MIXING A MOOC WITH FLIP TEACHING IN A TRADITIONAL CLASSROOM

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Abstract

MOOCs (Massive Open Online Courses) have been around us since 2008, when around 2,300 students took part in a course called “Connectivism and Connective Knowledge”, organized by the University of Manitoba (Canada). However, 2012 was widely recognized as “The year of the MOOC”, because some MOOC initiatives, such as Coursera, Udacity, or edX, gained a world-wide popularity. Many experts consider MOOCs a “revolution in education”. However, other experts think is too soon to make such a claim and MOOCs still have to prove their real value. Unfortunately, there are not many research studies on MOOCs.

In this paper, we present some lessons learned from our MOOC on XML (extensible Markup Language). Some features our MOOC included were self-paced learning, an online discussion group, and assessment of learning students progressed through the course. We used Google CourseBuilder as LMS (Learning Management Systems). In our MOOC we had two types of students: official on-campus students and unofficial off-campus students. On-campus students were taught using a blended learning method: a combination of traditional face-to-face classroom with online learning.

Apart from the data gathered from the LMS, we conducted two online surveys to better understand how students learnt. The goal of our study was to discover if there was any correlation between the subject perception of the quality of the course and the learning style of each student.

Firstly, students answered an online survey which goal was to measure the quality of the instructional material. Students had to assess the quality of the audio and the video image, the duration of the videos, the content of the videos, and the difficulty of the quizzes. This survey was a 13-item questionnaire.

Secondly, students answered the Index of Learning Styles, an online survey based on the learning style model formulated by Richard M. Felder and Linda K. Silverman. This model is used to categorize students’ learning styles based on the selection of some preferences from a group of four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global). This survey was a 44-item questionnaire. In this paper we present the results and the conclusions of our study.

Keywords: MOOC, on-line learning, quality assessment.

1 INTRODUCTION

Without a doubt, the year 2012 will be remembered as the year of the MOOCs, the year of the Massive Open Online Courses [1]. Revolution, disruption, earthquake, tsunami, shock, the future of education or the end of an era were some of the adjectives that accompanied the news about MOOCs that appeared in the mass media during that year. In addition, people like Sebastian Thrun, Peter Norvig, Anat Agarwal, Andrew Ng, and Daphne Koller, until then only known in limited circles, became internationally famous, and companies like Coursera, Udacity, and edX day were created allt at once with a strong investment by universities or venture capital funds. MOOCs caught the whole international educational community by surprise.

The MOOCs have been described as a "revolution in education" and the truth is that, if they meet the expectations that they are creating, they will mark the biggest change in the way people teach and learn from the past 500 years.

But what is a MOOC? So far, MOOCs do not differ much from online courses that have existed for years: a syllabus (with course objectives and expected outcomes), a calendar, some educational materials (mainly videos, but also lecture notes and assigned readings), some activities or projects, some quizzes and exams (usually multiple choice exercises) to assess students’ learning, and a forum to discuss with the teacher and other students. So why have MOOCs generated so much interest?

Their main interest lies not so much in the courses that are being offered, which are very interesting courses of high quality, but in the huge demand of people wanting to learn that has emerged thanks to them: MOOCs have discovered that there are millions of people around the world eager to learn.

In our society, the society of information and knowledge, knowledge needs are increasing, which causes a massive need of learning and training. These huge learning needs are part of the “lifelong learning”. This massive need for learning and training has been demonstrated by the successful enrolment that many MOOCs have had.

The first MOOC that really had an amazing success was the course "Introduction to Artificial Intelligence" organized in autumn 2011 by Sebastian Thrun, a professor at Stanford University, and Peter Norvig, Google's research director. Some 160,000 people from all over the world signed up for this course on artificial intelligence. The next MOOC that was very successful was the course "Circuits & Electronics" in the spring of 2012, organized by the Massachusetts Institute of Technology (MIT). In this course, more than 120,000 people signed up. The unexpected success of these two courses was the trigger for the current MOOC mania. But what lies behind these staggering numbers? A fashion? A paradigm shift in education?

In this paper, we present some lessons learned from our MOOC on XML (extensible Markup Language). This MOOC is based on a subject of the Master in Application Development and Web Services of the University of Alicante (Spain).

