Sophomore students perception in the flipped classroom uptaking

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INTRODUCTION

One of the consequences from the technological revolution of the past century has been the arising of digital era. Through the web, nowadays, educational content is available for anyone with internet connection, widening the possibilities of the learning process employing such a tool.

Some Universities have been adapting their learning capabilities to the new paradigm developing on-line tools that keep them in contact with the students or provides information.

On the other hand, not directly related but benefiting from it, new educational methodologies have arisen, in opposition to the most commonly used teaching approach in higher education: the traditional classroom model.

Among these new methodologies, flipped classroom, [1-5], is becoming increasingly popular and has obtained good results encouraging active learning.

1 FLIPPED CLASSROOM AT UPV

The Technical University of Valencia (Valencia, Spain) launched in 2014-2015 a programme encouraging flipped classroom methodology within a reduced number of subjects in some groups of size between 20 and 30 students.

This was a consequence of the Bologna process and its idea of involving students in their learning process facing thus settling the new student-centered university structure [6] making him principal character in his competences achievement [7].

Setting this methodology in Mathematics where students from different background are to learn basic competencies and groups have got around 100 students seemed complicated when not unfeasible.

For this reason we took it over the lab practice sessions by using the computer algebraic system Mathematica and an educational platform, PoliformaT, based on

the Sakai project [8] and developed by Technical University of Valencia (Universitat Politècnica de València, UPV), in the first two years of Mathematics subjects.

This new approach has brought out an increasing interest from engineering students by motivating them to work subjects of Mathematics in Aerospace Engineering [9]. Our lab practice flipped methodology has made an intensive and extensive use of the educational platform PoliformaT to provide the student the necessary material to prepare in advance the class, apart from the traditional text books. Most important is their awareness in the fact of their prominent role in their learning process.

The Technical University of Valencia designed a questionnaire to be answered by all students following a flipped class methodology. In this paper we will present the perception of students on this methodology including their perspective on whether it might be extended to other subjects.

2 RESULTS AND STUDENTS' FEEDBACK

We will then present the results of the surveys conducted which were answered by 38 out of the 119 sophomore students.

The questions were from very different nature to embrace the maximum scope about the methodology applied. In this section we will discuss the more relevant ones concerning the flipped classroom methodology in general and in particular related to their Maths lab practice. A relevant issue is the development of several transversal competencies.

Regarding the methodology and the competencies we have obtained the answers gathered in Table 1.

Table 1. Results of the poll question about assessment at lab sessions.

Competencies	Not Developed	A little bit developed	Developed	Enough developed	Completely developed
Understanding and integration	15,79%	7,89%	34,21%	21,05%	5,26%
Application and practical thinking	5,26%	15,79%	23,68%	31,58%	15,79%
Analysis and problem solving	7,89%	10,53%	21,05%	28,95%	23,68%
Critical thinking	26,32%	10,53%	23,68%	21,05%	2,63%
Permament learning	15,79%	13,16%	15,79%	34,21%	10,53%

From the above, it follows that in the students' opinion, the most developed competencies in the Mathematics lab practice have been Analysis and problem solving (74%), followed by Application and practical thinking (71%) and Permanent learning (61%).

It can be readily appreciated that, however, the variety of responses is very uneven in reference to other competencies. At this point we can say that the appreciation of a student to the list of competencies is quite subjective, as he/she may or may not appreciate that certain activities are aimed at improving one competency in particular.

From the beginning of the year, we have been pursuing to develop the competence of analysis and problem solving, because it is one of the competencies most related to the subject and more easily developed on a daily basis. The good results obtained in relation to the objectives encourage us to continue improving in this line.

One of the main objectives of the methodology is to encourage participation in class. In this regard there were some questions concerning their preparation, participation, reward and relative timing required from their part.

Their answers are gathered in Figure 1.

