EMOOCs 2014

European MOOCs Stakeholders Summit

Proceedings of the European MOOC Stakeholder Summit 2014

Proceedings Editors:
Ulrike Cress, Knowledge Media Research Center, Germany, Chair for the research track
Carlos Delgado Kloos, Universidad Carlos III de Madrid, Spain, Chair for the experience track

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Understanding Persistence in MOOCs (Massive Open Online Courses): Descriptive & Experimental Evidence

Rachel Baker, Brent Evans, Erica Greenberg and Thomas Dee

Abstract: *One of the fundamental critiques of MOOCs is the character of student persistence and engagement in the courses for which students have registered. This study provides new evidence on this question based on unique student-level administrative data from several dozens of MOOCs offered by a major provider (i.e., Coursera). We enhance these administrative data by using IP addresses and GIS data to match enrolled students to the geographic and socioeconomic traits of their localities. We also complement the insights from this descriptive analysis with the evidence from a designed field experiment conducted in one of these MOOCs. Specifically, this experiment sought to leverage student interest in sustained persistence through a scheduling "nudge" that allowed students to pre-commit to watch the first lecture videos at a designated time of their choosing.*

Study Purpose

The dramatic and recent proliferation of massive open online courses (MOOCs) offered by selective universities has captured the attention of researchers, policy-makers, and practitioners across the global higher-education landscape. These courses provide free and open access to college courses in online environments that include recorded lectures, readings, quizzes, problem sets, and interactive user forums designed to complement student learning and foster communities. The enthusiasm surrounding the emergence of MOOCs reflects the extraordinary promise of providing entirely open access to high-quality, advanced courses both on an unprecedented scale and at negligible marginal cost.

However, close observers of the early development of MOOCs have noted that, though there is often massive enrollment in such courses, student persistence in these courses is quite low, often less than 20% (Kizilcec, Piech & Schneider, 2013; Jordan, 2013). This trend has received negative attention in the popular media but there is little evidence on what characterizes the patterns of student participation and persistence in MOOCs (e.g., superficiality of interest, mismatch of requisite skills, etc.).

This paper addresses two research questions. The first is descriptive in nature, and the second is causal. First, the paper uses micro-level course data to examine the pattern of enrollment and participation among students across dozens of MOOCS offered through Coursera. Coursera is an educational technology company that partners with 77 universities around the world (e.g. Universitat Autonoma de Barcelona, Tel Aviv University, Princeton University, Ecole Polytechnique Federale de Lausanne) to offer free, open courses online. We supplement the course participation data that we get directly from Coursera with pre-course survey data, which provide a richer understanding of student goals and intent, and with geographic and demographic information from students' IP addresses. This analysis will establish important stylized facts on student usage patterns: registration, watching course lectures, completing assignments, and earning a certificate of completion. It will also provide an in-depth look at MOOC student geography, including information on the urbanicity, wealth and education levels of the areas in which course participation occurs, an analysis which is currently lacking from the literature (Liyanagunawardena, Adams, & Williams, 2013). Finally, this analysis will also provide indirect evidence on the character of student interest and motivation in the MOOCs for which they have registered.

Second, the paper discusses a pre-commitment device experiment conducted in a science MOOC in an effort to improve persistence patterns. Discontinuities in course participation motivate our experiment; they indicate that design features may matter for persistence and that there is some student interest that is responsive to course design. Randomly assigned treatment students were asked to schedule when they would watch the first video of the first week of lecture and the first video of the second week of lecture. Students responded through an online survey, and we compare the persistence rates of treatment and control students to observe whether a scheduling commitment influences outcomes. Outcomes include watching the first lecture video of the week, completing the weekly assignments, performance, and eventual course completion and earning a certificate.

Theory

Our theory is firmly grounded in two forms of economics: human capital theory and behavioral economics. Human capital theory (Becker, 1962) suggests that students pursue higher education in order to increase their knowledge and build skills that will be useful in the labor market. We posit a theoretical model in which a student chooses to take a MOOC for the human capital production and the consumption value (non-financial private gains) taking the MOOC provides. Alstadsaeter and Sieverstsen (2009) provide a literature review about the consumption value of higher education, and of particular relevance in MOOCS are the potential to build cultural capital and the satisfaction of learning new things.

We believe that students weigh the human capital and consumption value benefits of pursuing an online course against its costs. Because there is no charge to take a MOOC, the costs are limited to psychic costs associated with exerting effort in the course and time costs associated with watching lectures and completing assignments. Students will continue to complete the course week by week as long as their perceived benefits outweigh the costs. This perspective enables us to identify the potential reasons for a lack of course persistence. If many students cease participating at the same time, we can examine the video lectures and assignments at that time to observe whether increased length or difficulty of the material may have contributed to dropping out of the course. Likewise, if many students from the same type of area cease participating, we can begin to assess the relationship between students' background characteristics and persistence.

We also incorporate lessons from behavioral economics into our experiment. The combination of demonstrated student interest (high numbers of registered students) coupled with a lack of follow-through (large dropout rates) suggests that the use of choice architecture in the design of MOOCs may provide a way to promote the human-capital acquisition of MOOC students. The second part of this study presents the results of a field experiment examining the validity of this conjecture. We focus on a pre-commitment device that asks students to schedule when they will watch the first course video of the week and report that time to the instructor. Previous work in the field has shown that deadlines imposed by the students themselves do improve performance (Ariely & Wertenbroch, 2002). Our study tests whether this phenomenon holds in a more diverse set of students in a MOOC. If such strategies are found to be effective, this very low cost strategy could be widely implemented to improve persistence across online courses.

Data & Methods

The first part of this study presents descriptive evidence on MOOC students and participation and persistence in several MOOCs. We use unique student-level administrative data from dozens of courses across a range of disciplines all fielded on one widely used MOOC platform, Coursera. This detailed micro data about individual student participation enables us to track students in every component of the course including when they watched the lecture, what they posted on forums, and when they complete assignments. This level of data provides an exceptional capability to understand the learning process in higher education at the student level.

The administrative data is available for all courses we study, but it is complemented by pre-course survey data for the one course in which we conducted the experiment. In the survey, students volunteered why they were taking the course and how they intended to approach the course (the course offered three tracks, audit, quantitative, and qualitative, which had different assignments).

In order to explore the geographic and demographic characteristics of students enrolling in MOOCs, and to examine the relationship between these characteristics and course persistence, we make use of student IP addresses. These identifiers are available for roughly 80 percent of the students participating in each MOOC. We convert these IP addresses to latitude and longitude coordinates, and map these coordinates using ArcGIS 10.1. We are able to provide a global picture of MOOC participation for all courses included in this study. For students located in about 30 countries (including France, Brazil, Switzerland, India, Mexico, Vietnam and the United States) we overlay their IP address locations onto geographic and tabular Census data available from international databases like IPUMS. These data allow us to describe the demographic and socioeconomic characteristics of areas in which course participation occurs, and to make inferences about the types of students who enroll in and complete MOOCs. Finally, we make use of international institutional data on brick-and-mortar institutions of higher education. We map these institutions alongside student IP addresses and ask whether MOOC students would be able to access in-class instruction in the absence of online offerings.

We also use IP addresses to determine students' time zones. With these data, combined with micro-level course data, we can examine patterns of activity for MOOC students in great detail. Ours is the first study that analyzes at what times of day MOOC students are most active for all students enrolled in a range of classes.

We investigate persistence patterns in MOOCs using quantitative methods. By capturing individual observations on when (and if) students watch lectures, complete assignments, and use the discussion forums, we can longitudinally measure students' changes in course participation patterns and performance. To measure persistence patterns, we build on Kizilcec, Piech, and Schneider's (2013) work which aggregates student participation at the weekly level. By using variables for day of week and week of course, as well as indicators for course features, we identify if dropouts cluster in specific weeks, if participation varies throughout the week, and if certain course features (such as email communication) are associated with increased or decreased student activity.

The experimental component of the study relies on random assignment. We randomly assigned students to a treatment group who were asked to schedule when they would watch the first lecture video and to a control group who received an inert survey question about which browser they use to watch videos. This simple design enables an easy comparison of the difference in video watching and overall persistence outcomes between the treatment and control group. We estimate this effect of this treatment using a regression framework with controls for pre-course survey response to increase precision.

Preliminary Results

We have conducted data analysis using administrative descriptive data from the Coursera courses to observe location, and usage and persistence patterns. We also have preliminary results from our experiment to examine the effect of a commitment device on persistence.

Figure 1 provides a simple example of the geographic information we are able to determine using IP addresses. This is a map of registered students in two example courses, Computer Science 101 (black) and Understanding Einstein (light red), both offered by an American university. It shows that there are clusters of students in the United States, Europe, and India and pockets of students scattered across the globe. The dark red dots on the map show the locations of IP addresses registered for both classes. We are now conducting analyses quantifying, for example: how clustered or dispersed MOOC students are in different classes; how near students are, on average, to other users in the class; if student grades and persistence patterns are clustered in meaningful ways; and what proportion of MOOC students are within 20 miles of a brick-and-mortar institution of higher education. Preliminary spatial statistical analyses of the Understanding Einstein course indicate that students are clustered geographically ($p=0.000$). Among the students in the class, students are marginally clustered with respect to completion ($p=0.091$); that is, completers are not randomly distributed among students in the class. We have also looked at differences in persistence patterns between countries. Table 1 provides summary statistics for the Understanding Einstein course. We will complement these statistics with similar statistics for regions of countries, focusing on urbanicity and demographic characteristics. Because we have data from a number of MOOCs across topics and over time, we will be able to show the relationships between these statistics and course characteristics such as topic and length.

Information from students' IP addresses has also allowed us to study patterns of activity. *Figure 2* presents an example from one course, Understanding Einstein, of the days and local times that students were active online. This kind of information could be useful for instructors trying to determine the optimal timing of course communication.

Figure 3 provides the pattern of course participation from a sample of the MOOCs in our study. Each dot represents the number of unique students who watched each lecture video. This figure demonstrates the relatively similar trends across classes: a rapid initial drop off in course participation, which gradually evens out as the course continues. However, it is clear that students drop out at differing rates across the classes. We are now conducting analyses which link the slope of the decline to course characteristics such as topic, length and number of videos. There are examples of discontinuities in the decline (e.g. in Einstein, Science Writing and Math Thinking). We analyze events (course communication, particular lectures or topics, assignments) and timing (day of week) associated with discontinuities in the trend.

We have conducted analyses of the effect of our experiment. *Table 1* displays the percent of the treatment and control groups who watched the Week 1 and Week 2 introduction lecture videos in the "Understanding Einstein" course. The treatment explicitly asked students to schedule when to watch these two videos. The table shows that the pre-commitment treatment had no effect on watching the lecture videos- insignificantly fewer treatment than control students watched the videos.

Study Significance

This paper seeks to add to the growing literature on MOOCs. We analyze descriptive persistence data on dozens of MOOCs, including student usage patterns, the geography of access, and indirect indicators of student interest and motivation. Kizilcec, Piech, and Schneider (2013), which studied three classes, is the only other work of which we are aware that addresses this issue. Ours is also the first to provide an experimental test of a low cost intervention (precommitment to watching the first video) intended to improve persistence rates.

In order for the rapid expansion of online courses to prove successful, especially as courses begin granting college credit, instructors must encourage greater persistence rates. Applying lessons from behavioral economics and social psychology is one avenue for nudging students towards course completion. Improving persistence has wide applications across MOOC platforms with the potential to help millions of students across the globe improve their chances of completing coursework in postsecondary education. This study will increase our understanding of persistence patterns among online students across the globe and will improve our predictive knowledge of which students are more likely to complete. This study lays the groundwork for future work that will enable us to better target students who are likely to drop out.

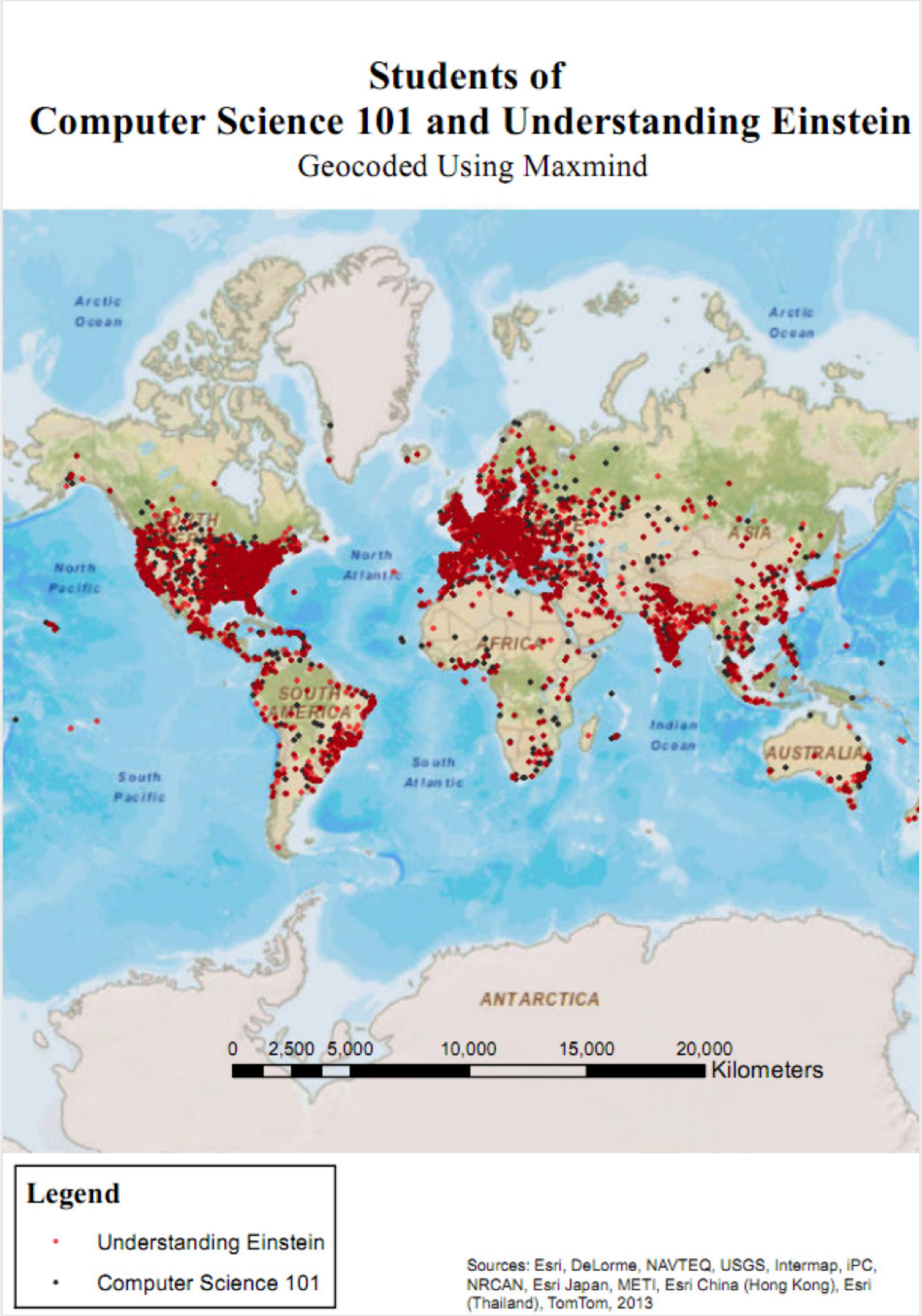

Figure 1: Map of MOOC students in Computer Science 101 and Understanding Einstein

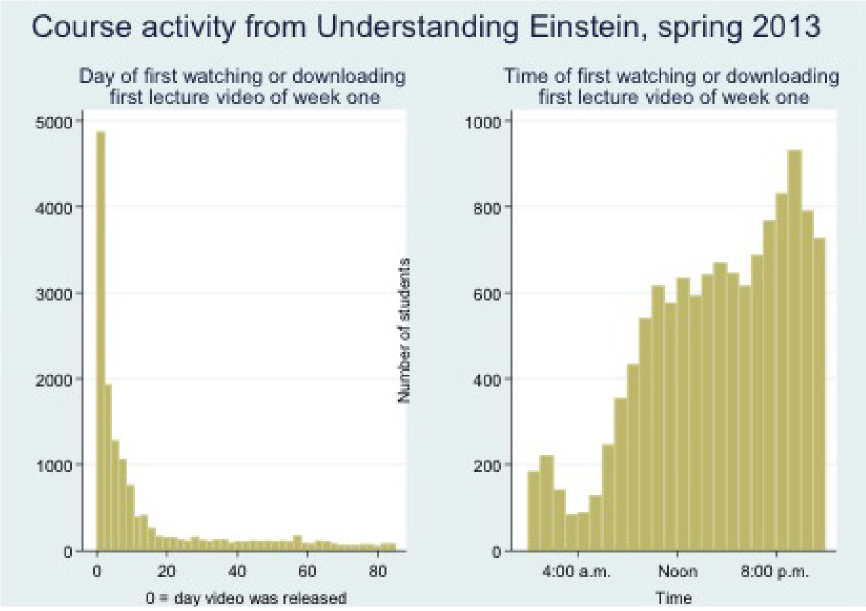

Figure 2: Day and Time of Course Activity

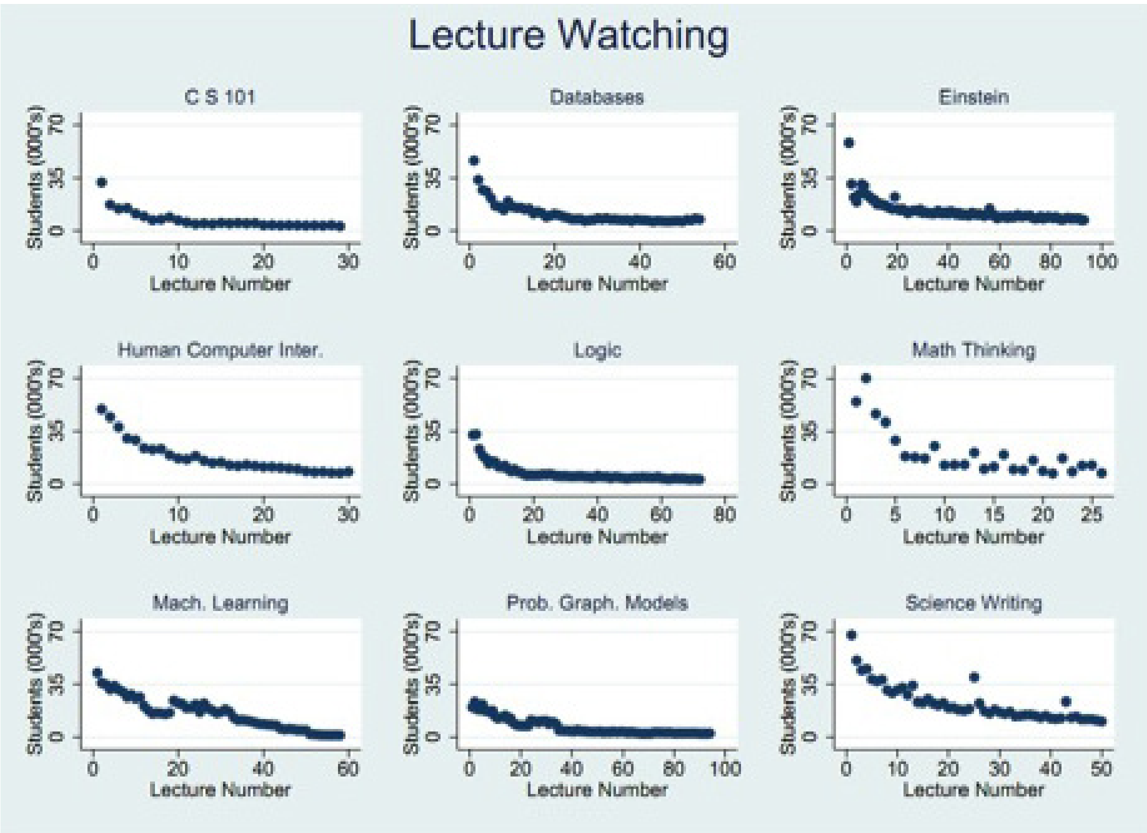

Figure 3: Persistence Patterns Across Classes

Country	Number of Students	% of students who participate through the last week of the course	% of students who got a certificate*	Average Grade**
Australia	402	26.4%	13.4%	17.4
Brazil	716	15.2%	5.9%	7.9
Canada	792	24.2%	12.4%	16.0
France	319	28.8%	13.8%	17.0
Germany	606	24.3%	13.2%	16.1
Great Britain	926	23.4%	13.9%	17.1
India	2,630	11.0%	4.9%	7.3
Switzerland	141	29.8%	14.9%	17.1
United States	6,226	19.5%	9.7%	12.8
Overall	**32,407**	**12.5%**	**6.4%**	**8.6**

*Students who had an average grade above 65% received a certificate.
**Students who did not complete any assignments received a grade of 0.

Table 1: Summary Persistence Descriptives for Understanding Einstein, by country

Outcome	Treatment %	Control %	Difference	Standard Error
Week 1 Video	46.28	47.37	– 1.09	0.74
Week 2 Video	32.04	32.30	– 0.26	0.70

Table 2: Experimental Results

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Analysing student participation in Foreign Language MOOCs: a case study

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Abstract: *This article discusses the theoretical aspects and practical applications of foreign language massive open online courses (henceforth, LMOOCs). Firstly, LMOOCs are presented as a fairly recent didactic modality that has emerged with an enormous potential for rich, flexible, and attractive collaborative learning and social interaction, in a world where huge economic unbalance gives rise to people with very different access opportunities to both formal language training and the diverse communicative scenarios that enhance the development of language competences. Secondly, the article also analyses the opposing views of LMOOCs presented by skeptical experts. While the practicality of this educational model is generally accepted as providing 'useful experiences' with more or less epistemological value, there is still some fundamental doubt that this educational model will actually be useful in helping students gain a command of a foreign language. Thirdly and finally, some of the conventional course quality factors are questioned, namely student participation, dropout and satisfaction. This will be illustrated with data from a sample course undertaken by Bárcena and Martín-Monje: "Professional English", the first LMOOC in Spain, with over 40,000 students.*

Key words:
Language MOOCs, Instructional design, Peer-to-peer.

Introduction

In general terms, MOOCs (Massive Open Online Courses) refer to a new model of online education delivering content and proposing activities to meet learning goals for a large number of people with a shared interest, with no initial limits of access, attendance and credits offered at the end (1).

Despite the potentially enormous conflict of interests with the objectives of formal educational institutions and the many criticisms raised in the literature by unconvinced experts (Jackson, 2013), this concept is both having a significant impact upon the online educational community, with hundreds of thousands of people undertaking these courses, and gaining significant media presence, where hardly a week passes without a new article or report being published on the subject.

An example of this media phenomenon was the definition of 2012 by ***The New York Times*** as "the Year of the MOOC". However, the difficulty with MOOCs starts with the term itself, which can cause confusion since a number of courses offered as MOOCs actually violate at least one of the letters in the acronym, while others have caused a number of hyponyms to arise (TOOCs, SOOCs(2), etc.). For example, how many students must a course have to be considered "massive"? Can there be no quantitative, qualitative, financial, etc. entrance restrictions for MOOCs? Can MOOCs not offer blended training and include face-to-face sessions? Do they have to be independent activities with a well-defined learning goal?, etc.

The problem is that the more we try to define the term, the less "open" it becomes and, conversely, the more open-ended we leave it, the harder it becomes to differentiate MOOCs from other Education 2.0 initiatives (Siemens, 2012). While practice is leading theory here in that efforts are being made to refine the concept empirically around what works best (number of hours, students, etc.; Read & Bárcena, 2013), its methodology (the optimum design to meet the same epistemological goals that are achieved in other well-established ways), arguably the core issue, inevitably depends to a large extent on the technology that is being made available, something which is constantly evolving.

Despite the conceptual and terminological confusion related to MOOCs, they have been very well received by society, in terms of student numbers, course statistics and teacher satisfaction (Martín-Monje et al., 2013). Students obviously appreciate the lack of associated cost and the enormous flexibility of access and commitment. Furthermore, unlike one of their key precursors OERs (Open Educational Resources), which consisted mainly of freely available learning materials, something that is fundamental to understanding the contribution of MOOCs is how they knit together the concepts of education, entertainment (gamification) and social networking (Read & Bárcena, 2013). They are both learner-centred and socially oriented, placing the emphasis on the social interaction generated in study groups around flexible learning materials and related activities, which the students find both stimulating and rewarding.

Adverse reactions and skepticism towards LMOOCs

The criticisms that this educational model has received so far include the unmanageable size and heterogeneity of the student group, the potential unreliability of the authorship of the assessment, and the high dropout figures (Read, in press). However, the authors argue that MOOCs can be effective learning mechanisms when compared to other online models, thereby addressing the previous criticisms. Firstly, the sheer strength of MOOCs comes from the large student numbers (that provide a varied and extensive community for collaboration, which, in turn, is believed to be effective for dynamic, critical and meaningful learning; Dillenbourg, 1999). Secondly, the emphasis of most MOOCs is not placed on preparing the students for assessment, but on assisting them with the development of relevant and updated capabilities. Furthermore, blended (regional and global) solutions are being explored for those cases where certification and proof of authorship are necessary. Thirdly, as for the high dropout rate (often greater than 80-85%), the numbers reduce considerably if a correlation is undertaken between students who actually watch the first course video and those who finish the course, rather than between registration and course completions. The authors argue that this would be an improvement in current MOOC quality assessment, since registration is free, many people sign up for many courses at once as a reflection of the general interest they have in a given topic, rather than any real intention to undertake the course.

Another concern is the suitability of different areas of knowledge and study for use in MOOCs. This depends to a large degree on the complexity of the learning materials, activities and infrastructure that are considered necessary for developing the capabilities required in each field. Foreign language (henceforth, FL) learning is argued by the authors to be in the middle of a scale of 'intrinsic MOOC suitability' as it is both skill-based and knowledge-based, which means that a network of capabilities (competences, skills and data) have to be finely intertwined as learning progresses. This process has been widely recognized as requiring both cognitive involvement (using high order mental skills) and social interaction (with competent speakers of the FL) (Read et al., 2010). However, not everybody agrees that the MOOC format is suitable for FL learning. Romeo's (2012:2) view on language MOOCs (henceforth LMOOCs) is damning: "If you think about it, ESL is all about exactly what the MOOCs specifically, and self-study in general, can not do" [author's own highlight]. Romeo claims that there are two crucial requirements for FL learning: pro-activeness and live communicative interaction with a 'native' speaker. The implications of his criticism are that LMOOCs can provide neither dynamic, learner-driven training, nor sufficiently rich and realistic interaction with competent speakers of the FL. Martin-Monje et al. (2013) and Read et al. (2013) have observed other potential difficulties with such courses, such as the change of role of teachers in such courses away from being an instructor, how to provide effective feedback with such an unbalanced teacher-student ratio, the sheer heterogeneity of the group and the difficulties of the individual evaluation of language communicative competences.

While solutions to these problems/challenges are being explored, the fact is that LMOOCs are becoming more and more popular worldwide(3). To give a few examples, in its first edition, UNED's Aprendo platform's three most populated MOOCs (out of 20) were for FLs (with between 30,000 and 40,000 students in each one). Furthermore, it was an LMOOC that won the First Prize for the Best MOOC in the Miriada X platform (Castrillo, 2013). In the UK, Bryant (2013) presented two LMOOCs at the New Media Consortium Summer Conference(4) after having his project selected as one of six 'Big Ideas for the Emerging Leaders Competition'. This work was about a highly popular social learning tool that consists of a free online educational platform that helps FL students find study partners, engage in conversation via Skype and improve their writing skills by keeping a blog and receiving feedback(5). Furthermore, the number of courses, institutional partners and international students in American platforms like Coursera and edX is impressive (with more than 900,000 course enrolments). The latter expects to serve a billion students worldwide over the next decade on its open-source educational platform, a number of which are to do with languages (Lewin, 2013).

A pioneer LMOOC experience: 'Professional English'

What follows is a specification of the first edition of the Professional English MOOC, one of the 58 courses offered by the MiríadaX platform (https://www.Miríadax.net), with special attention to the students' responses, which is typically taken to be a key quality factor in course assessment.

Research methodology

As a case study, this piece of research has utilised a range of methods for collecting and analysing data (Nunan, 1992; Cohen et al., 2007), adopting a mixed-method approach that combined quantitative and qualitative data collection (Robson, 2002). The main quantitative collection tool was the tracking of students provided by the online platform, and for the purposes of this paper one of the qualitative data collection tools will be focused on, namely the post-course student questionnaire, filled in by those who completed the course satisfactorily (a total of 1,120), which provided valuable information on students' profiles, fulfillment of course expectations and achievements, students' satisfaction in terms of course structure, contents, evaluation, duration of the course, teacher-student interaction, peer-to-peer (henceforth, P2P) interaction, and the feedback and scaffolding mechanisms.

Student profile

More than half of the students were from Spain, or at least accessed the course from this country, and the other significant home countries corresponded to Latin America: Argentina, Chile, Colombia, Mexico, Peru and Venezuela. Consequently, the native language of the vast majority of participants was Spanish. The majority of the participants were young adults (13.52% were under 25 years old and 46.11% were between 36 and 45 years old) and mainly female (61.28% women, contrasting with 38.72% men). As for their EFL (English as a Foreign Language) level, they all had to take a diagnostic test at the beginning of the course and they were in the bracket of A2+-B1 according to the Common European Framework of Reference (Council of Europe 2001).

This course proved to be the third most popular course, with 23,424 students registered, 19,076 who actually started it and 1,120 who completed the whole course (5.87%)! Although MOOCs are claimed to be a powerful educational tool to attract potential students who are not part of the formal education system, the course attracted people in the process of obtaining qualifications. Half of the participants (55.33%) were university graduates, near a quarter of them were undergraduates (23.18%) and almost 10% were pursuing postgraduate courses. Enrolling in a high number of courses could lead any student to eventual dropout. That is why this aspect was considered, which revealed that the majority of students enrolled in more than one MOOC at the same time. Figure 1 shows the number of courses that participants in the Professional English MOOC were doing at the same time. It can be seen that more than half of our students (57.14%) were enrolled in two to five other courses and a further 12.74% were doing up to 10. Only one quarter of the students (25.77%) focused on Professional English exclusively.

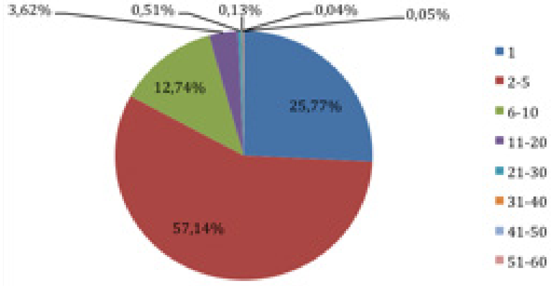


Figure 1. Number of MOOCs in which the participants were enrolled

Course materials and structure

It is early days for empirical research on MOOCs, but publications so far show a preference for a mixed-method approach (Cohen et al., 2007; Robson, 2002), combining qualitative and quantitative data collection and analysis, in order to capture the diverse activities carried out by course participants (individual activities, P2P, group discussions in forums, etc.). The platform allowed tracking of students' progress, logging all attempted and successfully completed activities. Also, a post-course questionnaire helped to obtain a more complete picture of the participants' learning experience.

The course was structured in six different modules with self-descriptive titles (Looking for a job is a full-time job; The first day at IBS; A new milestone in Peter's life; Settling in at work; Daily activities; Going online) and ran for 12 weeks (31 January-25 April 2013). It was designed for students to complete each module in a fortnight, although all the contents were accessible from the beginning, in order to provide participants with a highly flexible methodology, in which they could choose to work and progress at their own pace. The overall organization of the course followed previous ESP courses developed by the authors (Stevens & Bárcena, 2002; Bárcena & Varela, 2012), and included a scaffolding mechanism that guided the students through the learning processes related to written work. That is to say, since all activities included the answer keys (available at a click), students who performed below 60% in a number of fundamental activities were invited to undertake simpler directly-related activities before continuing with the course. Some scaffolding activities did, in turn, have further scaffolding support, in an iterative way. These sequences were mainly based upon the teaching team's own experience about the most likely cause-effect chains (e.g., simple conditional clauses as scaffolding for complex conditional clauses, complex verbal morphology as scaffolding for passive clauses, standard word order for certain non-prototypical cases, etc.). In this way, students with difficulties could resort to extra support activities to gain reinforcement. Furthermore, in the module tests, explicit feedback was provided in the form of a link from each question to the specific point in the course where the concept was explained, so the student who answered it incorrectly, or did not feel confident about his/her answer, could go back and revise it. In any case, scaffolding activities were optional in the course in order to provide flexibility and allow for less than typical profiles and performances.