Our MOOC had two groups of students: 30 tuition-paying students from de University of Alicante (official students), and 300 students from the general public who took the online class free of charge (non-official students). With official students we applied the flip teaching or flipped classroom method. Official students had to enrol in the MOOC as the rest of the non-official students and they had to view all the videos and do all the online activities outside of class time. Therefore, we did not have to impart the initial lessons of the subject. This allowed us to have more time inside the class to be used for additional learning-based activities. Besides, we could spend more time interacting with students instead of lecturing.

Apart from the data gathered from the LMS, we conducted two online surveys among the tuition-paying students to better understand how students learnt. The goal of our study was to discover if there was any correlation between the subject perception of the quality of the course and the learning style of each student.

The goal of the first survey was to measure the quality of the instructional material. Students had to assess the quality of the audio and the video image, the duration of the videos, the content of the videos, and the difficulty of the quizzes. This survey was a 13-item questionnaire.

The second survey was the Index of Learning Styles [2], based on the learning style model formulated by Richard M. Felder and Linda K. Silverman [3]. This model is used to categorize students’ learning styles based on the selection of some preferences from a group of four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global). This survey was a 44-item questionnaire.

In this paper we present the results and the conclusions of our study. The rest of the paper is structured as follows. In section 2, a brief introduction to MOOCs is provided. In section 3, the flip teaching or flip classroom, the form of blended learning used with our official students is presented. In section 4, the results of the first survey aimed to measure the quality of the course are presented, whereas in section 5 the results of the second survey regarding the learning styles are presented. Finally, the main conclusions are summarized in section 6.

2 WHAT IS A MOOC?

The MOOCs have just born and, therefore, are in a process of transformation and settlement and nobody can categorically say what a MOOC is. But in some way, MOOCs are the natural evolution of OpenCourseWare, first created by the Massachusetts Institute of Technology (MIT) in 2001 [4]. Therefore, it does not surprise that the MIT also leads the development of MOOCs, first with MITx [5], and then with edX [6].

The first online course that received the name of MOOC was the course "Connectivism and Connective Knowledge" designed by George Siemens and Stephen Downes at the University of Manitoba (Canada) in 2008. In this 12-week course, 24 fee-paying on-campus students and approximately 2,200 students from the general public were enrolled [7]. Obviously, this course did not

have the same success as current MOOCs, but it paved the way for the current MOOCs. The term MOOC was coined during this course by Dave Cormier, from the University of Prince Edward Island (Canada). At the beginning, the first MOOCs had a strong and deep collaborative philosophy (cMOOCs), but this philosophy has evolved to a commercial sense (xMOOCs) [8].

In “The MOOC model for digital practice” [9], a clear definition of a MOOC can be found:

A MOOC is an online course with the option of free and open registration, a publicly-shared curriculum, and open-ended outcomes. MOOCs integrate social networking, accessible online resources, and are facilitated by leading practitioners in the field of study. Most significantly, MOOCs build on the engagement of learners who self-organize their participation according to learning goals, prior knowledge and skills, and common interests.

However, it is not entirely clear when a course is or is not a MOOC, but there are a number of features that are typically required for a course to be considered a MOOC:

- **Course**: It should have some learning objectives to be achieved by students after certain activities within in a given period of time (therefore, it should have a beginning and an end). In addition, it should have some quizzes and exams to assess the knowledge acquired by students. And there should be some kind of interaction between students and teachers in every possible way (student-student and student-teacher).
- **Open**: Open has several meanings in MOOCs. On one hand, the course should be open to everyone and should not require some prerequisites such as possession of a qualification or a level of performance in earlier studies. On the other hand, the access to educational resources (videos, lecture notes) should be free (but other things, like being able to ask direct questions to the teacher, the correction of the activities, or obtaining a certificate at the end of the course may have an economic cost). “Open” is also often interpreted as it does not make use of a closed learning platform, but educational resources are hosted in different places like websites, blogs, wikis, or multimedia repositories. Finally, "open" is also often interpreted as the course makes extensive use of open content, and in turn, content generated by the course is also published open so it can be reused by others. This latter interpretation of "open" is the least fulfilled nowadays, as the most successful MOOCs are organized by companies, such as Coursera or Udacity, who have little interest in sharing their courses open.
- **Online**: The course is done remotely via the Internet and does not require physical attendance at a classroom. This feature is essential for anyone from anywhere in the world with an Internet connection can participate in these courses.
- **Massive**: It should allow access to a very large number of students, much larger than a face-to-face class, or a traditional online course. In addition, the course should be prepared to accept changes in the number of students in several orders of magnitude, for example, going from 1,000 to 100,000 students, without a major problem for operation.

