

Flipped @ SBU: Student Satisfaction and the College Classroom

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Abstract

In this paper, the authors find empirical support for the effectiveness of the flipped classroom model. Using a quasi-experimental method, the authors compared students enrolled in flipped courses to their counterparts in more traditional lecture-based ones. A survey instrument was constructed to study how these two different groups of students varied in terms of student engagement, student satisfaction, and academic performance. Overall, we found that high levels of student engagement and course satisfaction characterized the students in the flipped courses, without any observable reduction in academic performance.

Introduction

While flipped courses may sometimes be thought of as exotic, atypical, or even gimmicky, they are certainly not new. In the early 19th century, General Sylvanus Thayer created a system at West Point where engineering students, given a set of materials, were responsible for obtaining core content prior to coming to class. The classroom space was then used for critical thinking and group problem solving. This approach to teaching assumes that, regardless of discipline, good teaching should always limit the passive transfer of knowledge in class while also promoting learning environments built on the tenants of student inquiry, collaboration and critical thinking (Musallam, 2011).

Recently, there have been opinions that flipped classrooms are an improvement to education, often citing increased levels of student engagement and teacher efficacy as the primary reasons. Thanks to the financial and technical support of our institution, the authors had the opportunity to teach flipped courses in three different disciplines during the fall of 2014. When preparing these courses, it was common to hear other instructors insist that flipped classes increase student engagement primarily at the expense of student performance, reducing the overall academic quality of the course. Others commented that only the most technology-savvy instructors would be able to effectively flip their courses, adding that doing so required an excessively high investment of time and energy from the instructors.

We found that flipped courses did not require sophisticated technological expertise in order to implement. Additionally, the authors observed high student engagement levels and strong course satisfaction without any negative impact on academic performance. While teacher preparation time levels were increased, these courses were still highly regarded by the teachers. Likewise, flipped classes were strongly approved of by students, where high levels of student engagement were the central component to overall course success.

The Importance of Student Engagement

Student engagement, both within and external to the classroom, is being increasingly recognized as a crucial element in student success. Purposeful engagement, as defined by Harper and Quaye (2009) involves the active participation of the student in activities, as opposed to their passive involvement. The NSSE, or National Survey of Student Engagement, is a widely distributed instrument used to benchmark effective engagement practices at higher education institutions (Kuh, Kinzie, Schuh, & Whitt, 2005).

Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008) analyzed the results of the NSSE and found that the level of student engagement had a positive, statistically significant effect on performance. As such, institutions continue to seek methods by which to increase levels of student engagement, both inside and outside of the classroom.

Flipped Course Instruction

In an effort to intensify student engagement, some higher education instructors are employing active learning methodologies, which are used to increase student involvement in the learning process (Cavalli, Neubert, McNally, & Jacklitch-Kuiken, 2014). For example, one method used to free up class time for active learning involves moving a portion or the entire lecture outside of the classroom (Bretzmann, 2013; Cavalli et al., 2014; Mason, Shuman, & Cook, 2013). Flipped, or inverted, instruction is the practice of moving the lecture portion of the course outside of the classroom and engaging in active learning activities during class time (Bergman & Sams, 2012; Kim, Kim, Khera, & Getman, 2014; Pena & Rosson, 2014; Strayer, 2012). More generally, in a flipped classroom "...course material is disseminated outside of class time; and class time is used for learner-centered activities that help clarify and reinforce concepts" (Mason et al., 2013, p. 2). Short, video lectures are often used by flipped classroom instructors as a method of delivering their lecture content outside of the classroom (Bretzmann, 2013; Bergmann & Sams, 2014).

While the specific activities in any given flipped classroom may vary, they are generally student-centered with each student expected to prepare for class in such a way as to be able to fully participate in active learning activities (Bergman & Sams, 2012; Bishop & Verleger, 2013; McLaughlin et al., 2014). In-class active learning exercises may include working problem sets, using electronic classroom

response devices, and group learning activities (Bates & Galloway, 2012; Bretzmann, 2013; Bergmann & Sams, 2014; McLaughlin et al., 2014). In order to ensure students come prepared for classroom activities, instructors may want to incentivize students to complete the out of class assignments by assigning online discussions or low stake in-class assignments (Kim, Kim, Khera & Getman, 2014).

