The Flipped Classroom: It's (Still) All About Engagement

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Abstract

Our collective experience in comparing the results of teaching three courses using a variety of flipped classroom formats and the traditional format showed no compelling improvement of student learning results using the flipped format. Specifically, comparison of student outcomes in the form of grades does not show a consistent difference between a flipped classroom environment and a traditional teaching environment.

The results we observed have made us aware of the need to be more systematic in the pedagogy pursued to determine how we can improve student learning. The process of teaching, regardless of traditional or flipped, is a dynamic one, dependent on a number of variables, the impact of which are not always readily discernable. Hence, "testimonials' regarding the success of flipped courses can range widely, possibly all true to some degree, but may need further investigation.

It is our contention that student engagement outside the classroom is the most crucial element in the learning process. If a flipped classroom format does not provide effective student engagement outside of the classroom, flipping will simply be a different process in comparison to the standard lecture format, and there is no reason to expect improved student learning results. Hence, a key issue is whether a flipped format increases such engagement. If that were to happen, the flipped format has the potential to yield improved results. For us this is the key item that warrants further study.

Each of the three courses discussed had previously been taught in a traditional lecture format by the same instructor. Our results were very positive in terms of student reactions. Most students strongly preferred the flipped format. But from an impact standpoint the grades earned were reasonably similar between the flipped and standard delivery modes. The reason for that, in our opinion, is that the level of student engagement outside the classroom did not materialize to the degree necessary.

Introduction

The term "student engagement" is multifaceted and can take many different forms. Examples include academic, cognitive, social, emotional, and institutional to name a few [1]. For this paper, we will focus on academic engagement and will use the following definition. Academic engagement is the "participation in the requirements for school success" [2].

There are different strategies that educators use to promote and improve academic engagement. These strategies include problem-based learning, active learning, exploration and research, instructional methods, multimedia technology, and assessment [1] [3] [4].

The flipped classroom combines many of these strategies and has gained a great deal of interest in the last few years [5] [6] [7] [8]. The experiences cited in the references range from considerable student enthusiasm to a concern that the process of flipping has its own issues to be addressed. The process of flipping or inverting course content delivery has rapidly evolved with now readily available key technological capabilities, specifically, video recording and internet access and delivery of course content. The enthusiasm that has been generated rests on a perceived inherent promise of increased student engagement in the learning process, and the accompanying improvement of student learning outcomes. While delivering on that promise shows success, that success may be more limited than hoped for as there is little research proving the effectiveness when compared to more traditional classrooms [9] [10].

A flipped or inverted class environment can range from low tech to very high tech. This can be an important understanding for many instructors with limited budgets both in time and money. One of our examples will be a very low tech approach. A variety of flipped classroom models can be developed. Many instances include the use of podcasts for time independent, remote access to information. Central to the flipping process is that students have access to course material before that material is addressed in class. Furthermore, the key element for success is that students make a concerted effort to read, watch, listen, and think about the material before the actual class. The purpose is to come to class with questions that focus on the elements the student doesn't understand. Class time then is used to discuss in groups or with individual students. That is student engagement. And, that should (hopefully) result in learning.

What is it that is flipped and why does that matter? In the traditional learning process the student comes to class, listens to a lecture, takes notes of key points made, reviews the material sometime after the lecture, uses the combination of class notes, homework solutions, and discussions with classmates to prepare homework, complete projects, write reports and study for exams. A major component of academic student engagement occurs outside of the classroom after the lecture. This activity is often backend loaded with increasing independent effort expended as an exam or deadline approaches.

A flipped learning environment includes the activities found in a traditional setting, but also has additional activities that promise to increase academic engagement. The key difference is that the student must come to class prepared to participate, having taken the steps before class and when in class is ready to participate. This pre-class preparation typically includes some form of multimedia. Class time is generally used for active or problem-based learning, and post-class is often identical to the traditional. However, there is an implicit assumption that the students are more efficient in problem solving and, therefore, the time required to prepare homework, complete projects, write reports and study for exams should be less.

What is to be realized is that the flipped process inherently expects a fundamental change in student behavior. A similar set of statements relate to the function of the instructor. It is of interest to note that the central issue is not that either the student or the instructor is necessarily

asked to do something extra that isn't done in a traditional class room setting. Rather, the key difference is when, where and how these engagement activities happen in the learning process. The order, the sequence of activities, is rearranged with flipping. We believe that this change does impact the amount of time and effort (i.e. engagement) the student allocates outside of the classroom, but not necessarily in a way that greatly improves learning.