Interaction, both written and oral, was key to the course design. Consequently, the authors developed a series of activities to foster collaborative learning in the MOOC, firstly, in the forum, and secondly, via peer-to-peer activities. An example of the former consisted of a proposal posted in the course forum, which motivated students to practise open writing. An example of the latter was an oral task where students had to provide feedback on each other's audio recordings, something that paid attention to sociolinguistic aspects related to the corresponding intercultural topic of the module. P2P activities can be seen to represent a dynamic interchange between students, where they are, to some extent, freed from the structural restrictions of the course, in order to interact with each other in a way that is relevant to the activity that they have to perform, sharing and working together on what is being produced. Given the number of students in a MOOC and the autonomy of the way in which they learn (with very little, if any, contact with the teaching team), the forums typically offer the only way in which the students can interact. P2P activities, however, go beyond the types of message-based interchanges possible in the forums since they enable the students to work collaboratively on a given activity. In this example, students had to record their oral production in video format and upload it to the MOOC platform. *Table 1* shows an example from Module 1:

In the job adverts in some countries it is common to find references to what could be considered "personal" traits and require candidates to be a specific sex, age range, physical characteristics, religion, etc.

What do you think of this?

Do you consider that this procedure is discriminatory or not?

Can you identify any circumstances (types of jobs, etc.) where these personal requirements could make sense and be appropriate?

Table 1. Example of a P2P activity

The P2P interaction was undertaken in groups of four students. Each activity was sent automatically to three other students who acted as evaluators or raters and had to provide feedback following the guidelines provided in the MOOC. Only students who had uploaded their video recording were sent videos of their peers to be evaluated. This was an automated process in the MiríadaX platform; not all MOOC platforms permit P2P activities, since they require added technical sophistication in order to form the working groups. Participants were provided with evaluation criteria that they were encouraged to use in order to make their peer review more meaningful to their course mates. The criteria were, firstly, appropriateness of vocabulary, terminology and register; secondly, grammatical correctness; thirdly, fluency, pronunciation and intonation; and fourthly, intelligibility and coherence.

Data analysis

Table 2 shows the number of students who completed the P2P activity, compared to the number of students who completed each module:

Module	No. students who completed the module	No. students who completed the P2P activity
1	7922	2842
2	4869	2006
3	3641	1714
4	3016	1564
5	2662	1494
6	2477	1391

Table 2. Number of students who completed each module and P2P activities

The disparity between figures in the second and third column shows that P2P activities were not the most popular of the module activities. Students had to complete 80% of them in order to pass and these data suggest that, whenever possible, P2P activities were left out. When looking at written interaction in the MOOC forum, the number of threads and posts is quite staggering (see table 3):

Category	No. threads	No. posts
General discussion	206	1032
Presentation	36	273
Module 1	113	505
Module 2	75	334
Module 3	38	166
Module 4	30	151
Module 5	29	86
Module 6	19	55
TOTAL	546	2602

Table 3. Interaction in student forum.

However, the number of students who wrote posts in the course forum was quite low. Only 925 wrote posts in the twelve weeks of the course which, compared to the 19,076 participants who started the course, represents less than 5% of them.

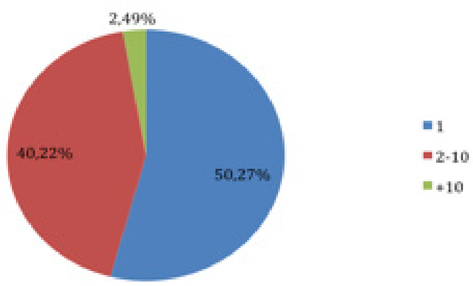
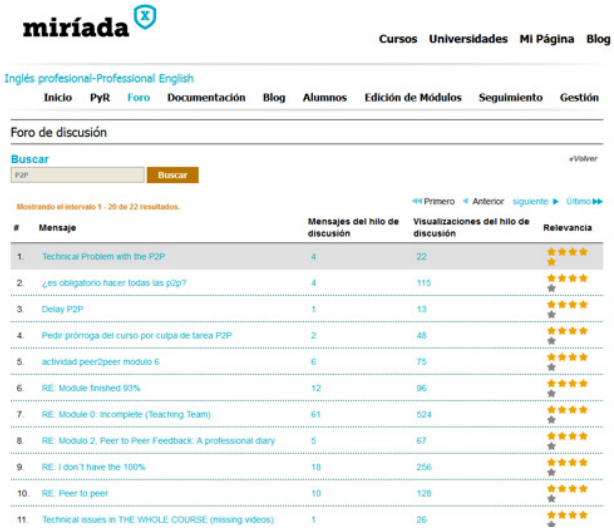


Figure 2. Proportion of students and posts

Furthermore, as figure 2 shows, out of those 925 active forum users, half of them only posted one message, and around 3% posted more than ten. It must also be mentioned that there was a very prolific forum user who posted a total of 96 messages in the course forum. This datum should be taken into account, since it affects the calculated average.


miríada X

Cursos Universidades Mi Página Blog

Inglés profesional-Professional English

Inicio PyR Foro Documentación Blog Alumnos Edición de Módulos Seguimiento Gestión

Foro de discusión

Buscar

P2P Buscar

«Volver

Mostrando el intervalo 1 - 20 de 22 resultados.

◂◂ Primero ◂ Anterior siguiente ▸ Último ▸▸

#	Mensaje	Mensajes del hilo de discusión	Visualizaciones del hilo de discusión	Relevancia
1.	Technical Problem with the P2P	4	22	
2.	¿es obligatorio hacer todas las p2p?	4	115	
3.	Delay P2P	1	13	
4.	Pedir prórroga del curso por culpa de tarea P2P	2	48	
5.	actividad peer2peer modulo 6	6	75	
6.	RE: Module finished 93%	12	96	
7.	RE: Module 0: Incomplete (Teaching Team)	61	524	
8.	RE: Modulo 2, Peer to Peer Feedback: A professional diary	5	67	
9.	RE: I don't have the 100%	18	256	
10.	RE: Peer to peer	10	128	
11.	Technical issues in THE WHOLE COURSE (missing videos)	1	26	

Figure 3. Threads in the MOOC forum related to P2P

As can be seen in figure 3, 11 threads out of the total of 546 in the course forum were related to P2P activities and they mainly focused on technical issues: problems with uploading the videos, students who were not sent P2P activities to assess, completed activities that appear as incomplete in the student log, etc.

The post-course questionnaire for students contained over 40 items but for the purpose of this paper, which aimed at analyzing the P2P module and its role in course abandonment, we will concentrate solely on those related to P2P activities and feedback, namely: satisfaction with P2P activities, satisfaction with P2P feedback (provided by course mates), adequacy of the evaluation with the course contents, and P2P usability. Table 4 below shows these four categories together, so that they can be compared and contrasted. A 5-point Likert scale was used, 1 being very little and 5 very much.

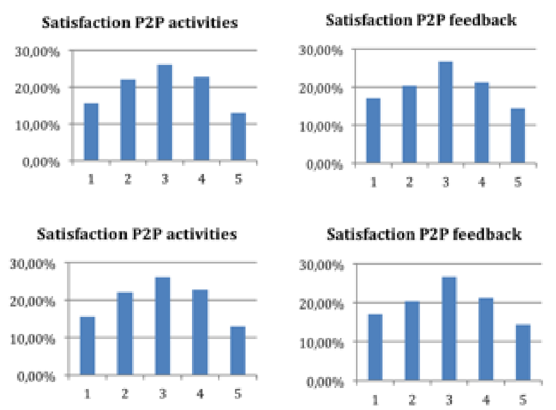


Table 4. Data related to P2P

Discussion

In the previous section the authors have provided data related to the first language MOOC in Spain, whose first edition was run during the first three months of 2013. Despite the precedents in other countries, where the background and profile of MOOC students is completely heterogeneous (Worlock & Ricci, 2013), the group of students here was mostly composed of Spanish natives, which was highly suitable to the approach followed in this course in the sense that it emphasized divergences between both languages and addressed English language topics of special difficulty for students with Spanish as their mother tongue (false friends, interferences, lack of structural parallelisms, etc.). The analysis of the students' educational background revealed that the majority were university students. This was rather unexpected because MOOCs are largely aimed at the population outside formal education, particularly those in tertiary education. However, the fact that the majority of the students in the MOOC were in formal education is due to the fact that this was one of the first courses in the Miríada X platform, and hence one of the first in the country. Most of the students were adults between 25 and 55 years of age, which does not coincide with the digital native age group and, as expected, most of the problems that were raised in the MOOC forums were related to technical difficulties. This fact was not expected, since the Miríada X platform is very intuitive and user-friendly. However, the reality was that students were often confused about the platform tools, particularly in the P2P module, and there were a high number of incidences raised online. During the first weeks, a high number of courses were launched and thousands of students invaded the server, which caused the server to crash and connection with the platform to be lost.

The reception of the MOOC initiative in Spain was welcomed with great enthusiasm, as can be demonstrated by the large number of registered students, not only in language courses (the most numerous) but also in other disciplines. It should be noted as well that MOOCs typically have between 3 and 10 European credits (the Professional English MOOC had 5). However, in contrast with UNED's online courses, whose students are very cautious when registering for a small number of credits per academic year given the costs of the registration they have to pay, both the attractive thematic offer of the MOOCs (mostly related to social and work demands) and the fact that they are free of charge by definition led students to register in several courses at the same time.

The information about the development of the course was obtained through the teaching team's observation of how students did in their activities and interacted in the forums, and also a final questionnaire. The students valued the course positively, three aspects in particular: its flexible structure, and the scaffolding and feedback mechanisms. Unlike other courses whose teaching teams decided to make materials available to students gradually to ensure that they worked with them in an organized way, all the materials in the Professional English MOOC were available to students from the beginning of the course in order to fulfill the condition of openness in this type of modality. The teaching team decided to rely on the students' responsibility to take their study seriously and not rush through the materials inappropriately. This feature provided flexibility to the course and allowed the course to be undertaken at different times and rhythms. As for the scaffolding mechanism that led students to simpler explanations and activities on a given topic when difficulties were encountered, it was used by less advanced students and valued as one of the key aspects of the course. This feature allowed for the diversification of the usefulness of the course, particularly since there was no entrance or diagnosis test.

Learning and using a language involves a number of written and oral skills and competences, including linguistic (formal), pragmatic (contextual) and sociolinguistic (cultural and intercultural) (following the terminology of *The Common European Framework of Reference for Languages* [Council of Europe, 2001]), all of which have a comparable importance in successful communication, particularly in professional environments. However, many computer-based language courses emphasize the development of reading/writing skills and on formal rather than functional linguistic aspects, because of their computational intractability (Chowdhury, 2003). For this course it was decided to include the most computationally problematic areas of language teaching, namely oral and written interaction and sociolinguistic competence by making the most of the P2P tool available in the Miríada X platform.

Students were asked to upload a video recording with an oral presentation on a given sociolinguistic topic and the online platform automatically sent the uploaded file to three other students, who had to provide feedback to their course mates using the following criteria: 1) appropriateness of vocabulary, terminology and register; 2) grammatical correctness; 3) fluency, pronunciation and intonation; and 4) intelligibility and coherence. Guidelines on how to provide useful and respectful feedback were provided in the course guide (consisting of an explanatory video recorded by the teaching team and a document), which was available for consultation throughout the course. Special emphasis was given to avoid erroneous feedback by asking students to stick to areas that they felt confident about and by asking for help if in doubt. In any case, the seven teachers tried to supervise most of the P2P activity and observed that the majority of students were prudent and responsible when they felt unsure about the correctness or appropriateness of a given element in the video. In fact, as the literature of P2P reveals, there is a tendency to be more cautious in correcting others' production than in one's own production. Furthermore, the students acknowledged (and there was evidence of this being true) having searched on the web and consulted several resources on the preparation of their feedback. On a negative note, it must be said that students focused their attention and criticism on criteria 1) and 2), rather than 3) and 4) (see above). Since they were university students (and highly likely to have undertaken a number of formal/conventional English courses in their academic lives), this preference is probably a reflection of the prioritization that they have experienced as students by their teachers. However, the skills which correspond to criteria 3) and 4) are of utmost importance in the professional world (Belcher, 2006), so further guidelines in this sense are likely to be incorporated into the feedback section of the course guide for future editions of the course.

Conclusion

This paper has provided an account of the first edition of the first language MOOC in Spain, which has recently taken place in the Miríada X platform. Although the overall feeling of the experience is rather positive both for students and for the teaching team, there were very significantly divergent results, reflected both in the statistical records of the students' log and the final student questionnaires. The analysis of the data made it obvious that language MOOCs capture the interest of the population, but publicity is clearly not focused in the direction of those people who could benefit the most by free and open courses: the socially unprivileged and those out of formal education. A thorough revision of this area is required in the future. There is a huge variety of MOOC models being used at the moment and results on the methodology of the Professional English MOOC demonstrate that most of its features are worth preserving for future editions of the course. However, there was considerable dropout, which reflects the misconception that the general population has on MOOCs, despite the fact that each course had an associated number of European credits, and that could give them a rough idea of the volume of work involved. However, the fact that they are free makes people register with no commitment to continue, and randomly poking around in the course, due to curiosity, although subsequently dropping out. This is likely to carry on to some extent in the future and questions the validity of course abandonment as a quality variable for MOOCs (Read et al., 2013). Finally, the P2P activity was developed by the platform developers as a key tool that would enhance interaction and was welcome by the language teaching team because of the opportunity to put into practice what is a key skill in language use. However, a large number of students, who acknowledged the importance of interaction, etc., in the questionnaires, failed to make the most of this opportunity, probably because of the extra work, time and effort that it entailed, a common social phenomenon that has been widely acknowledged by language teachers in this country. The teaching team has realized the need to change this attitude of language learners and intends to emphasize the importance of collaborative learning from the beginning in the next edition of the MOOC so that students realize the incoherence underlying their attitude and their loss by failing to undertake this type of P2P activities. Among the measurements for the next edition of the LMOOC "Professional English", an entire subsection is intended to be included within the course materials with the highly positive testimony of the minority of students who undertook the P2P with an attitude of effort and commitment.

1. An earlier and longer version of this article was presented by E. Martín-Monje, E. Bárcena and P. Ventura at ECLL 2013 – The European Conference on Language Learning (U. of Brighton, July 2013).

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Signals of Success and Self-directed Learning

Penny Bentley, Helen Crump, Paige Cuffe, Iwona Gniadek, Briar Jamieson, Sheila MacNeill and Yishay Mor

***Abstract:** Autobiographical records of learner experiences in Massive Open Online Courses (MOOCs) are ubiquitous; however, collaborative autoethnographic approaches are less common. Using group reflection within the same online, open, participatory approach and media as characterises MOOCs, this paper explores the experience of participation, learner views of success and if social interaction, self-efficacy and self-directed strategies supported this. How social interaction was achieved and experienced in the OLDSMOOC is intertwined with these factors for these learners. Completion and success are not synonymous terms for these learners and a definition of success is constructed by each participant. Their view of their participation supports the concept of self-directed learners defining their own achievement and their levels of activity vary. The creation of this collaborative paper is suggested as an example of another aspect of their definitions of success, which value and include establishing ongoing connection and shared learning between MOOC participants.*

Key words:
MOOC, participation, learner success, OLDSMOOC, learner perspectives, e-learning, Twitter, self-directed learners, self-regulated learners, connectivism

Background

The authors all participated in varying ways in the OLDSMOOC run in early 2013. This MOOC on Learning Design, aimed at post-graduate level study, had a nine-week structured format with each week led by different specialists in Learning Design. Dubbed a 'project' or pMOOC, the design aim was that learners undertook a group-defined and executed project within the MOOC, thus the initial week required learners to introduce themselves, define their project goal and discover others with similar goals with whom to work. OLDSMOOC was connectivist in style, though it had a clear pathway through the learning of this topic, with badges available for completion of activities in each stage. Use of a range of online spaces – provided and self-selected - was an intrinsic part of course design and learners were actively encouraged to contribute to these spaces which included, a course website, Cloudworks, Google discussion forums, a Facebook group, Twitter and Bibsonomy. Distinctively, each week concluded with a live streamed Google Hangout to which both specialists and a few learners were invited. Use of the Twitter backchannel for discussion and contributing questions to these hangouts was encouraged and formed a key characteristic of this MOOC.

A single tweet by the leader of the OLDSMOOC design team about the call for papers initiated this collaboration. It included twitter handles and the #oldsmooc hashtag as interaction between various OLDSMOOC learners and some members of the presentation team had persisted. A Google doc was opened and initial information on personal experiences of the MOOC captured within a few days. Augmented by input from the leader of the course design team, this paper synthesizes the various discussions this group has shared around the various aspects of their experience within the context of current MOOC research themes.

Research questions

Although a formal evaluation of OLDSMOOC has been undertaken by the host institution (Cross, 2013), there are still a number of key issues which merit further exploration including: measuring learning success, motivation, adaptation and community building. The latter has particular significance as connectivist MOOCs (cMOOCs) may be defined as "based on connectivist principles of knowledge creation encouraging collaborative content creation, creativity, autonomy, and social networked learning" (McGill, 2013).

In seeking success measures valid for this environment, Downes (2013) considers two approaches, one based on the elements of the process which he defines as Autonomy, Diversity, Openness and Interactivity and the other focused on the outcomes defined as new emergent knowledge in the network. That is, he forwards that "MOOC success is not individual success". The difficulties with this on a practical as well as philosophical level are explored by Hendricks (2013), and we propose that an alternative view in keeping with her analysis might be to consider the individual learners' measures of success and perception of the success of their learning.

By considering this viewpoint only in post-completion surveys conducted immediately after the MOOC closes, the opportunity to assess ongoing value of this learning in future situations (Dewey, 1938) is lost. Similarly, insights into expressions of self-determined learning, where personal experience and context is key and the learner is "the major agent in their own learning" (Hase & Kenyon, 2007, p. 112), and the opportunity to reflect on any self-directed learning strategies employed, are also difficult to fully capture. Self-directed learning is described by Knowles (1975) as "a process in which individuals take initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (p. 18). In this paper adaptation of course design and/or resources are also considered as demonstrating learner initiative. This collective reflective process, conducted six months after participation in the MOOC, offers another lens through which to explore concepts of learner success.

Issues explored include the extent to which participants adapted OLDS MOOC to suit their context and needs, and whether the inquiry/project -based pedagogy allows participants to create their own learning paths.

This study focuses on two research questions:

1) How do *learners* define success in a MOOC?

2) To what extent do connection, self-efficacy and self-directed strategies facilitate learning in a MOOC?

Research methodology

In order to explore this new territory and capture a rich view of individual participants' perspectives, a collaborative autoethnographic approach has been adopted. Collaborative autoethnographic practice has been described as "individually writing autoethnographic narratives … sharing these autoethnographic narratives in a public forum … publicly discussing the heuristic commonalities across these autoethnographic narratives … tying those commonalities back to the literature, and revisiting the autoethnographic narratives…" (Geist-Martin et al, 2010).

Possible limitations inherent in the chosen methods and methodology include that this study is dependent on a small, self-selecting sample of participants who have reflected on their experience on one particular MOOC. Their views are oriented by this; just as their individual reflections may have been oriented by their collective discussion. However, generalizations are not the aim of this study, rather 'naturalistic generalization' is achieved by moving "the focus of generalizability from respondents to readers" (Stake, 1994, p.195) allowing the reader to determine if sufficient content within the narratives resonate with their context to permit transfer of the findings.

Data collection and analysis

Approximately six months after participating in OLDSMOOC, the research was initiated by a tweet by the leader of the OLDSMOOC design team about the call for papers for this conference. The tweet included the twitter handles of those learners who had made use of Twitter during the MOOC and continued to connect through Twitter by following the course presentation team, as well as the #oldsmooc hashtag. Of the potential participants so defined, eight initially expressed interest in participating, with six ultimately contributing to discussions.

Through discussion on Twitter it was agreed to set up a Google doc and initial contributions were captured within days (Oldsmoop, 2013). It was then agreed that we collectively reflect on individual and shared experiences via a series of Google hangouts, which were recorded. These discussions were under-pinned by a number of shared documents in which more detailed evidence and reflection, both individual and collective, was gathered (Oldsmoop 2013). In addition, a Twitter hashtag, #oldsmoop, sufficed for brief sharing in the reflective process. Moreover, the data generated by the authors at the time of the MOOC (e.g. blogs, tweets, forum posts, Google Hangout sessions, personal notes) was re-visited to provide some triangulation. Analysis of data in this study was by way of broad thematic analysis.

Personal Reflections

Penny's reflection on Confidence

(Penny Bentley works with adults in the Australian Further Education and Training Sector on digital literacy, and is a PhD candidate at The Australian Digital Futures Institute, University of Southern Queensland)

"I've thought long and hard about the definition of "confidence" and my reasons for feeling this way during a connectivist MOOC. Where did this belief in my own ability to persist with OLDS MOOC come from? Upon reflection it seems that familiarity with the online environment and my personality traits are the two most significant factors.

Prior to signing up for OLDS MOOC I'd spent almost two years networking online and developing a Personal Learning Environment, my home on the web. I was comfortable finding my way around, communicating via social media, curating resources, blogging and learning in a virtual classroom. This familiarity with the online environment enabled me to jump into OLDS MOOC and enjoy the journey, rather than struggling to build my learning environment first. I also had my online identity/personality well established, not worrying all the time about my privacy being compromised. What I realise now is that I had sufficient digital literacy skills to cope.

Being confident doesn't mean believing you're the best, that you know and can do everything, will finish first and create the best artefacts. (One of my concerns was being perceived as overly confident. Building into Learning Design an official role/task for mentoring would alleviate this feeling and potential for pulling back). OLDS MOOC wasn't a competitive course to "finish" and get the best mark for. I couldn't "fail" the MOOC nor were people there "judging" my ability to succeed. There was feedback offered by various means, one of which was badges, fun to collect and useful as evidence of professional development. I was comfortable, enjoying the ride and happy to help others.

As an introvert, participating in an intellectually challenging, online learning experience was liberating. I'm often reluctant to express my opinions in busy, face to face learning environments as my thinking is slow, considered and easily discouraged. My confidence as an OLDS MOOC participant was enabled by the very nature of MOOCS, being online. I observed and contemplated before making contributions and worked at my own pace in a non-competitive yet productive way. I had control over when to participate and how much to contribute. (Bentley, 2013). Adapting to the connectivist pedagogy of open learning in OLDS MOOC had its challenges which I overcame with perseverance, support and the luxury of sufficient time.

So, did my confidence as an OLDS MOOC participant fulfil my measure of success? Yes, I have a richer Personal Learning Network (PLN) with connections made, have been extended and pushed in my thinking, learnt how to describe my professional practice in an explicit way, helped others, received positive feedback, gained and created new knowledge. Above all, I have found my voice as an online learner and educator."

Briar and Iwona's Reflection on Context and Success

(Briar Jamieson (@mbjamieson) is the Executive Director and Iwona Gniadek (@yvetteinmb) the Lead of Learner Services at English Online Inc. in Canada.)

"Success comes in many shapes, forms and sizes - 140 characters to be exact. It was OLDS MOOC trending on Twitter that brought the MOOC to our attention (@mbjamieson. January 7, 2013). Partnering with a colleague was one of the highlights of participation in OLDS MOOC. Although we did not engage the same way with the course activities, we complemented each other, one delving into theory and the other working out the activities.

The weekly Google Hangouts drew us in to see experts discuss the content of the week. Every week we waited for the rapid fire chats and tested our understanding of the weekly content. Serendipity was being noticed amongst the hundreds of learners: "I tweeted: "#oldsmooc is a learning space where participants can create their own social learning gardens. (@yvetteinmb. January 22, 2013)." My tweet got mentioned live! I was out of my chair fisting the air. (I. Gniadek, personal reflection, February, 2013). The draw of the OLDS MOOC Twitter community exemplified how this tool could be used more effectively to build a learner community.

Our organisation's summer course was inspired by OLDS MOOC (English Online Inc, 2013). The course incorporated elements of OLDS MOOC that resonated with us as learners. Modelled after the OLDS MOOC converge hangouts we incorporated a synchronous weekly Language Rendezvous and accompanying weekly blog encapsulating learning highlights. We curated OERs for the content of the course on an open wiki, incorporated a persona activity for learners, and included a Twitter hashtag for stakeholders to continue the conversation. It was exciting when learners shared their learning plans, videos, summer photos and blog posts.

Ongoing participation in OLDS MOOC resulted in our successful integration of a number of the learning design processes and resources into our workplace context. The activities that were incorporated into our work environment include: force maps (Jamieson, 2013), personas (Gniadek, 2013), and OULDI cards (@mbjamieson. September 23, 2013). The OULDI cards helped us to zoom out on our practice and learner support mechanisms. After using the cards with staff, we saw ways that the cards could be adapted to fit our language learning context. As a result of our experience in OLDS MOOC we will share our adaptation of the OULDI cards.

As informal learners outside of academia it is often difficult to find useful resources to support our practice. We have a small library of popular books on e-Learning, links to resources shared by colleagues, but ineffective Google searches and paid-only access to research form a significant barrier to adding to our knowledge on learning design. OLDS MOOC provided us with a plethora of activities and open access materials. A huge benefit was discovering open access journals, online tools, and adding more trusted sources to follow. The personal significance of having access to peer reviewed research is captured in this tweet: "@roughbounds Immersion in readings feels decadent, doesn't it? Some like chocolate...I crave...bibsonomy :) #oldsmooc" (@mbjamieson. January 30, 2013). The learning provided in OLDS MOOC initiated our application for further formal higher education.

Successful learning in OLDS MOOC is measured by our integration of various tools into our professional development practices and work context. We expanded our personal learning networks, were able to frame our work practices academically and enhance them by implementing some of the suggested tools and processes. Finally, we saw how our newly acquired learning positively affected our end-user."

Helen's Reflection on Connecting for learning success

(Helen Crump (@crumphelen) is a literacies practitioner working in community education in the North West of Ireland.)

"I consider my participation in OLDSMOOC to have been successful, adhering largely to the descriptor of an active participant of Milligan, Littlejohn & Margaryan (2013) by maintaining an active blog and Twitter account for the duration of the course, and afterwards by maintaining an enduring network of connections.

I embarked upon OLDS MOOC with the clear intention that participation would help me develop knowledge and skills pertinent to learning design, and compliment an existing project that I had already been blogging about. Having a clear aim for my participation was an important factor in my success, as was the confidence that I had already started to gain. This combination of purpose and confidence gained through prior experience was crucial in enabling me to participate actively and successfully. It enabled me to persist and overcome challenges that for others might have proved to be a barrier. As Cross (2013) recognises, within OLDS MOOC "the use of unfamiliar technologies such as Cloudworks presented an additional challenge to many participants in the first week". It was here that I invested considerable time and effort overcoming not only the challenges posed by the platform but the project grouping process as well.

"It was just impossible to figure out the platform and track down all the people that you wanted to talk to, so after considerable effort and not getting very far, I decided to park myself under the cloud entitled "Digital Identity and Social Media" […] and likewise with the Digilit study circle cloud […] I then pasted the links to these clouds into my Evernote account and proceeded to access Cloudworks from there" (Crump, 2013).

This was a telling stage as I not only developed a workaround solution, but I also formed the tenacious mind-set that, in the short term, would help me continue with the course. As I noted at the time, I hung on.

If hanging on was key to success in the short term, making connections was key to success in the long term. In making introductions at the start of the course, I deliberately mentioned that I was originally from Nottingham because I supposed a number of MOOC participants were likely to be UK-based. Indeed, this conversation trigger proved fruitful as it drew the attention of another participant who was based in Nottingham and from which point we were able to establish that we had similar learning goals. Locating this individual and realising that we had corresponding aims was as an important support for learning in the complex environment of OLDSMOOC, as was our ability to learn together. A large part of the success I experienced in OLDS MOOC can be attributed to the formation of this partnership and to cooperatively engaging in a learning design project."

Sheila's Reflection on Adaptation and Control

(At the time of writing Sheila MacNeill was Assistant Director for a nationally funded educational technology Innovation Support Centre in the UK (www.cetis.ac.uk).

"Unlike many MOOCs, OLDS MOOC didn't use a centralised platform or VLE for user engagement. Instead it utilised and encouraged the use of a number of different services including a dedicated website, google+, twitter, YouTube, bibsonomy and Cloudworks. This gave a range of spaces for learners to interact with, however it also overwhelmed some users in terms of where and how to interact online.

The use of Cloudworks was actively encouraged for collaboration, sharing and reflection. Cloudworks is a social networking site developed by the Open University specifically to support "participatory practices (peer critiquing, sharing, user-generated content, aggregation and personalisation) within an educational context, and promote reflective professional practice and development." (Galley & Mor, 2013)

However the user interface and navigation of Cloudworks is not particularly intuitive, and can lead to confusion for users. This was particularly apparent at the start of OLDSMOOC when many learners started to use it for the first time. I was in a fortunate position in that I had used the system before, however from the first week I did become increasingly interested in the potential extension and development of Cloudworks to show more explicitly network connections for and between learners, content and their activities. Stuart (2013) describes the various affordances of network participation in MOOCs. From previous experiments with the Cloudworks API I knew it was possible to create a mind map view of a user's personal space or Cloudscape. I felt that there was potential for this to be taken a stage further to create further visualisations of a users followers and content and their inter-relationships in a more visually explicit way.

"I'm also now wondering if a network diagram of cloudscape . . . would be helpful. . . . . . in starting to make more explicit links between people, activities and networks. Maybe the mind map view is too linear" (MacNeill, 2013)

From my initial blog post outlining this idea, Hirst (2013) developed a number of proof of concept visualisations based on the openly available data from Cloudworks. These networked views also illustrate some of the concepts behind notions of rhizomatic learning (Cormier, 2011).

In terms of context of learning, which was the theme of week two, I felt that these visualisations provided greater contextualisation of the collaborative space, providing a powerful way to allow greater engagement for learners by providing a number of different views of, the at times chaotic, developing networks and connections in Cloudworks. Koulocheri and Xenos (2013) have also demonstrated the potential positive impact on learning social network visualisation techniques within learning environments can achieve. The potential for transforming Cloudworks into a more user-friendly and more powerful learning tool dominated my engagement with the course and provided the basis for my activities. These moved from producing a learning design to producing a prototype of Cloudworks as an enhanced learning environment.

The flexible nature of the course, and the encouragement and engagement in these ideas from fellow learners on the course, the course tutors and those outside the course gave me a huge amount of inspiration and motivation. Being able to adapt the course curriculum to my needs also provided a level of personal empowerment that I had never experienced within a formal course setting before."

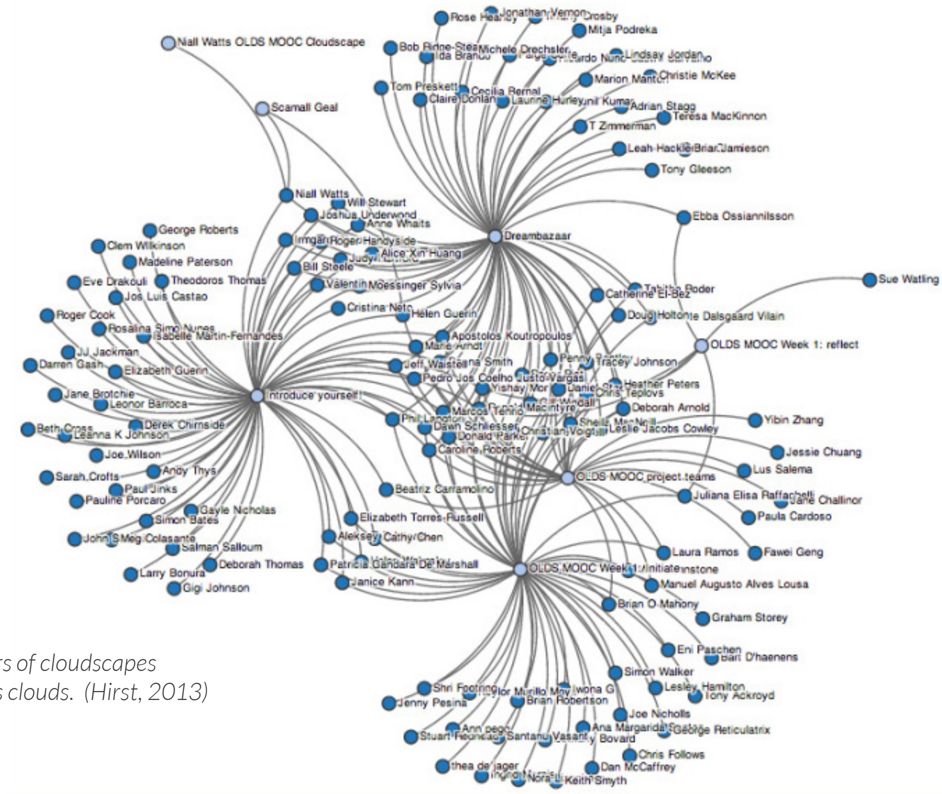

Figure 1. Followers of cloudscapes containing a user's clouds. (Hirst, 2013)

Findings

Defining success for/in a cMOOC

The authors variably define success as they both *intended* to learn different things and *differently adapted* the experience to meet their context and their needs. Measurement against personally created metrics such as the number of activities undertaken proved a useful self-regulating tool for some (Oldsmoop, 2013) but does not form the basis of their view of success. Penny particularly notes the sense of being free to define her own success, that 'failure' is not part of her view of the MOOC paradigm, and though expresses pride in her badges earned, refers to the growth of her PLN, and learning and discovery of a language to describe her existing practice in order to define her success. Helen achieved the growth in her PLN she desired, developed an online presence, increased proficiency with a number of tools, undertook the project design she had planned on and enjoyed greater academic confidence. Briar similarly notes introduction to new tools together with the discovery of new sources to follow, and a variety of sources of open educational resources as marks of success. Iwona demonstrates her learning through application of learning to her practice and together with Briar develops a new style of course within their organization, based on open practice and re-versioning of OLDS MOOC design materials. Sheila expresses success in being able, for the first time, to adapt the curriculum to her needs and demonstrates this in her forwarding proposals to re-design the user interface for Cloudworks. All the authors noted in group reflection that they view maintaining contact via Twitter post-MOOC, sharing ongoing learning, undertaking this independent project, and initiating various collaborative paper(s) to capture participant views as evidence of the achievement of connection that is central to connectivist MOOCs.

