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Perception and performance in a flipped Financial Mathematics classroom

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ABSTRACT

The “flipped” classroom model is a new organizational design for the teaching and learning paradigm, as its name transmits, stands for the pedagogical switch of the traditional academic procedure as students' first contact with the subjects is made outside the “four-wall classroom bounds”. Teachers' role is transposed into a kind of guide and facilitator, indicating the way to go, avoiding to walk in a parallel path, or even ahead, but indicating the way to go, motivating students in their own knowledge construction, letting them lead the way, following and supporting, constantly and carefully monitoring their learning outcomes. Classroom time is consumed with open discussions, solving tasks and application problems, clarifying the supporting fundamentals, in order to improve students' engagement into their learning process in a collaborative environment. A flipped model was implemented into a Financial Mathematics Course at ISCAP and the sample of our study consisted of 803 students, enrolled in 2014, 2015 and 2016. The main purpose of this paper is to investigate how the incorporation of the flipped classroom model into a Financial Mathematics class, affected students' class training, learning, and achievement. The results obtained with this approach have shown a positive impact on students' achievement overall.

1. Introduction

It is commonly accepted that the “Flipped Classroom Model” was born, in the year 2000, by the hands of (Bergmann & Sams, 2012). These two chemistry teachers, lecturing then at the Woodland Park High School in Colorado, had to deal with high absenteeism rates, which promoted failure and the drop of students' success in their classes. Trying to deal with this issue, they started to record their lessons and display them online, offering students an open access to classes, outside the classroom walls, anytime and anywhere. This has led them to question whether class time was, in fact, the best way to “transmit” all the basic and supporting information to students at all. In this sense, Bergmann and Sams became dedicated to prerecording their “live” lessons for review outside the classroom, leaving class time for more significant learning activities, promoting a more natural approach of more advanced and difficult concepts (Bergmann & Sams, 2014). In this way, the central idea is based upon the “inversion” of the traditional teaching paradigm, where the main phases of the teaching and learning process such as classroom activities and homework are reversed. The flipped classroom is then settled as a different course organization, where instructional content (e.g., pre-recorded video lectures, readings, online presentations, sample applications) is assigned as “homework”, to be analysed before coming to class,

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and in-class time is spent working on problems, advancing deeper concepts, and engaging in collaborative learning (Findlay-Thompson & Mombourquette, 2014). The flipped classroom may contain a large array of out-of-class activities, as mentioned, and in-class activities may also include a wide type of activities such as role-play, debates, quizzes, and group presentations, amongst many others (O'Flaherty & Phillips, 2015).

Confronted with this pedagogical teaching methodology, as theoretical/supporting materials must be provided as a “pre-class” tool for students to take and analyze individually, it is essential to examine what “kind” of materials promote students' engagement, as they must be responsible for class preparation. In this sense, with all these inherent changes, instructors have been forced to adapt fast to this reality, creating and developing an extensive variety of tools to grab student's attention and to motivate them to support the knowledge in their own learning process enthusiastically. One of the most engaging resources is the use of video lectures, since, through them, instructors can provide multifaceted information to students and, if used creatively, videos can become a powerful technological tool in the global and self-enrolment educational process (Soares, Lopes, & Vieira, 2015, pp. 435–440). One must note that video lectures are different from other teaching and learning technologies as allowing the benefit of using visual perception - “that powerful but neglected sense” (Moss, 1983) - in new ways. The image associated with movement can be vital to realize a specific process or understand how something works, moves, or performs, which is much more complex to transmit with static images or text.

This and several other materials, were developed from the scratch when implementing a Flipped Model into a Financial Mathematics Course, in the Bachelor Degree of Accounting and Management from the School of Accounting and Management (ISCAP), one of the eight schools of the Polytechnic of Porto (P. Porto), a Portuguese HEI with more than 20.000 students, teachers, and researchers, within the Porto metropolitan area. This flipped classroom model was used as a pedagogical teaching strategy to be tested for future purposes and kept its global traditional format in a control group. In this paper, we try to establish the eventual relations that such strategy takes with active learning practices and discuss its success, analysing how flipping may influence student's achievement and contribute to a better and fruitful engagement in this course.