In the next section, we describe how flipping processes were used in an electrical engineering curriculum for three different courses and compare our results to traditional instances of the courses. While not a controlled and comprehensive study as that being conducted by Harvey Mudd College [11], our results are consistent with these preliminary findings. We provide a discussion of our results and provide a simple model that helps us postulate an explanation for these results. Finally, we offer some closing comments and suggestions.

Results

We have three course instances in our electrical engineering curriculum where we flipped (inverted) the classroom experience. The results have provided us with some insights into what potentially the flipping process does and doesn't do. Our experience should be taken as a first effort to seriously introduce a flipped format into our teaching process. The courses and details are as follows:

- *Sophomore Course in Circuits - (Electrical Engineering)*

The first course to be described is part of our circuits sequence in our quarter system and is a sophomore, ten week course followed by a final exam. One of the authors (OGP) has taught that course in a traditional manner many times. During the second quarter of the 2013-14 AY he taught the course in a flipped manner. Immediately prior to doing so he sent a communication to all prospective students finishing the prerequisite course as to how he was going to run the upcoming course. The intent was to clearly make the students aware of the upcoming experiment and not cause them any surprises if they chose to register for his course section.

The flipping process was decidedly low tech. No cameras, no video, only the use of the internet for posting and sending assignments, homework solutions, past exams, and, above all, two page note sets that were required reading for each upcoming class period. The note sets were emailed and posted two days before the class period when the content was used. The decision to try a flipped setting was made shortly before the beginning of the upcoming quarter and devoting extensive additional time to course development would not have been feasible. Hence, the flipped course was run using the normal resources students receive. The degree of lecturing was reduced to approximately 1/3 of what was usual done. The typical class consisted of a few minutes devoted to key aspects of the topic for the day and answering any questions students might have developed from reading the de jour note set. When there was a shift from one major topic to another major topic a couple of full, traditional lectures were held. Central to the operation of the course was to send four groups of students, two students in each group, to the

board at the same time to work problems during class. All students were encouraged to collaborate, help with any solutions they believed to have errors. Complete solutions to the problems were provided to the students within hours of class time.

Quick surveys of how things were going were held in weeks 3 and 7 of the 10 week quarter. The student feedback was as follows:

- Week 3 Feedback:
    - 15 comments indicated the students liked the flipped setting
    - 10 comments related to things the instructor could do to improve course logistics
    - 7 positive comments regarding going to the board, in groups, to work problems

Some students made more than one comment. There were 23 students in the class.

- Week 7 Feedback – two questions were asked:
    - "What should the student do differently to improve his/her learning? Two points stood out:
        - Work more problems - 7 comments
        - Spend more time reading the lecture notes before class – 7 comments
    - "What should the instructor do differently to improve student learning?" Two points stood out:
        - Work more problems during class, including more difficult problems – 5 comments
        - Do nothing different – 6 comments

Also, an end-of-the-course faculty evaluation was done that allows for comments of any kind. The end-of-the-course comments can be summarized as:

- 18 comments expressed the willingness or desire to take a flipped class again.
- 2 comments were indifferent to the class style; traditional or flipped were fine.
- 3 students did not provide any feedback regarding the flipped classroom style.

What is of some interest is to compare the student grade outcomes (Figure 1) and their instructor rating (Figure 2) of the flipped classroom to the traditional teaching style the instructor had used the year before. The final course grades were based on exams, quizzes, and to a limited extent graded homework. This was equally true for both the flipped and traditional course offering. It is noteworthy that there was an increase in the number of grades of "A" and of "F" and a decrease in the number of mid-range grades. Further, the end-of-the-course faculty evaluations on 14 separate evaluation factors decreased from an average score of 4.84 (out of a maximum score of 5.0) for the traditionally taught course to 4.60 for the flipped course.

We believe that the students, despite being very enthusiastic in their comments in favor of the flipped classroom setting, nevertheless, recognized the *elephant in the room* and expressed their

concerns by giving considerable thought to the rating assigned. One telling comments was: “In order for this method to work the student needed to make a conscientious effort to learn the material beforehand.” If some significant effort is not expended before the class period, the flipped process may quickly be less successful than a traditional lecture. Countering such an effect requires effort on the part of the instructor.