The role of connection in achieving learning

Within this group, strategies to achieve connection are deployed by Helen and Penny and Sheila's proposed user interface changes are designed to facilitate it. Iwona and Briar rely on their offline connection through a shared work environment and all note the value of various channels of connection. For Helen the close working relationship with a learner met on the MOOC supported her completion of her project. For all participants, the experience of the synchronous Twitter chats during Google Hangouts led by course facilitators and including learners', and the inclusion of these tweets in live discussion within the Hangout, is noted as a motivator and focus of weekly activity. It was in this situation in particular that the shared connection of the authors was developed.

Self-efficacy as a function of experience

This group of learners has a key commonality, that at the time they commenced the MOOC they were all educators either working within online learning environments and/or experienced at online learning, and connecting using Web 2.0 tools and/or undertaking MOOCs. This is not the only source of confidence, however, as Iwona notes the value of undertaking the course with a colleague and the affective experience of achieving connection and interaction, and Helen achieves a sense of self-efficacy partly from her prior MOOC experience and partly through reflecting on her own activity in the MOOC, with respect to published literature on what defines successful MOOC participants.

Self-efficacy and experience are thus interlinked, but separately important for these learners in achievement of learning and connection. All note a growing sense of self-efficacy with increased interaction in this MOOC and in continuing connection.

Self-direction and adaptation

Whilst both were concerned with the transferability and applicability of learning to their own teaching context, Briar revelled in the exposure to open academic sources and Iwona focused on the activities. Choice in what to engage with characterized Sheila's complete re-versioning of the user interface of the discussion website itself. Penny felt free to choose without pressure of judgement and of notions of 'failure', and Helen embarked on the MOOC with a project to be developed and a clear desire to use the experience to develop her networking skills. Interestingly, none of these learners would describe participation as 'active' in all weeks or all spheres. That is, self-directed adaptation of the course pathway and/or content characterizes the strategies of all these learners who maintained activity for some of the time, at some level, during this MOOC.

Discussion and Conclusions

Central to this reflective exercise was the nature of this particular MOOC, which was designed to lead the learner through stages of learning though still with a cMOOC ethos. To ameliorate the effect of tension between a structured course and connectivist design (Mackness, Mak & Williams, 2010), the designers "sought to avoid … compulsion and subsequent guilt at missing out steps" (McAndrew, 2013) and offered guidance on high and low-level activity paths. The experience of the authors of this approach, suggests that even the notion of adhering to activities on a pathway does not particularly support their learning, describe the pattern of their participation nor indicate their ultimate success. Clow (2013) suggests that complete withdrawal of learners from MOOCs may reflect self-directed learners choice to 'climb-out' (rather than drop-out) and this mirrors these learners' variable levels of activity over the MOOC duration.

MOOC designers within an institutional context may – understandably - seek metrics that define success; however, this limits what can be included in the evaluation of success. Currently discussions within the published and informal literature (Clark, 2013; Hill, 2013; Jordan, 2013; Kizilcec, Piech & Schneider, 2013; Milligan et al, 2013) are characterised by discussion of learner activity patterns and the arising typologies of learners are closely tied to measurable progress in and engagement with the defined pathway of the MOOCs. Whilst this may seem reasonable when examining instructivist-style MOOCs (Kizilcec et al, 2013), the validity of such approaches for cMOOCs can be juxtaposed with the position of some founders of the cMOOC approach such as Downes (2013) who states that "you (as a student) define what counts as success … That's why we see many different levels of activity". This is the emerging view of the learners in this study, who all share the view that adaptation of the course is both a key indicator of success and supported their engagement with the MOOC.

Further, growing their level of connection with other educators, then later developing their cooperative learning with these new members of their PLN to the point of undertaking research work together, was a commonly shared marker and support of successful participation and learning in this MOOC. This too cannot be assessed at the time of MOOC completion. Additional personal measures of success may include use of this learning in their professional context and discovery of, or increased proficiency with new tools, sources and resources. The extent of this, similarly, emerges over time.

Like Kop, Fournier & Mak (2011) who found "It was clear that experience with this type of learning increases chances of success" and Milligan et al (2013) whose work supports this, these learners consider that achieving the level of self-direction necessary for successful learning in a MOOC is partially due to prior experience, in terms of using Web 2.0 tools, and because of the sense of self-efficacy prior experience afforded. Further, self-efficacy not only supports their self-direction and ability to interact with others, it appears to be dynamic, as it grows further with interaction in the MOOC.

Given the methodology gives a rich but necessarily tightly focused view of these issues, exploration of these themes with a broader range of OLDSMOOC learners, including those who have not maintained participation to the end of the MOOC, will elucidate if these views are unique to this group of learners. Comparison with learners on other cohorts of similar courses will further help establish the key factors for supporting their learning. In particular, the role of prior experience for enabling successful participation may inform learning design to prepare novice MOOC learners. The possible role of the online environment, particularly for novices, in successful participation, needs further exploration amongst groups of learners who show low participation, as this may inform course design that enables more new learners to participate to the extent they determine

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Analyzing completion rates in the First French xMOOC

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Abstract: Massive Open Online Courses (MOOCs) have spread incredibly fast since the foundation of Coursera and edX in 2012, initiating a worldwide debate over the place of online learning in educational systems. Their low completion rates have repeatedly been criticized over the past two years, forcing researchers to take a closer look at their complex dynamics. Introduction to Project Management is the first French xMOOC; it was organized on Canvas.net in early 2013. Two certificates involving significantly different workloads were proposed to address the various expectations and constraints of MOOC participants. We show that learners' personal aims and achievements are highly dependent upon their employment status, geographical origin and time constraints. Furthermore, the use of forums and involvement in peer-assessment are significantly associated with the level of achievement at the scale of the MOOC. Learners who interact on the forums and assess peer assignments are more likely to complete the course.

Key words:
Engagement, background, completion, indicators, MOOC, forums, peer assessment

Introduction

Over the past two years, the importance of Massive Open Online Courses (MOOCs) has increased dramatically in higher education, giving rise to numerous controversies (Bates, 2012). Originally inspired by connectivism (Siemens, 2004, Bell, 2010), the teaching model for MOOCs has evolved drastically since the foundation of Coursera and edX in 2012 (Cisel & Bruillard, 2013, Daniel, 2012). The most recurrent criticism is probably the low proportion of participants completing the courses, generally below 10 % (Breslow et al., 2013, Jordan, 2013, Kizilcec et al., 2013, Rivard, 2013). Dropout rates in online courses are not a new issue (Angelino et al., 2007). However, the environment differs fundamentally from online courses that have formed the basis for various studies until now.

The open nature of MOOCs implies rethinking our understanding of learners' engagement and disengagement. The monolithic distinction between completers and drop-outs is in many ways inadequate to describe the diversity of learning engagement patterns (Clow et al., 2013, Kizilcec et al., 2013, Seaton et al, 2013). On the one hand, there may be different levels of completion among completers, on the other hand there are different levels of non-completion. For instance, Kizilcec distinguishes auditing learners from disengaging learners, among other types of learners. Auditing participants usually watch videos but do not submit assignments, while disengaging students usually follow the beginning of the course diligently and eventually give up. One of the major issues of MOOCs is to identify the factors associated with the different levels of engagement (Hart et al., 2012). Such an understanding could be used to tailor the course for different types of learners (Grünewald et al., 2013). MOOCs provide us with two different types of data that can be used in that scope: background data collected through online surveys, and analytics collected by the platform on which the course is implemented (Breslow et al., 2013, DeBoer et al., 2013). This paper aims at identifying factors statistically associated with engagement in the French MOOC ABC de la Gestion de Projet (Introduction to Project Management), proposed by Ecole Centrale de Lille. How are the different levels of engagement linked to students' background? Which indicators could be used to predict completion rates based on the data collected by the platform?

Course description

ABC de la Gestion de Projet (Introduction to Project Management) is the first French so-called xMOOC (Daniel 2012), launched by the *Grande Ecole Centrale* Lille, a competitive higher education institution. The course lasted five weeks, and it took place from March 18th to April 21st 2013 on Canvas.net. Participants enrolled from January 10th to March 21st 2013; there were 3495 registered learners when registration closed.

Two certificates corresponding to different workloads were offered, a basic one and an advanced one. The former relied on the completion of quizzes whereas the latter involved submitting weekly assignments. According to the professor in charge of the MOOC, completion of the basic certificate and the advanced certificate required respectively around ten hours and forty hours in total. The objective underlying this design was to address the various expectations and constraints of MOOC participants. Those who had little time to spend on the course could follow the basic certificate, and those who wanted to learn more could follow the advanced certificate. The course provided quizzes, weekly assignments and a final examination. To obtain the basic certificate, it was required to complete the quizzes and the exam with a minimum of 280 points out of 400. The deadline for these quizzes was set to the last day of the course. These quizzes were mostly based on content recall although a few calculus applications were also included.

In order to obtain the advanced certificate, participants were required to pass the basic one and submit at least three assignments out of four. They also had to reach a minimal score of 560 points out of 800. Out of these 800 points, 200 could be gained through quizzes, 200 through the exam, and 400 through assignments. Each assignment could bring a maximum of 100 points. Those assignments were based on a case study and assessed through peer evaluation. Learners could take part in the evaluation process only if they had submitted the corresponding assignment. There was no time limit for peer assessment and learners did not gain any points by taking part in the process. Final marks were attributed by a team of teaching assistants based on the marks and comments previously left by assessors. Some new discussion threads were initiated every week, by the MOOC staff only, and monitored closely during the duration of the course.

In addition to a wiki, many resources provided information on the course and on associated tools, such as tutorials and FAQs. The type of certificate obtained will hereafter be referred to as “achievement”. Similarly, the type of certificate initially aimed at by learners in the initial survey will be referred to as “personal aim”. Based on achievements and personal aim, we designed an ‘achievement gap’ score. We qualify the score as negative when the achievement lies below the personal aim, and positive in the opposite case. It is considered as null when it corresponds to the personal aim. Furthermore, if the participant does not obtain a certificate and did not aim at it, the score is null as well.

Out of the 3495 participants who registered, 1332 (38.1 %) obtained a certificate. Among those who obtained a certificate, 894 (67.1 %) got the basic certificate only, and 438 (32.9 %) the advanced certificate. Among registered participants, 466 (13.4 %) did not go beyond the registration process. They will be referred to as “no-show”. 1697 (48.5%) were active, but did not obtain any certificate. They will be referred to as *Non completers*, they include both dropouts and auditing learners.

Available data

Student activity reports, gradebooks and survey responses used for this study were downloaded from the platform. Activity reports provide data on resources or discussion threads visited by the participants; timestamps or time spent on each resource were not available for every log. Therefore it was not possible to carry out any analysis based on time. Regarding the peer evaluation process, marks given by assessors and associated comments were extracted for all assignments. Participants were asked to fill in a survey at the beginning of the course. Out of the 3029 registered participants who went beyond the registration process, 74.3 % filled in this survey, on which subsequent analysis on demographics are based. 100% of those who obtained the advanced certificate, 98.5% of those who obtained the basic certificate, and 63.0% of *Non completers* filled in the survey. IP addresses were not collected, therefore all available data on geographical origin comes from surveys. Regarding the use of videos, some analytics were provided by YouTube but they could not be associated to analytics from Canvas. Anonymised data was analyzed with the open source statistical software R 2.12 (Team, 2012). In the subsequent analysis, chi-square test was used in order to identify statistically significant associations between survey data and levels of completion.

Results

Course Demographics

In terms of course demographics, 68 % of learners were male, and the average age as a whole was 34.7 (± standard deviation = 10.0) years. Among participants, 14.3 % were students, 13.4 % had lower supervisory and technical occupations, 13.7 % were job seekers and 52.2 % had higher managerial and professional occupations. Most participants lived in France (60.6 %). Still, some learners came from many other countries, mostly from African countries where French is an official language, such as Burkina Faso (6.2 %), Senegal (5.2 %), Morocco (4.7 %), or Ivory Coast (3 %). For the purpose of this analysis, these countries were classified based on their Human Development Index (HDI), on the basis of information provided by the United Nations Development Program (UNDP, 2012). HDI ranged from low to very high, with medium and high as intermediate values. Among learners who completed the survey, 66.7 % came from countries with a very high HDI, 3.7 % from countries with a high HDI, 5.4 % from countries with a medium HDI and 24.2 % from countries with a low HDI. Among participants from countries with a low HDI, 10.3 % were students, 19.1 % had lower supervisory and technical occupations, 16.9 % were job seekers, and 44.6 % had higher managerial and professional occupations.

Objectives, achievements and constraints

The following demographic comparisons are valid only under the assumption that responding to the survey is independent of the demographic indicators. At the launch of the course, 45.0 % of participants intended to obtain the advanced certificate, 28.9 % the basic certificate, and 26.0 % were unsure or were not interested in obtaining a certificate. Student achievements were significantly associated with personal aims (χ^2 = 307, df = 4, p-value < 0.001) (Figure 1.A). 43.3 % of learners got a null score, 13.4% a positive score, and 43.2 % a negative score, showing that a significant proportion of learners failed to reach their objectives. Unsurprisingly, both achievements (χ^2 = 191, df = 6, p-value <0.001) and personal aims (χ^2 = 449, df = 6, p-value < 0.001) were significantly associated with the number of hours learners intended to spend on the course (Figure 1.C). Only 19.7 % of participants who intended to spend less than four hours per week on the course obtained the advanced certificate, whereas 33.6 % of those who planned to spend more than six hours received it.

Background influence

Among demographic factors, HDI was the factor most associated with achievement (χ^2 = 50, df = 6, p-value < 0.001), personal aims (χ^2 = 143.8, df = 6, p-value < 0.001) and above all with achievement gap (χ^2 = 193, df = 6, p-value < 0.001) (Figure 1.D). Learners from low HDI countries tended to overestimate their ability to get the advanced certificate. Among them, 62.9 % stated that they aimed at getting it, and only 10.8 % obtained it. This occurred less often with participants from very high HDI countries, since 36.8 % of them aimed at the advanced certificate, and 21.9 % obtained it.

We did not detect any association between gender and achievement (χ^2 = 2.2, df = 2, p-value = 0.33), instead the association was highly significant with personal aims (χ^2 = 53, df = 2, p-value <0.001) and achievement gap (χ^2 = 31, df = 2, p-value < 0.001). Women tended to underestimate their ability, contrary to men, who tended to overestimate their ability. Only 33.9 % of women aimed at the advanced certificate and at the scale of the MOOC, 65.3 % achieved or exceeded their objectives. In comparison, 50.2 % of men intended to get the advanced certificate, and only 52.9 % reached or exceeded their personal aims (Figure 1.B).

Participants' employment status had an impact on both achievement (χ^2 = 21, df = 8, p-value < 0.01) and personal aims (χ^2 = 59, df = 8, p-value < 0.001), but did not affect the achievement gap (χ^2 = 12, df = 8, p-value = 0.15). For instance, unemployed learners tended to reach higher targets and achievements than students. Among students, 31.9 % aimed at getting the advanced certificate and 12.9 % got it. Among participants looking for a job, 56.2 % aimed at getting the advanced certificate and 22.8 % succeeded.

Experience in project management also had a slightly significant effect on personal aims (χ^2= 37, df = 8, p-value < 0.001) and achievements (χ^2 = 24, df = 8, p-value < 0.01). Those who had experience in project management and who had followed some training in the field had higher personal aims and achievements. Still, the participants' experience in project management did not have an impact on the achievement gap. Among learners who had some practical experience of project management and who had already followed some training in the field, 54.4 % aimed at getting the advanced certificate, and 21.3 % received it. 41.9 % of learners with no project management experience aimed at getting the advanced certificate, and 13.2 % obtained it.

Participation in forums

We sought to isolate simple indicators associated with achievement, such as the use of forums. At the scale of the course, 430 (12.3 %) of registered participants posted at least one message on the forums. However, 2625 (75.1 %) read a discussion thread at least once. The proportion of learners who posted on the forums was pretty low compared to the ones who read discussion threads. Among learners who had never sent any message on the forum, 8.8 % got the advanced certificate, whereas 46.9 % of learners who had posted at least one message obtained it. This association was statistically significant (χ^2 = 498, df = 2, p-value < 0.001) (Figure 2.A). The number of viewed discussion threads was correlated to achievement (ANOVA, R2 = 0.49 F2,3023 = 1451, p-value < 0.001). Those who got certificates read the forums more than others. We showed that *Non completers* read only 3.1 (± s.d. 3.6) discussion threads, those who obtained the basic certificate read on average 8.6 (± s.d. 5.5), and those who obtained the advanced certificate, read on average 16.9 (± s.d. 7.4) discussion threads.

Engagement in the advanced certificate

The use of forums is an interesting indicator at the scale of the MOOC, but some more specific indicators are needed for the advanced certificate. Among registered learners, 615 (17.6 %) took part in the advanced certificate by submitting at least one assignment; the drop-out rate was pretty low. Among them, 438 (71.2 %) obtained the advanced certificate at the end of the course. Among learners who took part in the advanced certificate, 116 (18.8 %) submitted less than three assignments, three being the minimum number of assignments required to obtain the certificate. 499 (81.1 %) submitted three or more assignments. Some of them did not get the certificate because they did not reach the minimum score of 580.

We sought to assess whether the participation in the peer evaluation process was associated with achievement within this certificate. Out of the 615 participants, 555 (90.2 %) took part in the peer evaluation process at least once. Once a learner had started evaluating an assignment, he evaluated the four assignments that he was supposed to evaluate in 93.7 % of the cases. Taking part in the peer evaluation process was strongly associated with achievement within the advanced certificate (χ^2 = 146, df = 2, p-value < 0.001) (Figure 2.B). Those who evaluated assignments were much more likely to get the advanced certificate. Indeed, 78.0 % of participants who took part at least once in the evaluation process, 8.0 % of those who did not, obtained the advanced certificate. Among the 555 assessors who took part in the evaluation process, only 45.6 % gave some feedback on the assignment. Giving feedback was slightly associated with achievement (χ^2 = 22, df = 2, p-value < 0.001), but the association was weaker. The completion rate was higher among those who gave feedback at least once (87.0 %) than among those who did not (70.5 %).

Discussion

The course completion rate was higher than those usually observed in MOOCs (Breslow et al., 2013, Jordan 2013, Kisilcec et al., 2013). On the one hand, this may be due to the course design and on the other hand, to the type of participants who followed the course. MOOCs were little known in France when *Introduction to Project Management* was launched (Cisel & Bruillard, 2013). The participants of the first session of this course may therefore be considered as early-adopters, probably more motivated than most MOOC participants. The MOOC design doubtlessly influenced its completion rate. The workload necessary to obtain a certificate was significantly lower for the basic certificate of completion than for the advanced one. Moreover, the course duration was shorter than most MOOCs since it lasted only five weeks. It was therefore easier to complete the course for learners who had little spare time. It is hard to compare MOOC completion rates among courses given the diversity of workloads that they involve. The highest completion rate reported so far was *Functional Programming Principles in Scala*, where around 20% learners completed the course (Miller & Odersky, 2013). Taken alone, the completion rate of the advanced certificate of *Introduction to Project Management* is more in line with the general results reported (Breslow et al., 2013, Jordan 2013, Kisilcec et al., 2013)

This course enrolled more male than female learners. This result is in line with results reported from other courses (Huhn, 2013, Kizilcec et al., 2013), sex ratio depending highly upon the topic of the course. Before being turned into a MOOC, this course was an online module taught in the context of lifelong learning courses. As a consequence, it is not surprising that this course attracted more full-time workers than students. Around a quarter of the participants came from French-speaking, low HDI African countries. In comparison, the proportion of learners from low HDI countries in the three Computer Science courses described by Kizilcec et al. (2013) was below 3 %. This proportion is doubtlessly dependant on the teaching language; it would be interesting to compare course demographics from MOOCs in English, Spanish and French, since these three languages are used worldwide as official languages in a variety of countries. It is obvious that the participants did not consist of a random sample of the general population, especially for low HDI countries, given the required technological infrastructure, literacy level and language comprehension.

Completion rates were associated mostly with personal aims, which depended on employment status, geographical origin, experience in project management and time constraints. Further research is needed to understand why participants from developing countries and job seekers targeted higher levels of completion than others. Time constraints must also be taken into account in the interpretation of personal aims, since the situation is fundamentally different for a person looking for a job and for a full-time employee. A deeper analysis of the diverse motivations and constraints of the different groups of learners is needed to better understand both their objectives and achievements.

Understanding drop-out rates and, generally speaking, the gap between learners' objectives and achievements is a major issue for MOOC pedagogy. The achievement gap observed in low HDI countries is probably caused by various cultural and technical issues such as low broadband, for instance, or language issues. As a reminder, French is not the native language of many African learners and could be an obstacle. Kizilcec reported that in the *Probabilistic Graphical Models* MOOC (Graduate level course), completion rates were four times smaller in low HDI countries compared to very high HDI countries, reaching only 2 %. Further research is needed to understand the causes of the gap between objectives and achievements in those countries.

Identification of indicators associated with course completion is a major issue in order to tailor and adapt eventual interventions (Arnold & Pistilli, 2012). For this reason, we searched for simple indicators, such as participation in forums and in the peer evaluation process. Regarding the use of forums, learners were more active than what was reported in some other MOOCs (Randy, 2013). For example in the *Circuits and Electronics* (xMOOC) course held on the edX platform, only 3 % of all learners interacted with others. In many courses, this proportion is lower than 5 %. This is probably due to the humble size of *Introduction to Project Management* compared to courses like 6.002x, which made it easier for the MOOC staff to interact with learners on the different aspects of the course. Getting quick feedback from the MOOC team may have encouraged participants to post more frequently on the forums. Participation in forums was significantly associated with achievements, which suggests that it is a relatively good predictor for completion. This trend was observed in many other courses from Coursera. *Organizational Analysis*, a MOOC held on Coursera in the fall of 2012, is the only course that reported that more than half of the students who had posted on the forums completed the MOOC (Randy, 2013).

The quest for more precise indicators led us to analyze the peer evaluation process. All learners do not engage in peer assessment in the same way. As far as the evaluations are concerned, some of them give consistently lower or higher marks than other assessors (Sadler et al., 2006, Bachelet & Cisel, 2013, Piech et al., 2013). From the engagement point of view, some take part in the process while others do not. Participation in peer assessment was a good predictor of achievement within the advanced certificate, whereas providing feedback along with the assessments was a weaker predictor for success. It is very likely that learners who do not take part in the evaluation process will not complete the course. Indicators must have a strong predictive power and still be simple enough to be accessible and understandable by MOOC designers. In the long run, some more precise indicators should be developed in order to monitor the course in real time. It requires the development of standards for MOOC data (Veeramachaneni et al., 2013), based on which algorithm-based indicators could be designed.

Another session of the course was launched in September 2013 and more than 10,000 learners registered. Some innovations were introduced, such as Mozilla Open Badges, and some novel course content was added. This will allow us to assess the repeatability of the results obtained during the first session of the MOOC and, to some extent, to assess the impact of the course design on completion rates. One of the most important challenges for MOOC designers is to build courses based on evidence drawn from data. Further research on MOOCs and cooperation between MOOC designers and researchers will be needed to face the challenges of the next generation of courses.

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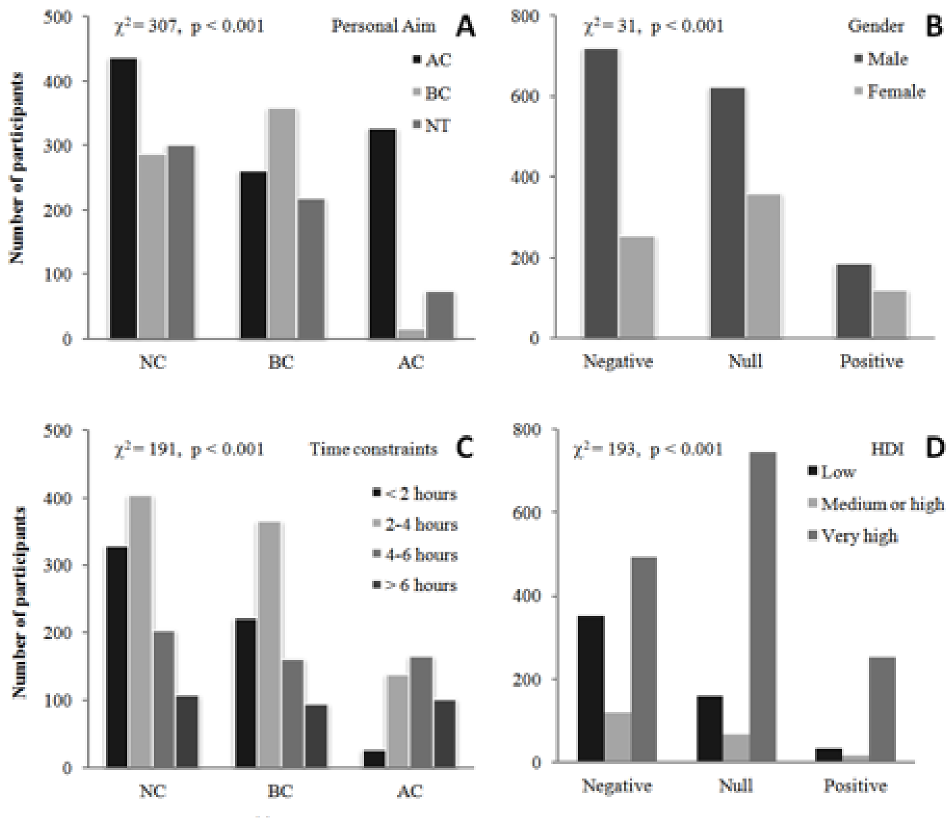

Figure 1 Understanding completion levels. NC : Non Completer, BC : Basic Certificate, AC: Advanced Certificate. Numbers represent chi-square test statistics. A. Personal aims and achievement, NT : No target or unsure B. Achievement gap and Gender C. Achievement and number of hours participants intended to spend weekly on the course when they filled in the survey D. Achievement gap and Human Development Index.

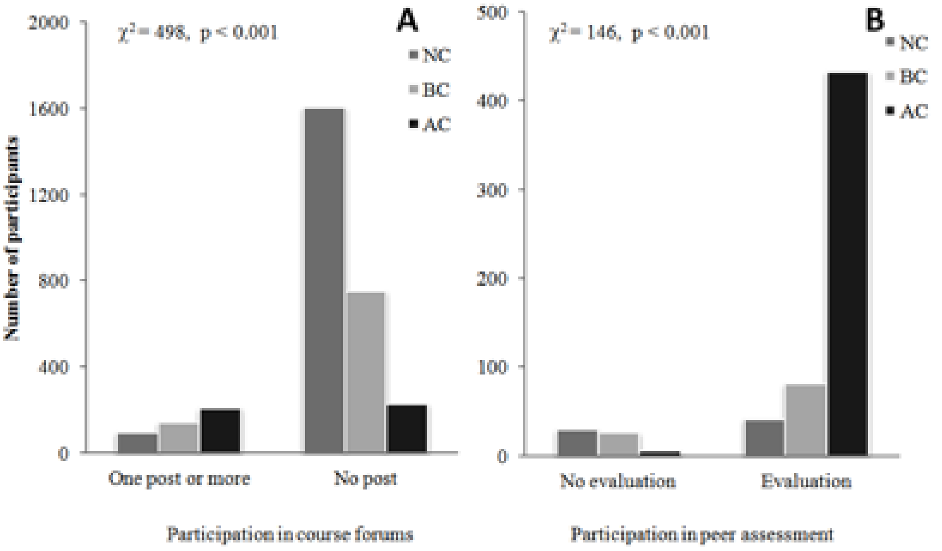

Figure 2 Simple indicators associated with completion levels. NC : Non Completer, BC : Basic Certificate, AC: Advanced Certificate. Numbers represent chi-square test statistics. A. Participation in course forums and completion levels B. Participation in the peer evaluation process and achievement, among participants who submitted at least one assessment.

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Challenges for conceptualising EU MOOC for vulnerable learner groups

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***Abstract:** This exploratory paper picks up elements from the European Commission's educational vision and philosophy behind Opening up Education, the resulting initiative of the OpenupEd.eu MOOC platform, and takes this as a starting point to look at potential challenges for developing MOOCs that include vulnerable learner groups. In order to align the future conceptualization of MOOCs with the vision and philosophy of Europe, potential tensions of contemporary and future education are listed. The current dichotomy of xMOOC and cMOOC are used to mark some of the unexplored MOOC territory. Practical answers to contemporary, ICT-supported educational challenges are provided as options to fuel the debate. The challenges and options for future online education initiatives are based on insights and ideas of international scholars and researchers reflecting on potential barriers for learners and online education. This paper aims to stimulate discussion of the potential for new educational technologies to ensure social inclusion for virtual and physical vulnerable learner groups.*

Introduction

Education is in a transformative state. Globally, the rollout of ICTs is pushing the boundaries of mass education. Education provision is a focal point inside and outside the European Union (EU). Of the various types of education within the EU, higher education and lifelong learning have been prioritised. Aligning with work being done internationally to help provide education for all, the authors of this paper think it is imperative that ICT-driven educational transformation, specifically the drive towards Massive Open Online Courses (MOOCs), should take into account vulnerable learner groups that are at risk of falling further behind as the Knowledge Society emerges.

Includ-Ed, an EU-funded research project exploring successful actions for educational and social inclusion in Europe, focused on five vulnerable groups at risk of social exclusion related to the educational opportunities available to them: women, young people, migrants, minority cultural groups (e.g. Roma) and people with disabilities. These five groups also comprise the definition of vulnerable groups as interpreted by the authors of this paper, and these groups are within the influence of EU policies that might drive the design and roll-out of EU MOOCs. Accordingly, they are important learner groups that should be taken into account when strategising ICT-infused education.

The impact of ICT and innovation on education is a global phenomenon. Since 2005, the worldwide rise of mobile devices, social media, and learning that is facilitated by new mobile and social technologies, has grown exponentially (Kop & Bouchard, 2011; de Waard, 2013). With the recent addition of a new form of open, online learning called a MOOC, the creation of new educational forms (both instructional and technological) is compelling educational institutes and policy-makers around the world to rethink education. Education is thus in a state of transformational flux due to new, pervasive educational technologies. This transformation can be used as a way to start and renew inclusive education that can reach all EU citizens. In order to achieve inclusivity, strategies must be put in place to address the challenges that threaten the ability of vulnerable populations to access, participate in, and benefit from education.

The EU MOOC setting

A 2013 European Commission initiative called 'Opening up Education' proposes "actions towards more open learning environments to deliver education of higher quality and efficacy and thus contributing to the Europe 2020 goals of boosting EU competitiveness and growth through better skilled workforce and more employment" (European Commission, 2013b, p. 2). A recent, practical example of a strategic, educational EU partnership has been the launch of the European MOOC platform by the European Association of Distance Teaching Universities.