2. Literature review

Even though there is no single model (Tucker, 2012), the Flipped Classroom also known as the “Inverted Classroom” is frequently characterized as a procedure driven by technological innovations and the facility to share content online (Albert & Beatty, 2014; Berrett, 2012; Garver & Roberts, 2013; Kim, Kim, Khera, & Getman, 2014; Rivera, 2015). Many authors compare the flipped classroom model with the traditional classroom setting and examining the potential benefits of this pedagogical practice and show the results of their studies comparing the impact of a flipped classroom to that of a traditional one. Some of these studies reveal a positive impact of the flipped model since the enrolled students tend to score significantly higher than students in the traditional classroom (Albert & Beatty, 2014; Berrett, 2012; Rivera, 2015). The flipped classroom calls for students to learn by themselves at home using all the available and diverse learning resources. Basic course content is given outside class, allowing students to study the material and apply the concepts to several settings and actively participate in class, promoting effective classroom discussions (Gilboy, Heinerichs, & Pazzaglia, 2015; Lemmer, 2013; Schlairet, Green, & Benton, 2014). In a flipped model, the first step in knowledge transfer process can be readily accomplished by each individual student out of the classroom, and thereby leaves class time to focus on more in-depth and complex learning and skill sets (Arnold-Garza, 2014). The theoretical strong point of this new pedagogy seems to be the combination of constructivist and behaviourist learning theories working together, in a constant interaction (Bishop & Verleger, 2013). According to (Bishop & Verleger, 2013) the flipped classroom approach is “an educational technique that consists of two parts: interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom” (p. 5). Is a learning model which aims to increase students' active learning, collaboration and support during the learning process, through a better allocation of teaching time (Bergmann & Sams, 2012). In particular, this model suggests that teaching time within the face-to-face school sessions should not be spent on teachers' lecturing, but instead should be invested to provide students with unique learning experiences within collaborative activities with their classmates as well as receiving support by their professor (DeLozier & Rhodes, 2017). To achieve this, Learning Management Systems (LMS) as well as educational material (e.g., video lectures and online quizzes) can be used to engage students study “at home” and self-assessment, before their school classes. Thus, the principal idea comes from reversing the traditional teaching paradigm, where the main phases of the teaching and learning process, such as classroom activities and homework, are reversed.

As previously stated, pre-recorded video lectures or screencasts are one of the most common means of delivering instruction outside the classroom, in a flipped classroom format, requiring students to watch these prior to attending class (Abeysekera & Dawson, 2015). Video lectures can present in a clear and striking way descriptions to articulate tacit information and knowledge hard to describe through text (Goodyear & Steeples, 1998). Since the lecture is such a great portion of a class (even within the flipped classroom), it seems rational to observe whether pre-recorded lectures have any impact, negative or positive, on learning. In (Bravo, Amante, Simo, Enache, & Fernandez, 2011) we can find a study where “the effect of the use of videos for assessing the enhancement of students' learning motivation” is explored. Nowadays HEI are trying to get the best students and students search for the best learning experiences, so flipped classroom and, in this sense, the use of video lectures may be a particularly attractive tool to these students. Following this thought, HEI face some important challenges: support and offer high-quality engaging video lectures with the lowest possible budget and create and sustain innovative video platforms more interactive for students. This strategy, according with (Bergmann & Sams, 2014), aligns well with the flipped classroom, where “we don't want to encourage passive viewership; we encourage interactivity.” Even Harvard University, ever the academic benchmark, has succumbed to the allure of the flipped classroom. One Harvard physics professor not only employed the flipped model but has also developed an accompanying site entitled

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