IMPLEMENTING FLIPPED CLASSROOM IN THE SCHOOL OF ARCHITECTURE

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Abstract

Teaching methodologies are under permanent development and innovation in higher education. One of the main pillars of these techniques is the student-centered learning, which implies shifting the focus of the instruction from the teacher to the student, aiming to develop learner autonomy and independence. Among these methodologies, flipped classroom pursues to facilitate and potentiate different learning processes such as acquisition of information and practical knowledge in the classroom, by transferring other processes out of it.

In the present work, flipped classroom was used in a group of 7 students of 2nd course of the School of Architecture of the European University of Valencia. The activity consisted of the students preparing specific materials dealing with concepts related to Structural Mechanics in order to develop and explain them to the rest of the group. The activity was exposed to the students and they were given two weeks to prepare it. At the end of the process, the students fulfilled a questionnaire to rate different items related to the experience.

Students' answers indicated that, in general, the activity was perceived as interesting and useful. In addition, more than half of participants stated that flipped classroom had a positive impact in their learning skills, as well as the time spent in preparing the activity was worthy the learning results. However, most of the students considered that only one flipped classroom per course was enough, so this methodology should be combined with others in order to avoid saturation. The present paper reflects on these results and aims to explain the evaluation of the activity.

Keywords: Flipped Classroom, Student-centered learning, Architecture.

1 INTRODUCTION

While there is no one model, the core idea of flipped or inverted classroom is to flip the common instructional approach. Teacher-created videos and interactive lessons are used and instruction that used to occur in class is then accessed at home, in advance of class. Then class becomes the place to work through problems, advanced concepts, and engage in collaborative learning [1]. According to Tucker (2012) [2], the flipped classroom represents a unique combination of learning theories once thought to be incompatible: active, problem-based learning activities founded upon a constructivist ideology and instructional lectures derived from direct instruction methods founded upon behaviorist principles.

Flipped classroom teachers almost universally agree that it's not the instructional videos on their own, but how they are integrated into an overall approach, that makes the difference [1]. The tasks do not consist of simply watching a video, students should be asked and their notes checked. Since this is a

significant different approach, it takes a while for students to get used to the system; however, as courses progress, teachers report that students learn to ask better questions and think more deeply about the content. As a consequence, students are having a more individual attention, even if not attending tutorials, and misconceptions or incorrect notions are more frequently amended [1].

Case-study teaching has been traditionally understood as the way to engage students and develop critical-thinking skills. However, it needs lots of preparation time, teacher's concern on content coverage as well as some student resistance [3]. As for teacher's concern on content coverage, this is even more extended in the case of science, technology and mathematics instructors, since in these areas coverage is usually equated with learning. At present, the availability of internet resources, which include audio, video or any virtual material, has launched the idea of the flipped approach. In particular, videos have a singular appeal to students in the present age. Flipped classroom is in some aspects similar to other related methodologies such as Team Learning or Just-in-Time teaching that depend significantly on students, which need to prepare materials outside class. Then, the classroom lesson is adjusted to suit the student's needs and class time is spent dealing with materials in a need-to-know basis. Blended courses also have students applying more or less similar methodologies since they use a combination of traditional classroom with internet-based learning [3].

As said, flipped or inverted classroom consists of switching what it is normally done in class and what is usually done as homework. Some authors make reference to the video or interactive material [1]; however, a more wide definition includes any material worked at home before the lesson. One of the principles of the flipped classroom is that typical homework is better undertaken in class, with the guidance of the instructor. According to Fulton (2012), some of the advantages of flipped classroom include [4]: students move at their own pace; doing "homework" in class gives teachers better insight into student difficulties and learning styles; teachers can more easily customize and update the curriculum and provide it to students; classroom time can be used more effectively and creatively; teachers using the method report seeing increased levels of student achievement, interest, and engagement; learning theory supports the new approaches; the use of technology is flexible and appropriate for "21st century learning". Specifically in the case of science, technology and mathematics education, Freeman-Herreid and Schiler (2013) surveyed more than 15,000 science instructors who identified, among others, the following additional advantages: there is more time to spend with students on authentic research; students get more time working with scientific equipment that is only available in the classroom; or students are more actively involved in the learning process [3].