EU MOOC initiative OpenupEd

In response to the perceived potential of MOOCs for maximising access to education, European partners in 11 countries have joined forces to launch the first pan-European MOOCs initiative, with the support of the European Commission (OpenupEd, 2013a). The EU MOOC portal http://www.openuped.eu offered 174 courses five months after its initial launch in April 2013. The portal does mention that the courses are "open to people" of all ages, contexts and students combining work, domestic duties or other activities; nowhere is it explicitly stated which groups are being targeted (OpenupEd, 2013b). This is one area in which the EU MOOC initiative could better enact inclusion through direct outreach to vulnerable groups as well as by providing these groups with equal opportunities to engage with and achieve personal goals via MOOC courses.

The OpenupEd initiative is a vision that aims at 'opening up' education for everyone with a platform that reflects European values of equity, quality and diversity. OpenupEd also claims to consider the variety of needs and circumstances of lifelong learners, along with the demands of a changing knowledge-based society (OpenupEd, 2013). However, there is no 'vulnerable European citizens and learners' strategy in place that could optimise the benefits of MOOCs for these vulnerable groups. Without clear indications as to which groups are being targeted with these initiatives, or a defined program that targets vulnerable learning groups, it is possible that people who could benefit from MOOCs will not participate in these initiatives. In a communication from the European Commission on 'Opening up Education', it is stated that:

> Higher education faces a digital challenge: with the number of EU students set to rise significantly in the next decade, universities need to adapt traditional teaching methods and offer a mix of face-to-face and online learning possibilities, such as MOOCs..., which allow individuals to access education anywhere, anytime and through any device. But many universities are not ready for this change (European Commission, 2013b).

While the European Commission is aware of the need to get both universities and learners up to speed for the educational transformation that is taking place, challenges need to be shared and philosophical decisions need to be made in order for a strong vision and strategy to become a reality.

But what happens to this vision when an overarching MOOC platform is built, which is the case at present with the OpenupEd MOOC portal (2013a)? What is meant by cultural and linguistic diversity - one of the fundamental principles of the European Union - if vulnerable groups such as migrants come into the picture? What happens to youth, women, cultural minorities and people with disabilities who are likely to have differential access to computers and other ICT devices due to issues such as costs, discrimination or other barriers? With the launch of the OpenupEd MOOC platform, cultural and linguistic diversity might appear to be addressed, but there is more that can be done to ensure that educational options that fit all EU citizens are provided.

Europe 2020, the EU's growth strategy, has five ambitious objectives on employment, innovation, education, social inclusion and climate/energy. This strategy provides a good background for which we can discuss the implication of MOOCs, especially the EU MOOC platform and the initiative of OpenupEd overall (European Commission, 2013c). While these initiatives are highly commendable and timely, the authors of this paper find that the launched initiatives lack some of the EU policy recommendations made by other educational projects such as Includ-Ed (2011), which are concerned with vulnerable groups. The seeming lack of attention to the inclusion of vulnerable groups in these new ICT-based educational initiatives risks creating unbalanced positive impact of the Europe 2020 strategy for EU citizens.

With more than 120 million people in the EU at risk of poverty or social exclusion (a figure equivalent to 24% of the entire EU population), EU leaders have pledged to bring at least 20 million people out of poverty and social exclusion by 2020 (European Commission, 2013c). Clearly defining and targeting vulnerable learning groups with these large-scale educational efforts is one strategy for pushing towards these goals.

The importance of targeting and including vulnerable groups in MOOCs

Vulnerable learning groups are defined here in keeping with the European Commission's factors contributing to poverty and social exclusion (2013c). The authors of this paper are also defining vulnerable learning groups in keeping with the groups established by Include-Ed, namely women, young people, migrants, cultural groups (e.g. Roma) and people with disabilities (Includ-Ed, 2011). These groups need to be considered in their physical, as well as in their virtual, reality. MOOCs organised by institutions previously limited to specific regions now attract (more) learners from other regions. As such the concept of migrants can be expanded to all learners who register and follow a MOOC course provided by an institution located in a different part of the world. These learners could be seen as virtual learner migrants. As more and more open learning and MOOC offerings are emerging from specific regional or national efforts, like the OpenupEd initiative, this concept of the virtual migrant will resonate even further. Many learners are crossing national boundaries by participating in these courses, virtual or otherwise.

The Includ-Ed project was a response to the realisation that one out of every five young people in the EU is at risk of poverty, and this is directly linked to their employment opportunities and to the educational levels attained. This situation can be reversed; research can provide key elements for European policy making to inform this process and achieve the 2020 Strategy objective in education: to reduce the share of early school leavers from 15% to 10% (Includ-Ed, 2011, p. 1). Europe 2020 only leaves a time span of six years to reach the aforementioned goals, which clearly underlines the urgency of rolling out appropriate strategies for inclusion, or at least to ensure indicators are embedded in the EU MOOC courses to increase understanding of the impact, if any, of MOOC courses on the vulnerable groups defined by the EU.

One of the Includ-Ed report (2011) policy recommendations is simple and of direct interest to the current reshaping of education on all levels: base educational reforms and policies on successful actions in order to achieve school success for all children. Where Includ-Ed focused more on compulsory education, adult education also remains high on the EU agenda. One of the EU Adult education central priorities is how to attract and support more adults back into lifelong learning; this is contrasted against the background of decreasing participation in adult learning. Participation in adult lifelong learning currently sits at 8.9% with the EU benchmark set at 15% by 2020 (European Commission, 2013e). As such the importance of merging these priorities and embedding them in new educational initiatives such as Opening up Education and OpenupEd.eu is crucial in order to obtain the EU goals of attainment and lifting up vulnerable groups via education. This will get both young and adult learners of all ages on board as target groups.

Problem

Contemporary education is moulded by a variety of new factors. The learning and teaching processes of today are impacted by the use of social media, new mobile technologies and pedagogical formats, among other things. Due to these new technologies and emerging formats, education is forced into a process of transformation. De Waard *et al*. (2011a) have argued that combining technologies that embrace the complexity of knowledge production with pedagogical formats that allow learners to build knowledge by filtering that complexity will encourage a new educational balance to emerge. This balance will possibly enable the construction of a redesigned educational landscape that better fits this Knowledge Age, whereby the word ‘possibly’ refers to Davis and Sumara’s (2008) statement that “an education that is understood in complexity terms cannot be conceived in terms of preparation for the future. Rather, it must be construed in terms of participation in the creation of possible futures” (p. 43). As such it can be said that the MOOC format allows for massive participation leading to the creation of possible educational futures, especially when including the aforementioned vulnerable groups as active participants in the creation of possible futures.

In addition to these new strains in education, the old challenges with regard to excluded, vulnerable learner groups continue to exist; in fact, in some cases they are becoming more urgent. These challenges include access to basic social services, including education, as well as gender discrimination, lack of accommodation for people with disabilities, racism, xenophobia and employability. As such, many tensions accompany this educational transformation both within and beyond the European regions. Portmess (2013) raised a crucial point when she stated that

> Knowledge in itself without a larger narrative of purpose lacks moral meaning, and with the ‘first world’ imprimatur given to the courses and the hopes and expectations that student data will be a test bed for educational experiments, the creation of an unspoken postcolonial project uncomfortably shadows the hope for democratized access to education (p. 6).

As the global economic crisis stays omnipresent, more European citizens and particularly vulnerable learner groups are becoming isolated as education is losing the larger narrative of purpose, especially for these vulnerable learner groups. An educational solution befitting the latest Technology Enhanced Learning opportunity must be sought to mitigate this isolation in order to begin drawing additional learners from these vulnerable learner groups. But before such a long-term solution is given shape, it is crucial to acknowledge the challenges involved in such a transformation and choose which to tackle as priorities.

Finding the right mix: cMOOC, xMOOC, borderless MOOC and EU-MOOC

The debate on the meaning and definition of a MOOC is ongoing as MOOCs are an emerging field. At present MOOCs are divided into two types (Rodriguez, 2012; Siemens, 2012a; Clow, 2013): cMOOC and xMOOC, each having their own technological and pedagogical characteristics. A third hybrid group is emerging which is attempting to combine characteristics of both, but for the purposes of this paper the discussion will be limited to xMOOCs and cMOOCs. The rationale behind describing both formats is to provide an idea of their possible strengths. In very rough terms, the xMOOC is in general more formal, most of the time comprising ‘top-down’ approaches to teaching and learning, whereas the cMOOC is said to be more collaborative, or ‘bottom-up.’ Each of these approaches has an effect on the teaching and learning structure of the MOOC and, as such, also influences the potential impact, reach and support of vulnerable groups. xMOOCs are evident in many of the MOOCs offered by Coursera, Udacity, and others.

McAuley *et al*. (2010) provided the following definition for a MOOC, which also mentions the self-organising factor related to self-directed learning:

> “A MOOC integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources. Perhaps most importantly, however, a MOOC builds on the active engagement of several hundred to several thousand ‘students’ who self-organise their participation according to learning goals, prior knowledge and skills, and common interests” (p. 5).

The cMOOCs are usually regarded as MOOCs that are distributed and follow the connectivist theory as it is put forward by Siemens (2005). The main features are that learners are in control of the content created and knowledge is distributed across connections or networks; knowledge is also generated by the participants creating and sharing artifacts. This approach allows learners to come forward as experts in certain areas, share their personal expertise with other experts or peers and collectively grow in the topics covered by the MOOC or its participants. But this also means the participating learner groups need to be more digitally skilled in order to take charge of the learning or to produce learning objects based on their own contexts. They must also possess enough self-esteem to dare to create and to share their insights. Examples of cMOOCs include CCK08 and MobiMOOC.

A cMOOC does not necessarily put one expert in charge of the course. The course content can be produced and offered by several peers or experts collaboratively, or it can be built up from scratch by letting the participants make up the syllabus and resulting curriculum themselves. One example of this, and an interesting experiment overall, would be to put vulnerable groups in charge of creating a MOOC on how to be successful in an EU-delivered MOOC. The vulnerable learning group would define their own learning agenda, define the learning objectives, and design the MOOC on how to be successful in an EU MOOC (a meta-MOOC, if you will). This experiment would generate, presumably, empowerment on the part of these vulnerable learning groups towards their own learning as well as reveal any disconnects that might exist between the EU MOOC and the learning needs of these vulnerable learning groups. More importantly, this is an example of what a cMOOC might look like.

xMOOC started off as more US-related MOOC platforms such as Coursera, EdX and Udacity, where online learning is provided as a service and institutes can purchase usage and the tools from the platform provider. These MOOCs adopt a more traditional cognitive-behaviorist lecture and knowledge dissemination approach to learning and in some sense only provide a scalable digitised version of traditional learning where the instructor provides the content (Rodriguez, 2012). Anderson (2013) added that in order to reach scalability, xMOOCs digitise teachers on video and use machine scoring of quizzes, thus morphing lectures, discussions, tutorials and feedback from classroom student-teacher interaction into student-content interaction. In most cases this approach does not allow the learners to provide content to the central core of the course. Because the expert is the one taking control of the course, the course content inevitably mirrors the thoughts, language use and cultural ethics of the expert, making the viewpoints on the topic less diverse. Nevertheless, if indicators or guidelines are provided that have an evidence-based positive effect on learning done by vulnerable groups, xMOOC can successfully turn around the lives of vulnerable groups as well. This can help keep these groups from the brink of poverty and ensure their inclusion in society overall by providing lifelong learning options that accommodate their participation.

Another interesting option is to consider the concept of a 'borderless' MOOC. The term 'borderless education' is used to describe educational provision that crosses conventional boundaries of time, space and geography (D'Antoni, 2006). Informal borderless education as mentioned by Cunningham *et al*. (2000) may be the direction of the future. It might be relevant to MOOCs, as borderless education is linked to the emergence of new providers and markets in higher education. Borderless education has been picked up by UNESCO in an effort to consider implications. It might seem counterintuitive to view these MOOCs as bordered or national or even regional environments, but they are designed in and reflect the cultural (including gender), linguistic and educational imperatives of their countries of origin. In a sense they have borders, so investigating the implications of borderless education is worthwhile.

A strategic cross-pollination of the xMOOC and cMOOC formats, possibly emphasising borderless education, might result in meaningful, life-changing courses for vulnerable groups. This cross-pollination of MOOC formats is undoubtedly happening in the EU MOOC courses currently gathered in the OpenupEd.eu platform. But until successful strategies are in place, suggestions need to be made and research needs to be conducted to help develop new, or improve upon current, MOOC strategies.

Tackling challenges

Portmess (2013) makes a strong point for the necessity to consciously direct MOOCs in a direction that fits the philosophical aim of the intended educational solution.

> In the myriad positions on MOOCs that have emerged — from utopian hopes for greater access to education by students traditionally barred from such education to skeptical arguments about hype, disruption to traditional learning models and knowledge fragmentation — the irresolution in how we should think about MOOCs and their still-to-be-realized potential reflect paradoxes of education as it globalizes, where (free) knowledge is a precious export of powerful institutions and a course — whether on artificial intelligence or circuits and electronics — is more than a course (p. 3).

In order to create a starting point to develop an online learning strategy that includes vulnerable learner groups, potential challenges must be listed and solutions must reflect the philosophical aim that provides the "larger narrative of purpose." Each of the following 12 MOOC challenges is situated within research, and is accompanied by possible suggestions to tackle these challenges, all keeping vulnerable groups in mind.

Digital and Social exclusion(s)

One area of social exclusion in the technological era relates to the digital divide. However, this term covers many factors. There are "multiple divides which relate to a variety of factors such as: age; gender; 'ethnic clustering'; uncertainty of financial conditions; work insecurity; and social insecurity" (Mancinelli, 2007, p. 7). Looking at this wide array of factors, Willems and Bossu (2012) suggested that the focus to address these educational challenges should be "on social inclusion rather than simply on the digital divide" (p. 188). Reaching social inclusion can only be obtained by planning a consciously inclusive education from early on, and by embedding inclusive strategies for all vulnerable groups. This could be achieved by giving all groups an active voice, empowering them to contribute their ideas, and by listening to their experience and perception of the MOOC being rolled out. Digital initiatives such as 'Opening up Education' will be crucial in mitigating the current 60% of nine year olds in the EU who are in schools that are still not even digitally equipped (European Commission, 2013b). This lack of digital equipment (e.g. computers, Internet) has a direct effect on their participation in the educational opportunities being provided by MOOCs, and indeed the race to create a knowledge society.

Increasing diversity of learner groups

Non-participation in adult and lifelong learning is deeply entrenched in 'trajectories' based on class, gender, generation, ethnicity and geography, among other factors, which are established at an early age (Tuckett & Aldridge, 2009). With the rise of MOOCs, global audiences - specifically virtual, potentially vulnerable learners - are starting to become more important as potential learners. Even though there is a rhetoric that MOOCs will offer opportunity to learners from developing countries in the EU who currently lack direct access to learning opportunities, in reality they may well be serving only the 'privileged' who already have access to digital technologies and international language learning opportunities, or otherwise are more easily able to access information about MOOCs that lead them to join a course (Liyanagunawardena, Williams, & Adams, 2013).

In order to overcome this, the digital literacies that accompany MOOC participation need to be taught and made measurable to track the reach of MOOCs among migrants, women, youth, specific cultures and disabled learners from all backgrounds. Europe has a long tradition in setting up and evaluating indicators and the new OpenUpEd.eu environment might provide additional indicators for reach, as well as success for learners belonging to vulnerable groups. These indicators need to be offered both as preliminary stand-alone learning opportunities in conjunction with, or prior to, each MOOC *and* scaffolded into the MOOC itself. Indicators such as this, that address the digital literacies needed to be successful in these open learning formats, will, presumably, make participation by these vulnerable learning groups more predictable and successful.

Formal and informal learning

There is a continuum between formal university- and higher education-driven MOOCs versus more informal, grassroots courses. Research shows that there is a greater uptake of informal kinds of online learning opportunities, and that the more informal the nature of the online learning activity, the more the factors beyond involuntary exclusion become important (Eynon & Helsper, 2011). Additionally Eynon and Helsper (2011) mention that informal learning is the area in which there is the largest proportion of unexpected learners in the examination of digital inclusion and exclusion. These are learners that might have not otherwise been accounted for in more formal learning options. This area of 'last-minute' learners and the degree of informality warrants greater attention.

A MOOC can have informality embedded in its format. However, in a UNESCO (2012) policy paper, regretfully, only new types of the more formal xMOOCs are mentioned (Coursera, Udacity and edX). Looking at the courses currently provided by the OpenupEd platform, the content offered also seems more formal, and attuned less to vocational education, or courses aimed at basic, overall education (for example, effectively dealing with unemployment challenges, how to re-enter the job market, etc.). If most MOOCs are targeted at or are dominated by the already educated, then they risk further segregating these learners from more vulnerable learner groups. Special attention must be directed to ensure that the course focus, content, and inclusion strategies reflect the needs of these vulnerable learner groups.

Local versus global

The tension between local and global regions is increased as digital communication has become a global reality. Termed by Wellman (2002) as 'glocalisation' in relation to the overlapping spheres of society, technology, and the World Wide Web, this concept has application to the blurred boundaries that exist in MOOCs. This glocalisation of education can simultaneously serve to perpetuate the status quo of existing power relations from one region to the next, as mentioned by Willems and Bossu (2012, p. 186). In order to avoid the disappearance of local knowledge and cultures into the void created by mainstream topics and education, special attention needs to be given to both the experts as well as the citizens from those regions and language groups, as well as specific vulnerable cultures (e.g. Roma). Without a specific strategy to increase participation by these vulnerable cultures and learning groups, ideally in a course designed implicitly to preserve local knowledge and culture, the gradual erosion and eventual disappearance of this knowledge and culture is all but guaranteed. Education of this sort can counteract that trend through inclusion.

North – South postcolonial tensions

Education in society always reflects the values of the dominant political ideology and this is true as well in MOOCs. In the West, this dominant ideology is neoliberalism (Apple, 2006), which concerns free market economics, constant consumerism and individualism, and it is inevitably reproduced in schools. Viruru (2005) adds that dominant ideologies of how children and youth grow and develop have become another 'truth' of colonialism that permits no questioning, for the dominant educational model is seen as 'the right one'. This postcolonial tension is increased by some MOOC courses that are currently promoted as providers of "education for all", but in fact they are a new form of the postcolonial push of the North/West, as suggested by Portmess (2013). These postcolonial tensions might have an effect on learning outcomes for migrants coming from the Global South, as well as learners joining EU MOOC but residing in the Global South. Special care must be taken to include vulnerable learner groups, many of which have migrated from the Global South, in the design and implementation of MOOCs, to mitigate these potential effects.

Ubiquitous social technology and infrastructure

Any educational initiative that wants to increase inclusion of vulnerable learner groups through the use of technology must take account of the technology most ubiquitous in the target groups in question. MOOC environments need to offer integrated learning, including web-based as well as mobile options. This can be done by offering a mobile Learning Management System (UosakiS, 2013) or it can be achieved by using Cloud solutions. Ozdamli (2013) offered an interesting view on the effectiveness of the Cloud for developing positive, seamless, ubiquitous learning perceptions. The Cloud software "gives the students the opportunity to communicate, cooperate, share and learn with their peers, teachers, and family members regardless of time and space" (Ozdamli, 2013, p. 605). Ozdamli mentioned that cross-platform software has the potential to allow education practitioners to provide mobile support to their learners' learning endeavors, while offering similar functionality to non-mobile users via more traditional computing platforms. The Includ-Ed project suggested, in an attempt to provide for greater inclusion, diversifying support (tutor and peers) depending on the needs/capabilities of the learners involved. These 'human' support mechanisms, along with the use of ubiquitous technology, might help in increasing inclusion in these vulnerable learner groups.

Technology also has a social factor. Mobile technologies enable communication and collaboration (Traxler, 2010; Kukulska-Hulme & Jones, 2011) and "in those university programs where communication and collaboration are important, the added dimension of mobile interaction may soon be considered essential" (p.68). Communication and social cohesion will presumably promote greater resilience in these vulnerable learner groups in their participation; however, these social factors need to be explicitly included in the design of MOOCs.

Individual learning versus networked learning

Downes (2007) stated that "knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks." (p. 1, par. 2) In order to optimise learning, individuals must be made aware of self-directed learning (SDL) options. The need for SDL in online learning is emphasised by Song & Hill (2007). They mentioned that "students need to have a high level of self-direction to succeed in online learning environment" (p. 29) and they proceeded to state that "successful learning in every learning environment involves the use of effective learning strategies" (p. 34). Developing learning strategies is an important part of SDL. A reference is also made to the level of learner responsibility "for seeking assistance is also much more centered with the learner since they are directly involved in monitoring the process, and seeking resources to improve the situation as needed" (p. 36). Where turning to peers for help is an option within online learning, it can pose a problem for some individual learners, as this implies overcoming potentially personal barriers (self-esteem, ego, language); this emerged from the de Waard (2013) study when searching for the main interaction drivers in a MOOC.

To be able to engage in a productive conversation, "all parties need access to a common external representation of the subject matter that allows them to identify and discuss topics" (Sharples et al., 2007, p. 226). But this is a capacity/skill loaded ability: it includes language, personal courage and self-esteem, prior knowledge, being able to use the technology to exchange ideas, having literacy skills… especially in courses that attract international and non-native English speakers. It might be that for some MOOC participants, specifically those from vulnerable groups, this combination of social skills might be a threshold, keeping them from any learning that might be derived from collaborative learning. In order to scaffold learners from these groups to become active, confident MOOC participants, virtual communities might be set up, in parallel with the successful physical learning communities that were built and reported by Gatt, Ojala and Soler (2011).

Saadatmand and Kumpulainen's (2012) study looked into Personal Learning Environments (PLE) as a set of learner-defined tools and services in the ecology of Web 2.0. For their online ethnographic study, they investigated three MOOCs. Based on their data they concluded that "learning in open online environments as experienced in MOOC was quite positively perceived by many participants nonetheless, there were some difficulties for some of them in terms of technological competencies and managing time and resources which then gradually they learned how to cope them." (p. 271). Song & Hill (2007) also mentioned the digital skills challenge: "increasing learners' information literacy skills … remains an issue that needs to be explored further" (p. 34), referring to critical thinking and retrieving relevant, valid information. In MOOCs, information literacy skills become very important as the learners become active creators of content/resources, and need to sift through more information (Fini, 2009). Kop and Fournier (2011) picked this up as well, emphasising in their SDL in MOOC research that "some literacies have been identified that are critical for learners to be able to effectively direct their own learning in an open online networked environment" (p. 4), and all the literacies must be mapped (and described). These literacies need to be explicitly addressed for vulnerable learning groups in terms of learning strategies.

Yet literacy skills are not limited to information; they are also concerned with the use of technology and more specifically how the learner can use their technology to achieve their learning goals. Cross-cultural literacy might also be a factor that influences non-native speakers engaging in MOOCs, such as those in English (cf. Willems & Bossu, 2012). There may also be technical literacy challenges for women, girls and youth who may be more unfamiliar with how to use technology because of a previous lack of access due to costs or cultural barriers. For these reasons, skills necessary to successfully follow and engage in a MOOC must be provided, supported and evaluated in order to ensure participation and empowerment of vulnerable groups.

Closed versus Open Educational Resources (OER)

OER can, and does, include full courses, textbooks, streaming videos, exams, software, and any other materials or techniques supporting learning (OER Foundation, 2011, p. 1). But what is shared builds upon the content and ideas of its makers. However, what people think others need is not always that content that is really needed. This highlights the 'top-down' nature of institutionally-driven formal learning (cf. Willems & Bateman, 2011; Bateman & Willems, 2013). cMOOCs in particular defy this trend to some degree by making the curriculum and course content skeletal to allow for divergences, alterations, and iterations. However, it is the belief of the authors that open educational resources (OERs) allow for the greatest possible use and reuse in the MOOC context due to their availability. However, the definition of availability needs to include the ubiquity of the technology being used by the learners.

McGill (2010) noticed that in order to make all the OERs or any educational materials and courses fully open and accessible, materials will be accessible on alternative technologies, including mobile technologies. Willems and Bossu (2012) added that "the development of OER for mobile learning applications may be a more appropriate strategy to make OER widely available to students living in developing regions" (p. 193), yet being part of what could be described as the virtual migrants. However, this means that all the MOOC material provided by OpenupEd.eu should be made available under an open license, allowing learners from other regions to possibly edit them so other peers can more easily learn from those OER (e.g. translation, changes toward authentic context).

Digital identity

Identity negotiation and its relationship to societal power and status relations is also clearly implicated in the phenomenon of 'stereotype threat' for which there is extensive experimental documentation (OECD, 2010, pp. 87-88). This research is summarised by Schofield and Bangs (2006) as follows: "stereotype threat, the threat of being judged and found wanting based on negative stereotypes related to one's social category membership, can seriously undercut the achievement of immigrant and minority students" (p. 93). Additionally, the risk of providing content for the masses is that identities get lost and that only the societal, predominant identity is represented in both the texts and in the visual material of the course content. This has a profound effect on learning, as identification is connected to motivation and learning. In order to avoid alienating learners from vulnerable groups, a diversity in identities should be provided in the examples accompanying MOOC content. A pre- and post-course screening tool enabling online course content and its active parts - specifically animations, actors, visuals or audio of any form - to be accounted for in order to ensure a balanced representation of the different identities (de Waard, 2009) comprising the vulnerable groups might be of interest. Additionally, course content and activity that promotes a diversity of identity should be encouraged.

Learner access and success

The systemic obstacles to access and success in MOOCs must be gathered in order to tackle them and ensure inclusion for all. In order to do this the authors feel it is important that the promotion of 'equity of access and fair chances of success to all who are seeking to realise their potential through education, while eradicating all forms of unfair discrimination and advancing redress for past inequalities' (Council on Higher Education, 2013, p. 27) needs to be a central goal. Low participation rates have implications for social and economic development, especially given poor completion rates in education. Furthermore, the gains made in equity of access need to be complemented by equity of outcomes, which – like CHE (2013) pointed out – includes coming to terms with the learning needs of the majority of the learners, in this case MOOC participants. The needs of the learners will result in higher access, but this is not enough. The most pressing result needed is success in order to safeguard the vulnerable groups from the downward spiral towards exclusion. Success is enabling vulnerable groups to actively take up a citizen role based – if only in part – on MOOC learning outcomes.

Global communication needs versus language barriers

The Council of Europe has consistently promoted the value of plurilingualism for all students, including migrant and vulnerable students (Little, 2010). However, at present, most international courses are either in written or spoken English. OpenupEd has multilingual courses, which is a bonus for reaching a broader learner audience. The majority of assignments or interactions expected from the MOOC learners are also more text-based, increasing the threshold for those learners not familiar with the language of instruction used in the MOOC.

All of these potential challenges can be used as strategic points to transform the EU MOOC to encourage multilingual participation. One strategy would be to create smaller, open learning groups based on native languages or languages that the learners feel more comfortable in, in order to build learner resilience in participating in MOOCs.

Possible future strategies

Finding the right mix between the current MOOC subsets of xMOOC, cMOOC and borderless MOOC formats is crucial to find an optimal European-driven online learning solution for the majority of learners, including many of the vulnerable groups in society, which would form the basis of an EU MOOC.

In a connectivist format, MOOCs are informal and include a wider learner audience than traditional education (for example, no degrees needed to participate in the course). Both xMOOC and cMOOC must be made mobile-friendly, making it easier for people from developing regions, as well as mobile learners everywhere, to participate. MOOCs need to become more focused on collaborative, networked learning, as this will increase the peer-to-peer interactions enabling a more scaffolded learning environment. If content that is produced for or within MOOCs is made open, for example, as OERs, others can change that content to fit their context, or simply add an additional layer to the OER to make it accessible in several other languages.

Participation and dialogue must be at the centre of MOOC interactions. Dialogue is one human factor that is now possible on a greater scale than ever before across borders, beliefs, cultures and time. Communication, or dialogue, and living through experiences in a collaborative way are central to a connectivist or collaborative oriented MOOC. As MOOCs are a gathering of people with generally no prior connection, they have a unique social advantage that relates to a more open and connected way of thinking (de Waard et al., 2011b). This relates to Downes' (2007) idea that the learning activities we undertake when we conduct practices in order to learn are more like growing or developing ourselves and our society in certain (connected) ways. "To stay viable, open systems maintain a state of non-equilibrium…they participate in an open exchange with their world, using what is there for their own growth…that disequilibrium is the necessary condition for a system's growth" (Wheatley, 1999, p. 78-79). This constant flux, with attention to context and personal experience and background should be an inherent part of every future EU-MOOC.

Borderless MOOCs based on the concept of borderless education (Cunningham et al., 2013) are an important option to consider, especially for communities linguistically not well represented in the more better-known MOOC offerings. In order to ensure MOOC openness and inclusiveness, EU collaboration is key. True learner participation needs to be ensured, enabling all citizens to keep themselves out of the pitfalls of the knowledge society (e.g. poverty, exclusion).

Conclusion

The Massive Open Online Course format, or MOOC, has the potential to address many of the above mentioned issues if the format is consciously built to do so. MOOCs have only emerged during the last six years. The insights into the risks as well as the capacities of MOOCs are becoming transparent, which will enable a more democratic and citizen strengthening format to be built. Without vision and strong educational decisions, MOOCs might reflect institutionalised patterns of power and authority, thus alienating those groups that are vulnerable even more from a successful education (Portmess, 2013).

The MOOC format is now mature enough to be optimised for the challenges that all of us face – as global learners, teachers, and researchers – during these times of financial and educational crisis. With the newly launched EU initiative of Opening up Education for all, and its subsequent MOOC portal, there is an opening to build a roadmap to transform existing MOOCs so that vulnerable groups can benefit from them on equal terms, to build instruments and indicators that enable participant success, and to build future MOOCs that are in tune with the inclusive European vision towards vulnerable groups, thus reaching the EU 2020 objectives.

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Scaffolding Self-learning in MOOCs

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Abstract: *MOOCs are considered an affordable alternative to higher education and vocational training, as students can complement their studies on particular topics related to their professional development and hobbies, generally free of charge. Nevertheless, not everyone can benefit equally from MOOCs. Due to the scarce personalized guidance that can be provided by MOOC teachers, it is much more likely that people lacking study skills and work habits drop out of MOOCs, contributing to increase the educational gap between those more and less educated. This paper presents the first steps towards a tool called MyLearningMentor, which is designed to guide and advise MOOC participants with less study know-how in the delicate task of facing MOOCs. MyLearningMentor aims to turn less experienced students into self-learners, helping them to plan the MOOCs as they enroll, and proposing tips and actions to achieve their successful completion.*

Introduction

MOOCs (Massive Open Online Courses) are a recent hit in online learning, and are positioned as an alternative to traditional higher education courses (Yuan & Powell 2013). The most successful initiatives in the MOOC area, such as Coursera, edX, Udacity, FutureLearn or MiríadaX are receiving strong attention from the media (Pappano 2012). MOOCs have brought a revolution to the education sector in a short time, opening up opportunities for new pedagogies (Martin 2012) and business models (Kolowich 2012), enabling thousands of students access to free, high quality education.

This free access makes it possible for people all around the world to register in MOOCs (Mackness et al. 2010). Despite varied social backgrounds, most MOOC participants have similar profiles regarding age and literacy. Several studies point out that most MOOC participants are workers aged between 25 and 40 years old that have a Bachelor's Degree, Master's Degree or PhD (Alario-Hoyos et al. 2013, Balch 2013). Learners with this profile have developed study skills, especially in face-to-face and blended instruction, as well as work habits. It is therefore easier for these learners to take advantage of the online instruction provided in MOOCs, updating their knowledge or covering new topics related to their professional career and/or personal interests.

However, the affordable education provided by MOOCs can also be seen as a chance for those who did not complete their studies and need a shift in their careers due to the current socio-economic context (Shen 2013), either because the sector in which they work is losing competitiveness as compared to other growing sectors, or because they are unemployed (Mourshed et al. 2013). As an example, Alario-Hoyos et al. (2013) reports 22% of unemployed participants in a MOOC on educational technologies taught in Spanish, with 59% of participants from Spain, a country that in December 2013 faced an unemployment rate of over 26%.

Those most affected by high unemployment rates are generally non-qualified people for whom accessing Higher education is a major challenge. This problem causes a growing educational gap between qualified and non-qualified workers, further hindering the latter's access to the labor market. For this reason, and in line with authors such as Sharples et al. (2013) and Shen (2013), we believe that MOOCs are a great opportunity to complement not only Higher education, but also vocational training, and to reach less experienced learners, who now have the opportunity to receive free, high-quality training. Aligned with this idea, major MOOC initiatives like Coursera are already offering courses that may be useful for this alternative student profile. As an example, the Tecnológico de Monterrey delivers a course on 'Continuity and development of the family business' (https://www.coursera.org/course/empresafamiliar), while the University of Florida offers a course on 'Sustainable Agricultural Land Management' (https://www.coursera.org/course/sustainableag). Transversal skills such as language proficiency may also be useful to help train less educated people, particularly in multilingual contexts such as Europe.

