Assessing the performance of Massive Online Open Courses: does strategy matter? An empirical case study of POK (PoliMi Open Knowledge) experience, 2014/15 (0238)

Tommaso Agasisti, Giovanni Azzone, Alice Bertoletti, Mara Soncin
Politecnico di Milano, Italy

Background and research questions

The MOOCs (Massive Open Online Courses) have become one of the main challenges for the higher education. The relevance of this new tool for digital learning is related with its major features: (i) courses are "massive" (i.e. allowing scalability), (ii) open to everyone interested in a topic, and (iii) available online just thanks to an internet connection and a digital device. Massive Open and Online Courses (MOOCs) are then an example of "disruptive innovation" that could revolutionize education as we know it (Christensen & Eyring, 2011). This research is focused on the MOOC platform developed by Politecnico di Milano, the first Italian university to develop its own portal: POK (PoliMi Open Knowledge). This online platform has its own unique strategy: not as a substitute to traditional education but as a "support", by facilitating, or actually "bridging", the transitions at key stages of the educational path – from high school to university, from bachelor to master degree, from university to the work environment: "*MOOCs to bridge the gaps*" (Politecnico di Milano, 2015).

The case of Politecnico di Milano represents a significant opportunity of research, thanks to its high international reputation[1], its technical/engineering background and, as said, its explicit strategy. Furthermore, a considerable benefit of focusing the research on POK platform is the availability of a large number of data concerning, not only POK users, but also all Politecnico di Milano students.

In the context of the MOOCs offer provided by Politecnico di Milano through its platform POK, this study wants to examine the following research questions:

1. Who are the users of the POK platform? Is it possible identify a particular pattern related to each MOOC typology provided through the platform?

    1.a What is the distribution of the retention rates for POK users? Which factors can predict course completion?

2. Which are the effects of using MOOC on the students' academic performances (i.e. reduction of dropout, number of formative credits acquired, grades, etc.), after taking into account their individual characteristics?

The research addresses the first research questions (1 and 1.a) using data from the entire population of POK platform. Regarding the second research question, we focus on the students enrolled at three different MOOCs, one of "From Bachelor's to Master" (FinAccount101), the other three of "From

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1 QS Ranking 2015: the QS World University Rankings proclaim the Politecnico di Milano the top Italian university both in the general category as well as in its vocational area, Engineering & Technology (Politecnico di Milano, 2015).

High School to University" (MAT101, FIS101 and FIS102) – the reason of the choice stems from the direct relationship between these MOOCs and subsequent PoliMi's courses taken by students.

A key innovation of this paper is the emphasis put on the *strategy* outlined to develop MOOC platform. Some researches had analysed the effects of MOOC's characteristics on MOOC's achievements; others had measured the effects of MOOC's achievements on students' performances. The present paper extends the literature, aiming at giving a more direct empirical measure of relation between design characteristics of MOOCs and students' academic performances.

Hypotheses of the research

Some existent contributions have investigated the factors that could predict a high retention rate in the context of MOOCs. Adamopoulos (2013) stated through his study that student characteristics such as gender and prior education were not related to likelihood of completion. Different results come from Greene *et al.* (2015); they indeed found some statistical significant factors associated with the decreased of dropout, such as increase in age, level of schooling, work experience of MOOC topic, prior MOOC experience, commitment to earn certificate. Furthermore, the student engagement with other students in the discussion forum seems to be a significant factor that decrease the likelihood of dropout (Breslow *et al.,* 2013; Yang *et al.*, 2013). Summarizing, our hypothesis is

- *HP_01: the strategy used to design the POK platform has a significant impact on the MOOCs results, and could be a significant factor in obtaining higher retention rates.*

[Figure 1] around here

The second research question deals with the measurement of the effects of using MOOCs. Our purpose is to offer an empirical analysis, not only of the impact on the MOOCs' performances (i.e. the success of the POK initiative), but also on the academic performances of students. Our hypothesis is that the effect on the performances will be different relating to different student's purpose. In order to support this hypothesis, we analyse students distinguishing three different categories: (i) Students using MOOCs for the enrolment test preparation, (ii) Students using MOOCs for the academic exams preparation, and (iii) students using MOOCs for pass the OFA exam[2]. According to the Politecnico di Milano's strategy of POK delivery, we expect to find a positive correlation between using MOOCs and the students' performances in the academic course, concerning the same topic developed in MOOC. In this case, our hypothesis is:

- *HP_02: students who attend a POK course do obtain higher performances (i.e. higher grades) in discipline-related courses that they attend in their subsequent studies at Politecnico di Milano (both bachelor and master courses).*

Methodology

Moving from prior literature (e.g. Yang *et al.*, 2013), the approach that better fits our data in approaching the first research question is a probit model. This allows to investigate the marginal

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2 OFA: Obblighi Formativi Aggiuntivi (additional educational obligations). OFA exam occurs when students fail one of two parts in the selective test that all the students must participate to, before enrolment.

effects related to different groups of variables, regarding course's characteristics and users' individual behaviours. Through this analysis, we can better understand which factors of the courses' design are systematically correlated with the students' ability of succeeding at them.

In order to answer to the second research question, we use a Propensity Score Matching (PSM) approach. Through a PSM technique, we can compare the performance of "treated" students (those who enrolled in the MOOCs), with that of "untreated" ones (those who did not attend the MOOCs). Thanks to a set of control variables about students' background, it is be possible to compare "treated" students with "untreated" ones, in order to obtain only the effect related to POK attendance.

References

Adamopoulos. P. (2013). What makes a great MOOC? An interdisciplinary analysis of student retention in online courses. In Proceedings of the 34th International Conference on Information Systems (ICIS). AIS, 2013

Breslow, L., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. Research & Practice in Assessment,
8.

Christensen, C. M., & Eyring, H. J. (2011). The innovative university: Changing the DNA of higher education from the inside out John Wiley & Sons.

Greene, J. A., Oswald, C. A., & Pomerantz, J. (2015). Predictors of retention and achievement in a massive open online course. American Educational Research Journal, 0002831215584621.

Politecnico di Mialno. (2015). Polimi open knowledge: MOOCs to bridge the gaps. http://www.metid.polimi.it/en/polimi-open-knowledge/

Yang, D., Sinha, T., Adamson, D., & Rose, C. P. (2013, December). Turn on, tune in, drop out: Anticipating student dropouts in massive open online courses. In Proceedings of the 2013 NIPS Data-driven education workshop (Vol. 11, p. 14).

Figure 1. Paper's hypotheses (HP_01) about the performance of various PoliMi's MOOCS