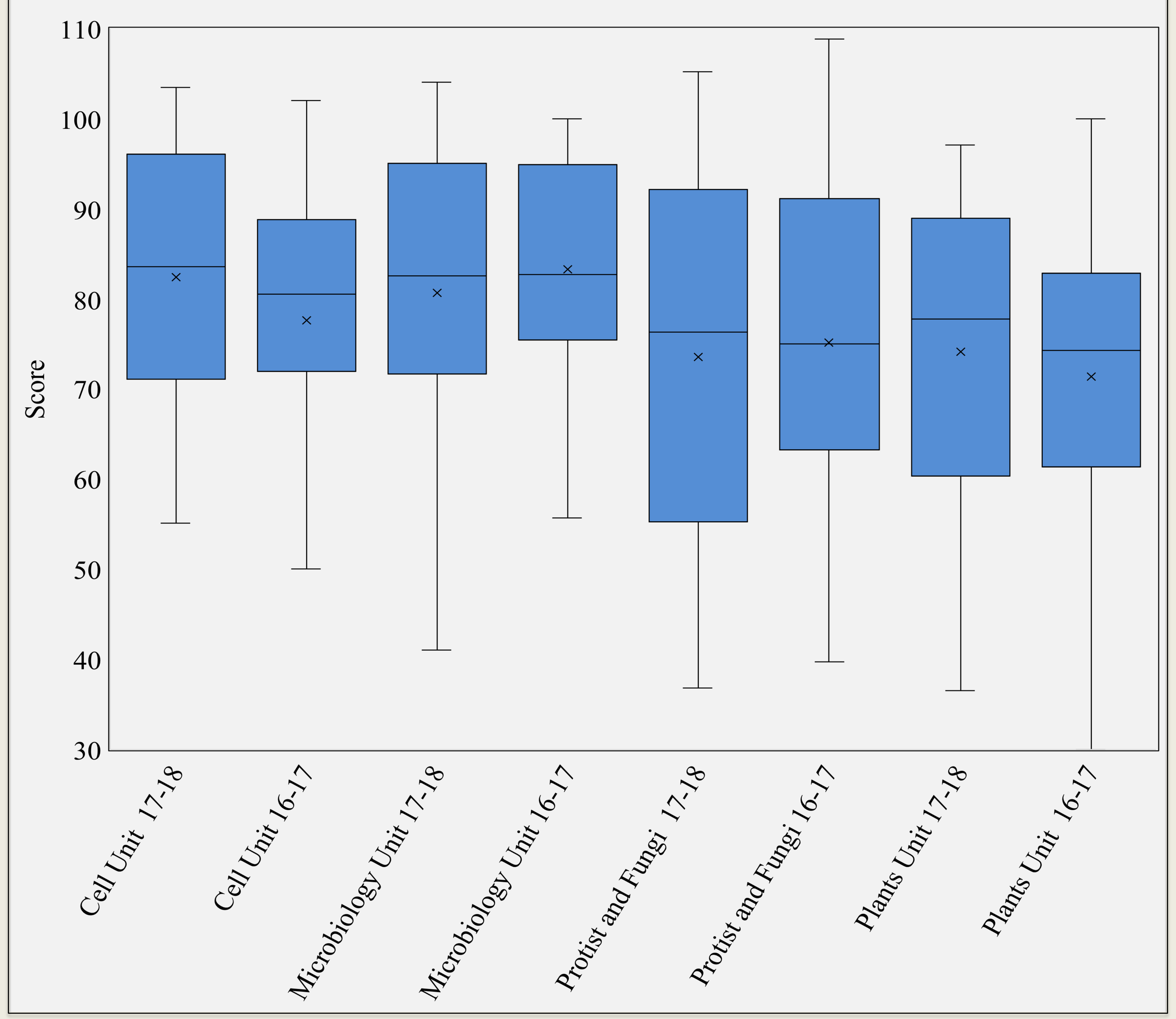

Figure 1 Shows student performance on unit assessments from 2017-2018 (*N*=44) with comparison group from 2016-2017 (*N*=41).