Nevertheless, facing an online course without having developed study skills and work habits can be frustrating and lead to early drop outs (Sharples et al. 2013). This situation is particularly aggravated in MOOCs due to the lack of support from teachers, who cannot respond to all learners' requests for advice (Downes 2010). Some authors go even further, suggesting institutions to discourage students who have no study habits from participating in MOOCs, and encourage them to take only blended or face-to-face courses (Beasley 2013); although these courses usually have significant costs associated. In the balance between education and economy there is a need for solutions that instill confidence and self-learning ability for those with no experience in online learning, so that they are able to follow the MOOC pace and learn whatever interests them. Such solutions could help reduce early drop outs from less experienced learners, and eventually the educational gap between trained and untrained people.

This paper presents the results of a research study that drives the requirements and preliminary design of a software application to help less experienced people take advantage of MOOCs. This application is called MyLearningMentor, and aims to scaffold self-learning in MOOCs and improve learners' performance by providing personalized planning, tips and hints for time management, study habits and teamwork, and a meeting point for people who need help to keep pace with the MOOC and need to know who can offer them support (mentors). Although MyLearningMentor is not exclusive for MOOCs, it is expected to have greater impact on them due to the lack of support from teachers and the large number of people that are currently joining these courses. MyLearningMentor is a first step towards understanding the role of massive online education for less educated people.

The next section of this paper deals with onto overall research methodology, and then the problem statement and initial hypothesis are established. The requirements of an application that addresses the problem statement are discussed immediately after. We then examine the design of MyLearningMentor, an application that meets the identified requirements, including architecture and user interface. Afterwards we discuss the potential impact of the application and the next steps related to this research work.

Methodology

Given the pragmatic purpose of this project and its application in a real-world setting, this project follows a 'design-based research methodology' as described in Wang and Hannafin (2005). This research methodology is characterized by an iterative process in which the goal is to produce artifacts quickly to be validated and used as the input for the next iteration. It is noteworthy that in design-based research the concrete research objectives are likely to evolve as the project moves forward.

Accordingly, this work starts by defining the research problem statement and the initial hypothesis. Once the existence of the research problem has been established, the initial requirements of a solution to addresses this problem are summarized; in this case, the solution proposed is a software application. After analyzing the extracted requirements, a mockup of the application is developed to validate whether the collected requirements can be implemented. Mockups (or wireframes) are one of the most popular techniques for agile prototyping, and are accepted in multiple software development areas to attain direct information from end-users (Budde et al. 1992). The application proposed in this paper addresses learners' needs and it is convenient to work first with simple and visual prototypes (like mockups) in order to detect whether learners' requirements are met.

A mockup of the application is the first step towards its implementation. This implementation will follow an agile software development approach (Highsmith & Cockburn, 2001). An agile development approach is aligned to design-based research, sharing such concepts as continuous and quick iterations and refinement.

Problem statement and initial hypothesis

This work starts with the formulation of the research problem: how to give support to less experienced learners in MOOCs. Although target learners in this research problem are inexperienced in online learning and particularly in MOOCs, the results of this work are expected to be useful for more experienced learners willing to improve their performance and self-learning skills when enrolling in MOOCs.

The initial hypothesis related to the research problem is the lack of study skills and work habits of less experienced MOOC learners, e.g. a proper place to study, a regular study schedule or the ability to solve problems in groups. In order to validate the existence of the identified hypothetical problems, 41 second-year Higher education students were surveyed through a Likert-5 about their study skills and work habits. This is a representative sample of students since they have considerable experience in face-to-face and blended learning, but have little experience in online education.

The survey results returned clear indicators about the choice of an appropriate workplace (more than 83% of students agreed or completely agreed that they usually studied in the same place and that it was quiet and well-lit) and the importance of distraction-free study (only 22% of them were in disagreement or complete disagreement that they studied away from distractions). Nevertheless, a lack of awareness of teamwork was also detected, as only 12% of learners agreed or completely agreed that they usually studied with colleagues, while 7% of them stated that they normally employed the course forum to solve questions. There was also a generalized disorder when planning their study time, as most students needed to reorganize their schedule several times per week. Teamwork and a good organization of study time are essential skills when facing online courses. Most surveyed students recognized major difficulties in participating in online courses (only 22% of them could follow their courses without major problems), and only a small fraction of them had managed to complete an entire online course (15%).

These results are interesting because even though the demographic consisted of Higher education students, they lacked the study skills and work habits for online education. If this also occurs with university students, it is envisaged that the problem will worsen when dealing with people that have a lower level of literacy. All in all, the survey results corroborated the existence of the research problem, and also served to extract a series of requirements for the design of an application that tackles this problem.

Requirements analysis

Before designing and developing an application that helps less experienced learners take advantage of MOOCs, the requirements that such applications should implement must be clearly stated. Table 1 summarizes these requirements, which are discussed throughout this section.

Identifier	Requirement
Req1	Distributed as a mobile application
Req2	Customizable to different student profiles
Req3	Include an adaptable daily planner
Req4	Rely on crowdsourced information
Req5	Provide tips and hints to make the most of MOOCs
Req6	Serve as a meeting point with volunteer mentors.

The first requirement (Req1) is that the application must be distributed as a mobile application. This requirement is justified insofar as most MOOC participants are typically aged between 25 and 40 (Balch 2013), and most people in this age group have incorporated mobile devices in their daily lives (GoGulf 2012, Nielsen 2012). This argument was confirmed through the aforementioned questionnaire, according to which most surveyed learners had incorporated smartphones in their daily routines, employing them for instance to consult their class schedule. In addition, people carry mobile devices with them all the time, and so can receive notification of planning and work habits even when not in front of a PC or laptop.

The second requirement (Req2) is that the application must be customizable to different profiles. Participants' profiles in MOOCs can be very diverse, comprising workers, students and the unemployed (Alario-Hoyos et al. 2013). They commit to differing study times, have different aims for their participation and can be registered for several courses at the same time. The survey handed out to Higher education students revealed that there was considerable heterogeneity regarding schedules and the number of study hours per week.

The third requirement (Req3) is that the application must include an automatic daily planner listing which MOOC-related tasks learners need to accomplish. This planner must be adaptable to different student profiles (see Req2) and take previous performance into account. It must integrate information about the specific tasks learners need to carry out and gauge their estimated workload so that more efficient planning can be scheduled. The survey handed out to Higher education students highlights the need for an adaptable daily planner since most of them reported the need for reorganizing their study hours several times per week.

The fourth requirement (Req4) is that the application must rely on crowdsourced information about MOOCs from the user community. In most cases the overall information about MOOCs, such as the start and end dates or the average workload per week can be collected from the web, but detailed information about the number of concrete tasks that must be performed and when their deadlines fall is not always easy to harvest automatically. In addition, this kind of detailed information is sensitive to changes and needs to be updated regularly. For these reasons, learners themselves will use the application for adding and curating the information related to the MOOCs they are following, and therefore receive a more accurate daily study plan (see Req3), customized to their profiles (Req2).

The fifth requirement (Req5) is that the application must provide tips and hints so that less experienced learners can make the most of their MOOCs. These tips and hints should cover different aspects related to study skills and work habits, such as what to do after failing several test questions or recommendations for reviewing peer activities. These tips will also stress the social dimension of MOOCs as this is a key issue to avoid early drop outs, e.g. reminding students to check the course forum, or to rely on peers using social tools when there are problems.

Finally, the sixth requirement (Req6) is that the application must be a meeting point for less experienced learners and volunteer mentors, or people with more experience in MOOCs that wish to spend their free time selflessly helping their peers. Those people that receive support from mentors typically achieve higher performance and are able to deal with more complex problems (Malgrem 2010). Despite the importance of mentoring, only 7% of the surveyed higher education students agreed or completely agreed that they usually had somebody to help them plan their study.

MyLearningMentor

This section presents MyLearningMentor, an application that aims to help students with little experience in online learning take advantage of MOOCs. This application has been designed to meet the requirements identified in previous sections. First, the architectural design of the application is presented. Second, mockups of the interface serve to illustrate how users will interact with the application.

Architectural design

MyLearningMentor follows a client-server architectural model as described in Figure 1. This decision stems from two requirements: making the application available to the users through their mobile devices (Req1), and crowdsourcing information about MOOCs (Req4). The former requirement indicates that users access the system with their mobile phones or tablets, which play the role of the client. In order to take advantage of most of the functionalities available in a smartphone (e.g. the use of notifications related to work habits, Req4), a native application is more appropriate than a web application. The latter requirement implies the need to have a server that provides access to crowdsourced information.

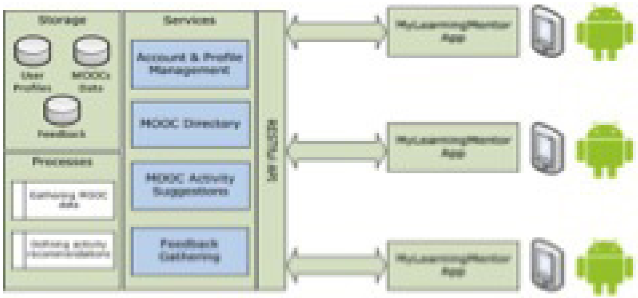

Figure 1. Diagram of MyLearningMentor architecture with the server on the left and the client on the right.

The server centralizes the storage of information, the execution of processes that affect the adaptive daily planner and the provision of services to be used by mobile clients. The information to be stored includes 'user profiles' (Req2), 'MOOCs data' (Req4) and 'feedback' provided by learners that indicates their progress in the courses (Req3 and Req5).

Two processes are executed periodically on the server side. The first process is 'gathering MOOCs data' from a set of platforms, including characteristics such as course duration, recommended weekly dedicated study time, and activity type (Req4). The second process consists of 'defining activity recommendations' for the adaptive daily planner (Req2, Req3 and Req5) based on learners' profiles and MOOC data.

The server includes a service layer for mobile clients to interact with the databases and processes. The 'Account & Profile Management service' administers and authenticates user accounts. The 'MOOC Directory service' provides course information collated from major MOOC platforms and handles additional MOOC data submitted by users. The 'MOOC Activity Suggestions service' provides tips and hints to be displayed in a daily adaptive planner for learners. The final service, 'Feedback Gathering', collects and processes comments from learners' progress within the MOOCs that they are enrolled in. The whole server-side architecture will offer a RESTful API, so that several clients (mobile, web) can be supported.

Interface design

This section presents a mockup of MyLearningMentor. This mockup is a first prototype design and takes into consideration the requirements identified in the previous section. The mockup has been created using Balsamiq, an application for developing interactive mockups easily and quickly. Balsamiq mockups can be used to check whether the key ideas behind an application meet target user needs or to communicate with the stakeholders involved in the development process. Further, mockups can be easily modified in real time while users interact with them.

To address the first requirement (Req1), the mockup simulates a mobile application. As with any mobile application, the user will download it from the corresponding application store (App Store, Google Play…) and install it on his/her personal device. Once installed, the application requests that the user register. There are two different ways to register: quickly, where users can re-use their credentials from Google, Facebook or Twitter accounts, and manually, where users manually complete the information required: name, surname, age, e-mail address and password (Figures 2a and 2b).

The first time the user logs into the application, the system asks him/her to adde further detail to his/her profile, such as whether (s)he works/is unemployed/is a student and his/her availability (e.g. number of available hours to study per week). This profile information is related to the second requirement (Req2), and is employed by the application to customize some of its functionalities according to different student profiles (Figure 2c).

Figure 2. Screenshots of MyLearningMentor. From left to right: (a) Log in screen, (b) User profile screen, and (c) User study preferences screen.

As a third step, the user is forwarded to the MOOC selector page (Figure 3a). On this page, the user can select the MOOCs (s)he wishes to follow and then click the 'Join the course!' button to be redirected to the course website. If the user does not find the course (s)he wishes to join, MyLearningMentor will offer the option of 'Adding a New Course' not registered in the current list. This option asks the user to introduce information related to a new course, such as a title, amount of hours required, number of lessons, dedication needs, types of activities to accomplish, the platform where the MOOC is hosted and a link to the course website or knowledge area. All the information uploaded by the user is directly added to the MOOCs database in the application so that other learners can find the course when using the system (Req4). In this way, the application benefits from 'the power of the crowd' to extend the MOOCs' database (Figure 3b).

The application includes a 'Tips List' (Req5) that can be directly accessed from the daily planner. This tips list includes practical advice about self-learning, particularized for the MOOC context. These tips range from recommendations about how and where to study to strategies for organizing and planning work, as well as mechanisms for being more productive. Tips are updated dependent on user profiles and their performance as the courses move forward (Figure 4c). The tips list also includes the 'Ask for a Colleague Mentor' button, which users can click to send an e-mail to a mailing list of registered mentors, enabling them to arrange meetings with colleagues, collaborate and advance together in the MOOCs (Req6). Further communication between MyLearningMentor users and mentors are out-of-scope of this application.

Figure 3. Screenshots of MyLearningMentor. From left to right: (a) Course selector screen, and (b) the form to fill in when users want to join a new course.

Figure 4. Screenshots of MyLearningMentor. From left to right: (a) the Daily Plan screen, (b) the calendar indicating the tasks distributed in a month, and (c) the tips list screen.

After choosing a course, the user is redirected to the 'Daily Planner'. This daily planner is presented as a daily list of tasks that workload learners must dedicate to the MOOCs they are enrolled in (Req3) (Figure 4a). How generic or specific the information about these tasks is depends on previously-collected data (either automatically or from the community). Users can mark these tasks as finished after completing them in the MOOCs. It is noteworthy that MyLearningMentor does not intend to integrate the MOOC activities, and so users need to go to the course website to complete them. The Daily Planner is proposed according to learners' profiles and the characteristics of the courses selected. Mobile telephone alerts complement this planner, occurring to indicate the learner's MOOC work schedule. At the end of the week users are asked to complete a brief survey indicating more information about the kind of activities completed, whether the scheduling for the activities was suitable or not, and whether they are happy with their performance. Planning for the following week is modified according to previous weekly results. The application also includes a monthly calendar where users can visualize their tasks in advance (Figure 4b). These planning functionalities are expected to overcome students' organizational weaknesses identified by the survey.

Discussion and next steps

The survey employed to demonstrate the initial hypothesis concerning the research problem as presented in this paper served to identify the lack of study skills and work habits as a significant factor, hindering the successful completion of MOOCs by less experienced learners. MyLearningMentor addresses this by providing personalized planning and tips aimed at helping less experienced learners make the most of MOOCs by scaffolding self-learning. However, this work is still at an early stage and needs to be implemented and evaluated with real MOOCs.

The tips provided by MyLearningMentor include common strategies for time management particularized for MOOC context. Examples of time management strategies are: having regular study periods, taking short breaks, alternating subjects and prioritizing tasks (Dembo, 2004). Although some authors claim that there is no correlation between awareness of time management strategies and learning success (Jung, 2007), there is a general agreement in the community that metacognitive self-regulation correlates with learners' achievement and course completion (Puspitasari, 2012). Nevertheless, the usefulness of the tips provided by MyLearningMentor, as well as the effect of the suggested time management strategies on metacognitive self-regulation in MOOCs are aspects that need to be researched further.

The analysis of study skills and work habits in those students that have successfully completed different MOOCs can enrich planning and advice provided by MyLearningMentor, resulting in specific study guidelines for each particular MOOC and generic guidelines for specific domains. Even though MyLearningMentor targets MOOC participants that lack study skills and work habits, it needs to be researched further to see if it can be useful for other kinds of learners and in other contexts, such as blended learning scenarios (e.g. freshmen and University students that have not yet developed study skills) or other online contexts that are not necessarily MOOCs (e.g. ALISON, Canvas, MIT OpenCourseWare, etc.).

MyLearningMentor aims to prepare less educated people to face the MOOC challenge, and eventually reduce the attrition rates of those who cannot keep up with MOOCs. This is a first step towards the ultimate goal of shrinking the gap between qualified and non-qualified people. Nevertheless it requires further research on how to promote the use of MOOCs for vocational learning rather than as a complement for higher education. Moreover, the study advice and activity planning provided by MyLearningMentor can also serve to interiorize work strategies and improve productivity in the workplace. Thanks to MyLearningMentor, people can reflect on their current work habits and incorporate the tips and planning provided by the application into their daily routine. All in all, MyLearningMentor can enhance future experiences of users both in learning and work settings.

Steps in the near future include the continued implementation of MyLearningMentor following an agile software development methodology. As a preliminary step, the current mockup will be reviewed by target users. A fully functional application will be implemented afterwards, taking into account the feedback collected from target users; this application will be distributed using current mobile app marketplaces such as Google Play Store and iOS App Store. Evaluation experiments will ascertain whether MyLearningMentor facilitates the development of study skills and work habits in less experienced learners, and whether target users have the discipline to use this application regularly.

Future work will also include the development of functionality for synchronous communication with mentors via MyLearningMentor. These mentors will be volunteers who wish to share their experiences of MOOCs in general or of the actual MOOCs that MyLearningMentor users are registered in. Another line of work is the integration of MOOC recommenders (e.g. moocrank, see Gutiérrez-Rojas et al. 2014) in MyLearningMentor, enabling users to discover and receive recommendations of which MOOCs suit their learning profile. Finally, MyLearningMentor is expected to be offered by MOOC providers as a way to increase student and teacher awareness, as well as the completion rates of their courses.

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Towards an Outcome-based Discovery and Filtering of MOOCs using moocrank

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Abstract: *The recent outbreak of massive open online courses (MOOCs) is empowering people around the world to satisfy their learning needs. More and more universities are offering MOOCs in online platforms such as Coursera, edX or Udacity, and thus, the catalog of courses to choose from is largely increasing. With the growth of available MOOCs, there is a need for approaches to facilitate the discovery of courses and filter those that best meet the learning objectives of each learner. This article presents moocrank, a web application that maps MOOCs from different platforms with learning outcomes, allowing learners to discover the most suitable MOOCs for their profile and learning objectives. This article presents and discusses the requirements of moocrank as well as the first prototype of the application and next steps.*

Introduction

2012 was declared by The New York Times "the year of the MOOC" (Pappano 2012), since the number of massive open online courses (MOOCs) offered by Higher Education institutions greatly increased. With the coming of the MOOCs there is a plethora of learning opportunities open to any learner all around the world (Cooper & Sahami 2013). Nevertheless, the MOOC offerings are so large that sometimes it is difficult to find an appropriate path across the vast amount of learning opportunities. It is not easy for learners to discover new MOOCs that meet their personal learning objectives, taking also into account previous achievements and knowledge (Boyatt & Sinclair 2012). One of the reasons that hinder the discovery and selection of new MOOCs is that major platforms do not use the same taxonomy to describe the learning outcomes (LO) that students achieve once accomplishing the courses.

The European Qualifications Framework defines learning outcomes as "statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence" (http://ec.europa.eu/eqf/terms_en.htm). Several European research projects have worked with LO, finding relationships between open educational resources (OER) and learning outcomes (Kalz et al. 2010). Among these projects ICOPER (http://www.icoper.org/) stands out, whose main objective was to define best practices in the usage of standards and specifications in competence-based education. One of the developments carried out within the ICOPER project was the Open ICOPER Content Space (OICS), a tool that allowed the outcome-based search of open educational assets (learning designs, assessments, etc.) harvested from several OER platforms. This project classifies learning outcomes as intended LO (i.e. those that a learner wishes to get), and achieved LO (i.e. those already acquired by the learner). This is the terminology adopted throughout this paper.

Another related initiative at the European level that addresses open educational resources (OER) is the recent Opening Up Education initiative (http://www.openeducationeuropa.eu), which intends to be the European reference site for searching open educational assets, sharing experiences of usage among European practitioners, and aggregating related research papers and news. Recently, this site for the first time included MOOCs as open educational assets, as well as a scoreboard indicating the number of available MOOCs in Europe per country (http://www.openeducationeuropa.eu/en/european_scoreboard_moocs). However, the Opening Up Education initiative does not take into account learning outcomes and how these outcomes can be used to link OER with learners' objectives.

The aim of this work is to take advantage of the research carried out in previous European projects like ICOPER about outcome-based education and OER, applying the results to a particular kind of open educational asset: MOOCs. In this context, the research objective is to give some order and structure to the vast number of MOOCs that are currently available, associating LO to MOOCs following established taxonomies proposed by recognized institutions such as the ACM and IEEE-Computer Society. So, learners can take control of their own learning path when looking for new MOOCs to update their knowledge on particular areas. moocrank allows learners to discover courses that meet their profile and align with their intended LO. Further, moocrank allows learners to annotate courses with information about the achieved LO, collaboratively enriching the discovery of MOOCs.

The rest of the paper is structured as follows: the next section describes the methodology followed in this work.

Then, the problem statement and initial hypothesis are clearly defined. A set of requirements that lead the design of a system for supporting users in the discovery of MOOCs is discussed immediately afterwards. The following section presents the design and preliminary implementation of moocrank, a tool that is being developed following the aforementioned requirements. Finally, the last section discusses the requirements and current implementation of moocrank, providing some insights about the next steps with a special emphasis on how to include a recommender module.

Methodology

In this research project we follow a design-based research approach, as described in Wang and Hannafin (2005). We chose this methodology because its features are very aligned with the project objectives: we work on a real-world problem, iteratively searching for a solution to that problem; the research objectives can be redefined during the project; and we are evaluating the results making use of mixed methods.

As a first step, we employ a survey and state-of-the-art literature to justify the problem we are trying to solve: due to the great variety of MOOCs offered, it is difficult to find courses aligned to learners' intended LO. Once justified that this problem exists, a series of initial requirements are defined in order to lead the design of a system that addresses the research problem. The definition of these requirements is based on previous research results, such as the aforementioned ICOPER project. These requirements tackle the usage of a learning outcome taxonomy that relates learners' intended LO and MOOCs.

Based on these initial requirements, we design and implement an application prototype to demonstrate the linkage of outcomes to MOOCs, and whether it is suitable to discover courses aligned to learners' intended LO. The application is developed using agile development technologies and methodologies (Highsmith & Cockburn 2001), which are very aligned to the principles of design-based research. The developed application is deployed to a production environment and used by real users for several months. The interactions of end-users with the application support a preliminary evaluation to refine the application in future iterations.

Problem statement and initial hypothesis

The problem addressed in this work can be summarized as enabling the discovery of MOOCs based on learning outcomes. As stated by Crespo et al. (2010), focusing on intended LO is part of a change of paradigm towards placing learners' needs in the center of the educational process. This emphasis on the learner rather than on closed curriculums is illustrated by the idea of MOOCs, which promote the freedom for learners to choose courses that satisfy their goals.

Our hypothesis is that by associating MOOCs with a taxonomy of learning outcomes, it will be possible to determine the suitability of each MOOC for each learner, and provide them with a list of courses that will most likely help him/her achieve the intended LO. One approach to do this is to use taxonomies for identifying gaps in learning skills and knowledge (Paquette 2007). Moreover, using taxonomies is a common practice in adaptive educational systems, as stated by Brusilovsky & Millán (2007) with the use of the term goal catalogs.

The results of a survey conducted by the authors during November and December 2012 show that there is a lack of awareness about the available MOOC platforms, hindering people from finding an appropriate course for their needs. 70 people based in Spain filled out this survey, 67% males and 33% females, 74% were in the age range of 25 to 40 years, and 87% had a higher education degree. The results indicate that 56% of the participants did not know MOOC platforms such as Coursera, edX, or Udacity. The difficulty of keeping up to date about available MOOCs increases even more for platforms of recent creation or intended for a more localized audience. Examples of the former are NovoEd, FutureLearn or iversity; MiríadaX and UNED COMA are examples of the latter, since they are intended for the Spanish-speaking audience. Moreover, people with a lower educational background are more likely to present a lower level of awareness about MOOC offerings.

Selecting MOOCs to help learners achieve their intended LO is a process similar to those that filter or recommend learning resources. In the technology enhanced learning field, a lot of research has been done in recommenders' systems for adaptive learning (see Manouselis et al. (2011) for a review of the main approaches implementing adaptive educational systems). This previous work refers to intended LO as learning goals or learning objectives as one of the features that conditions the behavior of an adaptive educational system (Brusilovsky & Millán 2007). Other several proposals include learning goals as part of the context in which learning objects are recommended (Verbert et al. 2012). According to this last idea and to the model proposed by Draschler et al. (2008), in this work we abstract MOOCs as learning objects employed in lifelong learning scenarios that can fit with the particular needs of an informal learner.

Therefore, the main research question behind this work is: how to facilitate the outcome-based discovery of MOOCs? To face this challenge, we assume using learning outcome taxonomies a) to match MOOCs with LO; and b) to enable students to define their intended LO.

Requirement definition

To design and develop a software system that addresses the problem, we state a set of initial requirements for this software system. Table 1 summarizes these requirements, which cover both the discovery and filtering of MOOCs based on learning outcomes.

Table 1: Requirements of the system.

Identifier	Requirement
Req1	Identify the MOOC learning outcomes and map them with a LO taxonomy
Req2	Manage users' profiles based on their intended LO
Req3	Support the discovery of MOOCs based on users' profiles
Req4	Filter MOOCs based on users' profiles

The first requirement (Req1) is that MOOCs must be explicitly associated with the learning outcomes they provide after successful completion. Nowadays, most MOOCs describe their learning outcomes either in the textual description of the course or during the presentation video. In order to enable the identification of MOOCs according to learners' intended LO, these learning outcomes must follow an established taxonomy. Several approaches have been proposed to assign learning outcomes to learning resources. For instance, the Learning Object Metadata (LOM) standard allows the classification by educational objectives. Another example is the combination of Learning Outcome Definition (LOD) and Personal Achieved Learning Outcomes specifications, both defined by Najjar, et al. (2009) as a result of the ICOPER project.

The second requirement (Req2) is that the system must allow users to specify the learning outcomes they intend to obtain through MOOCs. To facilitate the configuration of users' profiles, learners must be able to select their intended LO from the same established taxonomy. This taxonomy must be appropriate for the learner's field of interest (e.g. learners in Computer Science must employ a taxonomy that includes only those learning outcomes relevant for the Computer Science field). Furthermore, the system must allow users to indicate the MOOCs they have already completed and the learning outcomes they have already achieved. Thus, the user's profile must contain the information of intended and achieved LO plus the MOOCs already completed by the learner.

The third requirement (Req3) is that the system must allow the discovery of MOOCs based on intended LO. Users must be able to search for MOOCs, providing several filtering parameters. Examples of these parameters are keywords included in the name and description of the MOOC, workload demanded by the course, its duration and tools employed in the course (e.g., videos, forums and Q&A).

The fourth requirement (Req4) is that the system must provide personalized MOOCs filtering that match learners' intended LO. This functionality aims to allow users to find MOOCs in a more efficient way, helping them get a more efficient learning experience. The system must provide an open ranked list of MOOCs, that is, users must be able to access the entire MOOC catalogue but there must be an indicator of the suitability of each MOOC for the current user. Using this open ranked list allows users to access MOOCs that are outside their main domain of knowledge but that may be of interest for personal development.

A first implementation: moocrank

A preliminary implementation of moocrank (http://www.moocrank.com) was developed to validate the above-mentioned requirements. moocrank offers three important functionalities for learners. Firstly, the learner is able to look for MOOCs in many platforms within moocrank, indicating different filtering parameters. Secondly, the learner can select the learning outcomes s/he is willing to achieve, and receive a ranked list of MOOCs related to the intended LO. Finally, the learner can contribute to the community, annotating the courses s/he has completed as well as the achieved LO. For the design and implementation of moocrank, we took as input the requirements discussed in the previous section. According to the overall methodology, this prototype was implemented using rapid-prototyping technologies.

Selecting a learning outcome taxonomy

The first step towards the implementation of moocrank was to decide whether the system would be useful for any area of knowledge, or just for a specific field. For the first prototype, we decided to give support only to Computer Science, since this is the authors' field of expertise, and the adequacy of the learning outcomes taxonomy could be better validated. Besides, there are currently a lot of MOOCs on Computer Science in major MOOC platforms and they are the most popular ones. This fact allowed for generating a big enough initial MOOC database. To have a great number of courses in the system from the very beginning is convenient because it raises the possibilities of discovering and recommending MOOCs.

The next step was to find a taxonomy for describing the learning outcomes of the courses and the learners' intended LO. For that purpose we took as a reference the Computer Science Curricula 2013 (CSC2013), which describes the learning outcomes of Computer Science degrees. Moreover, CSC2013 is elaborated by well-recognized organizations such as ACM and IEEE-Computer Society (Sahami et al. 2013) and is usually taken as a reference in many universities for defining the curriculum of Computer Science degrees. The information provided by the CSC2013 is a set of learning outcomes organized in categories and subcategories. The main categories are called knowledge areas, and there are 18, ranging from "Algorithms and Complexity" to "Social Issues and Professional Practice".

Architecture

As MOOCs are inherent to the web, moocrank is being developed as a web application, and its architecture follows a client-server architecture (see Figure 1). moocrank implements the well-known Model-View-Controller (MVC) pattern. MVC enables the separation of models (data), views (used to render information in the client) and controller (to define the routes and processes that implement the expected behaviors).

At the model layer, a database stores the information of every entity involved in the system: MOOCs, learning outcomes, learners' profiles, and the matching between MOOCs and learning outcomes. MOOCs and learning outcomes are loaded into the system and cannot be modified by end-users.

On the client side, the system includes four views that play the role of interface for end-users. The first view allows users to register and sign into the system. There is a second view for users to indicate their intended LO, and a third view to indicate the MOOCs they have already taken along with the achieved LO. A last view presents a recommendation list with MOOCs sorted by their suitability to fulfill the user's intended LO.

Along with the web application, a set of other software components are being developed. Firstly, a set of scripts collects information about courses from the MOOC platforms and populate the courses database. Secondly, another script reads the CSC2013 information about learning outcomes and populates the outcomes database. Services that provide the functionality to manage learners' profiles, generate MOOC filtering, and allow users to annotate MOOCs and learning outcomes are also included in the architecture.

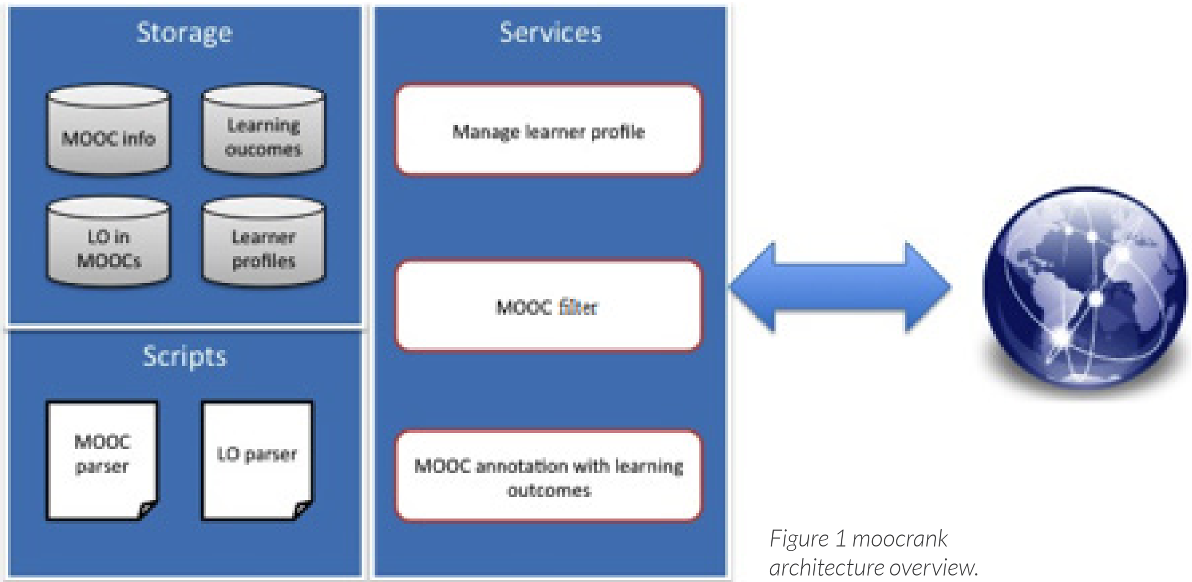

Figure 1 moocrank architecture overview.

Implementation

The next step in the implementation of moocrank was to collect the information necessary for the system to work. For that purpose, we found the CSC2013 in the InLOC (Integrating Learning Outcomes and Competences) digital format easy to read and load in our application database (http://wiki.teria.no/display/inloc/Information+-Model). The following step was to collect the information about MOOCs in our database, so that we could attach additional information to them about the learning outcomes that they allow students to achieve. For this first pilot, we collected the courses from the three most popular MOOC platforms: Coursera, edX and Udacity. Since each platform presents course information in a different format, they were analyzed separately. From all the courses collected, we selected only those belonging to the Computer Science field.