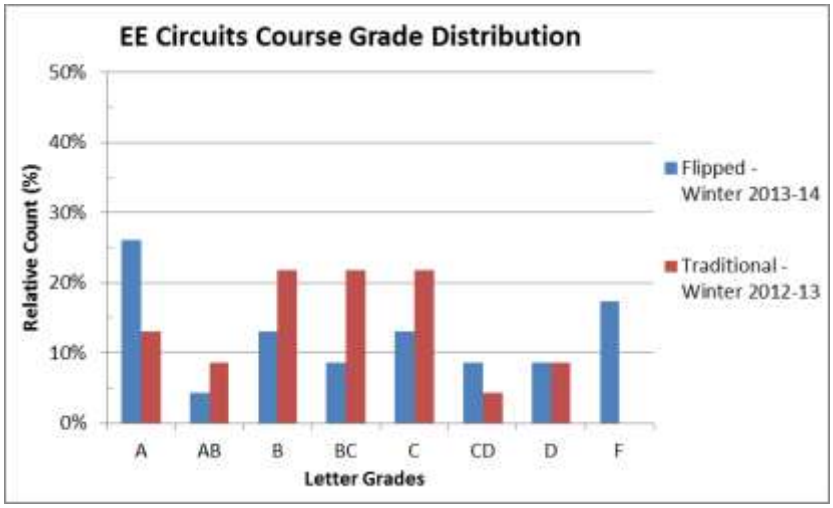

Figure 1. Relative Grade Distribution – Same Course, Same Instructor

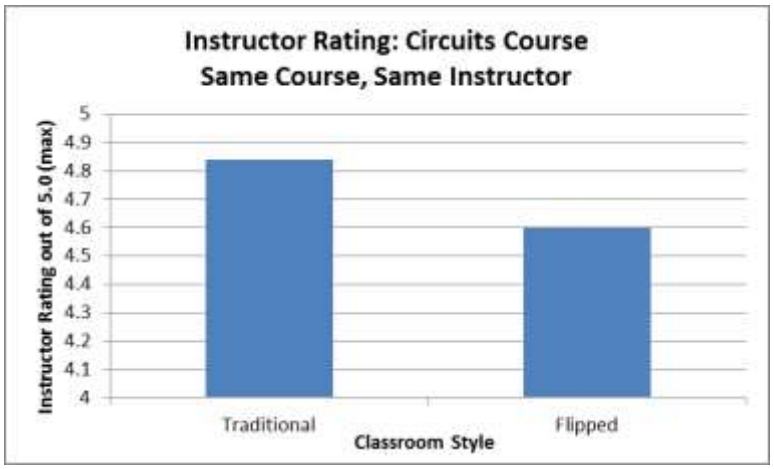

Figure 2. Faculty Rating for Traditional and Flipped Classroom

- *Junior Course in Signals and Systems - (Electrical Engineering)*

The second course was a continuous-time signals and systems course occurring in the junior year. One of the authors (CJP) had previously taught the course twice using a traditional format. During the spring term of 2013-14 AY he taught the course in a flipped manner.

The flipping process involved video segments which were posted online and made available to students in advance of each class period. Students were asked to watch the videos and take notes

prior to class. They were also encouraged to formulate questions pertaining to the concepts they didn't understand. These videos comprised the core course material that in a traditional format had been delivered by the instructor during regular lecture periods. The videos were organized as a series of 3-5 minute segments and covered only the essential ideas for each course topic. Generally speaking, material which might have filled a 50 minute traditional lecture was compressed into somewhere between 4 to 6 short videos. Where appropriate, separate videos involving example problems and solutions were also provided. The videos were created using a laptop computer, a USB tablet, and screen/audio capture software. There was no editing or post-production of the videos.

A typical class period would begin with a brief review of the video material (no more than 5 minutes) during which students had the opportunity to ask questions. The remainder of the class period was devoted entirely to solving homework problems. Students worked together in groups of two or three students in each group. For any given problem, two such groups worked the problems at the board. The instructor circulated throughout the room, offering guidance and hints when groups were "stuck." In most cases, problems were not solved to completion, but rather once the majority of student groups had identified the process/steps necessary to solve the problem (i.e., they were able to connect what was presented in the video to the homework problem), the groups at the board together with the instructor provided comments on the solution path and the class proceeded on to the next problem. The details of the final solution were left to the students to complete individually after class. Not all homework problems were addressed during class periods, so students were left to solve some problems in a more traditional manner. Homework was submitted, typically 2 to 3 days after the corresponding in-class session, and then graded and returned to the students. These homework sets formed the basis for the type and scope of problems that students would later be asked to solve during exams.

It is the authors' belief that solving problems is essential to student learning in this course, and the opportunity to solve problems in-class was the primary motivation in adopting a flipped format. During past offerings, students struggled with homework for a variety of reasons, including inadequate understanding of the course material, difficulties in connecting the lecture material to the problems, and deficiencies in pre-requisite material. No matter the reason, the flipped format gave the instructor the opportunity to address these struggles in real-time, face-to-face with the students.

