



## **How Students' Views of New Teaching Techniques Change Over Time**

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# How Students' Views of New Teaching Techniques Change Over Time

## Abstract

Many new faculty are eager to try new teaching techniques in their classrooms, but students are often resistant to change and convince new faculty to abandon their ideas for a more traditional style that students are more familiar with. This study looks at the change in attitude of students towards a flipped classroom format and the concept of assessment corrections during the semester. A subset of the students voluntarily completed an anonymous survey approximately five weeks into the course and again at the end of the course.

Students were enrolled in a junior-level dynamics course. On the first day of class students were informed that the class would be using a flipped format rather than a traditional lecture format. Students were required to learn the material before coming to class using their preferred combination of a video lecture, video example problems, and the book. Students completed a pre-class quiz, worked on homework during class, and completed an end-of-class quiz.

Students were asked to compare their perception of the format with a traditional lecture format at the beginning of the semester. 55% of students responded that they liked the idea worse than a traditional lecture while only 36% said that they liked it better. However, when students were asked again after five weeks of class, only 9% of students said that they like the idea worse, 36% said they liked it better, and 45% said they liked it much better. Furthermore, when students were asked how they were learning 0% responded worse, 45% responded better, and 18% responded much better.

The second technique that was employed was assessment corrections. Students were allowed to do corrections to their quizzes, homework, and tests to earn points back. This was done in place of a curve because it causes students to revisit their mistakes and learn the material. In each case, students not only had to produce the correct result, but also explain why they were doing each step. Many students (45%) indicated that they would not have looked back and learned how to correctly do the problems that they missed if they did not receive points for corrections while 45% of students indicated that they learn a lot from corrections and 55% indicated that they learned some from the corrections.

These two techniques can be beneficial to new faculty as they develop their teaching style. The fact that students initially did not favor the flipped classroom format but changed their minds after 5 weeks indicates that new faculty should resist students' objections to a new teaching style if the faculty member believes that it is beneficial to both the faculty and the students.

## Introduction

New faculty often want to try new teaching techniques that they believe will improve students' learning. However, students tend to resist change and therefore, do not like new techniques. It is important for new faculty to know if they should abandon a teaching technique at the first sign of student dissatisfaction or to continue on through adversity.

The flipped classroom technique is one that has been gaining popularity<sup>1</sup>. This technique often uses video lectures and active learning each of which has been shown to increase students' knowledge of the material<sup>2,3,4</sup>. Since this technique requires students to learn the material outside of class time, faculty often struggle to convince students to be prepared when coming to class<sup>5</sup>. If students are unprepared for class, the technique typically fails and the students and/or faculty consider it a failure of the technique rather than a failure of the student<sup>6</sup>.

This study investigates if the initial resistance to a new teaching technique decreases over time. If so, this knowledge will encourage new faculty, who are often concerned about student evaluations, to continue on with new teaching techniques rather than reverting to a format with which the students are more comfortable.

## Methods

Students (n = 13) were surveyed approximately five weeks into the semester and at the end of the semester of a junior level dynamics course with 31 total students at California Baptist University (primarily a teaching university). The course met for one and half hours, twice a week, for 13 weeks. Students were asked to rate their feelings towards the new classroom techniques as described below. Their answers were then compared to see if the attitude of the students changed after they had been exposed for a longer period of time. The students were first asked if they liked the flipped classroom format better than a traditional format. This was done because many students fill out course evaluations based on how much they enjoyed a class rather than how much they learned in a class. This makes it important to new faculty members who are evaluated partially on their teaching evaluations. Secondly, students were asked how well they believed that they were learning in the flipped classroom format compared to a traditional lecture format. This was done because pleasing students does not directly relate to increasing their learning levels.

## Flipped Classroom Structure

At the beginning of the semester, students were given a brief lecture about the advantage of the flipped classroom. This included the availability of the professor during homework time as well as increasing the student's ability to learn on their own.

Students were to learn the material before coming to class. In order to do this, the professor made videos of the relevant material using Screencast-O-Matic and posted them to YouTube. Separate videos covered lecture material and example problems. The lecture videos averaged approximately 10 minutes and the example problem videos were approximately 15 minutes. Students were also permitted to read their textbooks or learn the required material in other ways if they so desired.

