



How to Prevent Students Falling Down in a Flipped Classroom

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Abstract

In order to serve the educational needs of the Y-generation, universities have witnessed a transformation in the way they teach. A popular concept is the flipped classroom where students digest the major course materials before the actual lecture hours. The lecture hours are used for hands-on practices, discussions, and practical work. The theoretical and practical parts of the learning process have changed their order. We will focus on the disadvantages in this work. We will also offer some remedies for the problems based on empirical evidence.

A major requirement for the flipped classroom to be successful is that students are aware of their responsibilities. Furthermore, the majority of students (almost 100% in our case) did not experience a similar instruction in their previous education. Hence, it is not an easy task for students to "stand-up in the flipped classroom." In our case, we teach a freshman course, Engineering Guide and Ethics, in a blended way to a group of approximately 150 students for more than 15 years. In the last two years, we have also flipped the classroom based on positive responses from former students to do so. However, the initial observations have caused us to rethink about our strategy: A large group of students (80% in the start of the course, and 40% in the end of the course) did not perform what they had to do! The numbers are based on observations of two metrics: number of students participating in discussions, and grades of quizzes and exercises carried out during/after the lectures. Even though the students soon realized that their quiz and exam grades are not satisfactory, we could not convince them to browse course materials before the lecture hours. The major reason seems to be the lack of previous experience, and the lack of motivation. A survey done after the course has supplied valuable results: Students originating from private high schools performed significantly better than students from public high schools where students are compared within groups of their entrance points to the university. (There are mainly three groups of students where all groups have a mixture of graduates from public and private high schools.) The survey revealed the result that students can adapt to the flipped classroom much better if they have previous experience in project work where students are forced to work independently outside of the classroom. We have concluded that students have to be motivated to adopt the flipped classroom as they do not have a cultural affinity for the process. This year, we have included an orientation period for the flipped classroom as a soft transition where the initial lectures have been redesigned for increased student motivation. Results of this approach are promising that student participation has almost doubled with increasing student satisfaction.

1. Introduction

Education of the future generations has been a major concern because education is considered to be the fundamental pillar for the survival and sustainable development of the society. The role and character of university education are questioned whether the university can prepare the students for the challenges of the future adequately. The efficiency and effectiveness of instruction attracts a dominant interest within this scope. The last 20 years have witnessed a solid shift from traditional face to face classroom instruction having the teacher in its focus towards a student centric instruction deploying education strategies coupled with digitization [1-7].

The flipped classroom concept has been adopted in a diverse range of courses with respect to level and subject of the course. A thorough analysis has been carried out in the scoping review article in [5]. This review considers papers published in the last 20 years about the use of flipped classroom. In summary, there is indirect evidence for improved academic performance and student/staff satisfaction with the flipped classroom approach, but the contribution to lifelong learning and soft skills is limited. There are concerns that "educators renewing the curriculum may not fully understand the pedagogy of how to effectively translate the flipped class into practise" [5]. There are also many papers describing merits of flipped classroom in recent literature [6-7]. In this work, we will share our experience about the adoption of the flipped classroom approach in a freshman engineering course. Essentially the work will focus on the difficulties experienced in student engagement, and the related reduction in

performance in the initial adoption phase. The efforts to overcome those problems and their results will also be highlighted.

2. Case Study

Engineering Guide and Ethics is a 3 credit mandatory freshman course offered in the first semester at Kadir Has University for all engineering majors. The course topics can be summarized as the academic system, knowledge management, engineering, soft skills for engineers, ethics, ethical problem solving and academic integrity. The course has been offered in a blended way for more than 15 years where an online learning management system is used for the last 9 years. Through the years, the instructor has tried to improve the instruction to fulfil the expectations of the new generation of students. Attempts to incorporate blending have been carried out incrementally, in an evolutionary way, where the responses of students have been taken into account seriously each year [3]. Based on the “lack of opposition” in student opinions obtained through course evaluation surveys, we have decided to flip the class in 2013. The surveys conducted in two consecutive years revealed the fact that students do not have any previous experience of flipped classroom. The survey defined how the concept of the flipped classroom will be implemented: **“All course materials about theoretical subjects are delivered in online form. Students will browse the material and take the associated quizzes online. There will be two hours of lecture every week where practical studies, discussions, and workshops will be carried out. The lectures will not be used for the instruction of the material available online.”** Students are asked for their opinion in Likert scale whether they would like to take the course in the flipped way. The responses are given in Table 1 where the response of students in 2013 and 2014 are also included. Furthermore, students are also asked for the possible advantages and disadvantages of such an approach. The most common possible advantages mentioned were “the freedom to choose the time/location of studying” and “skipping boring lectures.” The common comments for disadvantages were “lack of possibilities to ask questions,” “lack of instructor control causing ignorance in students,” and “getting bored by reading longer documents.”