A second motivation in using a flipped approach was that it might present an opportunity to address prior student feedback indicating that the course material seemed disconnected to real-world applications. The hope was that an increased emphasis on in-class problem solving together with increased efficiency in solving those problems would allow the instructor to introduce more applications of the course material, and therefore further boost student interest and engagement in the course. Two such application modules, organized in the same manner as the core course material (online videos and in-class problem solving) were incorporated.

Following week 3 of the course, a brief survey was administered to the students. Student feedback was as follows:

- 71% of the students reported that they prepared for all class sessions by watching the videos and taking notes in advance. The remaining 29% reported that they prepared for all but one of the class sessions.
- On average, students spent 3.7 hours per week watching videos and taking notes.
- On average, students spent 3.8 hours per week completing the homework assignments.
- Students were asked an open-ended question regarding what they liked about the flipped format. The following items stood out:
    - Working homework problems in class, in groups, at the board – 8 comments
    - Access to online videos; ability to watch/re-watch – 7 comments

A comparison of the relative grade outcomes of the flipped classroom and the traditional classroom is shown in Figure 3. In both offerings, final course grades were based on exams and homework submittals. No discernable pattern presented itself when comparing the two courses. Figure 4 shows the composite instructor rating from the end-of-the-course student evaluations in which the instructor was evaluated on 14 separate factors. The ratings decreased from 4.72 (out of a maximum score of 5.0) in the previous offering using a traditional format to 4.36 using the flipped approach.

The homework sets used in the flipped version of the course were very similar to those used in the traditional version of the course. One might expect that devoting entire class periods to solving problems would have led to higher homework scores. In fact, there was no improvement in average homework scores. There was, however, an increase in the number of very low scores (including scores of zero indicating students who did not submit the homework) and very high scores. The increased number of very high scores is most readily explained by the simple fact that a student who came to class prepared (by watching and studying the videos), was engaged in the in-class problem solving, and then followed through with completing the problems on their own after class, is in a better position to earn a higher score. On the other hand, a student who fails to follow-through at any point in that process is no better off (and perhaps worse off) than they would have been in a traditionally formatted course. The following pair of student comments, provided on the end-of-course student evaluation form, illustrates this point.

> "…it forced students to spend more time on the material…getting help with difficult homework in class was much more efficient than spending hours confused at home trying to figure it out."

> "…there were days that I didn't have time to watch the videos and it made going to lecture almost pointless because I was unable to follow along."