Because the courses collected did not provide enough information about learning outcomes, moocrank includes features to enable learners to annotate MOOCs with this information. Thus, when a learner finishes a course, s/he can indicate what learning outcomes were achieved. The information about learning outcomes associated to MOOCs is used by moocrank to further filter that course to other learners with similar intended LO. Therefore, we are making use of a crowdsourcing strategy to fill the existing gap between MOOCs and learning outcomes.

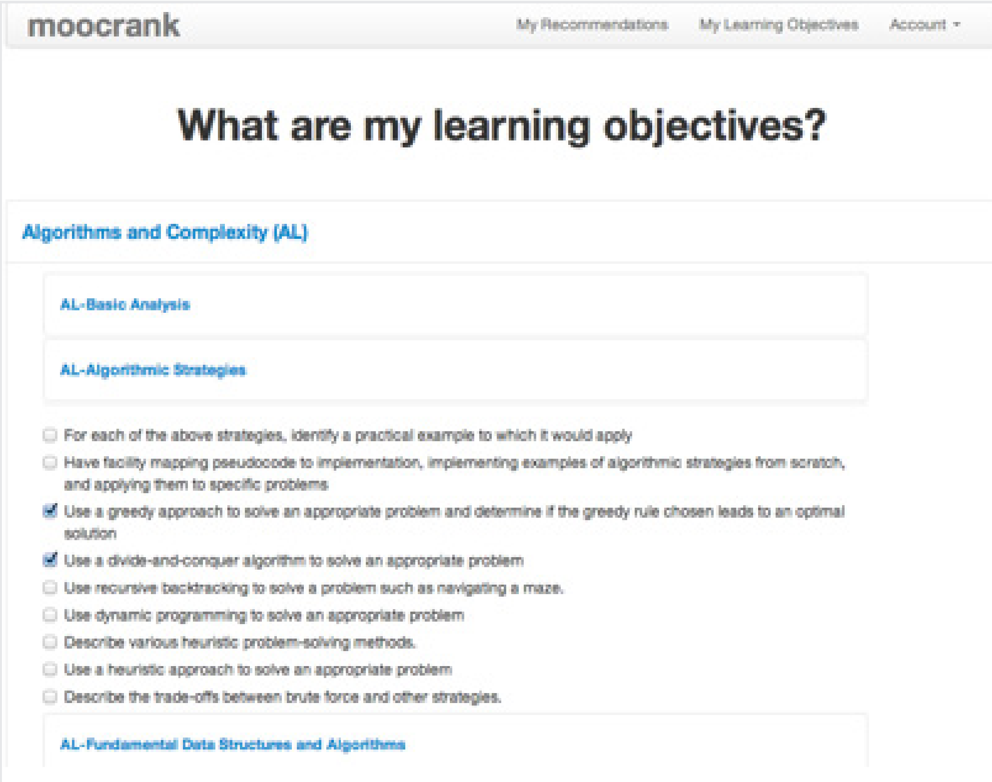

Figure 2 Screenshot of moocrank showing the selection of intended learning objectives in the users' profile.

Given the previous data sources (learning outcomes and courses), we developed a prototype of moocrank that implemented the functionality for discovering and recommending MOOCs based on learners' intended LO. For this development we made use of technologies that are commonly employed for quick digital prototyping such as bootstrap and jquery in the front-end, nodejs and express in the back-end and a mongodb database. For the deployment of the system, we have used the Amazon Elastic Compute Cloud (EC2), as well as github as the code repository.

The workflow that moocrank offers to end-users involves the following steps: The first time that the user accesses the application, s/he has to register in the system using email and password. Registration is required in order to store the students' profile information, necessary to present the MOOC recommendations. Once registered, the user is presented with the wishlist view, that is, the list of learning outcomes extracted from the CSC2013, ordered by category and subcategory. The learner should explore this list in order to find and indicate his/her intended learning objectives, that is, what outcomes s/he is willing to acquire (see Figure 2). After indicating his/her personal learning objectives, the user is presented with a set of filtered courses based on these objectives. The filtering approach is to display the courses ordered by their suitability for the user; the suitability is a simple count of the number of matches between the LOs intended by the learner and provided by the course. The user can explore the rank of courses and s/he can access more information about them, such as the platform in which the MOOC is deployed, the institution or teachers providing the content, and a direct link to join the course (see Figure 3). From the list of courses, the user can indicate that s/he has finished some of the courses. That action takes the user to the next screen, which contains a shortlist of learning outcomes that the course is likely to provide. Based on his/her experience during the course, the user selects from the shortlist of learning outcomes those that were actually achieved. moocrank makes use of this information for suggesting that course to other users. Hence, the accuracy of the filtering is improved as end-users evaluate the achieved learning outcomes of the MOOCs they have completed.

Discussion and next steps

In this paper, we presented the design and implementation of moocrank, a web application that recommends and enables the discovery of MOOCs aligned with learners' intended LO. The design of this application is based on a set of initial requirements that address the target research problem, and the results of research studies about outcome-based education.

As of this writing, other approaches are also centralizing the search of MOOCs deployed in different platforms. First, ClassCentral (http://www.class-central.com) aggregates MOOC information from several platforms, allowing a simple keyword-based search of courses. More attractive is the approach of CourseTalk (http://coursetalk.org) that enables learners to discuss and rate the courses they have followed. However, both approaches simply allow learners to search for courses, but without taking into account learners' intended outcomes, nor filtering the most suitable courses according to each student's profile.

Other initiatives promote replicating formal learning paths through MOOCs. For example, MyEducationPath (http://myeducationpath.com) allows users to define learning paths based on existing MOOCs. In this way, students pursuing learning objectives aligned to an existing learning path could use this path as a roadmap to enroll in MOOCs. The approach of SkillAcademy (http://skillacademy.com) is to facilitate the discovery of courses, although they are also composing tracks (learning paths) with courses from several sources that are closely related, covering similar fields or knowledge. For example, the Master for Business Administration (MBA) track includes courses from Udacity about startups and statistics, from edX about justice and some others from Coursera ranging from finance to marketing. These approaches that make use of learning paths mix courses from several sources, but they still lack the concept of learning outcomes, and how those courses are related to the learners' intended learning objectives.

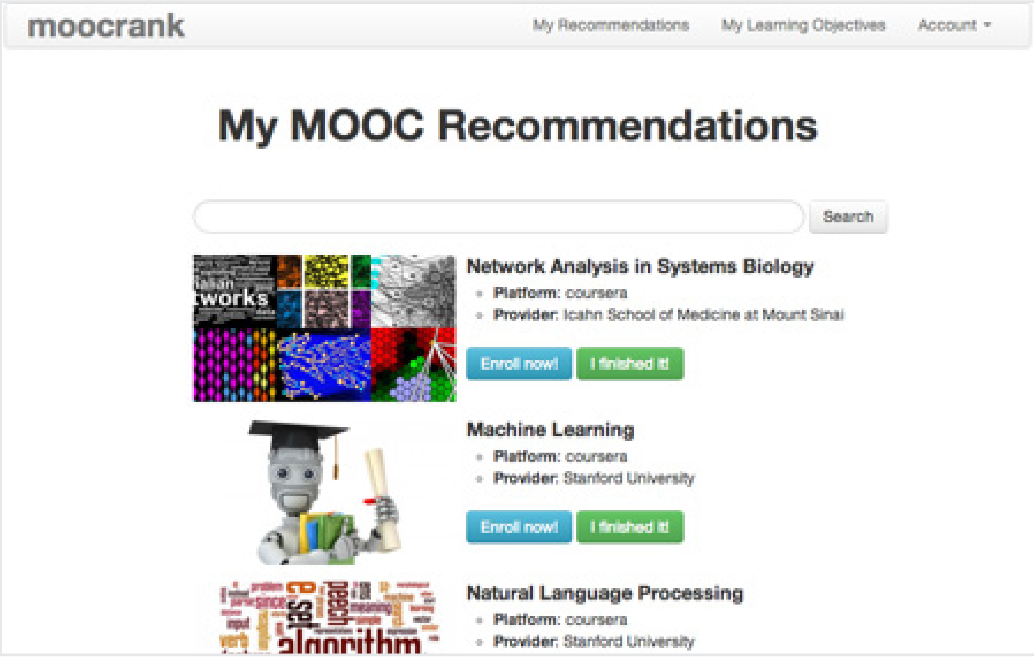

Figure 3 Screenshot of moocrank showing the outcome-based recommendation of MOOCs.

Moreover, moocrank could be easily applied in other contexts beyond Computer Science. The main concern for that application would be finding the appropriate learning outcome taxonomy for the domain. Given the taxonomy, it would be quite easy to include the courses from that area in the recommender and implement the annotation of courses with the chosen taxonomy. We envision moocrank to be able to support taxonomies in an extensible manner, which would allow the final taxonomy to be upgradable. Thus, users will be able to filter LOs based on the taxonomies that better fit their needs.

The MOOCs ranked list provided by moocrank is currently bound to MOOCs. But the same principles and procedures could be applied to other type of courses, online or not. The only thing that would change in moocrank would be the scripts collecting information about courses from the platforms. New scripts could be implemented to retrieve information from sources containing courses other than MOOCs. Furthermore, the processes of annotating learning outcomes and filtering courses could also be applied to more generic, open educational resources under the same procedure.

An important added value of moocrank is the crowdsourcing approach to annotate MOOCs and intended learning outcomes. As the number of moocrank users grows, the accuracy of the annotations will be much bigger. At that stage, moocrank will constitute a database of courses annotated by the community with the learning outcomes they achieved. This information from the community is expected to be more relevant for learners than the description about MOOCs provided by their teachers themselves.

moocrank has been implemented and deployed to a production environment, offered to any interested learners. Up to September 2013, moocrank received 312 visits with 191 unique visitors. The most common query is the word "software", and the most consulted courses are "Human Computer Interaction", "Software Defined Networking", "Startup Engineering" and "Cryptography", all of them provided by Coursera. Overall, the usage has not been as widespread as expected.

Given the previous results, the filtering mechanism was not as good as it should be, due to bootstrapping problems. That is, in order to do good filtering, moocrank needs information from users who previously completed the courses and indicated the achieved learning outcomes. Until a critical mass of courses is annotated, the ranked list is not very accurate. But, precisely due to the fact that the filtering is not too accurate for the first users, the system has not been used as widely as expected. That problem is known as the bootstrapping (or cold start) problem. In order to solve that situation, we are developing an automatic annotation tool. This tool annotates the courses with their intended learning outcomes based on existing information about MOOCs, like description, outline, background information, etc. The automatic annotation system makes use of a natural language processing algorithm in order to identify what outcomes are most likely provided by the course. Still, the automatic annotation tool can lead to mistakes. For that reason, learners will be able to amend the automatic annotations, and therefore the relationships between MOOCs and learning outcomes will evolve, driven by the moocrank users. In the case that users provide divergent annotations for the LOs of a course, the automatic annotations will serve as the judgment to decide the final LOs to be assigned. Once we get enough activity in the platform, we will be able to perform a better evaluation of its performance using typical metrics of information retrieval systems, such as precision and recall. On this line, one of the next steps is to thoroughly explore the literature in the recommenders' educational systems domain so as to incorporate a recommender module based on similarity measures already tested and evaluated in this field.

The next steps in the short term include leveraging moocrank with more social features to enable users to rank the courses, provide comments about their experience to help future participants, provide feedback about the teachers, the contents, the learning pace, etc. With that social information, learners will have more data to make more informed decisions about what course to take next.

Another future line is to improve the usability of the moocrank site, since we detected that the selection of learning outcomes by learners is a somewhat cumbersome task, due to large list of learning outcomes provided by CSC2013. Furthermore, we plan to update other components in the user interface like the recommendation screen, so that moocrank presents the courses ordered by relevance, although this information is not explicitly reported to the user.

Further plans also include collecting the dependencies between courses (what courses are pre-requisite for others) from the users themselves and other sources of information. With that information, we would be able to offer learning paths for the users to follow, aligned to the intended learning outcomes, and moocrank will not recommend advanced courses to novice learners.

Finally, the last future line we are going to explore is the application of moocrank for learning in the workplace. We think that the CSC2013 taxonomy could be used by employers to indicate the learning outcomes that a company wants for its employees. Following this idea, employees will be recommended which online courses to follow; courses that are also aligned with the training expectations of their employer. This could be useful to complement the training used in the workplace, by recommending courses aligned to company objectives. Furthermore, the application would aggregate the learning outcomes achieved during an employee's career, offering information on how the worker has updated their knowledge and skills to adapt to new company needs.

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Dropout Prediction in MOOCs using Learner Activity Features

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Abstract: *While MOOCs offer educational data on a new scale, many educators have been alarmed by their high dropout rates. Learners join a course with some motivation to persist for some or the entire course, but various factors, such as attrition or lack of satisfaction, can lead them to disengage or totally drop out. Educational interventions targeting such risk factors can help reduce dropout rates. However, intervention design requires the ability to predict dropout accurately and early enough to allow for timely intervention delivery. In this paper, we present a dropout predictor that uses student activity features to predict which students are at risk high of dropout. The predictor succeeds in red-flagging 40% - 50% of dropouts while they are still active. An additional 40% - 45% are red-flagged within 14 days of absence from the course.*

Introduction

Over the past two years, MOOCs have offered educational researchers data on a nearly unprecedented scale. In addition, since MOOCs allow students to join and leave freely, they have enabled new investigations into when and how students voluntarily engage with online course material.

One consequence of the availability of voluntary MOOC data is that researchers can attempt to predict when a student will stop visiting the course based on his or her prior actions. The ability to predict dropout offers both short-term and long-term value. In the short term, predicting dropout helps instructors to identify students that are in need of scaffolding, and to design and deliver interventions to these students. In the longer term, dropout prediction can provide valuable insights into the interactions between course design and student factors. For example, studying the relationship between student working pace and dropout across different courses can provide insight into the features of a course that make it more or less compatible with slow-paced students.

In the short term, the goal of intervention design and delivery defines several bounds on a practically useful dropout prediction model. For the model to be actionable, the instructor needs to know:

- *Who is at risk of dropout and who is not:* If the model cannot accurately identify high-risk students, then instructors obviously run the risk of sending interventions to the wrong students.

- *When the student activity starts exhibiting patterns predictive of dropout:* The sooner we can detect dropout risk, the sooner we can intervene. If an intervention is sent too late, it may be less effective.

In order to help instructors to identify high-risk students in a timely manner, we have developed a dropout prediction model that scans student activity for patterns we have found to be strongly predictive of dropout. Once a student starts exhibiting such patterns, the predictor red-flags the student, alerting the instructor or LMS.

This paper is organized as follows: Section 2 provides a brief account of factors from the education literature that we believe affect student persistence in MOOCs. Sections 3 and 4 establish required definitions for dropout and what it means to successfully predict it. The predictor design is discussed in Section 5. Section 6 presents performance results that illustrate the strengths and weaknesses of our prediction model. Conclusions and future work are presented in Section 7.

Persistence Factors and Dropout

In this paper, we only develop our model for students who have joined in the first 10 days of the course and have viewed at least one video. We chose this cutoff because we expect instructors and researchers to develop interventions within the course materials, which would thus only be seen by students with some initial presence.

Given this cutoff point, what factors influence dropout? MOOC dropout is exceptionally heterogeneous (Breslow, Pritchard, DeBoer, Stump, Ho, and Seaton, 2013). Put simply, students have different goals and intentions that interact and change over time, and because of the low cost of entry and exit for MOOCs, the decision to leave can easily be triggered by any number of factors in a student's life. As Lee and Choi (2011) noted, these factors can be roughly divided into internal motivational factors (influencing a student's desire to persist) and external factors like outside life commitments (Rovai (2003)). External factors are practically impossible to intervene upon, and most are also virtually impossible to detect purely through the digital traces of behavior data on a website. They require survey questions such as "Are you taking this course while maintaining a full-time job?" In this paper, we focus entirely upon behavior data that are collected from a learner's interaction with the platform.

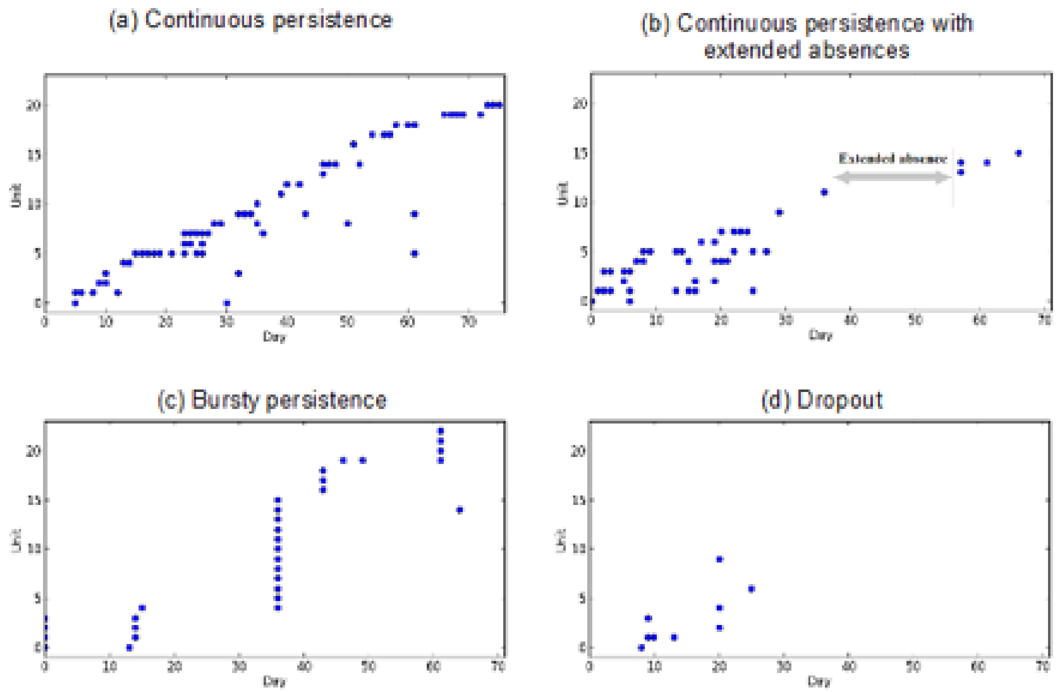


Figure 1. Four common persistence patterns that represent the majority of MOOC students

Focusing on internal factors, ability is perhaps the most obvious internal predictor of student performance and persistence. Across a wide range of academic settings, low-performing students tend to drop out more frequently than high-performing ones (Hoskins & Van Hooff, 2005). However, the effects of ability on dropout are mediated by self-perceived self-efficacy – the degree to which a student believes that he or she can achieve a particular academic goal. Self-efficacy has been identified as a central construct in motivational models, and self-reported self-efficacy is a strong predictor of academic persistence and performance (Zimmerman, 2000). Students who believe that they can achieve an academic goal are more likely to do so, and students judge their own self-efficacy from their own interpretations of their performance and from social cues (Bandura, 1994). We therefore might expect performance feedback to be an important predictor of dropout.

Students also vary widely in their ability to self-regulate their own learning, a skill set that is particularly important in learning environments like MOOCs with low entrance and exit costs and little external feedback. Researchers have defined taxonomies of self-regulation skills (Zimmerman, 1990), such as time management, self-teaching methods, and metacognitive evaluation of one's own understanding. These skills have been shown to recursively influence learning outcomes, motivation, and further self-regulation (Butler & Winne, 1995).

Other factors affecting dropout include students' level of interest in the material that they are learning. Lack of interest can cause students to dedicate less time to the course, leading them to skip pieces of content, disengage from assessments, or simply proceed through the content at a slow pace. However, pacing and engagement are also affected by external factors. The amount of time a student can allocate the course depends on what other activities the student is involved with in her life (Rovai (2003), Tinto (2006)). It can be challenging to decide whether a drop in persistence is caused by a drop in interest, or by some external factors. In such situations, it is useful to try to elicit more information from the student herself through the use of surveys.

We emphasize that this work is the start of a long process of linking individual factors to student participation, but as a first approximation, we assert that any accurate predictor of student dropout will necessarily be tapping into both internal and external factors.

Defining Dropout

Before discussing our prediction model, we need to present the definition of dropout that we used in this work. We have defined dropout so that it includes any student who meets one of the following two conditions:

1. The student has been absent from the course for a period exceeding 1 month.

2. The student has viewed fewer than 50% of the videos in the course.

Our choice to coin the first condition based on total absence time rather than the last time the student visited the course was the result of a study we undertook to understand what common persistence patterns students follow, and which patterns seem to correlate with drops on certain performance measures. We generated activity graphs for thousands of students from different MOOCs, and were able to identify the 4 common patterns illustrated in Figure 1. Each graph shows which units of content the student visited (viewed any of the unit's videos or attempted any of its assessments) on each day of a course.

Class (a) students visit the course once every few days at most. They usually spend several days on each unit. Class (b) students follow a similarly smooth trajectory, except that there are one or more "extended absences", defined in this work as absences of 10 days or longer after which the student continues from where she stopped previously. The reason for choosing a 10 day threshold is that it separates students who have periodic leaves (e.g.: students who only visit the course on weekends) from students whose persistence changes from continuous to sudden absence and then back to continuous. Class (c) students only visit the course occasionally, and usually sample content from different units each day they visit the course. Selectors (students who view only a selected subset of videos or units), mostly belong to this class. Class (d) students start off as continuous or bursty visitors, but disappear totally after a certain point before the end of the course.

The analysis revealed that, just like complete dropout after a certain time causes the student to miss a part of the course content, students who have been absent for some time and then return tend to perform worse than class (a) students on many measures, as demonstrated by Table 1. For most of the courses we analyzed, the student's ability to complete videos and assessments as well as the final exam entry rate and performance dropped as the total absence period lengthened.

Table 1. Performance comparisons between students of different absence periods for a MOOC

Total absence	Percentage of students*	Median percentage videos viewed	Median percentage assessments taken	Final exam entry rate	Mean final exam score
Less than 2 weeks	37%	77%	62%	66%	71%
2 – 3 weeks	36.4%	62%	60%	64%	68%
3 weeks – 1 month	13.8%	44%	33%	42%	61%
Longer than 1 month	12.8%	21%	17%	13%	46%

We consistently observed drops in all of the performance indicators in the table across different courses for students in the third and fourth groups. Our choice was to use the more tolerant threshold of 1 month for our dropout definition.

Dropout Prediction Merit

Our dropout predictor can be implemented as a LMS component that is run periodically (e.g. once every midnight). Every time it is run for a course, the predictor is applied once for each learner in the course. The predictor analyzes the course activity for learner l and produces the binary output:

$$pred_l = \begin{cases} 1 & \text{if student } l \text{ is believed to be at risk of dropout} \\ 0 & \text{otherwise} \end{cases}$$

(1)

The main goal behind dropout prediction is to enable delivery of interventions to red-flagged students (those predicted to be at-risk). This goal must be the basis on which merit is defined.

As with any other predictor, accuracy (the ability of the predictor to accurately predict whether or not a student is going to drop out) is a main criterion. In a course where no treatment of any kind was performed on high-risk students, we have ground truth data (who persisted in the course and who dropped out). Based on the prediction and whether or not the student actually dropped out, four classes of students exist:

1. True negatives (TN): Students who were never red-flagged, and never dropped out
2. False negatives (FN): Students who were never red-flagged, but dropped out
3. False positives (FP): Students who were red-flagged, but never dropped out
4. True positives (TP): Students who were red-flagged, and dropped out

In order to ensure that the sizes of these classes truly reflect the accuracy of the predictor, it is important to ensure that the prediction process has no induced effects on the course or students. Hence, all analysis and discussion must be restricted to courses where no dropout risk information was communicated to the student, and no persistence or performance interventions were implemented.

We can now compute the following traditional quantities:

$$Recall(R) = \frac{|TP|}{|TP| + |FN|}, \quad Specificity(S) = \frac{|TN|}{|TN| + |FP|}$$

(2)

Recall measures the predictor's ability to have correctly red-flagged every student who will drop out of the course. Specificity is a measure of the predictor's success in keeping students who will not dropout unflagged. Statistical merit requires the predictor to have high values of R and S.

This, however, is not the only relevant criterion. Practical merit of the predictor also requires that high-risk students be red-flagged early enough to enable timely delivery of interventions. The following prediction rule

Three days before the end of the course, red-flag every student who has been absent for the last four weeks.

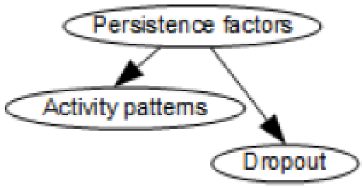
will yield a predictor with excellent specificity and recall but too little practical value because it leaves no time window for intervention.

Predictor Design

Even though activity patterns and dropout decision are two distinct constructs, we believe that influence flows between them, as described by the following claim, which is the main principle underlying our predictor design.

Design Principle

Since a student's activity patterns and dropout probability are both affected by his or her degree of possession of different persistence factors, a flow of influence potentially exists between the two, which may allow the use of activity patterns to predict dropout.



Utilizing student activity to predict dropout might imply that our predictor only operates on a student for as long as she is active in the course. Nonetheless, if some unflagged student goes absent for an alarmingly long period, it is still desired to deliver an intervention. Thus, our *"integrated predictor"* consists of two components, as illustrated in Figure 2.

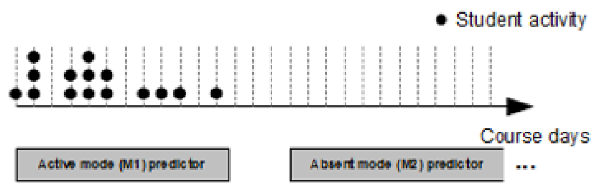


Figure 2. Active mode predictor switched out and absent mode predictor switched in after the student has been absent for an extended number of days

1. Active mode (M1) predictor: Operates while the student is still active. It analyzes student activity, looking for patterns that suggest lack of motivation or ability. It continues to operate on a student as long as she is performing new activity.
2. Absent mode (M2) predictor: Operates once the student has been absent for a certain time period. It uses the number of days for which the student has been absent to evaluate the probability that the student is heading for a dropout.

Active mode (M1) predictor

This predictor uses the following simple routine to determine whether or not the student should be red-flagged:

1. Compute scores for certain features in the student's activity

2. Make a prediction using each individual feature by comparing its score to a threshold

3. The output prediction is a red flag if any of the individual feature predictors predicts a dropout.

4. We started off with a large number of candidate features selected based on the persistence factors discussed in Section 2. Candidate features included:

5. Features that suggest a lack of ability, such as low quiz scores or a relatively high rate of seek-back in videos

6. Features that suggest a lack of interest or time, such as: Did the student skip any videos? Does the student re-attempt a quiz if her score on the first attempt was low?

Our goal was to find out which of these features correlate strongly with dropout for the majority of courses. We constructed a course-corpus consisting of 12 courses from different fields of study including mathematics, physics, agriculture, political science, and computer science. We created dozens of variants of our candidate features with different thresholds, aiming to find those that succeed in predicting a substantial number of dropouts with good specificity. Out of all the features and variants, the 4 features listed in Table 2 stood out and were hence selected in the design of the current version of the prediction model.

Note that none of the individual features has a recall that exceeds 0.5. This is acceptable, since students drop out for various reasons. The expectation from a predictive feature is to successfully predict a subclass of dropouts without falsely flagging too many persistent students. Recall is of interest for the combined prediction, since a high combined recall suggests that our features have tapped into most of the common dropout reasons. The combined M1 predictor captures almost 50% of the dropouts, falsely flagging almost 1 in every 4 persistent students on the average.

Table 2. Median specificity (S) and recall (R) for top ranked features and the combined M1 predictor

Feature name	Feature description	S	R
video-skip	Did the student skip any videos in the previous unit? Decision rule: = 1 if yes, 0 otherwise.	0.80	0.31
assn-skip	Did the student skip any assignments? Decision rule: = 1 if yes, 0 otherwise.	0.90	0.27
lag	Is the student lagging by more than 2 weeks? (Some students login to the course every few days, but view too few videos per login. Consequently, the student can develop a lag. A lag of 2 weeks, for instance, is when the student is still viewing week 1 videos after week 3 videos have been released.) Decision rule: = 1 if yes, 0 otherwise.	0.86	0.19
assn-performance	Student's average quiz score < 50%? Decision rule: = 1 if yes, 0 otherwise.	0.97	0.19
M1	**Combined M1 predictor**	**0.77**	**0.48**

Absent Mode (M2) Predictor

For most students, absences of several days at a time are not uncommon. As the absence lengthens, however, the probability that the student may not continue to persist in the course increases. The job of this predictor is to red-flag a student once he or she has been absent for a certain number of days, called the *"absence threshold"*.

To determine the optimum threshold, we studied the variation of accuracy with threshold. The threshold was varied from 0 to 3 *"course units"*, where a course unit is defined as the time period between the release of two units of course content. For most courses, a course unit is 1 week long. The variation of specificity and recall with the threshold is presented in *Figure 3*.

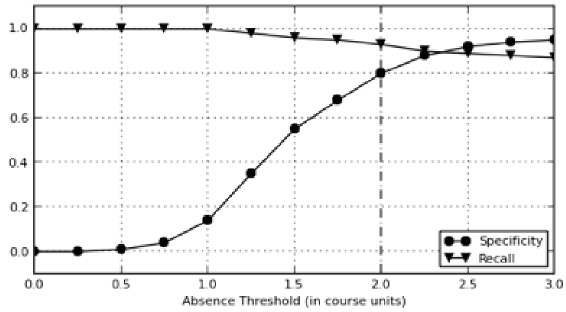


Figure 3. Variation of specificity and recall with the absence threshold At very low thresholds, S is very low and R is very high because almost every student has an absence at least as long as the threshold. As the threshold is increased, S improves and R deteriorates. We identified the point at 2 course units (14 days for a typical course) as a convenient threshold, where R and S are both above 0.75, and have selected this value to be the threshold of our M2 predictor.

Results

Specificity and Recall

First, we evaluate our predictor's specificity and recall observed over 10 test courses different from the 6 training-set courses. Table 3 shows the best, median, and worst observed recall and specificity figures.

Table 3. Best, median, and worst specificity and recall for various predictor components

	Individual feature predictors				M1 predictor	M2 predictor	Integrated predictor
	assn-performance	video-skip	assn-skip	lag			
Specificity							
Best	1.0	0.86	0.96	0.96	0.85	0.93	0.68
Median	1.0	0.82	0.92	0.84	0.72	0.80	0.58
Worst	0.96	0.40	0.73	0.47	0.36	0.70	0.29
Recall							
Best	0.008	0.58	0.38	0.43	0.67	0.98	0.99
Median	0.006	0.30	0.25	0.17	0.48	0.93	0.93
Worst	0.00	0.23	0.10	0.14	0.41	0.77	0.91

In order to develop an understanding of what the strengths and weaknesses of our predictor are, we need to provide some interpretation of the numbers in Table 3.

The 'assn-performance' (assessment performance) Feature

This feature generally has high precision and specificity. Over 95% of students it flags (students with average assessment scores below 0.5) eventually dropout. However, its recall was observed to be generally very low compared to the other features. For the majority of MOOC quizzes, mean scores are in the range of 70% - 85%. Even though some students occasionally score below 50% on certain quizzes, there are very few students whose average quiz scores are below 50%. This could be attributed to the deliberate easiness for which MOOC assessments are designed, or due to MOOCs' self-selective nature (students who believe that the course will be too difficult refrain from enrolling or refrain from attempting assessments).

The 'video-skip' Feature

This feature was observed to vary in specificity across different courses. Its specificity is high for the majority of courses, as demonstrated by the small difference between the maximum and median, so it is generally a robust feature. Specificity worsens, however, for courses with too many videos per topic. We observed that persistent and dropout students alike tend to start skipping videos when the total duration of videos to watch per week exceeds 2 hours. Some specificity drop occurs in courses where it is not necessary for students to view every video in order to be able to follow future content. In such cases, some students who fell behind in watching some videos skipped them totally and continued viewing other content.

The 'assn-skip' Feature

Similarly, this feature's specificity is generally high, with noticeable drops in courses with heavier assignment workload. The recall of this feature is worse than that of video skip, due to the presence of a group of students who are interested in viewing the videos but not in the assessments.

The 'lag' Feature

This feature was observed to have higher recall in courses with stronger interdependencies between different parts of the content. In such courses, a student who falls back has to view what she has missed before proceeding to the more advanced units. This increases the probability that the student will not be able to continue the course after dropping behind by a certain amount, especially in courses with higher work loads. The peak recall of 0.43 in our study was observed for a probabilistic graphical models course with 2.5 to 3 hours of video per week, and a topic interdependency map that makes it difficult to follow a topic without having mastered the previous topics.