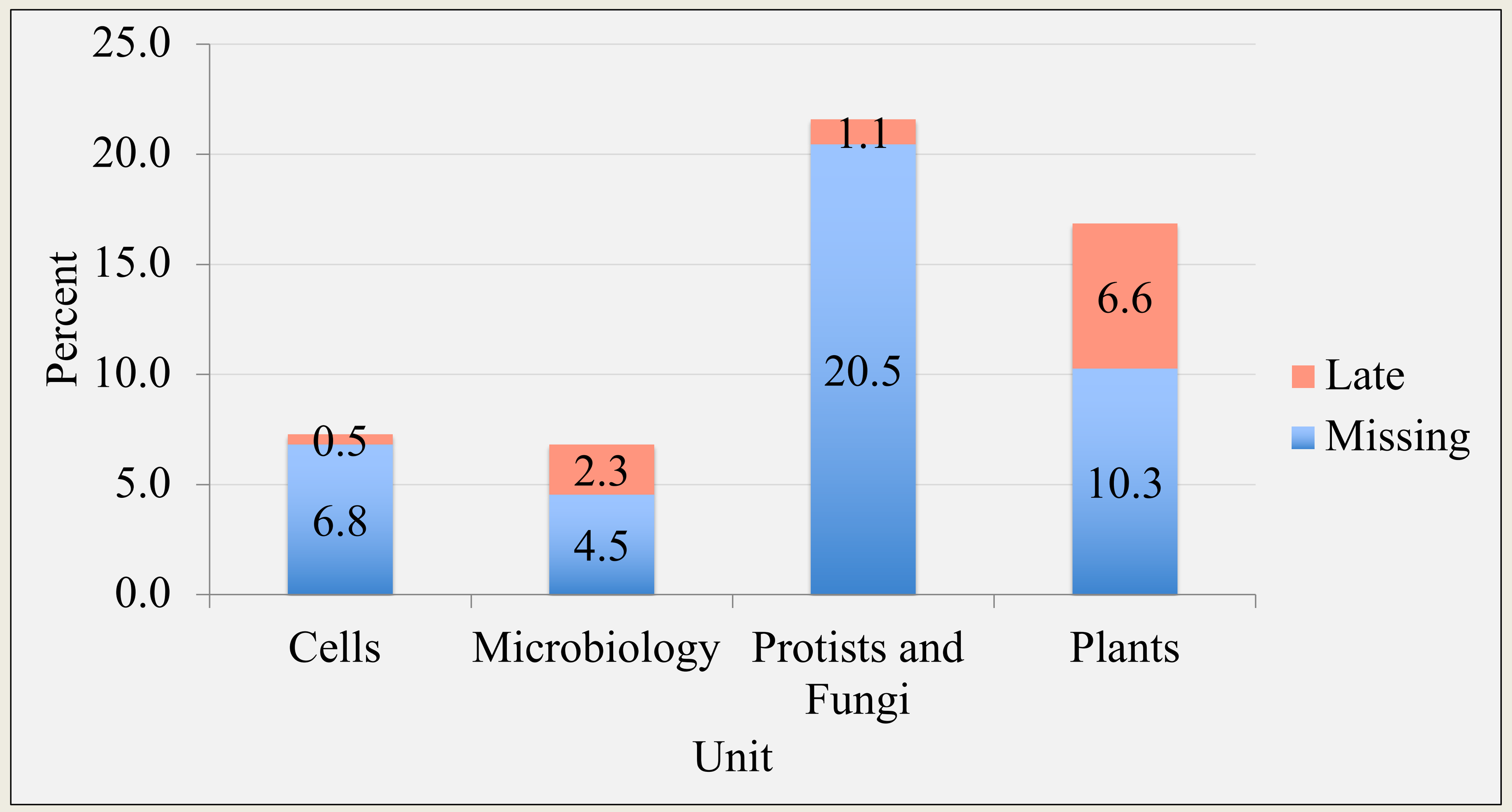

Figure 2 Shows percentage of missing or late assignments during each unit.

References:
Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111,* 8410-8415.
Fulton, K. (2012). Upside down and inside out: flip your classroom to improve student learning. *Learning and Leading with Technology*, *29*, 12-17.