Efficacy of Flipped Course Instruction

A number of research studies have been conducted in an attempt to evaluate the efficacy of the flipped instruction model and, specifically, how the outcomes of flipped instruction compare to those of traditional, lecture-based instruction. Mason, Shuman & Cook (2013, p. 17), for instance, compared upper-level engineering courses taught in both traditional and flipped course formats. The authors found that the flipped format allowed instructors to cover more material and that the flipped format "... does not compromise student learning on fundamental topics". In a qualitative study of undergraduate statistics students, Strayer (2012) found that students in the flipped classroom were more open to cooperation and innovation than students in the traditional classroom. Strayer (2012) also found, however, that students in the flipped classroom struggled with task orientation, such that these students had a harder time understanding the task at hand than their peers in the traditional classroom.

As previously mentioned, many instructors choose to implement flipped classrooms as a method by which to increase student engagement. McLaughlin et al. (2014) flipped a required, first-year graduate pharmacy course. Through quantitative research methods the authors found that students in the flipped classroom reported a higher degree of instructor support for active learning than did their traditional classroom peers. Furthermore, the flipped

classroom students had higher rates of attendance than the traditional classroom students (McLaughlin et al., 2014).

While there are benefits to flipped course instruction, there is research that highlights some of the obstacles instructors may face when implementing this pedagogy. As an example, the flipped classroom may increase instructor workload. Gilboy, Heinerichs & Pazzaglia (2015) conducted a quantitative flipped classroom research study with 142 undergraduate students. In their findings, they concluded that “the upfront time to digitize lectures as well as think of appropriate active learning strategies to use in class is extensive” (Gilboy et al., 2015, p. 112). They further suggest that instructors seek assistance from instructional designers in flipping their classrooms. Additionally, utilizing these active learning techniques may also make it difficult for a professor to cover all of the course materials (Mason et al., 2013).

Hypotheses and Methodology

Based on this literature, we expected to find the following:

Students will exhibit a preference for flipped classes rather than lecture-based courses.

Students will have higher levels of engagement in the course.

Students will show more satisfaction with the course.

Student performance will not be reduced by a flipped course.

In order to test these hypotheses, three faculty members at Saint Bonaventure University participated in a quasi experiment-based format during the fall of 2014. In our design, three courses would be delivered to students using the “flipped” method, while three others would rely on a traditional lecture based format. Each instructor involved in the study offered a flipped and traditional course covering precisely the same materials, which means that the changes in student performance and satisfaction control for course

material and instructor. Scores for each of the three flipped and traditional courses were then aggregated into an overall total, since no significant differences in totals were found between the three course instructors within either format. The data collected is measured as ordinal, so each survey item was subjected to a Wilcoxon sign ranked non-parametric test in order to identify significant differences between the two groups.

To measure the perceptions and attitudes of the students, a self-administered survey was constructed. This survey measured the variable "student satisfaction" by using six items from the newest version of "The University Student Satisfaction and Time Management Questionnaire" (Neill, 2011), a well-tested index that has been subjected to rigorous validity testing. All of these questions used 10-point agree/disagree semantic differential formats to measure how the student felt on a variety of student satisfaction items. These items had a Cronbach Alpha score of .886, indicating a high level of measurement reliability.

Likewise, in order to measure the variable "student engagement", we used ten items taken from the well-established "National Survey of Student Engagement" (NSSE) survey instrument (2014 version), choosing items which focused on measuring perceptions of higher-order, collaborative and integrated learning. These questions also required the use of a 10-point agree/disagree semantic differential format to measure various items related to student engagement. A Cronbach Alpha score of .728 was found among these items, which is widely considered to be acceptable. Additionally, since this index is well-known and frequently used, we have no concerns regarding measurement validity.

The variable "student performance" was measured in two ways. First, the professors compared the average grades for both the flipped and traditional courses. The measure also

included a survey item which asked students to tell us whether they “feel that I learned a lot in this course”. Doing so allowed for both objective and subjective measures of student performance in order to make useful group comparisons.

Finally, six questions measuring the perceptions of flipped class effectiveness were given to only the students in the flipped courses. All of these were 10-point closed-ended Likert-scale questions where responses ranged from “Very Satisfied” to “Very Dissatisfied”. In addition, a variety of questions measuring gender, race, age, and student class level were included for the purposes of acting as control variables. This measure scored high in reliability with a Cronbach Alpha score of .845, and with no identifiable validity concerns.

Overall, 121 of the 136 students in these courses completed this survey, yielding an 88.9 percent response rate. Of the respondents, 64 were in a flipped course, while the other 57 were enrolled in one of the traditional lecture-based courses. The survey was distributed in December of 2014, just before final exams took place. No incentives or benefits were offered to the students for their participation, and all responses were collected confidentially. This survey also received IRB approval from Saint Bonaventure University.