The Active Mode Predictor

This predictor was able to predict between 40% and 50% of dropouts most of the time. Its toughest challenge was courses with high workloads (all students tend to show signals of poor interest at some point in the course if the work load is constantly high, including those who persisted until the end of the course).

The Absent Mode Predictor

This predictor was able to pick up over 90% of dropouts in most of the courses. Lower specificity was observed in courses with lighter workloads, since such courses make it easier for a student to catch up and continue in a course after an extended absence.

The Integrated Predictor

The consistently high values of recall of the integrated predictor are a consequence of the integration of the M2 predictor. Recall of a combined predictor is at least as good as the recall of the best of its components. The biggest weakness in the integrated predictor, however, remains to be specificity, which has to be worse than its worst component. The worst observed specificity (0.3) was for the probabilistic graphical models course, which has a relatively high number of videos and assignments per week, leading the predictor to falsely red-flag many students who skipped some videos and assignments. In future work, we hope to improve the overall specificity by making the features more sensitive to specifics of the course, such as workload. Another strategy is to try to add a second step to filter out false positives. This can take the form of a survey that starts by asking the student about their learning experience in the course to try to confirm whether the student is really at risk. If the presence of risk factors is confirmed, the survey advances the student to the intervention stage.

Distribution of Intervention Window Lengths

The other important figure of merit of the prediction model is the length of the intervention window (the time between the first red-flag the student receives and the last activity the student performed in the course). Figure 4 below shows the distribution of intervention window lengths aggregated over several courses.

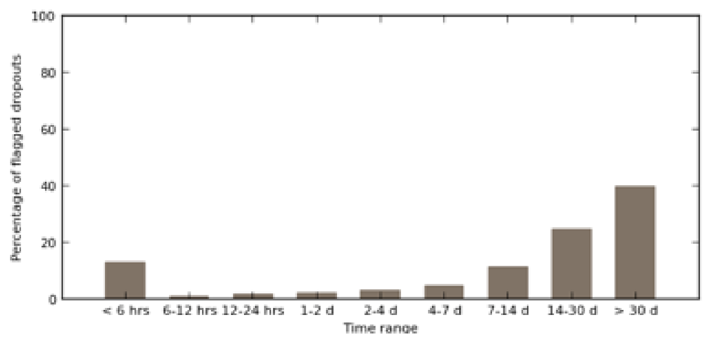


Figure 4. Percentage of flagged dropouts with intervention windows in 9 time ranges

The distribution shows that, for approximately 80% of the flagged dropouts, the student persists in the course for at least 4 days after the red flag is first raised. For well over 60% of the flagged dropouts, the student starts exhibiting activity patterns that raise the red flag more than 2 weeks before the last activity.

Conclusions and Future Work

Predicting student dropout is an important task in intervention design for MOOCs. Our study has shown that complete dropout is only one type of bad persistence patterns. Absence times exceeding 3 weeks are associated with drops on multiple performance metrics.

We have designed a prediction model that scans the student activity for signs of lack of ability or interest that may cause the student to dropout from the course or go absent for dangerously long periods. For most courses, our model predicted between 40% and 50% of dropouts while the student was still active. By red-flagging students who exhibit absences of 14 days or longer, the recall increases to above 90%.

The time window from the first red flag to the last activity shown by the student in the course is a critical figure that affects the effectiveness of the interventions we can deliver. Our analysis reveals that, through our choice of predictive features, we are able to spot risk signals at least 2 weeks before dropout for over 60% of the students. This suggests that it is feasible to design and deliver timely interventions using our prediction model.

As future work, we plan to use multiple strategies to improve the performance and usefulness of our prediction model. First of all, we have answered the question "What are some different activity patterns, inspired by persistence factors, that we can use to predict dropout?" However, we have not answered the question of "Which of the persistence factors do we believe student X lacks?" If our model could be made to distinguish whether a student is at risk due to lack of ability, interest, or both, it would have better implications on intervention design in MOOCs.

Secondly, we believe that other persistence factors exist that have to be studied, including mindset, self-efficacy (Bandura, 1994), goal setting (Locke & Latham (1990), Locke & Latham (2002)), and social belongingness (Walton & Cohen (2007), Walton & Cohen (2011)). Expanding our feature set to measure these factors, as well as using more sophisticated machine learning algorithms to enhance the design and combination of features are two directions that could potentially improve prediction performance and deepen our understanding of what makes a student persist in or leave an online course.

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Self-Regulated Learning in MOOCs: Do Open Badges and Certificates of Attendance Motivate Learners to Invest More?

Simone Haug, Katrin Wodzicki, Ulrike Cress and Johannes Moskaliuk

Abstract: *Massive Open Online Courses (MOOCs) claim to offer self-regulated learning. Learners decide which activities they will undertake, structure the provided learning content themselves and connect with other learners. But are learners in MOOCs really that active? Based on theoretical approaches concerning self-regulated learning, intrinsic motivation and self-determination, we present the concept of 'open badges' as a form of certification in self-regulated learning settings. We conducted a study during a MOOC and analyzed logfile data as well as questionnaire data. We looked at the relation between learners' activities and their self-set goal of achieving an open badge or a certificate of attendance. The results showed that learners' activities decrease continuously over time, but that this decrease was smaller for learners who aimed to achieve an open badge or a certificate of attendance. We discuss why open badges and certificates of attendance could serve as adequate motivators.*

Introduction

Massive Open Online Courses (MOOCs) are a new format for online courses. They are open to everyone and participation is voluntary and self-responsible, which makes them a new and interesting learning format. MOOCs take a new didactical approach that is fully learner-centered: it is not the teacher who structures learning and interaction. The learners freely decide upon which activities they undertake and what content they want to know about. In their self-determined activities, learners create their own space of interaction (Siemens, 2011) and interact with other members of the learning community. So in a MOOC, it is expected that learners will not only receive learning content passively, but also actively select information they see as interesting and relevant, discuss it with others or create any kind of artifact that they can save or share with others. Through a Web 2.0 infrastructure the learners can aggregate, remix, repurpose or forward content to others (Downes, 2012). The teachers take the role of facilitators and provide, besides learning materials, a technical infrastructure that supports communication and interaction.

But are learners in MOOCs really that active? Do they really regulate their actions themselves and make use of the provided technical and social environment? From many online settings we know that active participation is weak (Kimmerle & Cress, 2009, 2008). Some researchers have observed that participation in MOOCs reflects certain types of behavior similar to those in online communities (Nielsen, 2006): 90% of users are 'lurkers' that never contribute, 9% contribute little and 1% of users account for almost all action taken (Robes, 2012). Although more and more MOOCs are provided and seem to attracted huge numbers of participants, there is a lack of research into what makes people really engage in MOOCs instead of only registering as participants. This study aims at describing just how active learners are in MOOCs, and at investigating whether learners' continued involvement is related to individual factors like media literacy, motivation, interest and embeddedness in the learning community.

Our first step is to provide some insight into the concept of Massive Online Open Courses and show why they represent a prototype of intrinsic learning. We then take up the current discussion of open badges (Sharples et al., 2012, pp. 16-18) and show how these badges could serve as self-set goals that support a learner's engagement in the course. We present data from Open Course 12, a MOOC about E-Learning Trends which took place in 2012 with 1400 participants.

Massive Open Online Courses

The first course labeled as an Open Course took place in 2008 and was organized by George Siemens and Stephen Downes. They opened up their course about 'Connectivism and Connective Knowledge' to learners who wanted to participate but were not interested in course credit (Cormier & Siemens, 2010). In this case there were no admission restrictions. The course ran over 14 weeks, with each week devoted to a different topic. Since 2008 several Open Courses have taken place with large numbers of participants. The example of Sebastian Thurn, a teacher at Stanford University, has shown that participation in Open Online Courses can become massive. In the fall of 2011 he offered the free of charge online class 'Introduction to Artificial Intelligence' in collaboration with Peter Norvig. 160,000 students participated and over 23,000 students from 190 countries graduated. In 2012 he left Stanford

University to launch the company Udacity. Two other Stanford professors then started up the company Coursera, and both companies provide MOOCs. In addition, several universities, including Harvard and MIT, founded edX and started as providers of MOOCs.

The Learning Theory behind MOOCs

Some see different ideologies, or at least pedagogies, behind what MOOC offers. There are connectivist MOOCs (cMOOCs), then there are MOOCs such as those offered by edX, well-funded and with a more instructional learning approach that consists of video presentations, quizzes and testing - the so-called xMOOCs (Bates, 2012). Siemens criticizes their difference harshly by saying "cMOOCs focus on knowledge creation and generation whereas xMOOCs focus on knowledge duplication" (Siemens, 2012). In this paper we focus on the special learning conditions in cMOOCs. In a cMOOC the emphasis is on the collaboration and interaction with other learners that take part in the course. The central goal of a cMOOC is to build a community of learners that discuss their experiences, develop shared understanding and create new ideas. This leads to two forms of learners' investment: self-centered and interactive. Self-centered forms of investment refer to learning activities such as reading course material or listening to presentations. The individual learner carries out these activities independently of the community of other learners. Interactive forms of investment refer to learning activities such as commenting on the ideas of others or publishing one's own idea. These activities are carried out by the community of learners who are part of a MOOC. Both forms of investment are indicators that a learner is actively participating in a course, and these indicators could be used to differentiate between successful and unsuccessful learners.

cMOOCs are learner-centered and based on a socio-constructivist approach, where learners actively construct their learning. Different learning styles are encouraged. This means that in MOOCs participants have a great deal of autonomy with almost no control, but with rich social contexts which provide the possibility of communication. According to the Self-Determination Theory (SDT; Deci & Ryan, 1985) this autonomous environment supports intrinsic motivation and leads to high-quality learning. Free choices and the opportunity for self-direction (e.g., Zuckerman et al., 1978) appear to especially enhance intrinsic motivation, as they afford a greater sense of autonomy.

In addition, Cognitive Evaluation Theory (CET) presented by Deci and Ryan (1985), specifies factors in social contexts that produce variability in intrinsic motivation. CET, which is considered a sub-theory of self-determination theory, argues that interpersonal events and structures (e.g., rewards, communication and feedback) can enhance intrinsic motivation. Such interpersonal factors can lead to feelings of competence during a certain action, thereby yielding satisfaction of the basic psychological need for competence. Accordingly, such factors as optimal challenges effectively encourage feedback and freedom from demeaning evaluations are all predicted to facilitate intrinsic motivation (Ryan & Deci, 2000). The opposite of this is tangible rewards: but threats (Deci & Cascio, 1972), deadlines (Amabile, DeJong, & Lepper, 1976), directives (Koestner, Ryan, Bernieri, & Holt, 1984) and competition pressure (Reeve & Deci, 1996) have been shown to diminish intrinsic motivation as students perceive them as controllers of their behavior. The significance of autonomy versus control for the maintenance of intrinsic motivation has been clearly observed in studies of classroom learning (Deci & Ryan, 1985; Ryan & Deci, 2000).

This idea is aligned with the learning theory behind MOOCs. Instead of following a strict curriculum, conducting formal learning assessments and certificating learners' performance, focus is on self-regulated learning and communication processes. Open badges are one method of recognizing and documenting one's own learning and skill development. Each learner sets his or her own learning goals and the open badge works as a tool to summarize one's own success. In the sense of the Self-Determination Theory, this should support intrinsic motivation, because learners perceive themselves as autonomous but also connected to others.

In the first cMOOC, Stephen Downes and George Siemens followed the idea of a connected learner and based their course concept on the idea of connectivism. Connectivism takes into account aspects of network theory, chaos theory and self-organization theory (Siemens, 2005). Key principles for learning in connectivist terms are autonomy, connectedness, diversity and openness (Downes, 2010). Learning is seen as "the process of forming and pruning connections through social and technological networks" (Downes, 2010). It is claimed that learners can massively improve their learning by integrating the network or community. As defined by Downes, (2010, p. 503) "knowledge is found in the connections between people with each other and […] learning is the development and traversal of those connections."

With regard to this foundation, social connectivity can influence involvement and learning in Open Courses. This is supported by the findings of Garrison, Anderson, & Archer (2000) who differentiate between three forms of presence that play a role in education: cognitive presence, social presence and teacher presence. It seems that the closer the ties among the people involved, the higher the level of presence and the higher the level of involvement in the learning activity (Kop, 2011, p. 22). Research about extrinsic and intrinsic motivation also supports the assumption that social connectivity is important for learning. The "tendency toward assimilation or integration can lead people not only to do what interests them, but also to internalize and integrate the value and regulation of activities that may not be interesting but allow them to feel both autonomous and related to others within the social world" (Deci & Ryan, 1991, p. 255). Siemens sees MOOCs as a "large public experiment exploring the impact of the Internet on education" (Siemens, 2012). It was the dissemination of web 2.0 tools like weblogs, podcasts, RSS, wikis and the mobile devices that paved the way for the breakthrough of MOOCs (Siemens, Tittenberger & Anderson, 2008). Open access to all learning resources over the web was key to this new format of distance education. Different web 2.0 tools are available to support information transmission and communication, but participants are free to choose the tools that they use. Downes recommends that participants "use the tools and just practice with them" (Downes 2012, p. 497) and only listen to and read contributions that meet their own individual interests (Downes, 2012, p. 496). Participants are asked to create their own personal learning environment by choosing the tools that seem appropriate for them.

Types of action regarded as essential for learning in MOOCs are aggregating content, managing and working on content (remix, relate, repurpose), creating and sharing content (Downes, 2012; Kop, 2011). Participants in MOOCs can aggregate the material provided by the organizers, teachers and other course participants. Material can be delivered through different platforms such as weblogs, twitter, e-mail and mailing lists. Participants should find their own ways to store and manage their collection of content by using a blog, social bookmarking, twitter or other tools.

The question arises as to which opportunities and tools organizers of cMOOCs should provide to enable their students to connect with other participants. In this paper we present a case study of Open Course 2012 to investigate to which degree participants use the technology provided and how often they use it to connect and exchange with other participants. We also assess how this affects their learning activities.

Research Question 1: How does participation develop over time?

Participants working in MOOCs are expected to aggregate content in relation to their own context and add their own interpretation. This process of relating or repurposing content is considered the "hardest part of the process" in MOOCs (Downes, 2012, p. 496). Learners are then requested to create their own contributions and share them with other participants (i.e. through sharing interesting websites or other resources with other participants). By sharing their own content, participants start to interact with the learning community. While they will have to cope with any negative feedback they receive in response to what they share, they may also receive support and praise. In her research about the MOOC PLENK, Kop (2011) stated that students "mostly felt happy to aggregate, relate and share resources, but only a minority [...] were engaged in the creation of artifacts, such as blog posts and videos, and in the distribution of these" (p. 35). So what does a learner's involvement actually look like? How actively do participants use the provided tools and exploit the provided content? How did involvement in learning develop over time? To answer this question, we categorized the learners' activities into two different forms of involvement: activities for which participants have no interaction with other participants (i.e. aggregation and managing content), or 'self-centered forms of investment,' and activities in which people communicate or share content with others, or 'interactive forms of investment.'

Research Question 2: Do external motivators support participation?

In traditional courses at universities the main goal for a student is to pass the final exam, receiving the associated study credits. This external motivation (Deci & Ryan, 2002) is an important factor that keeps students learning. In an open course all participation is voluntary and so motivation may result from different sources: interest in the content, interest in the course format, getting to know new people or connecting with the learning community. Official grades that verify learning are not necessarily awarded upon completion of MOOCs. However, some MOOCs offer the option to receive a certificate of attendance at the end if certain requirements have been completed. If the participants require such a certificate, they must provide the study documents they have generated (e.g. the posts or essays they have written), thereby attaining their certificate on request without formal assessment. Open badges are used in some MOOCs as a new way to acknowledge online activity. Substantial impetus for applying badging to learning has come from the Mozilla Foundation, which published a white paper about the concept in 2010. A software infrastructure was designed that can support the collecting of badges. An open badge is primarily an image file that contains information about who earned the badge, what they had to do to earn it, when it was issued, and who issued it. They are used as an alternative to a formal assessment, to recognize, represent and validate achievement and learning. They can also foster motivation in learning environments, especially if they are based on self-regulated learning (cf. Sharples et al., 2012). The organizers of MOOCs define the performance requirements, such as written contribution to a blog, written comments or attending an online session. Because participants decide on their own if they wish to attain a badge or certificate of attendance and what actions they will take to earn the badge, this form of self-directed external motivation has to be interpreted differently from that of a formal exam. Nevertheless, award of an open badge or a certificate of attendance might be an important motivation factor. In contrast to formal assessments or grades, open badges and certificates of attendance do not depend on specific achievements. The idea is that learner provides published documents, detail how they participated in the course and request the MOOC organizer awards the open badge or certificate of attendance. So the question is: do self-set external motivators like open badges support or inhibit active participation? To answer this question, we analyzed whether the decision to achieve an open badge or certificate of attendance influenced both self-centered and interactive forms of investment.

A Case-Study of Open Course 2012

The Open Course 2012 (OPCO12) was organized by three German institutions of higher education that are engaged in e-learning support and training. The Open Course took place from April 16 to July 21, 2012. The OPCO12 covered six topics that were derived from the Horizon Report 2012 (Johnson, Adams, Cummins, 2012), a highly regarded trend study conducted by New Media Consortium and the EDUCAUSE Learning Initiative. The topics were Mobile Apps, Tablet Computing, Game-Based Learning, Learning Analytics, Gesture-Based Computing and Internet of Things. Every two weeks a new topic was covered. Each unit lasted two weeks and addressed one of the six topics. On Monday at the beginning of each unit an introduction was given on the OPCO-Weblog. Every Friday the organizers circulated discussion points to be covered over the coming week to the OPCO mailing list, summarizing participants' contributions. On Wednesday of the second week an online event took place where the topic was introduced. These online events consisted of presentations by experts. All participants were asked to join the discussion via chat. In addition the blog, news and comments (of organizers and participants) were published in a twitter stream with the hashtag #opco12. On Friday at the end of the second week a second summary was circulated.

The technical infrastructure of the course consisted of one central course blog. Here the participants could access information about organizational issues and the learning material for all six units. The participants were motivated to use their own weblog or twitter channel for activities relating to course topics. Posts in participants' blogs as well as tweets containing the hash tag 'opco12' were aggregated automatically into the course blog. Regular newsletters and weekly summaries were sent to participants by email. Adobe Connect was used to facilitate online sessions as it allows live streaming as well as recording of online events. During this live event a chat channel was available for all participants.

Participants and measures of activity

1451 participants registered for the course. For each unit of two weeks we analyzed the logfiles (visitors per day on the course website) over the four days when newsletters were sent out or events took place (see Figure 1). For each unit we calculated the total number of distinct users that visited the course blog on these four days.

In addition we used two questionnaires to measure participants' subjective estimation of their activity. After the first half of the course the first questionnaire was sent to all registered participants. 85 participants answered this first questionnaire, which dealt with the investment of learners during the first three units. A second very similar, but slightly extended questionnaire was sent to all registered participants at the end of the course. It dealt with the investment of learners during the second three units. 147 participants answered this second questionnaire. In both questionnaires we asked the participants in which activities they had participated during each of the six units of the course (e.g., Did you use twitter?).

Their activities were categorized as self-centered forms or interactive forms of investment. Examples for self-centered forms of investment were: listening to two weeks' online events; reading offered materials, the newsletter, and blog entries about the topics of the course; and researching additional information. Interactive forms of investment were: blogging, commenting on blogs, tweeting and chatting. We also asked the participants if they were aiming to receive a certificate (open badge or a certificate of attendance) or not. The certificates and open badges were not bound to specific exams or inquiries but issued by request. The participants had to document their own activities during the course to obtain a certificate or open badge of attendance from one of the institutions hosting the course.

Design

For Research Question 1 we used the 6 units (2 weeks per unit, each unit immediately following the other) of the course as an independent variable and measured participants' activity as a dependent variable.

The course blog logfile data was used to measure participants' activity. As the course blog was the central information hub, to which all contents of the course were linked, the number of visitors per unit is an objective measurement for learners' activity regarding provided course material. This measurement was complemented by subjective measurements of participants' activity using the two questionnaires described above. We measured the amount of active and self-centered investment that the participants reported in the questionnaires. These two measurements (objective logfile-data and subjective reports by the participants) validate each other, providing a complete picture of participants' activity during the course and the development of activity-over-time.

For Research Question 2 we used the course units (within subjects) and our question regarding participants' to acquire an open badge or certificate (between subjects) as independent variables. We again used the amount of active and self-centered investment as dependent variables.

Results Research Question 1: How does participation develop over time?

With used the logfiles to measure the number of visitors to the blog per unit. Figure 1 visualizes that the number of blog visitors continuously decreases over time (except for unit 4) and the number of blog visitors per unit.

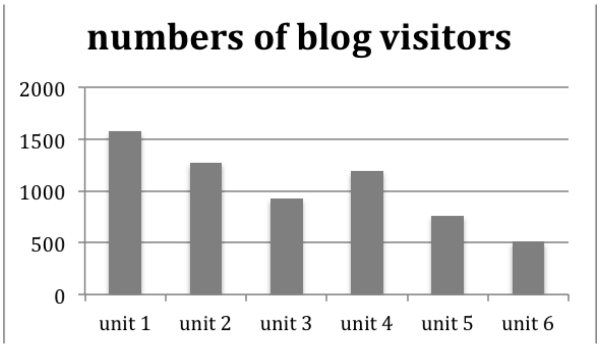

Figure 1: Number of blog visitors decreases over time

The descriptive results of the questionnaire also support this result: Self-centered and interactive forms of investment decrease over time. Table 1 shows the results for self-centered forms of investment and Table 2 the results for interactive forms of investment.

Table 1: Self-centered investment during OPCO12

	FORMS OF INVESTMENT							
	Reading material		Listening online events		Reading blogs		Reading the newsletter	
UNIT	M	SD	M	SD	M	SD	M	SD
1	.71	.458	.65	.481	.61	.490	.75	.434
2	.68	.468	.66	.477	.55	.500	.74	.441
3	.60	.493	.60	.493	.53	.502	.72	.453
4	.67	.473	.47	.501	.50	.502	.78	.419
5	.58	.496	.37	.484	.47	.501	.76	.427
6	.54	.500	.35	.480	.47	.501	.76	.427

Table 2: Interactive investment during OPCO12

	FORMS OF INVESTMENT							
	Chatting		Tweeting		Blogging		Blog commenting	
UNIT	M	SD	M	SD	M	SD	M	SD
1	.25	.434	.26	.441	.25	.434	.15	.362
2	.18	.383	.26	.441	.28	.453	.15	.362
3	.16	.373	.18	.383	.22	.419	.07	.258
4	.14	.344	.12	.329	.15	.358	.05	.228
5	.10	.295	.07	.264	.11	.313	.03	.182
6	.07	.253	.10	.304	.08	.275	.03	.182

This data shows that both forms of learners' investment continuously decreased over the six units. The only exception was 'Reading the newsletter,' although that may be because newsletters were sent directly to participants' mailboxes and could thus be described as a 'push-medium.' The other forms of investment could be described as 'pull-mediums,' where participants had to actively visit the course website, other platforms or web resources.

Results Research Question 2: Do external motivators support participation?

In the first questionnaire, 62.35% of the responding participants reported that they aimed to achieve an open badge or some other form of certificate. 29.41% reported participation without such an aim. In the second questionnaire, 49.66% of the responding participants reported that they started with the aim of achieving an open badge or some other form of certificate, whereas 45.58% started without such an aim. In order to test if both groups of participants differ we conducted 4 mixed 3x2 ANOVAs per unit as repeated-measures factor and 'certificate or not' as a between-groups factor.

The first ANOVA was based on the data from the first questionnaire and thus assessed the interactive forms of investment for the first three units. The second ANOVA was also based on these data and assessed the self-centered forms of investment. Two analog ANOVA were calculated for the data from the second questionnaire, which assessed the investment of participants for units 4-6. Because the questionnaires were anonymous we do not have any information about how many of the participants took part in both questionnaires.

In all four ANOVAS we found a significant main effect of certificate, $F(1, 76) = 13.69$; $p < .001$; $F(1, 76) = 8.55$, $p < .01$; $F(1, 138) = 23.48$, $p < .001$; $F(1, 138) = 17.27$, $p < .001$.

Except for the second ANOVA (where we found just a tendency) we found in all ANOVAs a significant main effect of unit, showing that the students' investment was decreasing from unit to unit, $F(2, 75) = 3.69$; $p < .05$; $F(2, 75) = 2.97$, $p < .10$; $F(2, 137) = 6.29$, $p < .01$; $F(2, 137) = 6.00$, $p < .01$. Furthermore, the first and fourth ANOVAs revealed a significant interaction, showing that the decrease in investment was stronger for people without the aim of receiving a certificate than for those with this aim, $F(2, 456) = 4.97$, $p < .001$; $F(2, 828) = 6.00$, $p < .01$. Thus during the first half of the course, the aim of receiving a certificate reduced the students' decrease of self-centered investment across the three units. In the second half a similar pattern occurs. Here the aim of achieving an open badge or certificate of attendance reduced the decrease of interactive investment. To sum up, our results show that the amount of investment decreases over time, and that this decrease is smaller for participants who aimed to obtain an open badge or certificate.

4. Conclusion

The descriptive data for Research Question 1 shows that self-centered forms of investment are more frequent than interactive forms of investment. The data also show that participants' involvement decreases over time. Our results answer Research Question 2 by showing that participants who self-set the goal to achieve an open badge or a certificate of attendance revealed a higher investment, both for self-centered and interactive forms of investment. The main effect reported above shows that the aim of achieving a certificate seems to have a positive effect on both kinds of investment.

What makes research about participation in MOOCS difficult is that it is not possible to technically assess participants' involvement. Did they only receive or did they really read the whole newsletter? Did they listen to the whole online lecture or did they only see the first five minutes? Did they read the postings of other participants or not? Did those that appeared to be lurkers only use other channels to continue the conversation? This methodological problem could not be solved in a study of the field. However, our work is one of the first studies providing quantitative data about learners' participation in a MOOC. We combine two kinds of data: the logfiles that objectively measure how many users visit the course website per unit, and the questionnaires which analyze how participants subjectively rate their own participation. Both sets of data display a similar result: involved participation decreases over time. Another methodological challenge is the self-selection of participants. From the 1451 participants registered to the course, only a small number of participants (about 10%) were included in our study. As we used the newsletter and the course website to invite course participants to take part in our study and answer the questionnaires, only the more active participants read this invitation and were therefore able to answer our questionnaire. However, one could state that this makes our results even more convincing, as even the more active participants comply with the pattern of decreased participation over time. In addition the logfile data (Research Question 1) included all course participants, not only those participants who also responded to our questionnaire. The same is true for the decision to obtain an open badge or certificate of attendance. It is possible that participants who decided to get an open badge would be more likely to take part in our study. In addition, our results could also be interpreted in reverse: participants who show more self-centered or interactive investment decided to get an open badge or certificate of attendance. Participants were made aware of the option to earn an open badge or certificate at the beginning of the course and were able to decide if they wished to earn one. This is why we state that our results could be interpreted in the following way: if participants decided to aim for an open badge or a certificate of attendance, this reduced the decrease of investment over time. In sum our results lead to the following conclusions:

(1) The participants' self-centered and interactive forms of investment decrease over time. Thus the challenge of motivating MOOC participants to become active learners still exists.

(2) Participants continue to read the regular newsletter throughout the course, indicating that this kind of push-medium is an effective way to motivate self-centered investment.

(3) Participants who aimed at getting an open badge or a certificate of attendance showed a reduced decrease of investment. Thus using open badges or similar certificates could support users to set their own learning goals and ensure ongoing participation.

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Extending the MOOCversity A Multi-layered and Diversified Lens for MOOC Research

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Abstract: *While there are many ways at looking at MOOCs at a global scale, this paper seeks to identify a number of factors according to which MOOCs are considered to be successfully implemented in Europe. The principles behind the US-American MOOC higher education landscape appear to be mainly of financial and reputational relevance which are neither pedagogically nor cross-culturally driven. By analogy, European universities try hard to follow the same path. For the purposes of this paper, a brief examination of existing MOOCs is undertaken before presenting intercultural factors and learning theory mechanisms that might call for a diversified and thus different approach than the one adopted by the US digital agenda. A European lens takes into account culture-sensitive and learning theoretical factors, calling perhaps for an additional classification of MOOCs, one that we call enhanced MOOCs - in short, eMOOCs.*

Introduction

In line with the globalization efforts around the world, the European higher education area has recently placed particular focus on innovative dissemination and educational tools for a variety of purposes, but most importantly, for means of competitiveness, not to substantially fall behind in the international race of online learning. Although much effort has been made to catch up with the mainly US-American dominance, Europe can by no means be regarded as being at the forefront of educational technology providers. Given that MOOCs (Massive Open Online Courses) "are the educational buzzword of 2012" (Daniel, 2012), an analytical lens is taken to investigate into how and whether MOOCs can simply be translated into a European context by foregrounding intercultural and learning theory perspectives and by claiming that the intersection of culture and technology has been given little, if any, priority. "As a digital phenomenon, a MOOC provides the means for connecting, interacting, and sharing across diverse cultures, attitudes, and skill sets in short order and with low cost." (McAuley, Stewart, Siemens & Courmier, 2010, p.45). As such, a stance shedding more light on diverse cultures and attitudes will help to raise awareness for cross-cultural issues among the MOOC community in general and in particular for this work in progress. In this position paper we take the view that this is a fascinating ongoing journey through a thrilling research area which has mainly been sidelined by most researchers in this field.

State-of-the-Art

In this section the MOOC landscape will be sketched. By taking a closer look at the MOOCversity - as we would like to call it - one might get the impression that a somewhat new and successful way of online learning has emerged. To elaborate on this view, we seek to draw a broader picture of its genesis.

Starting from Canada and America, MOOCs quickly spread all over the world and were enthusiastically implemented in a variety of countries in Europe, Asia, Australia and Latin America. When turning a watchful eye on the MOOC landscape altogether, it might be helpful to differentiate between xMOOCs and cMOOCs. It was back in 2008 that the first MOOC kicked-off focusing on topics about connectivism (McAuley, Stewart, Siemens & Courmier, 2010). Based on the learning approach of connectivism, learning with cMOOCs has become synonymous with presenting learning materials, connecting people via networks (Twitter, Blogs etc.) as well as stressing collaborative learning with Web 2.0 tools. Such an approach is most different to the one taken by the creators of xMOOCs, which were mainly developed by the Ivy League universities consisting of short video lectures followed by quizzes (Siemens, 2012). As Clarà and Barberà (2013) point out xMOOCs are not pedagogically driven and cMOOCs aim to explore and explain learning in Web 2.0 based on connectivism. As Siemens puts it "cMOOCs focus on knowledge creation and generation whereas xMOOCs focus on knowledge duplication" (Siemens, 2012, para.3). To take an xMOOC example, we wish to state Coursera which started in 2011 with free online course founded by Daphne Koller and Andrew Ng (Pappano, 2012). In 2012 Stanford University offered a free online course on "Artificial Intelligence" run by Sebastian Thrun. Spurred by the success of this online lecture Sebastian Thrun, professor at Stanford University founded Udacity. In cooperation with Harvard and UC Berkeley (Daniel, 2012) the Massachusetts Institute of Technology (MIT), in an attempt to jump on the online educational bandwagon, announced their MITx, nowadays known as edX. Whereas the MIT offers free online courses as part of their policy considering a non-profit start-up in line with their educational understanding, Coursera can on the other hand be seen as a provider for MOOC with a different motivation starting as a for-profit MOOC provider (Daniel, 2012, Pappano, 2012). What is worth stressing at this point is that Coursera does not create any courses; they are mere providers for online courses for their partner institutions (Armstrong, 2012). As to the stakeholders of MIT, they seek to advance their own strategic vision and "to learn how to use new technologies to most effectively educate their own on-campus students" (Armstrong, 2012, para.10). There is no doubt that MOOCs are constantly growing, and as Pappano writes "Coursera, Udacity and edX are defining the form as they develop their brands" (Pappano, 2012). Although MOOCs are open and free, Coursera has $43 million in new investment money (Rivard, 2013) which clearly shows the added value of such an educational form in terms of financial means.

The European landscape of MOOCs and the major stakeholders in this field were discussed and identified at the European MOOC Stakeholders' Meeting in Lausanne in June 2013. In his presentation, Dillenbourg (2013) listed 13 European countries that are eagerly involved in establishing and providing MOOCs, seeking to thus unravel and consequently further develop the European MOOCversity. When taking a closer look at the different providers of MOOCs in Europe, one gets the impression that the concept of American MOOCs (cMOOCs and xMOOCs) is simply copied. As an example we would like to take the German provider iversity (https://iversity.org/). iversity- in its own words- introduces its courses by referring to the slogan "Ivy-League for everyone" (https://iversity.org/en/pages/ivy-league-for-everyone). This bold statement shows the eagerness to take the Ivy-League concept as a role model when it comes to offering MOOCs.

