FLIPPED LEARNING IN A MARINE ENGINEERING SCHOOL. A SUCCESS STUDY

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Abstract

During the last years, numerous methodologies and pedagogical techniques have been implemented and supported in the educational platform Moodle, as a main tool for learning management system. A few examples are collaborative learning, team work, educational videos, which guides the implementation of cross-disciplinary skills, with remarkable success of acceptance by students.

The objective of this paper is to improve the development of knowledge and experiences of the students through Flipped Learning strategies, taking advantage of another resources more widely spread among the technical subjects, as for example the Just in Time Teaching.

In this paper it is explained a Flipped Learning project where it is combined different efforts prepared by a group of professors of technical subjects, based on a dynamic implementation of this teaching and learning methodology. This project will allow to extrapolate the results to other subjects in Technical University studies, as well as making appropriate comparisons between them and other lectures or studies leading to a conclusion of lesson learns:

- Academic performance, through the analysis of academic results metrics.
- Cognitive, through the assessment of the media of each test/exam.
- Student’s perception toward each subject and professors measured through surveys.

All this is performed in a highly demanding environment at the University, most accused if possible by the enormous and obvious differences between the technical subjects of an engineering School, which go beyond its own structure depending on basic subjects, from applied physics to a particular subject of Marine engineering.

As conclusion of this research, the success of the project has been directly connected to some public University issues: massive groups, absenteeism, significant percentage of little-motivated teachers to change their way of teaching, etc. This environmental condition is a real challenge for the implementation of this type of methodologies, which makes particularly interesting this type of projects seeking both, the simplification of methodological processes, and its ease application into the classroom.

Keywords: Flipped Learning, Bachelor’s and Master Degrees, Naval Architecture and Oceanic Engineering Master, research projects.

1 INTRODUCTION

Flipped Learning is a pedagogical methodology in which the orthodox concept of lecture or class learning is overturned, so that scholars are presented to the educational material before the beginning of the session, with teaching time then being used to extend and expand understanding through debate and discussion with the students fixing the questions with several activities enabled by professors.

The term Flipped Learning appeared into broad use in the 1950’s when it was popularised by Jon Bergman, Aaron Sams and Salman Khan [3]. However the Flipped Learning methodology traced back much further than the 1950’s.

In the 1990’s, Eric Mazur elaborated a model of peer instruction in which he supplied material for scholars to organise and prepare the subject before the lesson and then used the session time to inspire greater cognitive rational via peer collaboration and coach challenge. He called this just in time teaching [1].

This methodology was later extended to contain scientific foundations. At the International Conference on College Teaching and Learning in 2000 a presentation was carried out as regards The Classroom
Flip: Using Web Course Management Tools to Become a Guide by the Side [4]. It settled the flip idea and highlighted the role of Learning Management Systems in supplying tools and materials to the students before the lecture. Meaningfully, the role of the professor was formulated as enabler and coach, always staying near the students [5], [6]. Consequent examination focused on the concept of inverting the lecture space as a means of supplying a comprehensive educational atmosphere in which tailored teaching and coaching was the standard [7].

Nowadays the new technologies and methodologies move quicker and quicker, linked with the Industry 4.0, where everything is connected, where the use of smart devices and social networks are used worldwide, with a huge increase of online content creation, teamwork, partnerships and supply tools provide specialists with an open toolkit for supplying Flipped Learning. Video making (as for example Webinaria or Screnvr) and dissemination tools (e.g. Youtube and Vimeo) deliver the opportunity to produce flipped content easily. Otherwise, there is a huge media library existing and available for recycle (e.g. Open University Courses) [8], [9]. Although the technology is not a requirement, there is no any doubt that the joint between this technology and the learning methodology has permitted Flipped Learning to develop a valuable supplement to the range of blended learning.

2 OBJECTIVES THAT ARE INTENDED TO ACHIEVE

The objective of this work is to explain how to implement a Flipped Learning methodology that involves different educational dynamics such as Just in Time Teaching, teamwork, collaborative learning, the use of the technology of the information and communication and educational videos, multimedia material, etc.

Due to the implementation of the Flipped Learning at the University, there are several improvements that could be implemented in education in our University, as the enhancements in peer-to-peer learning processes and self-learning-autonomous learning through methodologies with common fundamentals.

There are also progresses in evaluation processes in some of the following events related with the evaluation:

- Co-evaluation.
- Evaluation of learning.
- Performance evaluation.