Results

Overall, the instructors in this study found the flipped course experience to be a great success, with students largely preferring them over the traditional lecture-based formats. In fact, several students approached the instructors late in the semester to ask if their courses next semester would also be flipped. The students were actively seeking other college courses that also created heightened opportunities for in-class participation and active learning pedagogical approaches.

First, we observed that students in the flipped courses had not suffered any reduction in basic knowledge in any

way, similar to what Mason and colleagues (2013) found. Second, each instructor recognized by the end of the semester that students in their flipped courses were much more emotionally and intellectually invested in the class than their counterparts in the control group. Students engaged in a high level of interaction with classmates and their instructors, similar to what McLaughlin and colleagues (2014) had found in their research.

In conjunction with these observations, we also used the data collected from our survey to find whether the differences in student experiences between these two groups were of statistical significance. Our first test involved comparing the two groups in terms of a preference for flipped instruction. Table one shows that flipped courses were most commonly associated with a perfect score of 10 on all of the six items listed below.

When comparing the perfect 10 responses to the scores of 5 or less column, there were four items which had at least a 3:1 ratio of student approval: the perception that the use of technology made learning easier (16:1 ratio), that in-class activities were more effective for learning the material than listening to lectures (5.33:1 ratio), perception that the course was more engaging (3.25:1 ratio), and student willingness to recommend a flipped class to a friend (3:1 ratio). We interpret this data as support for hypothesis one: students exhibit a preference for flipped courses. The flipped courses are not only preferred by students, but are also perceived by the students that they are learning more within these courses. Next, we compared the scores for student engagement between the two types of courses. These results can be seen in table two, where the mean score of the flipped courses was higher than the traditional courses, albeit by relatively small margins, on eight of the ten index items. The data shows two items where the flipped course had a significant

Table 1: Flipped Classroom Student Evaluations

Flipped Classroom Items (1 – 10 scoring system)	Score of 10	Score of 8 or 9	Score of 6 or 7	Score of 5 or less
N = 64				
The flipped classroom is more engaging than traditional classroom instruction.	26 (40.6%)	23 (35.9%)	7 (11%)	8 (12.5%)
I would recommend a flipped classroom to a friend.	24 (37.5%)	19 (29.7%)	13 (20.3%)	8 (12.5%)
I preferred viewing the course materials on Moodle rather than listening to lectures in class.	29 (45.3%)	9 (14.1%)	11 (17.2%)	15 (23.4%)
The teacher's use of technologies made it easier for me to learn the course materials.	32 (50%)	21 (32.9%)	9 (14.1%)	2 (3.2%)
Our in-class activities helped me learn course materials better than I would have from a lecture.	32 (50%)	16 (25%)	10 (15.7%)	6 (9.4%)
The flipped classroom gave me more opportunities to learn from fellow students.	28 (43.8%)	21 (32.8%)	5 (7.8%)	10 (15.6%)

advantage: feelings that the class included diverse perspectives in discussion and assignments, and students engaging in collaborative learning by working with other students on course projects and assignments.

While the group differences are small, we are fully confident that the flipped courses do not have reduced levels of student engagement, and the results are suggestive that flipped courses have slightly higher levels. For example, only the flipped classes saw an average score of 9 or higher (which occurred twice) on any of these items, and averaged a score of at least 8 on 60 percent of the items, compared to only 40 percent of the lecture-based courses.

With regard to hypothesis two, our interpretation of the data is somewhat mixed in terms of clear support for the flipped classroom. It does, however, indicate with a high degree of certainty that flipped courses are at least equivalent to other course structures when it comes to student engagement levels. When these results are taken in conjunction with table one, we have reason to conclude that flipped courses offer more student engagement, and students prefer them to traditional courses.

Student satisfaction levels between these two types of courses are reported in table three. Here, we again found modest but consistent evidence that flipped courses were superior, scoring slightly higher than traditional lecture-based classes on all six items, with a significantly higher score found for the belief that the course instructor was more available in a flipped class. We found it interesting that students, in general, showed very high levels of satisfaction for all the courses mentioned, which may reflect high overall quality teaching more than anything else.