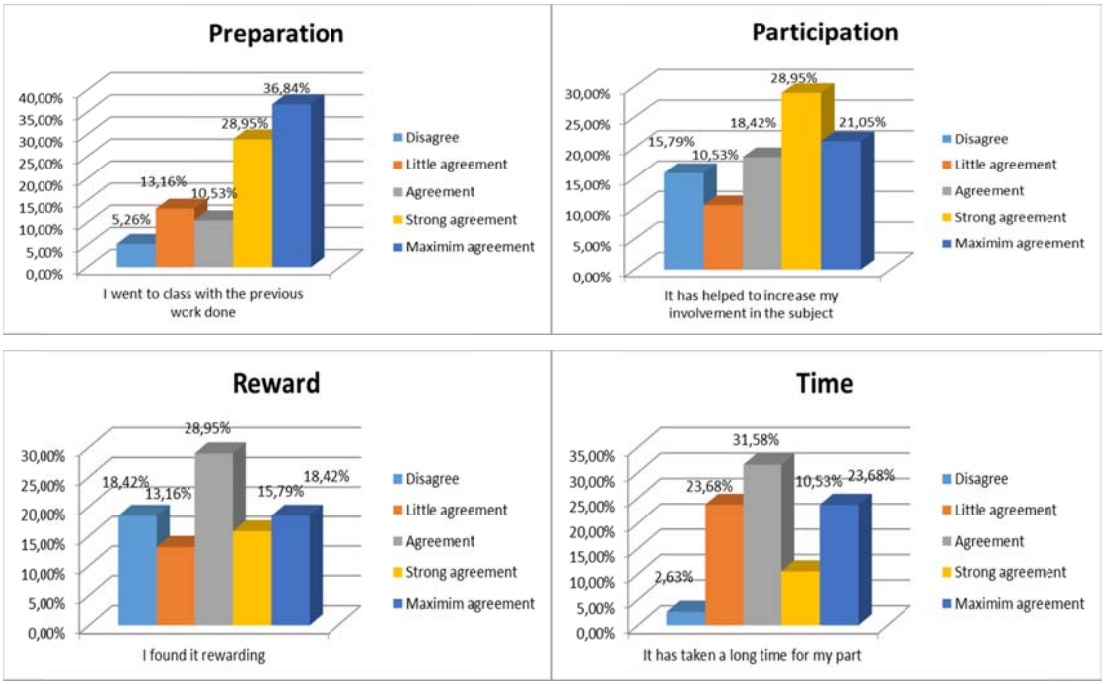

Fig. 1. Result of the Poll about assignments during the course.

As can be seen a 76.32% of students have performed the home tasks and 68% of students think that this has helped them to increase their involvement in the subject, resulting rewarding to 63.16% of respondents despite that there is a 65% of students think that this method took a long time this process.

One of the goals we set is that the methodology allows the student to better prepare for evaluation. However, the results show that only 52% think that it was really helpful. On this point it will be necessary to comment on the findings.

Concerning the development of the classes, *Table 2* collects the answered.

Table 2. Results of the poll question about assessment at lab sessions.

What liked most	Disagree	Little agreement	Agreement	Strong agreement	Maximim agreement
Materials provided by the teachers	21,05%	18,42%	18,42%	26,32%	7,89%
Activities performed at class	15,79%	2,63%	39,47%	23,68%	10,53%
Activities performed at home	28,95%	21,05%	18,42%	21,05%	2,63%
Close relationship with the teachers	26,32%	13,16%	15,79%	21,05%	18,42%
Relationship with my mates	13,16%	7,89%	18,42%	18,42%	31,58%
Assessment method	23,68%	10,53%	31,58%	15,79%	10,53%
Preparation of the subject (Teacher)	15,79%	18,42%	15,79%	21,05%	21,05%

From Table 2 it follows that students have appreciated the materials used and the activities performed. However, it is clear that the students did not like specially the assessment method which consisted of weekly tests done with Mathematica through PoliformaT, plus an individual exam at the end of the semester.

Regarding the opinion of the students about this new methodology, they were asked several questions, one of them, question Q8, being the satisfaction with the methodology. Another question, Q9, was intended to know if they thought that they would recommend this methodology and, finally, question Q10 addressed the issue of whether they would like to participate with this methodology in other subjects.

Results are displayed in the Figure 2.

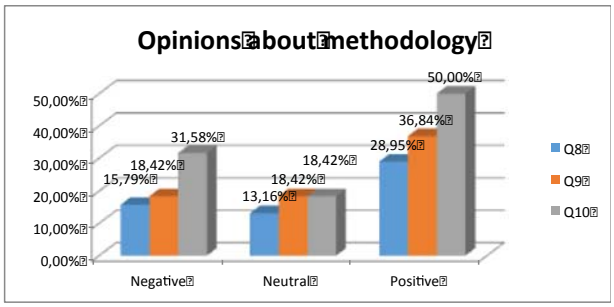

Fig. 2. Results of the Poll about FLIP: Q8 satisfaction, Q9 recommendation; Q10 extension to other subjects.

Apart from the questions from the survey, they students had the chance to express their opinions in no more than 400 characters.

In their answers we found very few opinions which in fact differed one from each other. We would like to highlight one of these opinions: “Despite the fact that the previous tasks helps to prepare the lab sessions, this methodology’s objective is to strengthen and helping the theoretical part. I think this methodology is appropriate for a subject as Mathematics”.

3 CONCLUSIONS

For some years, in the courses of Mathematics II and III we have been adapting laboratory sessions to a flip-teaching methodology with good results. Several articles have been published on the student’s academic results obtained when this type of methodology is applied. However, the implementation of a new educational methodology such as this one has allowed us to collect the opinions and assessments that are sophomores. Their opinions are important because such students already have experience several methodologies at the university and are able to detect the strengths and weaknesses of them.

The results show that the trend is to a significant appreciation, although they felt critical on some aspects of the implementation process.

During this course it was our objective to strengthen some transversal competences that are part of their education. The type of methodology is determining to the competency we want to develop. In our case Analysis and problem solving it has been the most relevant one and students have perceived it more strongly.

These surveys and opinions have led us to a critical analysis of the results we have obtained so far. Several minor corrections have proved necessary during the implementation process.

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