Table 1. Survey results for the question: *I would like to have this course in a flipped version.*

Opinion	Year	2011 (%)	2012 (%)	2013 (%)	2014 (%)
Totally agree		12	18	8	15
Agree		19	21	21	22
Neither agree nor disagree		26	28	35	25
Disagree		36	23	22	26
Totally disagree		8	10	14	12
Number of respondents		118/159	127/149	84/154	124/171

The course has been transformed into a flipped version where the students are required to browse narrated presentations and/or book chapters before the lecture hours. Lecture hours are used for workshops, group work, practice and discussion, and then the students take an online quiz. If a student misses 4 or more quizzes out of 10, the student fails the course. This rule was applicable for more than 8 years. Students are graded on 6 in-class exercises and 10 online quizzes. There are also homeworks, project work, and final examination but the focus of this study is the change in performance of students in the quizzes and exercises. Homework, project and final exam grades did not exhibit a significant change between the two types of instruction.

In the first year of the flipped classroom an orientation has been carried out. In the first half of the semester,

i.) More than 80% of the students did not browse the course materials before class time even though e-mail notifications are sent twice a week. Consequently, students did not participate in discussions and exercises actively.

ii.) Quiz attendance and quiz scores have fallen back in a significant amount: At the end of the third week, there were 45 students who missed two or more quizzes.

Student behaviour changed significantly towards the end of the course because the students realized that they are “falling down” in the flipped classroom. More than half of the students started to study the materials. Participation to discussions also increased. However, the final results were not satisfactory: A total of 39 students (25% out of 154) failed because they missed four or more quizzes whereas this ratio was around 5-15% before. Moreover, average scores for quizzes and exercises dropped by more than 15 points over 100.



Personal communication with the students revealed that the students were not prepared to carry the responsibility required for the flipped classroom as they continuously needed supervision in the instruction. The lack of previous experience and the habit of studying in the last day before the examinations have contributed to the falling down. An interesting factor seemed to be the type of the high school, public or private, in the performance of the students. Students from private high schools tended to be more motivated for discussion. A survey is conducted in order to clarify the reasons. This contained open ended questions about the reasons why students did not adapt to the flipped classroom and what they would suggest to improve the performance. The distribution of grades with respect to the scholarship percentage (a broad measure of the entrance points of the students) and type of high school are given in Table 2. The analysis of this data and survey results has given valuable clues for the next year.

Table 2. Quiz and exercise scores with respect to scholarship % and type of high school in 2013 (repeating students excluded).

HIGH SCHOOL TYPE	PUBLIC		PRIVATE	
	Count	Average	Count	Average
100	20	37	3	67
50	69	54	16	64
25	7	60	22	58
ALL	96	51	41	61

Firstly, students found the idea of the flipped classroom interesting. They enjoyed discussions, workshops, and group work. However, more than 70% of the responses imply that it was more difficult in quizzes than they expected. Neither the students could motivate themselves nor could the instructor! They suggested that the classroom should have been flipped gradually so that students could adapt to it. More than 60% of the students admitted that they did not care about their success until the mid of the semester. One thing did not change: approximately one third of the students did not like the flipped classroom. Furthermore, to the contrary of the historical statistics, the full scholarship students from public schools obtained the lowest average grade because they were used to a totally different method of studying and they were over confident. Based on these observations, the following modifications are done in 2014:

- i.) The first two weeks have been conducted in the traditional manner where the new approach is introduced to the students. Students are motivated to discuss the feasibility of the flipped classroom so that the flipped approach is not mandated by the instructor but requested by the students willingly: students would prefer interactivity.
- ii.) Recitation sessions are arranged for problem solving. Even though participation remained around 30%, students' feedback states that they found this opportunity useful.
- iii.) An online forum was available for 24 hours prior to the start of each quiz where students could ask questions. Again, the participation never exceeded 10% of the population but seemingly more students have followed the forum, and this has caused awareness about the quizzes.
- iv.) Statistics of the previous year has been shared with the students. They have been reminded about their responsibilities, and the consequences of failure. Special emphasis is put on full scholarship students: They have been mentioned anonymously that there are expectations from all students according to their potential.

The distribution of scores is given in Table 3 for 2014. The results show clearly that the performance has increased: the average for all students (excluding repeating students) has increased from 54 to 66 which is closer to the historical average of 68. The increase in the group of full scholarship students is remarkable (from 37 to 70). Moreover, only 8 students (5%) missed 4 or more quizzes.

Table 3. Quiz and exercise scores with respect to scholarship % and type of high school in 2014 (repeating students excluded).

HIGH SCHOOL TYPE Scholarship %	PUBLIC		PRIVATE	
	Count	Average	Count	Average
100	19	70	1	95
50	55	65	22	68
25	9	77	21	59
ALL	83	67	44	64

3. Conclusion

It is not an easy task to change the behaviour of students in adopting the flipped classroom. Lack of experience both on the students' side and on the side of the instructor is the major reason. The instructor has to find ways to motivate students as those young people are not capable of carrying the responsibility of the flipped classroom. This becomes more difficult if the students experience only one course in the flipped approach. In this work, we shared our experience of transforming a freshman college course to a flipped classroom. The initial attempt to flip the class has caused some students to fall down. We have learned from experience: We tried to overcome the difficulties by a smooth transition, and by paying more emphasis on the motivation of students. Seemingly, efforts to motivate students have worked well. The failure rates of the previous year must have also contributed to the level of consciousness of students.

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