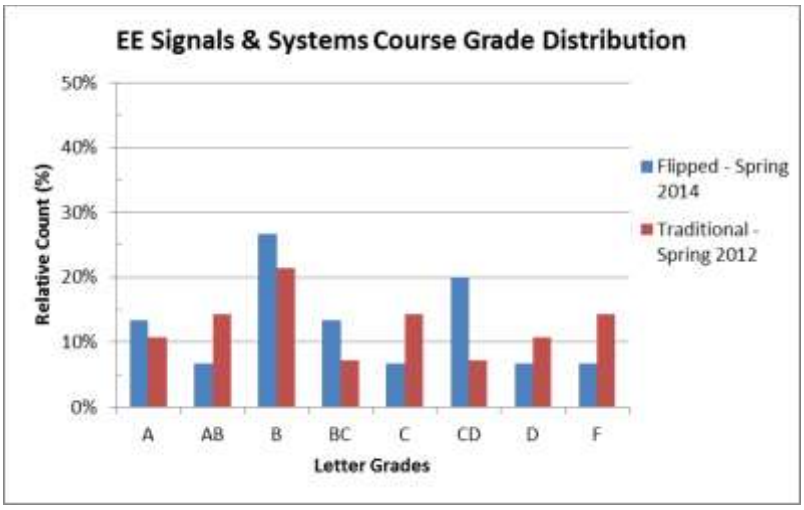

Figure 3. Relative Grade Distribution – Same Course, Same Instructor

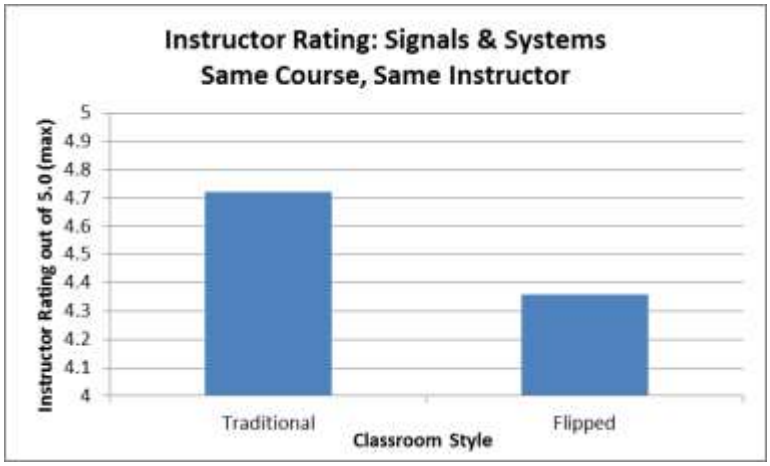

Figure 4. Faculty Rating for Traditional and Flipped Classroom

- *Junior Course in Dynamic Systems - (Electrical Engineering)*

The third course was a dynamic systems course occurring in the junior year. One of the authors (RWK) had previously taught the course using a traditional format and then taught a variation of the course for transfer students in the spring term of the 2013-14 AY in a blended manner. Flipping was also used most of the time, but there were a couple of weeks in which a traditional lecture format was used.

The blended component of the course consisted of 6 video segments per week. The lengths of each video segment varied depending on whether the in-class time was used for problem solving (flipped) or a lecture format. When the class period was flipped, theory was presented in the video segments, 6 to 8 minutes in length. When the class period was a traditional lecture, the video segments were used to demonstrate problem solving. The typical length of these video

segments ranged from 10 to 15 minutes, depending on the complexity of the problem. Post processing and editing was used for the majority of video segments.

Because the course was blended, viewing the video segments was an important component to the course. Therefore, online multiple choice quizzes were used to asses if the video segments were watched. These quizzes counted for 5% of the total course grade.

Problem solving in this course, like the others described above, is an important component to student learning. Graded homework was used in a manner similar to the junior level signals and systems course. The homework used in both the flipped and traditional sections was very similar in nature. It is interesting to note that there was no improvement in average homework scores for the flipped course as compared to the traditional course. The average scores were 85% and 86% for the flipped and traditional courses, respectively. In addition, the overall grades were not significantly different between the flipped and traditional sections.

A comparison of the relative grade outcomes of the flipped classroom and the traditional classroom is shown in Figure 5. In both offerings the final grades were based on exams, homework submittals and quizzes. In both offerings the quizzes were weighted low and used as incentives. In the traditional course, quizzes mimicked a homework problem and were used as an incentive to perform well the homework assignments, and in the flipped course, quizzes were used as incentive to watch the video segments. One can speculate but no discernable pattern presented itself when comparing the two courses. Figure 6 shows the composite instructor rating from the end-of-the-course student evaluations in which the instructor was evaluated on 14 separate factors. The ratings increased slightly from 4.77 (out of a maximum score of 5.0) in the previous offering using a traditional format to 4.85 using the flipped approach.