3 FLIP TEACHING

Since nowadays all of the content of a course can be easily delivered to students online, students can absorb this content whenever they want and listen to it or read it as many times as they need. The actual classroom time can be used to solving out problems or discussing some topics, and there the professor-student interaction should be all about. It is obvious that students can get the facts from books, videos, and other educational resources, but the last part of interacting with somebody, making sure everything is properly connected and understood, should be done in the classroom. This is the idea of the flip teaching or flip classroom or inverted classroom [10, 11], an innovative way of teaching that moves the lecture outside the classroom via technology and moves homework and practice with concepts inside the classroom via learning activities.

In our MOOC, we applied the flip teaching with official face-to-face students. Besides attending the on-campus classes, official students had to enrol in the MOOC as the rest of the non-official students. Official students had to do all the activities proposed in the MOOC, such as viewing all the videos, doing all the online activities, and taking part in the discussions organized in the online forum of the course. All these activities had to be done outside of class time.

The flip teaching offered us some important benefits. We did not have to impart the initial lessons of the subject, because they were taught by online videos. This allowed us to have more time inside the

class to be used for additional learning-based activities. Besides, we could spend more time interacting with students, working one-on-one with students in class, instead of lecturing.

4 QUALITY OF THE COURSE

At the end of the course, on-campus students had to answer an online survey aimed to measure the quality of the instructional material and the possibilities of this new educational method. Students had to assess the quality of the audio and the video image, the duration of the videos, the content of the videos, and the difficulty of the quizzes. This whole survey, composed of 13 questions, is displayed in Table 1.

Table 1. Quality assessment survey

#	Question	Answer type	Mean	Standard deviation
1	How do you rate the quality of the videos? In general, all aspects of the videos as a whole	1	4,0	0,6
2	How do you rate the image quality of the videos?	1	4,5	0,7
3	How do you rate the sound quality of the videos?	1	4,3	0,6
4	How do you rate the length of the videos?	1	4,1	0,7
5	How do you rate the content of the videos?	1	3,8	0,6
6	Do you consider useful/interesting the videos of the course?	2	3,9	0,9
7	Does the number of videos have been adequate to learn the course content?	2	3,5	0,8
8	Do you consider useful/interesting the proposed activities?	2	3,9	0,6
9	Do you consider useful/interesting to provide the assignments in a video?	2	3,6	1,1
10	Do you think it is possible to independently learn with this course?	2	3,3	1,1
11	How much do you think it is possible to learn with this course?	3	3,7	0,8
12	Did you like this course?	3	4,0	0,7
13	Comments Leave any comments, ideas, suggestions or proposals that you think might help to improve this course	4	-	-

There were four types of answers (Table 2). Types 1 (questions from 1 to 5), 2 (questions from 6 to 10), and 3 (questions 11 and 12) were a 5-point Likert scale. Type 4 was an open question.

From the 30 tuition-paying students, 26 students answered this survey. The mean and the standard deviation for each question are showed in the last two columns of Table 1.

In general, students considered the quality of the course was quite good. Therefore, these results encourage us to continue working in this educational method. However, the result of question 10, “Do you think it is possible to independently learn with this course?”, the question most directly related to our educational method, was the worst with a value of 3.3 points, near to a neutral answer.

Table 2. Answers of the quality assessment survey

Answer type	Answer values
1	Very bad (1) ... Very good (5)
2	Strongly disagree (1) ... Strongly agree (5)
3	Very little (1) ... Very much (5)
4	Open question

5 LEARNING STYLES

Students have different levels of motivation and different attitudes about learning. In order to explain these differences, different models have been developed [12].

The seminal work “Learning and teaching styles in engineering education” [3] proposed a learning-style model that classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information. Based on this model, a self-scoring web-based instrument called the Index of Learning Styles [2] that assesses preferences on four scales of the learning style model was developed some years later. This instrument is a 44-item questionnaire.

In order to determine the learning styles of the students of our MOOC, we have applied the Index of Learning Styles to a total number of 24 students, and we have considered the following four dimensions of the test:

Sensing and intuitive learners: What type of information preferably perceives students?