Similar to hypothesis two, there is mixed support. On one hand, scores are consistently higher among students in flipped courses. In particular, there was a significantly higher perception in the flipped courses that their instructor was

Table 2: Student Engagement Levels

Student Engagement Items “In this class....”	Flipped Mean	Traditional Mean	Mean Difference	Wilcoxon Z Score
...we combined ideas with those taught in different courses	7.50	7.37	+.13	.136
...we connected course materials to societal problems or issues	9.02	8.67	+.35	.420
...we included diverse perspectives in our course discussions & assignments	9.00	8.46	+.54	2.199*
...I re-examined my own views on a topic/social issue	7.64	7.67	-.03	.300
...I tried to better understand someone else's views by imagining his/her perspective	8.25	7.88	+.37	.948
...I learned something that changed the way I understand a topic/social issue	8.42	8.00	+.42	1.261
...I connected ideas from this course to my prior experiences & knowledge	8.80	8.82	-.02	.029
...I asked another student to help me with the course material	6.05	5.26	+.79	1.221
...I explained course material to one or more students	6.50	6.33	+.17	.709
...I worked with other students on course projects and/or assignments	8.00	6.54	+.146	2.843**

Note. * = 95% Significance Level; ** = 99% Significance Level.

available, which is consistent with what McLaughlin et al. (2014) also found. On the other hand however, scores among the students in the traditional courses were higher than expected, which is why the gaps between the two groups are relatively small. Nevertheless, the data shows that there is enough evidence here to indicate that the flipped courses were not inferior to traditional courses. While we cannot definitively conclude that the flipped course model was a superior pedagogical approach, we feel strongly that its use is more than justified with these results.

Table 3: Measures of Student Satisfaction Levels

Student Satisfaction Items	Flipped Mean	Traditional Mean	Difference	Wilcoxon Z Score
Quality of the education I received in course	8.88	8.77	+.11	.385
Quality of the instructor teaching me	9.20	8.81	+.39	1.253
The availability of my instructor	9.02	8.40	+.62	2.240*
The course workload and study demands	8.50	8.26	+.24	.907
The way in which I am being taught	8.75	8.18	+.57	1.808
The intellectual stimulation of this course	8.47	8.07	+.40	.965

Note. * = 95 % Significance Level, **= 99% Significance Level

Finally, we wanted to compare overall course performance. What we found is that all six courses had a roughly equal grade point average, showing no statistical significance for the clear superiority of either format.

Likewise, perceptions of effective learning using a 10-point Likert-scale showed equivalence between the two types of courses, with a mean score of 8.80 for flipped courses versus an 8.77 average for the traditional model. We interpret this to support our fourth hypothesis: That flipped courses are just as effective at teaching students as lecture-based ones. This finding is supported using either objective or subjective based measures of course performance.

Discussion and Conclusions

Overall, we feel confident of having compelling evidence that flipped courses work very well at the collegiate level. Likewise, we found during our research that the flipped course design could be successfully applied to a variety of academic disciplines. Students, by a fairly wide margin, enjoyed their experience of being in a flipped course. Also, students felt that the course was more engaging and that the format aided them in learning the material. Moreover, a number of the survey items we used showed that the flipped course model improved student engagement and satisfaction levels, with virtually no evidence to the contrary. We also found that students performed very well in flipped courses, learning at least as much, if not more, than in other courses.

All instructors involved in this study agreed that they would be willing to flip future courses based on their experiences. We suspect that many other professors who have not flipped a class before will be impressed by the affordances made to their classes by the new technology, which students liked to use, and proved to be fully effective in meeting course objectives. The combination of recording our lectures beforehand while integrating other online resources into our classes was not a significant hindrance or time-consuming component of this experiment. Given how much content is already available online, instructors could

easily flip their classes without having to become an expert in cutting-edge new technologies.

It should also be stated, however, that flipped courses do have a couple of limitations that deserve to be mentioned. First, consistent with the findings of Strayer (2012), we found that students were initially slow in adapting to the different norms and expectations of the flipped course format. The instructors usually utilized either quizzes or assignments due at the beginning of class to ensure that students would review the required materials before class each day and come to class fully prepared. Secondly, there is also a considerable amount of extra preparation required of the instructor throughout the semester in order to ensure a successful flipped course, a sentiment echoed by Gilboy et al. (2015). All of the instructors agreed that an instructor new to teaching a topic area should probably avoid flipping their course until they have more experience.

We believe that flipped courses are too often thought of by college professors in a negative light. All of the authors here could give a number of anecdotal examples where flipped classes were surprisingly quick to be dismissed by others for reasons which do not seem justified by the data found here. Instead, we find that the flipped model should be seen as a fully respectable alternative to lecture-based college courses, and might be preferable to them in many cases. While the data consistently showed trends of higher scores for flipped classes, we did not find enough evidence in the data to say conclusively that traditional lecture-based courses were inferior formats.

It is our hope that further research will be conducted with regard to the effectiveness of flipped college courses, and that professors will think twice about dismissing them on the basis of decreased course effectiveness, lowered student engagement, or lowered student satisfaction. In addition, further research could identify what advantages flipped

course designs offer to specific academic disciplines, and how instructors within each of those fields could take advantage of these new affordances.

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