Students then completed an online multiple choice pre-class quiz. The quiz had approximately six multiple choice questions. This was to ensure that students learned the material before coming to class. At the beginning of class the professor answered any questions that the students

had and worked through the first homework problem. This took approximately five minutes. Students then worked in groups of two or three to complete the homework set (including the first homework problem) using the Mastering Engineering online homework system for the majority of the 90 minute class while the professor answered questions and explained concepts as needed. Students were given three chances to obtain the correct answer on Mastering Engineering. This was done so that students would work together more rather than work on the problems individually and try each student's answer.

At the end of the class time, students took a single-problem post-class quiz using clickers. This quiz typically took between three and five minutes. The purpose of this quiz was to ensure that the students were working together to understand the material rather than one student finishing the problems as quickly as possible. The two quizzes (pre-class and post-class) made up 15% of the final grade.

The problems that were not completed during class in groups were completed outside of class individually. Students were allowed to help one another, but each student was to complete their own work. This removed the issue of students trying to organize a time to meet together and finish the homework and also allowed students that were not in class to complete the homework on their own. The homework was 15% of the final grade.

#### Corrections Structure

Students were able to gain points back on every assignment. In each instance, students were required to write out both the correct answer and an explanation for why they were completing each step. This was to ensure that the student had an understanding of the engineering principle required to obtain the correct answer, rather than just knowing what the answer should have been. It also encouraged the students to do well on the first attempt as the corrections required more work than the original assessment.

Since the purpose of the pre-class quiz was to ensure that students were prepared for class, the questions could be corrected for full credit if they were completed before the start of class. This further encouraged the students to understand the material before coming to class so that they would be able to use the class time effectively.

Homework problems could be corrected for full credit if they were completed before the test over the material as the purpose for the homework was to solidify the knowledge and prepare students for the test. Students had three chances to obtain the correct answer for each homework problem on their individual assignments. After that, the answer was given to them and the students were required to write out corrections in order to get credit. Both the homework and post-class quiz problems could be corrected for full credit if they were completed before the test over the material.

Students' tests were scanned in for the professor's record and the solutions were published online. The ungraded tests were then given back to the students. Students looked over their work

and the solutions to identify their mistakes. The students then wrote out corrections to earn points back. Students were awarded approximately 40% of the points back on the problems that they fully corrected. There were three tests throughout the semester which were a total of 65% of the final grade.

## Results

Students initially were not in favor of the flipped classroom format. As shown in Figure 1 below, 55% of students responded that they liked the idea worse than a typical lecture. Only 36% of students responded that they liked the idea of the format better. However, just five weeks into the semester attitudes had already shifted. Only 9% of students said that they liked the format worse, 36% said that they liked it better, and 45% said that they liked it much better. This trend continued to the end of the semester where 0% of the students said that they like the format worse.

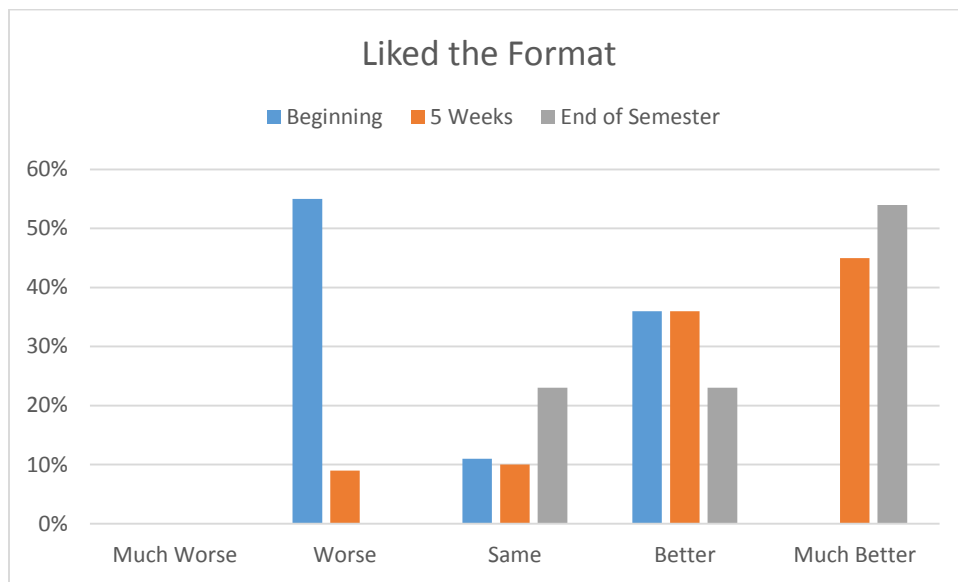


Figure 1: Students' opinions of the Flipped Classroom format compared to a traditional lecture style format shows a major adoption of the Flipped Classroom after five weeks which increased again at the end of the semester.