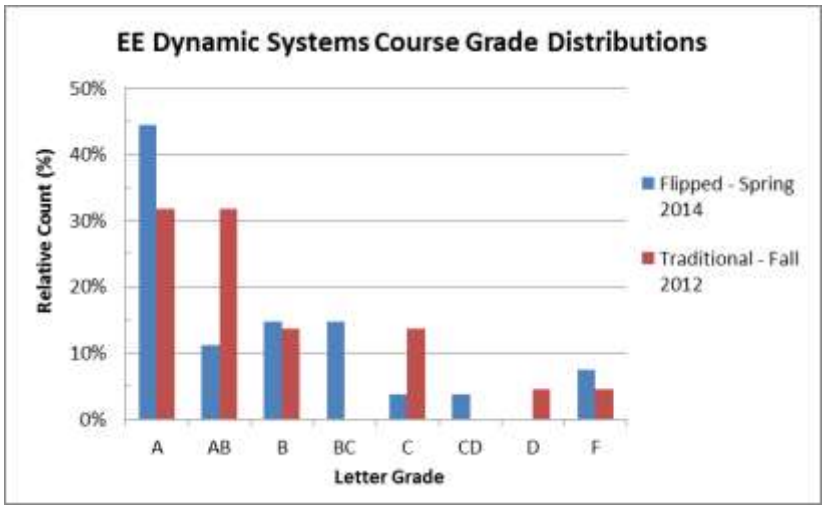

Figure 5. Relative Grade Distribution – Same Course, Same Instructor

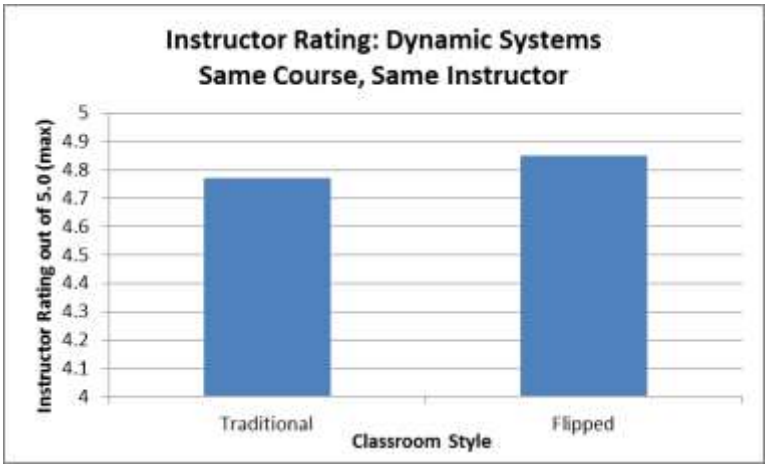

Figure 6. Faculty Rating for Traditional and Flipped Classroom

Discussion

We would sum up our experience with two overriding comments:

1. Our collective experience of each of us teaching a course in the traditional manner, followed very soon afterward teaching the same course in a flipped manner, is that there is no discernable pattern to the student learning outcomes based on student grades. For an individual course some specifics could be offered, but not for the collection of courses.
2. We believe the results have made us aware that the process of teaching, regardless of traditional or flipped, is a dynamic one, dependent on a number of variables, the impact of which are not always readily discernable. The impact of changes in the teaching environment, such as the nature of the resources used, and when and how they are available, can be quite consequential. Hence, "testimonials' regarding the success of flipped courses can range widely.

There are a number of things that bear discussing or mentioning regarding what we learned.

- Our experience with the sophomore circuit course indicates the potential for the flipped classroom to "hollow out" the middle of the grade distribution. Depending on how the course is implemented, it is possible that those who typically earn grades in the middle of the grade range can either substantially be pulled up or pushed down in a flipped environment. Students who consistently earn high or low grades will most likely continue to do so regardless of the teaching approach. But the broad middle of the grade distribution, they potentially are the somewhat average students who tend to expend more effort when a deadline looms or an exam is near. Their normal mechanism for "survival" is to read their notes, or the notes of friends, and review problem solutions they submitted, where the work often is done as part of a group. If they find themselves in a flipped classroom and maintain their overall effort in the same time sequence, their

performance may suffer because there is no note set of the normal kind. But what is also missing are the words that accompany the lecture material on the board, the words of caution, the explanation of comparing approached, the reasons why, etc. Without that type of material, and no adaption to the flipped environment, grades earned could readily suffer. On the other hand, if they adjust to the requirement of being prepared for class time in a flipped environment, we would argue their performance may be better than in a traditional classroom.

- The circuit course note set that was provided two days prior to class time was deliberately chosen to be a bare-bones version of the essentials of the theory, enough to allow the process of solving problems to start. The short videos used in the signals and systems course were also a bare-bones version of the theory. We have consistently found that students want only the essentials. More is generally seen as superfluous. Students generally did little in the way of problem solving before class. For the circuit course, some fully worked out problems were provided before class. What was missing is the instructor working out problems with all the accompanying comments normally made regarding what to watch out for and what to consider. The flipped setting, in view of the resources supplied may have been overdone. Student feedback in both courses specifically suggested the need for more fully developed problem examples, worked by the instructor. Shifting to a flipped model with greater emphasis on self-learning is a slow process to master. It needs to be demonstrated and reinforced, many times.
- The signals and system course and the dynamic systems course did not show the same grade distribution results as the circuit course when comparing grades between the flipped and traditional classrooms. The simple reason may be that these courses, while very similar to the circuit course in many respects, provided richer resources in the flipped implementation. In both of these two other courses the resources included videos with the normal complement of verbal material found in a live lecture.
- A flipped classroom potentially isn't for everyone (students). People have a variety of styles that are both inherent and practiced habits. Students may find it difficult to change. This again puts a burden on the instructor who must assume the role of teacher, coach, and mentor. These activities are all doable, but take time. Where is that time going to come from? We all have to answer that individually.
- A flipped classroom potentially isn't for everyone (instructors). Instructors are also creatures of habit. In addition, there are the pressures of covering all the required material, etc., that may cause an instructor to feel a traditional classroom setting allows greater control to achieve the course outcomes (as opposed to the student outcomes).
- For the flipped classroom to succeed there have to be changes in habits. The comfort zones must be redefined. But things would work best if one can align the flipped process to the max extent possible with normal student habits. Why align to the student habits, rather than the other way around? There are more of them than of us (instructor).