The Flipped Learning methodology also allow the preparation collaboratively of teaching materials and student guides that are involved in the process, generation of multimedia material for use as Educational Open Resources (EOR) and possible fitting in courses as MOOC (Massive Open On-line Course).

As a summary, introducing the Flipped Learning may increase the quality of teaching both from the point of view of the student and, above all, from the own professors, in such a way that it facilitates their incorporation into the teaching process. It has also measured all the improvement variables associated with the UPM metrics, as well as user-friendliness and applicability for the professors, including those related to the use of English as the vehicular language of the process.

3 RESULTS

3.1 Contribution to quality improvement

The project addresses two key issues that directly result in improving the quality of the teaching-learning process of UPM students, and in their academic results (by raising the degree of motivation to acquire the knowledge to be imparted):

- Facilitate the teachers’ implementation of the indicated methodologies through duplicable procedures and successful experiences.
- Motivate the student to perform a task of immersion in the subject in such a way that it finds academic and emotional benefits that result in the improvement of their results.
3.2 Methodology

The methodology to be used during the application of the Flipped Learning will analyze the situation of seven different subjects of our University and were coordinated by the authors of this paper [2], [10], [11], [12]. There are several activities which there are carrying out during this year and following ones:

- Coordination of the different accomplishments to be carried out and their distribution among the various subjects.
- Realization of methodological experiences during the different semesters of the 2018-19 and 2019-2020 courses.
- Management of the results, including comparative information between subjects and within each subject with previous academic courses.
- Identification of several subject information for teaching purposes.
- Generation of a methodological application proposal based on each subject information identified.
- Dissemination of the results obtained and the conclusions of the Flipped Learning project.
- The following teaching materials would be elaborated:
  - Teaching guide of seven subjects with Flipped Learning methodology according to the typologies identified.
  - Questionnaire of utility for the students of the subjects in which this methodology has been applied.
  - Questionnaire of interest for the teachers of the ETSI Navales (UPM).
  - Report on comparative results between subjects and each subject with respect to past courses.
  - Report of proposed improvements in the applied Flipped Learning methodology.
  - Application guide of the Flipped Learning methodology applied with the proposed improvements for each subject type.

3.3 Monitoring and evaluation

Different follow-up meetings of the Flipped Learning methodology to be applied would be based on the control of the production of resources (teaching guides, questionnaires and supporting documents) indicated by those responsible for each part of the Flipped Learning methodology, according to the deadlines established in the first project meeting once approved.

The measurement of results would be made after the completion and final delivery of the documents for analysis and approval by the authors, who would be met monthly to verify the degree of progress of the project and the results thereof.

In particular, all the improvement variables associated with the UPM metrics would be measured, as well as ease of use for the student and applicability for the professors:

- Academic performance, through the metrics of analysis of academic results: efficiency, success and absenteeism.
- Cognitive, through the assessment of the average mark of each test, exercise, practice, examination, etc.
- Emotional, affective degree of the students towards the subject and the teaching staff measured through assessment surveys.

The evidences of achievement would be those associated with the final achievement of the proposed objectives by:

- The quantification of the subjects involved.
- The measurement of the improvement of the results.
- The number of surveys conducted on the total population of students.
- The quantifiable results of the surveys.
3.4 Tangible results

All the planned material will result in a tangible product that will allow, as appropriate:

- Student questionnaires: track year after year the evolution of student results in the subjects in which they pass.
- Questionnaires to the professors: follow up year after year the evolution of the degree of involvement of the professors in the implementation of the Flipped Learning methodologies proposed by the authors.
- Teaching guides: adjust the current teaching guides to the proposed Flipped Learning methodologies.
- Guide for the implementation of Flipped Learning methodologies to engineering subjects according to their typology.
- Facilitate the implementation of the proposed Flipped Learning methodologies and improve the experience of the professors in its use while improving the teaching experience and the results obtained by the students.

4 CONCLUSIONS

The triumph and success of the Flipped Learning strategies are directly associated to some of the University concerns. One of them are the students, who are expecting the conventional mode of lecture-based teaching might find the sudden implementation of a new model disorientating. The importance of setting expectations and priming students for active student-centred learning, in which they will be expected to manage their own learning in a more proactive way, is crucial. In addition, some teachers may find that the shift in their role from presenter to facilitator is challenging and requires the development of new competencies.

ACKNOWLEDGEMENTS

This project is a reality thanks to the involvement of some professors of the Marine Engineering School (ETSIN) and the funding of the Technical University of Madrid (UPM).

REFERENCES