A similar trend was found for how much students felt that they were learning using the format as shown in Figure 2 with only 18% of students responding that they learned much better after five weeks but 54% responding that they learned much better at the end of the course.

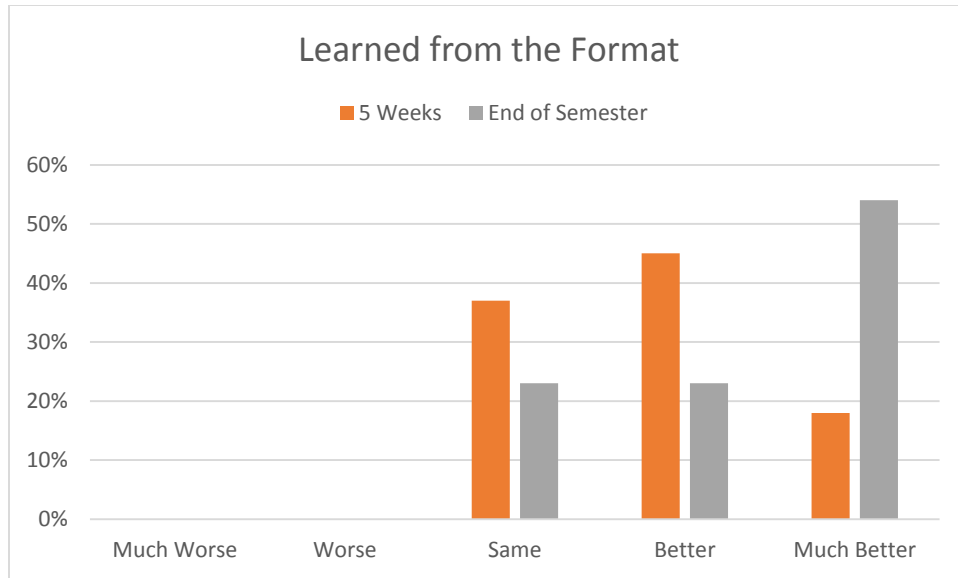


Figure 2: Students opinions of how much they learned using the Flipped Classroom format compared to a traditional lecture style format shifted positively during the semester.

The student’s opinions of test corrections did not change much during the semester. As shown in Figure 3, five weeks into the semester 55% of students said that they learned some from doing corrections on quizzes and homework while 45% said that they learned a lot. After the final exam, 23% said that they learned a little, 46% said that they learned some, and 31% said that they learned a lot. This shows a slight decrease in the amount of learning students felt that they were getting from doing test corrections.

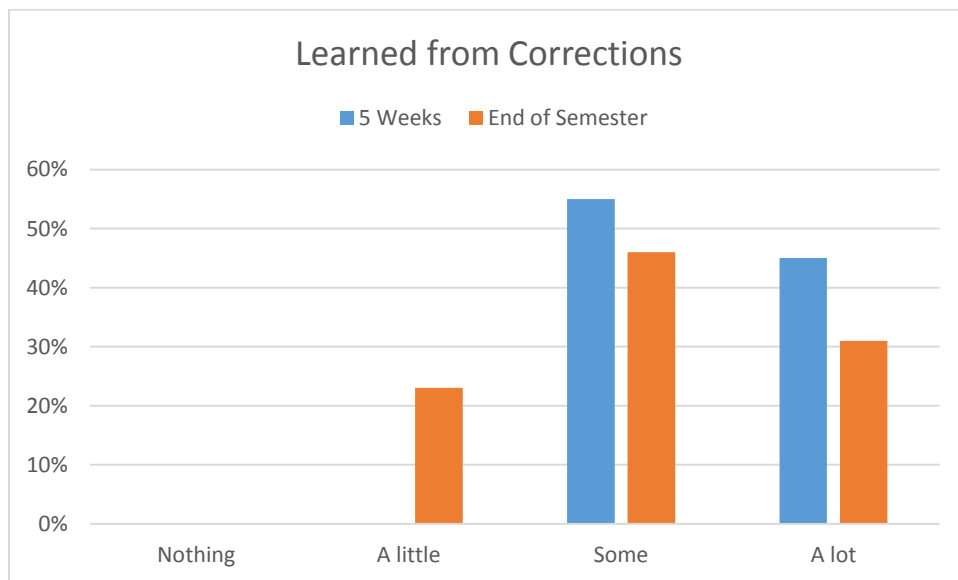


Figure 3: The amount that students learned from doing test corrections at five weeks and the end of the semester did not show a large change.