- The flipped classroom should not ask students to work harder. Students are asked to work differently. The same work should be done, but distributed differently in time. The workload is frontend loaded. This shifts the type and timing of out-of-classroom student engagement as compared to traditional lecture based courses. To be successful, the format literally demands pre-class student engagement. This needs to be clearly understood by students.
- What to do about the student who misses class and all the engaging problem solving information? Stuff happens and a recovery process must exist to overcome the hiccups that life presents. Students must have a "backdoor" out of the flipped classroom environment and be able to return to a studying methodology that allows catching up. This may be were focused videos play a vital role, along with solution techniques, etc.
- There are some unique opportunities for instructors using a flipped teaching method. It allows the instructor to bring students face to face regarding what the student knows and does not know. It is the latter that is a confounding issue because many students (our experience) fail to distinguish between knowing something about a topic versus having a significant degree of expertise. One specific shortcoming that instructors can identify in the closer interaction between instructor and students are any gaps in prerequisite knowledge.
- Some essential things that the instructor needs to consider or do (based on student feedback):
    - The course material presented to the students should have some real appeal and be accessible numerous days before class time. Our suggestion would be more, shorter, focused presentations. These would augment or replace a note set, as was used in our circuit course.
    - Presentations that go over the basics that should have been learned in the prerequisite courses. Students often do not understand that the barriers to understanding concepts and methodologies in their present courses are due to what they learned inadequately in a prior course.
    - Fully work out at least one example in class. Also, partially or fully work out a problem that requires understanding of some nuances.
    - Develop a methodology that does not require having to make contact with all students in the class. Similarly, develop a strategy for dealing with individual students or a small group of students who need considerable help and could easily take up most of the class period.
    - Give specific information for problems done in class as to what are "correct" methodologies for solving the problem and what are the "correct" answers.

Model of Student Engagement

From our findings we concluded that a flipped classroom does not necessarily provide an improvement in student performance. Our experiences are limited in scope and size, but are consistent with preliminary findings from a long-term study being performed at Harvey Mudd College [12] [13]. In fact, performance outcomes could deteriorate for some students. We asked ourselves why? We believe the answer lies is in the amount of time and effort students expend for each activity in a progression of steps that constitute the learning process. This time and effort associated with these activities can be thought of as a way to measure the student's academic engagement for the course and is different when comparing traditional to flipped learning environments.

We propose a simple model, shown in Figure 5, which may be useful in helping to explain the results we observed. In the model, we consider the engagement activities occurring in three sequential phases. The first phase is pre-class engagement, the middle phase is in-class engagement, and the third phase is post-class engagement. Two of the student engagement phases occur outside of the classroom. In addition, we hypothesize that the instructor and student have different expectations as to the amount of time and effort associated with each of these engagement activities and that they will differ between the traditional and flipped models.

For example, in a somewhat idealized traditional course we believe that an instructor expects students to read the assigned sections from the text and come to class with some familiarity of the material. During the class, the instructor provides a "highly engaging" lecture, perhaps with some interactive learning. The instructor then assigns complex homework problems or projects for the student to complete. From the instructor's perspective the pre-class engagement is at a medium level, the in-class engagement is at a high level and the post-class engagement is also high. This would be modeled as "M, H, H", as shown in the top row in Figure 6.

In a flipped classroom environment the instructor's expectations are probably pretty much the same. Pre-course engagement is nearly mandatory for a flipped classroom; therefore, pre-class engagement is medium to high. Because the students have the necessary knowledge to solve problems and hold meaningful discussions, the in class engagement is also very high. Finally, the same homework expectations are assumed and, therefore, the post-class engagement is high. However, because the students have new insight and have practiced solving similar problems, their post class engagement should take less time and effort to complete, which is one of the claimed benefits of a flipped environment. Hence, the model would be "M-H, H, H".

But, what are student expectations? Starting with a traditional environment, we believe the model may be closer to "L, M-L, H". The likelihood of students pre-reading material before class with a critical eye is probably unlikely. Some may casually skim the relevant sections at most. Hence, that component of engagement is low. During the lecture, engagement on the average is probably closer to medium and perhaps can be low depending on the material being

presented. Finally, post-class, the amount of time and effort required to solve complex homework problems is relative high. In addition, students most likely perceive a different academic model, one of either in-class or out-of-class. All engagement activities that occur outside the classroom are not necessarily segmented as pre and post class time.