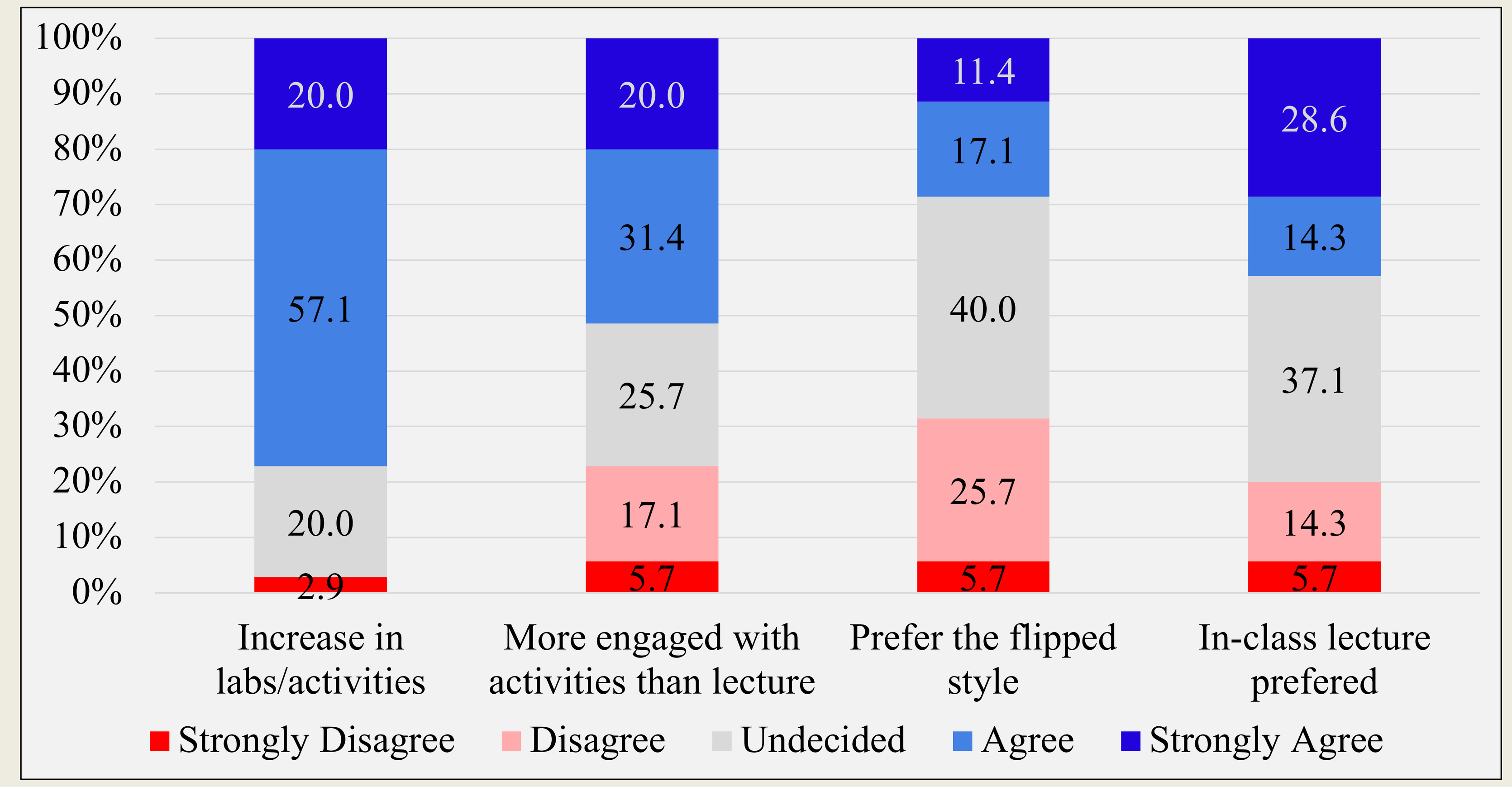

Figure 3 Shows student responses on post-treatment Likert survey (*N*=35).

> "I feel like if I do notes in class, I won't be able to forget about doing them… In-class notes are much easier."

> "It's more fun and easier to learn, and it's refreshing compared to every other class where we sit down and take notes."

Conclusions and Implications

Based on the surveys and interviews, students prefer the in-class lectures. Student commented that it was hard to remember to complete the computer-based assignments during the flipped units which was consistent with the data on missing assignments. There was a decrease in performance on the unit exams during the flipped units, but this the same pattern as the previous year which suggests the decrease was not due to teaching style alone. Students assessed the difficulty of each unit however there was no pattern to this data, so it did not help provide insight towards student performance. Moving forward, I anticipate continuing to use the flipped method at times, likely combining it with some in-class lectures. In the future, I plan to teach students how to use calendars and reminder features on their Chromebooks. As students become more comfortable with their Chromebooks, I anticipate more completion of assignments and improved attitudes towards their use for school.