However, some difficulties with the approach have also been described [4]: Students new to the method may be initially resistant because it requires that they do work at home and, consequently, they may come unprepared to class. In some cases, this problem can be solved or reduced by giving a short quiz either online or in class. Another reported difficulty is that the homework material must be carefully tailored, and most teachers think that finding good quality materials is difficult. On the other hand, if the materials are finally teacher-created, they require a significant amount of time (especially in the case of creating videos), which is often not available.

Therefore, since there is crescent interest in studying the results of applying flipped classroom at the university level, and specifically in the scientific and engineering context, the present work focuses on the use of flipped classroom and discussion of its results in a particular case: teaching Structural Mechanics in the School of Architecture of the European University of Valencia.

2 METHODOLOGY

The activity was undergone with students of 2nd year of Architecture Degree, in the School of Architecture of the European University of Valencia, in the context of the Structural Mechanics course. Flipped class was used as the methodology to be applied in a discrete activity planned as follows. Students had to prepare specific materials, formerly selected by the teacher, dealing with new concepts related to the course, not previously explained in class. Students had to work in their task individually, at home, before the teacher's explanation. After giving the instructions to perform the activity, they were given two weeks to prepare it. In addition, each student was asked to play the role of the teacher by explaining the concepts included in their material to the rest of the group.

The number of students in class was 7 and the total amount of sessions devoted to the activity was 3 (2 students participated in the first session, 2 more in the second session and 3 students in the last one). Each student had 20 minutes to make an oral presentation using Power Point or Prezi, plus 10

minutes for questions. The specific material was previously selected by the teacher and then facilitated to the students. This included: specialized bibliography that could be consulted at the University library, specific internet links related to the subject and access to the Virtual Classroom of the European University (https://www.youtube.com/user/AulaUE) where a collection of videos of a broad set of scientific contents were available. After the student explanation, his/her role was to raise some questions about the speech to generate debate in class. Moreover, he/she had to answer several questions asked by the teacher to demonstrate knowledge.

In order to register the students' opinions on the activity, they were asked after the last flipped session to fulfill a questionnaire and rate different items related to the experience. The questionnaire consisted of a seven-question test (five-level Likert scale) plus an open question that included the following statements:

1. I consider the activity has been interesting.
2. I feel I have learned more with this activity than if the concepts had been exclusively explained by the teacher.
3. I believe this activity facilitates the learning process.
4. I would like to have more than just a single flipped classroom activity, I would prefer to have more activities or courses in which flipped classroom is applied.
5. The selection, synthesis and analysis of contents before class have had a positive impact in my learning skills.
6. I believe that the time consumed in developing the activity is worthy the learning results.
7. As a whole, I think this has been a useful activity.

OPEN QUESTION:

4'. If affirmative, state how many flipped classroom activities you would like to have.

The answers to the questions were registered as A-E, according to the following levels of a Likert scale:

A. Totally disagree
B. Disagree
C. Neutral
D. Agree
E. Totally disagree

3 RESULTS

With regard to the materials facilitated to students, the instructor's impression was that it was easy for the students to find specific information about their particular topic; but most of them had problems for selecting the relevant information and synthesize it in a 20 minutes speech. Besides, in most of the presentations the slides were filled with too much text, lacking of images and examples for a better understanding. Regarding the quality of the contents and the terminology used, both aspects were considered appropriate.

On the other hand, all students showed quite nervous at the beginning of their presentations, however after 2 or 3 minutes they gained confidence and their speech flowed more easily.

Several students proposed that it would be better for them to work the flipped class in pairs in order to facilitate the process and promote teamwork.