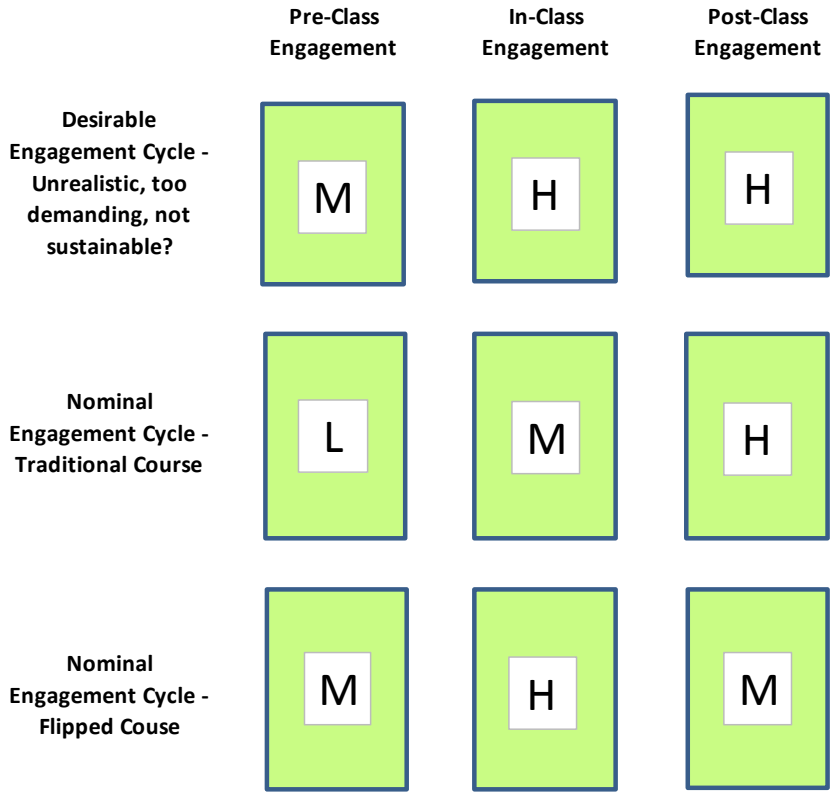

Figure 6. Proposed Model for Time Segmenting Student Engagement

In the flipped environment, we believe the nominal student's experience is closer to "M, M-H, M". Students learn quickly that pre-class engagement is mandatory in a flipped classroom and, therefore, requires a medium amount of engagement effort and time. The student engagement during the classroom portion is higher when compared to a lecture format, and the effort required to solve problems is less as compared to the traditional format. We believe that the students may perceive that they know the material well enough and are able to satisfactorily complete the post-class engagement activities, but are not likely to put in additional independent effort into solving more complex or challenging problems. Therefore, the actual post-class engagement is medium or even low.

If everyone's expectations were the same, say that of the nominal traditional classroom, the flipped environment will be inferior for learning. Central to learning is to ask what needs to happen to gain maximum advantage from the middle, in-class, phase of the learning process. This requires preparation before class time and is the most important part of the process. Only if

the preparation is at minimum at the level of M (medium) will the student be engaged in-class to the extent desired.

Ideally, the top series of MHH is desired but it is very questionable whether that could be sustained. In comparing the "Nominal" flipped and traditional cycle the overall effort of LMH and MHM are reasonably similar but the flipped cycle may be pushing the boundaries of what students are willing to do. If there is a payoff of less time spent on doing homework, that cycle may become acceptable. The redistribution of the effort associated with the quite normal, and accepted, last minute "cramming" for an exam in the traditional setting to more of a front-loaded model should reap considerable benefits. The benefits would be to not only understand the basics of the topical material, but also to allow filling in gaps of knowledge that constitute the nuances associated with every topical area.

Conclusion

The flipped classroom is not a cure-all. While the flipped format exhibits considerable promise for improved student engagement in the learning process, it also has its own set of challenges. We believe that once we have the opportunity to use the flipped classroom on a somewhat regular basis we will then better understand its effectiveness. Its successful implementation requires changed student habits and changed expectations for both students and faculty, of themselves and each other.

It is our contention that student engagement outside the classroom is the most crucial element in the learning process. While that is true in either the traditional or flipped setting, it is most crucial in the flipped environment. Changing habits for the pre-class engagement must occur in order for the flipped classroom to succeed.

We suggest that the role of the instructor might very well be quite important in the pre-class phase of the flipped format. Instructional videos can potentially contain a significant amount of information in the form of the normal comments, warnings of why something works or pitfall to avoid, that an instructor makes in a lecture.

It has always been the case that the classroom environment of some instructors is better received by students than for other instructors. There is the challenge to distinguish the impact of a specific instructor from the impact of the classroom setting. With time the assessment of student learning will distinguish whether the flipped classroom is simply a version of the French proverb – "plus ça change, plus c'est la même chose" [14], or something more permanent.

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