A pilot study on a MOOC-based flipped class: Students' adoption and learning outcomes

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Abstract: MOOC-based flipped courses are a new educational trend that has been on the rise over the last few years. This paper presents the results of a case study about students' adoption and learning outcomes of a MOOC-based blended learning experience, specifically through the flipped-class methodology. We define blended learning as the combination of face-to-face activities with technology-supported activities in student-centered learning environments where the teacher's main role is to encourage students to be active seekers of their own knowledge instead of spoon-fed learners. The preliminary findings suggest that a MOOC-based flipped course is an appropriate solution to promote learning, collaboration among peers and class participation.

Keywords: MOOCs, Higher Education, Pilot Study, Adoption, Learning Outcomes.

1 Description of the Pilot Study

The study was conducted on a mandatory third-year course on Organizational Behavior in the School of Engineering at Pontificia Universidad Católica de Chile with a sample of 316 students, divided into a control group of 148 students and an experimental group of 168. The pilot study lasted an entire semester (20 classes).

Two research questions were addressed: (RQ1) How is the students' adoption of the blended learning methodology? and (RQ2) What are the effects of participating in the MOOCs in terms of students' learning outcomes?

1.1 Methodology

We used several data gathering techniques for capturing data in and beyond the classroom, and analyzed the data according to three metrics to evaluate the research questions addressed: (1) online metrics, to understand student's use of the Coursera MOOC course; (2) Classroom metrics, to understand students' activities within the classroom; and (3) Success metrics, to measure the effects of the experience in terms of students' learning outcomes.

Online metrics were calculated by analyzing the students' movements in the MOOCs from the beginning to the end of the study to understand the activity patterns in the different periods. This data was given by Coursera's log-files that registered students' interactions with the Coursera course content. We also analyzed the students' interactions with the videos, readings and the exercises (quizzes and other activities) and organized the students into different groups as active, medium-active and non-active according to the number of interactions registered in the platform. A challenge we encountered in this task was that sorting and putting the data in order is a difficult job because the platform's log files are not easy to work with.

Classroom metrics were calculated by using different student surveys. First, students answered an online Active Learning questionnaire at the beginning and at the end of the semester (pre/post). This was a self-reported survey composed of 42 questions to capture students' active learning abilities before and after the flipped class learning experience. Also, given that students worked in class in groups of eight, every week, where they gave feedback to their peers regarding the team work through an online peer-evaluation survey. Both of these surveys' answers were used to better understand

student's behavior in the flipped classroom. A challenge we encountered in this task was that sending out the co-evaluations every week and sorting the replies was a very tedious job.

Success metrics were calculated by analyzing all the course grades of both control and experimental groups. The course evaluations were the same for both groups and were taken on the same days. A challenge we encountered in this task was that creating evaluations that did not favor one group or the other was very difficult, given that, although the contents that were being taught were the same, the teaching methodologies were completely different.

2 Preliminary results and lessons learned

Preliminary analysis of the data shows the following. First, **the blended learning experience through a flipped course has a positive effect on student's first course exam grades**. In the first course exam, the experimental group obtained significantly higher scores than the control group. We estimated the effect of students' general knowledge in their performance on this exam through a nearest-neighbor-matching statistical analysis and a propensity-score-matching analysis, and the results were statistically significant as well.

Second, **the difference between the control group and the experimental group in the rest of the course evaluations is not as promising as the first evaluation**. This fact needs to be double-clicked to better understand what happened (changed) throughout the semester between the groups (did the control group improve its performance or did the experimental group decrease theirs?).

Finally, **students' movements in the MOOC decreased through time**. This can can either mean that students gained a better understanding of how to study for the course, being more efficient as the course advanced, or they came to conclude that the MOOC wasn't as useful as expected.

3 Future work

This pilot study provided a lot of data that has yet to be analyzed. Therefore, future work will consist of a deeper analysis of all the data that was gathered in order to obtain important results in student's instructional technology adoption and in students' learning outcomes.

Regarding student's adoption, we expect to observe that (1) at the start of the semester, students struggle with the new teaching methodology, but manage to adopt it successfully as the course evolves, and that (2) although all the content of the course is available in the MOOC from day one, students access the content sequentially, in parallel with the face-to-face course curriculum.

Regarding student's learning outcomes, we expect to observe that (1) students who were more active in the MOOC show better scores on the course evaluations than those less active, and that (2) the experimental group obtains better scores in the course's evaluations than the control group.

4 References

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