- **Sensing**: Sensors remember and understand information best if they can see how it connects to the real world. If they are in a class where most of the material is abstract and theoretical, they may have difficulty. It is better for them to ask the teacher for specific examples of concepts and procedures, and find out how the concepts apply in practice.
- **Intuitive**: Many college lecture classes are aimed at intuitors. However, if the student is an intuitor and he/she is in a class that deals primarily with memorization and rote substitution in formulas, they may have trouble with boredom. It is better for them to ask the teacher for interpretations or theories that link the facts, or try to find the connections themselves.

Visual and verbal learners: Through what sensory modality is more effectively perceived the cognitive information?

- **Visual**: Visual learners remember best what they see: pictures, diagrams, flow charts, time lines, films, and demonstrations.
- **Verbal**: Verbal learners get more out of words, both written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

Active and reflective learners: How students prefer to process the information?

- **Active**: Active learners tend to retain and understand information best by doing something active with it, such as discussing or applying it or explaining it to others. Active learners tend to like group work.
- **Reflective**: Reflective learners prefer to think about it quietly first. Reflective learners prefer working alone.

Sequential and global learners: How students progress in their learning?

- **Sequential**: Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Sequential learners tend to follow logical stepwise paths in finding solutions.
- **Global**: Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it." Global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

When the student is balanced is due to the fact that for that dimension both features are useful for the learning process of the student.

The results obtained by our students can be observed in the following figures. We have included a figure for each one of the four dimensions analyzed

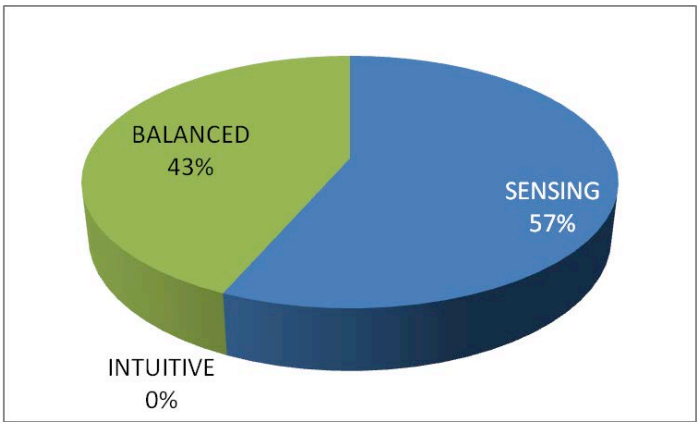

Figure 1. Sensing and intuitive learners

Regarding sensing-intuitive dimension (Figure 1), in our evaluation group, there are no intuitive learners alone, and more than half of the group are sensing students and the other half are balanced. Being balanced in this dimension is very important in order to be an effective learner and problem solver, due to the fact that if a student overemphasizes intuition, he/she may miss important details or make careless mistakes in calculations or hands-on work; whereas if he/she overemphasizes sensing, he/she may rely too much on memorization and familiar methods and not concentrate enough on understanding and innovative thinking.

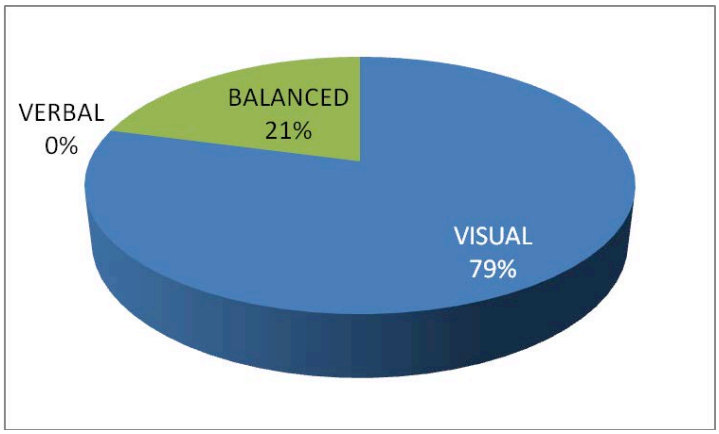

Figure 2. Visual and verbal learners

Regarding visual-verbal dimension (Figure 2), 79% of the students are visual, and none of them resulted as verbal students. So, for helping our group of students it is important to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly visual. The teacher can provide any videotapes or CD-ROM displays of the course material are available and prepare a concept map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections.