Five weeks into the semester 55% of students said that they would have looked back over mistakes to learn from them as shown in Figure 4. After the final exam only 31% said that they would have looked back over their mistakes.

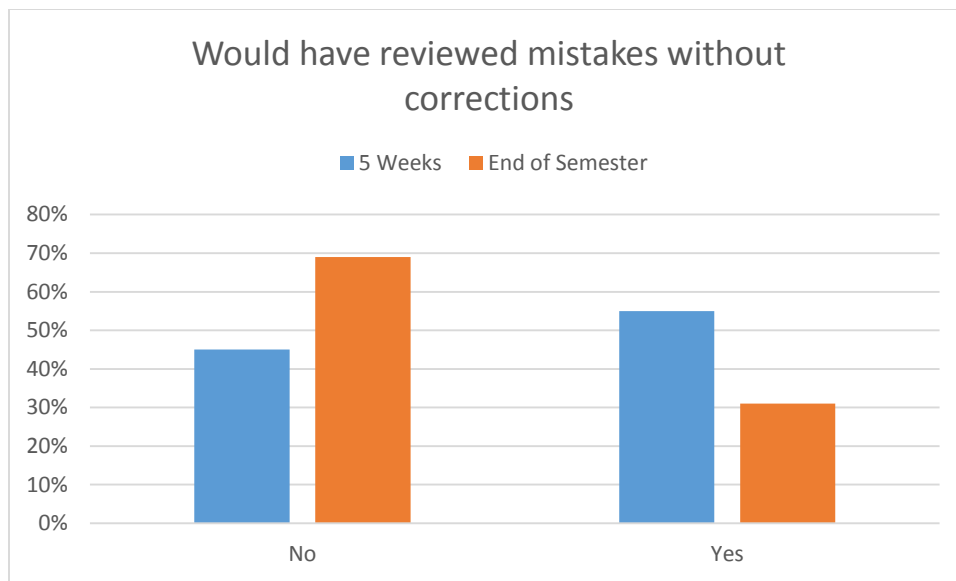


Figure 4: The amount of students that would have reviewed mistakes if they were not given points back shifted slightly over the semester towards less students reviewing mistakes.

## Discussion

This study showed that student's feelings towards a new teaching style (flipped classroom) changes over the course of the semester. This is important because new faculty members often have new ideas on how to improve their teaching, but due to their lack of confidence and concerns over student evaluation results the new faculty members may abandon those methods based on student feedback. This is more likely to occur with new faculty as they do not have years of experience to draw from and often value student feedback as a way to improve their teaching.

Even more important than the students' feelings towards a teaching style, students' perception of their learning also increases with additional exposure. While this may seem intuitive, it is important to remember that through the course of the semester the topics grow more difficult. This shows that even once students are required to use the new technique for more difficult material, they do not blame the teaching method for the increased difficulty.

The decrease in students saying that they would have reviewed the topics that they did not understand at the end of the semester could have been influenced by the final exam. Since the course had been completed, the students are less likely to look back at the information since they will no longer be tested on it directly.

Unfortunately, the sample size (n=13) was very small for this study. While the trend is good, since the participation was voluntary it is impossible to know if this is reflective of the class as a whole. The author is working on duplicating this study in other courses to increase the sample size since the IRB is not comfortable with making participating mandatory.

Secondly, the flipped classroom technique may be cumbersome to new faculty. The initial time to construct videos, while not recorded here, has been shown to take approximately 80 hours<sup>6</sup>. However, once the videos are produced the preparation time for the course may be less than for that of a traditional lecture course. New faculty may also benefit from the video lectures as student questions will not interrupt the lecture which sometimes derails new faculty.

This class was relatively small with 31 students. This allowed the faculty member to personally address questions as they arose. With a larger classroom, additional teaching assistants may be needed to eliminate prohibitive waiting time by the students. Another possible solution would be to encourage student groups to help one another which may lead to better understanding for both groups.

Grading of test corrections did lead to additional work by the faculty member. However, since the quizzes and homework were both done online, the amount of grading was not larger than it was for a traditional course without using online systems.

## Conclusion

While this study does not show that the flipped classroom or test corrections actually improve a student's knowledge of the material, it is important for new faculty that may try out a new teaching technique and face initial resistance from students. This study suggests that new faculty should not immediately change their technique if the teaching method is sound because students' attitudes towards both the style itself and the students' ability to learn using that method may improve throughout the semester.

## References

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