As for the activity itself, our experience indicates that flipped classroom is a useful approach to engage students since they feel an active part of the learning process. In addition, they work the contents themselves what fosters the development of several competences: searching and selecting information, critical thinking, ability to synthesize and oral skills. On the contrary, the activity is more time-consuming for the teacher than the traditional lecture. It implies preparing and selecting the materials in advance, usage of part of the time-class for the activity and planning an extra time to reinforce the concepts explained by the students so that any important concept is missing. However,

teachers' impression is that the activity was worth doing since most of the students reported to be satisfied with it as well as they acquired the required knowledge.

Students' impressions are commented in detail according to the survey:

Answers given by students (Fig. 1), show that the activity was generally perceived as interesting and useful (Q1 and Q7). The majority of the participants stated that flipped classroom had a positive impact in their learning process and skills (Q3 and Q5), as well as the time consumed in preparing the activity was worthy the learning results (Q6).

In contrast, students did not clearly perceived that this activity has advantages *vs.* the sole teacher's explanation (Q2), which is a bit in contradiction with the previous answers, mainly to Q3 and Q5. This probably indicates that students could not separate here the fact of preparing the material at home from the fact of he/she explaining the materials in the role of the teacher. Some change in the mechanics of the activity or in the test presented to students needs to be made in order to clarify this question.

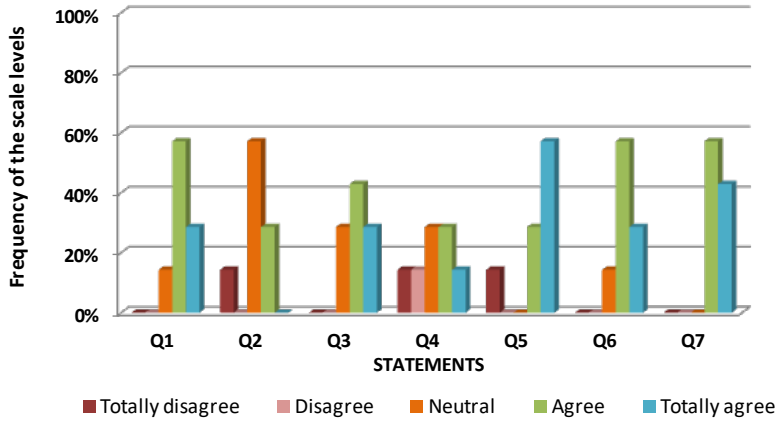

Figure 1. Results of the questionnaire given to students to assess the activity.

With regard to Q4, most of the students considered that a single flipped classroom per course was enough. Again, the fact of combining the flipped classroom with a student presentation, taking into account the need of preparing it, could have influenced this answer. In any case, if considering the activity as presented here, students' opinion indicate that this methodology should be combined with others in order to avoid saturation. As for the open question which completes Q4 (4'): 4 students reported that it is enough with one flipped classroom per subject; 2 students stated that they would like to have 2, and only one student reported that 3 is the ideal number of flipped classroom per subject.

4 CONCLUSIONS

The authors of the present work conclude that this activity is worth performing since it provides a set of benefits for the students: they play an active role in the learning process, they develop and/or strengthen several competences (searching and selecting information, critical thinking, ability to synthesize and oral skills), they perceive the activity as useful and they also acquire knowledge related to the subject. Thus, even if this activity is more time-consuming for the teacher and it makes to rethink and restructure the class sessions, advantages clearly outweigh disadvantages.

On the other hand there are several aspects that can be improved for future sessions. Most of the students verbally reported that they would feel more comfortable working in pairs. This issue can be tested in future experiences. This will foster teamwork but it will be essential to check whether each student works and acquires the knowledge properly, so that the work within each pair is not imbalanced.

Finally, according to the opinion of most of the students, flipped classroom methodology should be combined with others in order to make the learning experience more fun.

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