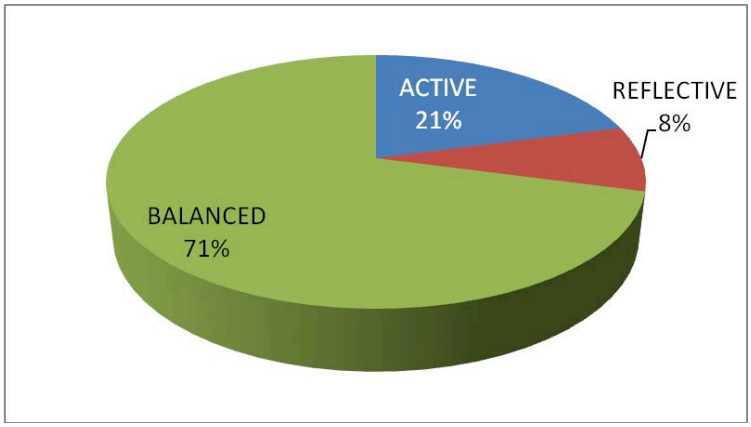

Figure 3. Active and reflective learners

In the case of active-reflective dimension (Figure 3), most of them (71%) are balanced in this dimension. This is a very interesting result because a balance of the two is desirable. If a student always acts before reflecting he/she can jump into things prematurely and get into trouble, while if he/she spends too much time reflecting he/she may never get anything done.

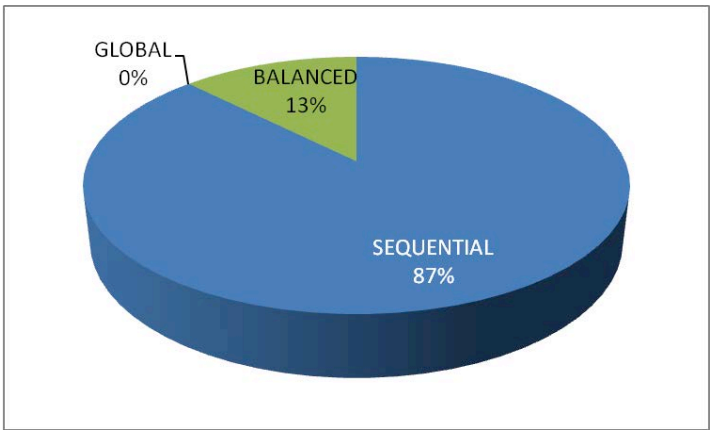

Figure 4. Sequential and global learners

Finally, for the case of sequential-global dimension (Figure 4), almost 90% are sequential learners and none of them are considered global. Sequential learners may not fully understand the material but they can nevertheless do something with it (like solve the homework problems or pass the test) since the pieces they have absorbed are logically connected.

6 CONCLUSIONS

Massive Open Online Courses (MOOCs) are open access courses that operate on a vast scale, that are available to anyone and anytime, online, and for free. During the last two years, MOOCs are proving to be extremely popular.

MOOCs can greatly accelerate the introduction of flip teaching in higher education. However, some students can be ill prepared for these new methods of teaching and learning. Therefore, the introduction of these methods should be done gradually. MOOCs can be seen as a supplement to traditional courses, rather a replacement for them. Besides, MOOCs can be a great help to meet the diverse needs of students. And opening up on-campus courses via MOOCs can benefit in-class students by producing a more diverse class for discussion and greatly improved educational resources.

However, there are also some criticisms against MOOCs. Traditional face-to-face education provides some benefits that cannot be easily replicated in online education. For example, in traditional education teachers can observe the progress of students and can help them to resolve problems

when necessary. Besides, the personal interaction is completely missed out in a MOOC. Therefore, we think a blended learning approach is the best method because it takes the best of both worlds.

Furthermore, and according to the results of our research, students believe that it is possible to learn autonomously with a MOOC, but they are not completely certain of it. Therefore, this perception confirms our idea that MOOCs can be a good complement of flip teaching.

Finally, the study of the learning styles shows that 79% of our students are visual. Therefore, MOOCs based on an extensive use of videos are a good pedagogical option for this type of students.

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