Learning Cultures

Behaviorism and xMOOCs

By taking a closer look at the pedagogical models of existing MOOC platforms, it becomes apparent that xMOOCs seem more strongly rooted in the tradition of behaviorism which originated in America, while cMOOCs are more likely to be associated with constructivism. The founders of behaviorist ideas such as Watson, Skinner and Thorndike are all important American representatives of classical and operant conditioning. Skinner's work, well-known for different experiments with animals, gave evidence of how behaviour can be changed through reinforcement. He is also considered to be the father of programmed instruction. The idea behind his teaching machine was to create learning content in small steps and give immediate feedback to the learner (Vargas, 2005). Nowadays this form of computer based-learning is known as drill and practice, which is reflected by simple presentation of learning material where learners respond to quizzes and receive feedback on whether the answer was right and wrong. When taking a closer look at the xMOOCs tradition, most of the features remind us of learning in a behavioristic way falling back on video lectures (the learning material) and self-quizzes (see also Bates, 2012; Clarà & Barberà, 2013).

Connectivism and cMOOCs

The idea behind cMOOCs in general is to cope with the new possibilities offered by the Internet. Being aware of the complexity of this new digital era, Siemens (2004) proposed a new learning theory that he named connectivism. Siemens argued that it was important to know where information can be found and how it might be successfully used. Information will be changed through use, reuse, and connection of nodes of information sources. What is most essential here is the way of connecting information and persons, yet having an eye on the impact of networks. The issue at stake, however, is that connectivism can, in our view, hardly be labelled a learning theory. Clarà and Barberà (2013) identified three critical issues in this context. First, connectivism does not address the 'learning paradox' which is, "how do you recognise a pattern if you do not already know that a specific configuration of connections is a pattern?" (Clarà & Barberà, 2013, p.131). Second, in connectivism interaction and connection are reduced to a static binary form. This is contrary to the understanding of learning as a process and the quality of interaction rather than the simple view of interaction on/off. The third challenge recognized by Clarà and Barberà (2013) is that connectivism does not explain concept development. Every learning theory explains different forms and aspects of human learning and extents the view of knowledge acquisition (Behaviorism), knowledge integration, memory, cognition (Cognitivism) to knowledge creation and collaborative learning (Constructivism).

The fact that knowledge is constantly growing and we are permanently confronted with a huge variety of new information that can be connected or externally stored cannot per se be explained as an additional aspect of human learning nor raise a claim of being a new learning theory altogether. Such a new learning concept will have to explain if and how learning changes when new technology and additional possibilities come into play, be it in form of hardware i.e. tablets, smartphones, new user interfaces and interaction (touch instead of clicking), or software developments and the technology behind Web 2.0 (e.g. Ajax).

Constructivism and Web 2.0

The increasing possibilities due to the omnipresent and easy use of Web 2.0 tools such as Wikis and Weblogs question whether, and if so how, they could be used for learning.

More recent pedagogical approaches emphasize learning in both groups and authentic and real situations. Constructivist learning suggests inquiry and problem-based learning (e.g. Savery & Duffy, 2001), situated cognition (Brown, Collins & Duguid, 1989) and a number of pedagogical methods to facilitate knowledge building rather than simple knowledge acquisition. In this context, knowledge building as proposed by Scardamelia & Bereiter (1996) means focusing on problems rather than on topics of knowledge. By doing so, students should be encouraged to discuss contrary ideas, enquire about causes and principles and explore relevant issues. Learning should take place through social interaction, negotiation with others and work in small groups. Such reasoning suggests opening the knowledge community to experts and other contributors outside of class and to provide private and public discourse (Scardamalia & Bereiter, 1996).

Trialogical Learning

Clarà and Barberà (2013) stress a variety of learning concepts based on cultural psychology i.e. cultural-historical activity theory (CHAT) to address MOOCs with some fresh pedagogical approaches. By combining the ideas of connectivism and principles of CHAT Clarà and Barberà (2013) distinguish two principles: "the visualization of objects and the enabling of dialogic and sustained joint activity" (p. 134). Representations (i.e. knowledge) are psychological tools that mediate between the subject and the object. Further, they are distributed in communities, used, reused and transformed. Such psychological tools in the sense of Vygotsky can either be maps or mathematical signs (Kaptelinin & Nardi, 2006).

In addition, learning takes place in a way in which learners internalize representation in relation to an object. For learning in MOOCs Clarà and Barberà (2013) suggest visualizing an object to guide and focus on what should be learned to enable opportunities for joint activity and collaboration to use a representation as a common object for internalization. Based on cultural-historical activity theory (CHAT), the work of Engeström (expansive learning, 2001), Nonaka and Takeuchis's model of knowledge creation (1995) and the theoretical considerations of Scardamelia and Bereiter (knowledge building, 1996), Paavola, Lipponen and Hakkarainen (2004) conceptualized, what they call, the trialogical learning approach.

They distinguish between three metaphors of learning: 1) the acquisition metaphor, 2) the participation metaphor, and 3) the knowledge-creation metaphor. The acquisition metaphor refers to the monological approach which means individual learning that emphasizes conceptual knowledge. The participation metaphor, on the other hand, refers to the dialogical approach which stands for collaboration and interaction with others emphasizing situated cognition. Finally, the knowledge-creation metaphor defined by interaction through these common objects (or artifacts) of activity, is not just applicable between people, or between people and environment" (Paavola et. al., 2004, S. 545). This means that the interaction between people is extended beyond its rigid boundaries; it is interaction through shared objects. Such objects can be conceptual or material artifacts, practices or ideas, mainly developed collaboratively (Paavola & Hakkarainen, 2009). In other words, the trialogical approach facilitates "developing something new collaboratively, not repeating existing knowledge" (Paavola & Hakkarainen, 2009, p.84). Trialogical learning takes place in present situations of knowledge-centered work which is more open-ended, dynamic, reflective and creative (Paavola & Hakkarainen, 2009).

Extending the MOOCversity: enhanced MOOCs (eMOOCs)

When taking account of the concepts of trialogical learning and the issues pointed out by Clarà and Barberà (2013), one might deduct that learning with xMOOCs which are predominantly concerned with simple knowledge acquisition and require an additional lens - one that incorporates a cultural psychology approach in the sense of knowledge-creation and transforming practices by using shared objects.

In analogy with the trialogical learning approach, learning with and in MOOCs knowledge acquisition is covered by xMOOCs, whereas cMOOCs relate to knowledge participation. A predominant part, however, which seems to be lacking is the cultural perspective - that is to say, people on the Internet shaped by different cultures using different tools and collaborating through shared objects. Most essential at this point is that during collaboration social practices and shared objects are transformed through mediated tools. Inspired by Paavola and Hakkarainen (2009) this process is visualized in Figure 1. To state an example, the object can be a specific assignment which has to be carried out collaboratively. Each member states their own perspective, knowledge and expertise and falls back on their cultural background. Figure 1 reflects a three-level transformation of team collaboration. The arrows symbolize the ongoing transformation process of social practices, the one of shared objects and of the usage of the tools. Similarly, Paavola and Hakkarainen (2009) provided an example such as writing a research article where the article is the shared object; one agent is the main organizers of the paper, all other stakeholders write the paper, highlight the ideas, point out some arguments etc.

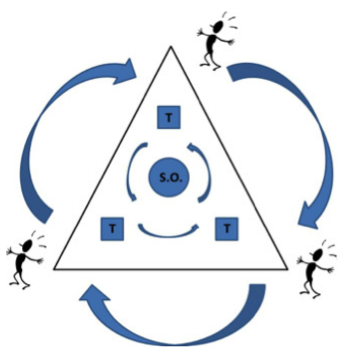

Figure 1. Trialogical Learning in MOOCs (T=Tools, S.O.=Shared Object)

Additionally, the following features identified by Scardamalia and Bereiter (1996) can be easily adjusted to MOOCs: Turn-taking with asynchronous discussion, comments and notification by peers and an open learning environment for every student (i.e. less knowledgeable, younger students with different abilities), provides different communication modes so that students can choose whether they want to include videos, audios and animation. Students require more time to reflect in a virtual learning environment than in a face-to-face situation. As a result, it is most vital to give them sufficient periods to reflect.

Taking all the above mentioned factors into consideration we feel that although focusing on cultural psychology is crucial, it is not enough. It is also essential to shed light on cultural differences per se, because learning in MOOCs seems to deal with students from different cultural backgrounds. As Kuzulin puts it, "each culture has its own set of psychological tools and situations in which these tools are appropriated" (Kuzulin, 2003 p. 16). For these purposes, we seek to extend the MOOCversity, one that we call the enhanced MOOC, in short eMOOC. This additional form of MOOC places particular emphasis on knowledge creation around a shared object, transforming social practices during learning by incorporating culture-sensitive material. Those objects and practices are in line with the tradition of cultural psychology given that cultural dynamics constantly trigger social practices, and as a result, permanently change the social setting. See *Table 1* for relevant factors regarding the learning approaches mentioned above.

Table 1: Overview of the MOOCversity

	xMOOCs	cMOOCs	eMOOCs
Learning Metaphor	Knowledge Acquisition	Knowledge Participation	Knowledge Creation
Learning Approach	Behaviorism	Connectivism	Constructivism and Cultural Psychology
Focus	Concepts, Facts	Collaboration	Shared Objects, Mediated Artifacts
Learning Environment	Video Lecture Quizzes, Peer Grading, Discussion Boards	Video Lecture incl. Web 2.0 i.e. Blogs, Microblogs; Social Media	Diversified and Customized Learning Material; Culture-sensitive distribution of Content
Culture	Epistemological Culture, in a Technical Tradition (ICT, Mathematics) Low-context	More Pedagogically Driven, in the Tradition of the e-learning Community High-context	Epistemologically Diverse, both Pedagogically and Culturally Driven, Based on Psychological Theories Low-context and High-context

Understanding Cultural Differences

General Reflection on Interface Culture and MOOC

The concept of culture traditionally referred to people living in "other places"; however, in contemporary expressions such as youth culture, gay culture, pop culture the principle of differentiation has shifted entirely to the notion of different "kinds of people" (Goddard, 2005, p 58). This standpoint sheds a different light on cultural concepts altogether, leaving the question open whether one might also talk of a MOOC culture, and if so, how such a cultural conceptualization looks like.

Against this background, and despite the lack of substantial treatment of cultural issues in the MOOC literature, there is a general intention of spreading the Anglo-American MOOC concept within Europe. This position paper might contribute to a reflection process within Europe incorporating socio-cultural considerations and hence add a further lens to MOOCversity.

General Differences in Cultural Behavior

Academic literature in the field of cultural studies has identified a range of cultural dimensions, standards and behavioral patterns that are of utmost importance to today`s understanding of how cultural diversity comes about and why internalized frames of reference need to be reflected, filtered or shifted in order to work effectively within cross-border teams (for a general overview of cultural dimensions and standards see Hofstede, 1991; Hall, 1969; Hall, 1984; Trompenaars and Hampton-Turner, 1998; House, 1999; Thomas, 2005).

The rationale for this position paper, among other things, has been to identify those dimensions that might be of crucial relevance for a successful implementation of the MOOC concept within Europe and a widespread acceptance within this particularly diversified setting. In exploring cultural dimensions and standards of perceived importance for our research, we were drawing on different frameworks so as to ensure a varied picture.

Crucial Cultural Concepts: US-Americans versus Europeans

At first glance, one might think there are no or only minor cultural differences between US-Americans and Europeans. Such a perception might be even more true given the globalization efforts we are facing today where cultural fluidities are on the daily agenda. The Western World - as it is frequently referred to - is a clear dichotomy between western and eastern perspectives, often considered as a monolithic unit, integrally connected and thus comprises Europe and the USA alike.

<u>Individualism versus Collectivism</u>

The first dimensions worth drawing upon are the individualism versus collectivism pattern identified by the Dutch researcher Hofstede (1991). He states that "Individualism pertains to societies in which the ties between individuals are loose; everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onward are integrated into strong and cohesive in-groups, which throughout their lifetimes continue to protect them in exchange for unquestioning loyalty" (p.76).

US-Americans are per se most individualistic and "highly mobile geographically, socially, and economically and by necessity have developed strategies for interacting with strangers" (Hall, 1990, p 37). This melting pot society where already young children are socialized with a highly individualist mindset seems to be unified by this common feature that acts like invisible glue. In contrast, the European mindset is much more diversified, where collectivistic communities play a crucial role in the Mediterranean area as much as in many parts of Eastern Europe.

Community building, in-group feelings and social networks are critical factors that might if ignored-lead to a lack of acceptance of whatever concept to be introduced. If we are to frame the Anglo-American MOOC concept in this context and shed a light on it from a collectivistic perspective, there seems to be ample room for reconsideration and improvement.

<u>High Context versus Low-Context</u>

Context is generally defined by the information that surrounds an event. A high context (HC) communication or message is one in which most of the information is already in the person, while very little is in the coded, explicit, transmitted part in the message. A low context (LC) communication is just the opposite; i.e., the mass of the information is vested in the explicit code (Hall, 1984). Cultures that have extensive information networks and are engaged in close personal relationships are per definition high-context cultures.

Low-context cultures include US-Americans and some European countries (Germany, the Scandinavian cluster). However, vast parts of Europe are high in context and therefore seem to need a different information flow and learning concept. As a rule, high context people are apt to become impatient if provided with too much information (Hall, 1990, p9).

Taking as a base understanding that MOOCs - as they exist today - are predominantly conceptualized by low-context people that seem to disregard specific requirements embraced by high-context cultures, there is a need for a wider conceptualization.

Considerations of Space

Visible boundaries are always surrounded by invisible ones, the ones that are crucial when it comes to defining one's personal space or territory. This invisible personal bubble is clearly defined by culture, be it because it communicates power, a compartmental mindset or a strong territorial sense or because it expresses proximity or a longing for intimacy.

With the rapid spread of the Internet and the shift of identities involved, the notion of space also has to be re-evaluated. Digital space, by some referred to as social space "to denote the people populating a space (currently or over some time period) and the practices and procedures that these people use" (Rudström, Höök & Svensson, 2005), shifts previously relatively static boundaries and bubbles and as such challenges the notion of space altogether.

Reflection and Discussion

Despite the huge number of MOOC providers, it seems to us that most countries fall back on the xMOOC or cMOOC concept from America.

In line with the above mentioned arguments we feel that an additional form of MOOCs, namely eMOOCs, generate added value to the MOOCversity in general, and the European landscape in particular. By adding culture-sensitive factors and focusing on a trialogical learning approach, we seek to bring together ethnical, professional and learning cultures under a single umbrella.

In this context we consider it vital not to give any preference or priority to any form of the MOOCs described. Instead, different MOOCs offer both advantages and disadvantages. The xMOOCs in line with the behavioristic tradition have the potential to present learning material for beginners and can be used as tutorials for learners who want to repeat certain topics or get further explanation from a different point of view. They mainly encourage the users to 'lean back' and passively receive input from experts without taking any active participation. From a cultural perspective such an approach facilitates collectivistic cultures as the activities within this form of MOOC are highly face-saving. In contrast to individualistic cultures where people are culturally socialized in a way that losing one`s face (be it during individual tutoring, question/answer sessions at school…) is a previously learned pattern most westerners can cope with. Stepping out of one`s collectivistic comfort zone is a face threating situation which might not be favored by communitarian societies. Therefore, the xMOOC concept seems to be most appropriate for those who shy away from individualistic online-behavior.

The cMOOCs with their focus on collaborative work via Web 2.0 already seem to be more challenging for learners, because they require advanced skills with online tools such as blogs, microblogs and others. Participating in a cMOOC course means more active behavior and requires more proficiency with Web 2.0 tools i.e. set up posts in different tools, contribute to discussion etc. We strongly feel that the cMOOC concept is more compatible with individualistic cultures given the pro-active set of activities where one has to stand out from the crowd.

Due to the lack of a comprehensive model that bridges both approaches, an additional form of MOOC is introduced in this position paper. The enhanced MOOC, in short, eMOOC, combines cultural psychology with trialogical learning. Learning with eMOOCs means to collaboratively develop shared objects in a culturally-sensitive setting by taking account of both the knowledge building and knowledge creation tradition. Each learner in each learning setting brings their own cultural background, knowledge, socialization, social practices and ideas to each collaborative learning phase. As a result, those shared objects (practices, ideas, artifacts etc.) get constantly transformed during the collaborative process.

Conclusion

Although this model of eMOOC is clearly work in progress, we feel that this approach might be a promising alley of research for the future. The focus on an additional MOOC concept has been guided by the researchers desire to add and incorporate factors that have so far been sidelined by the existing MOOC forms, gaining a deeper and more comprehensive understanding of how a MOOCversity in future might look like.

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Encouraging Forum Participation in Online Courses with Collectivist, Individualist and Neutral Motivational Framings

René F. Kizilcec, Emily Schneider, Geoffrey L. Cohen and Daniel A. McFarland

***Abstract:** Online discussion forums have been shown to contribute to the trust and cohesion of groups, and their use has been associated with greater overall engagement in online courses. We devised two experimental interventions to encourage learners to participate in forums. A collectivist ("your participation benefits everyone"), individualist ("you benefit from participating"), or neutral ("there is a forum") framing was employed to tailor encouragements to motivations for forum participation. An email encouragement was sent out to all enrolled users at the start of the course (study 1: general encouragement), and later in the course, to just those who had not participated in the forum (study 2: targeted encouragement). Encouragements were ineffective in motivating learners to participate, but the collectivist framing discouraged contributions relative to the other framings and no encouragement. This prompts the question: To what extent do online learners experience a sense of community in current implementations of online courses?*

Introduction

Massive Open Online Courses (MOOCs) have swept through higher education like wildfire since Stanford University launched three open-access computer science courses to the world in Fall 2011. The predominant instructional model for MOOCs to date is one that emphasizes instructionist, individualized learning, structured around regularly released video lectures and individual assessments. However, as demonstrated by decades of research and theory in the learning sciences, learning with others is a central mechanism for supporting deeper learning (Brown & Cocking, 2000; Stahl et al., 2006; Vygotskiĭ, 1978). Social learning requires individuals to articulate and externalize their ideas, learn through teaching and engage in dialogue with others who may have different perspectives or greater expertise.

This begs the question of where social learning occurs in MOOCs. In most courses to date, the discussion forum provides the primary opportunity for learners to interact with one another. On discussion forums, learners can ask clarifying questions about course content and their expectations, seek and provide help on assessments, discuss ideas related to and beyond the course, or simply socialize with one another, which creates a sense of cohesion and trust among the group (Garrison, Anderson and Archer, 1999). While in some ways this may be idealized behavior, prior work has also found that participants in open online courses who engage more actively with videos and assessments are also more active on the course forum (Kizilcec, Piech, and Schneider, 2013). This may simply reflect a higher level of engagement with the course overall, but it is also plausible that the social and informational flows in the community create a positive feedback loop that helps some learners stay engaged at a higher rate than they would otherwise. Taking this theoretical and empirical work together, it appears that forum participation is a valuable aspect of online learning, and one worth encouraging.

A traditional approach to encourage forum participation in online learning environments is to make learners' grades depend on their level of participation, thereby creating external reinforcement. Deci (1971) found that external reinforcements can increase or decrease intrinsic motivation, depending on the type of external reward. Engagement-, completion-, and performance-contingent rewards were found to significantly undermine intrinsic motivation (Deci, 1999). Hence, rewarding learners with a higher grade is expected to reduce their intrinsic motivation as a result of reevaluating forum participation from an intrinsically motivated activity to one that is motivated by the anticipation of a higher grade. Positive feedback, in contrast, was found to significantly strengthen intrinsic motivations and interest, as people do not tend to distinguish such rewards from the satisfaction they receive from performing the activity (Deci, 1999).

An alternative approach to encourage forum participation is to increase the salience of the activity in the learner's mind, which may be achieved by sending out reminders. Beyond increasing salience, such reminders could act as positive reinforcement for active participants and spark intrinsic motivations that lead non-participants to start participating while avoiding engagement-contingent rewards. The framing of these reminders is likely to moderate their effectiveness, as research on persuasion highlights the importance of designing persuasive messages such that they are relevant to the audience (Rothman and Salovey, 1997). For example, in another setting, Grant and Hofmann (2011) found a moderating effect of framing messages that encouraged hand hygiene among health care professionals who are stereotypically less concerned about their own health than that of their patients. As a result, messages that emphasized patients' safety were more effective than those that emphasized personal safety. Consequently, the design of encouragement messages should be informed by online learners' motivations for forum participation.

Motivations for participation are likely to vary across learners' own goals for the course, perceptions of the community and perceived benefits from participation in the forum. Some learners may be self-interested and motivated purely by what they can gain by using the forum – for example, help on a particular homework question – whereas others may be more motivated by the opportunity to help other individuals or to support the community at large (Batson, Ahmad, and Tsang, 2002). To leverage this insight in the MOOC setting, we devised two experimental interventions that used self- and other-focused framings to characterize the merits of participation in the discussion forum. The encouragement was framed as individualist ("you benefit from participating"), collectivist ("your participation benefits everyone"), or neutral ("there is a forum"). Within each course, across the randomly assigned groups of learners, we compared two proximal measures of participation – whether learners participated in the forum at all and how actively they did so – and an overall outcome measure, their attrition in the course over time.

Background and Hypotheses

At the heart of most theories of human decision making in economics, sociology, psychology, and politics lies the assumption that the ultimate goal is self-benefit: in economics, for example, a rational actor is one that maximizes her own utility (Miller, 1999; Mansbridge, 1990). Another school of thought that spans across academic fields has suggested that while self-benefit is a strong motivation, it does not explain the human capacity to care for others and make sacrifices for family, friends, and sometimes complete strangers (see Batson, 1991, for a review). To successfully encourage forum participation, we need to form an understanding of what motivates people to engage in such participation.

A substantial amount of research investigated people's motivations for contributing to knowledge-sharing and knowledge-building online communities, such as Wikipedia or question-answering sites (e.g., Nov, 2007; Yang & Lai, 2010, Raban & Harper, 2008). Batson et al. (2002) present a conceptual framework that differentiates between four types of motivations for community involvement – egoism, altruism, collectivism, and principalism – by identifying each motive's ultimate goal. For egoism, the ultimate goal is to benefit yourself; for altruism, it is to benefit other people; for collectivism, it is to benefit a group of people; and for principalism, it is to uphold certain moral principles. This taxonomy of motives can be applied to the case of forum participation, such that a person may use the forum for their own benefit (egoistic or individualist), someone else's benefit (altruism), all course participants' benefit (collectivist), or to comply with course requirements or the instructor's recommendation (principalism). Empirical evidence from online marketing research suggests that the framing of participation encouragements in terms of these different types of motivations can affect decisions to engage (White & Peloza, 2009).

In the present study, we focus on encouragements that employ either an individualist or collectivist motivation. To quantify the effect of the individualist or collectivist appeal in the encouragement relative to an appropriate counterfactual encouragement, we employ a neutral reminder encouragement to participate. Consequently, we formulate the following hypotheses:

H1: The encouragements with collectivist or individualist framings lead to increased forum participation compared to the neutral framing or in the absence of an encouragement.

In testing this hypothesis, we measure two aspects of forum participation: the proportion of learners in each experimental group who choose to participate and the average number of contributions (posts and comments) that those who participate author on the forum. Beyond forum participation, recent theoretical and empirical evidence suggests that increased participation on the forum is associated with greater group cohesion (Garrison et al., 1999) and greater overall engagement in open online courses (Kizilcec et al., 2013). Hence, we formulate the following hypothesis:

H2: The encouragements with collectivist or individualist framings reduce attrition compared to the neutral framing or in the absence of an encouragement.

Grant and Dutton (2012) found greater commitment to pro-social behaviors after individuals engaged in written reflections about giving benefits to others rather than receiving benefits from them. This could suggest that collectivist appeals to encourage forum participation would be more effective than individualist ones. In contrast, collectivist appeals were found to be less effective than individualist appeals when responses were private rather than public, because people could not be held accountable for not engaging in socially desirable actions (White et al., 2009). Given this conflicting evidence, we have no definite hypothesis about the relative effects of the types of appeals and therefore pose the following as a research question:

RQ1: Which motivational appeal is more effective at encouraging forum participation: a collectivist or an individualist one?

We conducted two experiments to test these hypotheses and this research question. In study 1, an email encouragement was sent out to all enrolled users at the start of the course (general encouragement). In study 2, a similar encouragement was sent out later in the course to a subset of learners who had not participated in the forums (targeted encouragement).

Study 1: General Encouragement

Methods

Participants

A subset of learners who enrolled in a MOOC on an undergraduate-level computer science topic offered by a major U.S. university participated in this study (N = 3,907). Learners who enrolled after the intervention took place or did not access the course page at all after the intervention were excluded. Consent for participation was granted by signing up for the course.

Materials

Each user received one of three possible emails at the beginning of the course: either a neutral 'reminder' email about the discussion forum; a collectivist encouragement to use the forum; or an individualist encouragement to use the forum. The lengths of the emails were very similar and each text began with "Hello [name of student]". Specifically, this is a representative extract from the neutral encouragement: "There are a number of lively posts on the discussion board." Similarly, from the collectivist encouragement, "We can all use the discussion board to collectively learn more in addition to video lectures and assignments in this course," and from the individualist encouragement, "You can use the discussion board to learn more in addition to video lectures and assignments in this course." Note that the non-neutral encouragements emphasize the goal of learning more yourself or together as a community.

Procedure

The encouragement emails were sent using the course platform's tool for sending mass emails and bucket testing, which randomly assigns enrolled users into the specified number of groups. Combining these two features, each user was assigned to one of three groups (neutral, collectivist, and individualist) and sent the appropriate email encouragement. The resulting groups comprised 1,316, 1,287, and 1,304 learners, respectively. The email was sent out at the beginning of the first week in the course. All forum contributions (posts and comments) used in the analysis were recorded automatically by the course platform.

Results

In total, there were 5,183 forum contributions from 182 (4.9%) of the study participants, i.e., the remaining 3,725 did not contribute.

A simple comparison of the proportion of contributing forum users between conditions one and ten weeks after the intervention yields no significant differences. As illustrated in Figure 1, the intervention had no significant effect on learners' decision to contribute on the forum, neither one week after the intervention, $X2(2) = 3.15$, $p = 0.21$, nor ten weeks later, $X2(2) = 2.04$, $p = 0.36$.

Beyond the question of whether a learner contributed or not, we compare how many contributions learners in the three conditions made on the forum. Figure 1 illustrates the average number of contributions with 95% confidence intervals that were computed by fitting a negative binomial model to account for over dispersion. One week after the intervention, learners in the group that received the individualist encouragement made significantly fewer contributions than those who received the neutral message, $z = 3.52$, $p = 0.0004$, and marginally fewer than those who received the collectivist message, $z = 1.77$, $p = 0.077$. Those who received the neutral message made 2.6 (1.7) times as many contributions in the first week than those who received the individualist (collectivist) message.

Ten weeks after the intervention, at the end of the course, we observe very similar patterns in the number of contributions from the experimental groups as we observed only a week after the intervention. While the number of contributions is not significantly different between the individualist and collectivist groups, $z = 1.42$, $p = 0.16$, it remains significantly lower than for the neutral group (relative to the individualist group, $z = 3.88$, $p = 0.0001$, and the collectivist group, $z = 2.34$, $p = 0.019$) by a factor of 2.3 and 1.6, respectively.

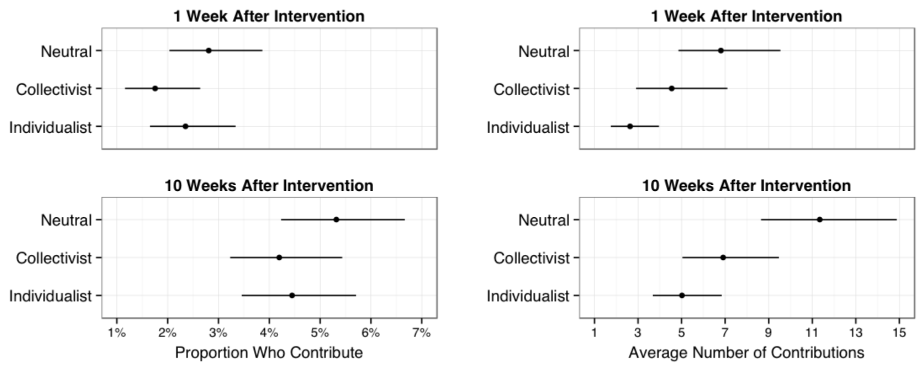
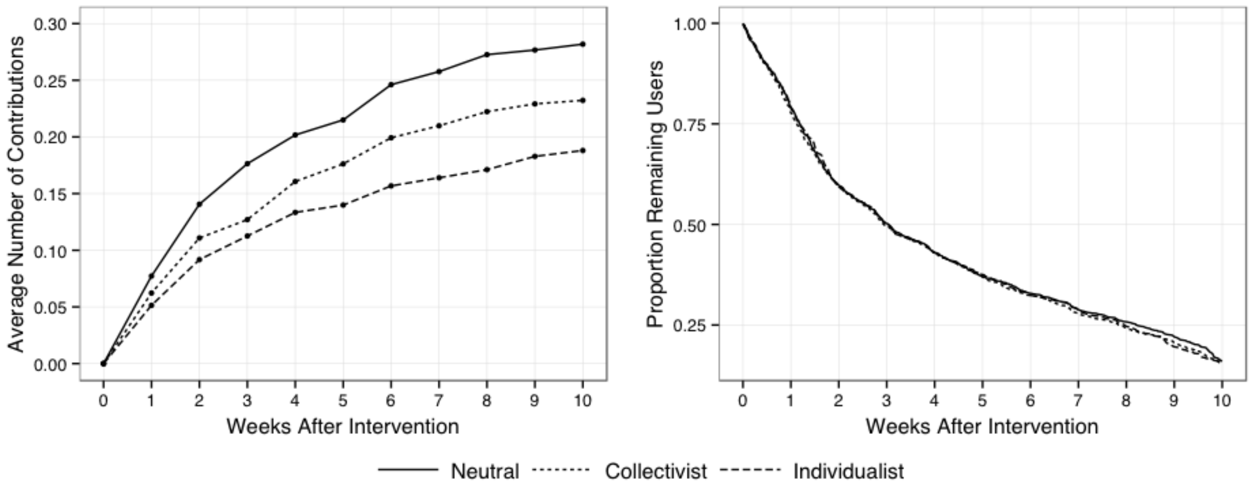


Figure 1. Proportion of contributing forum users in each condition (left) and their average number of contributions (right) one and ten weeks after the intervention with 95% confidence intervals.

A longitudinal visualization of average cumulative forum contributions from learners in the three conditions suggests that the intervention permanently discouraged contributions from those who received the collectivist and, especially, individualist message relative to the neutral group (Figure 2, left). Taking a step back from forum activity, we compare how the encouragements affected learner attrition. Figure 2 (right) shows Kaplan-Meier survival curves for each group, which indicate the proportion of learners remaining in the course after a certain time. There is clearly no evidence for differential attrition as a result of the intervention as the survival curves overlap.

Figure 2. Average cumulative number of forum contributions (left) and Kaplan-Meier curves (right) by encouragement condition for the duration of the course following the intervention in the first week.



Overall, there is no empirical support for hypotheses H1 and H2. Instead, the effect on forum participation measured by average contributions is found to be in the opposite direction than was hypothesized: the non-neutral framings discouraged participation rather than encouraging it. In answer to research question RQ1, we found no significant difference between the effect of the collectivist and individualist framings on forum participation.

Discussion

We found the framing of the general encouragement as neutral, collectivist, or individualist to not affect learners' decision to contribute on the forum. While we cannot infer the effectiveness of the encouraging email because learners' behavior in the absence of the encouragement is not observed, it still suggests that the framing manipulation alone is too weak to push learners over the participation threshold.

A large, significant effect of the framing manipulation was found in the number of contribution authored by those who decided to contribute on the forum. Surprisingly, the collectivist message and to an even greater extent the individualist message effectively discouraged forum contributions compared to a neutral reminder. This result stands in conflict with studies (e.g., Grant et al., 2011, 2012) that report positive effects of framing calls to action (requests, offers, encouragements, etc.) to highlight the personal benefit of action (individualist) or the benefit to others (collectivist, or altruist).

We can offer a number of possible explanations for why we observe the effect reversed: First, if the non-neutral encouragements were perceived as too strong persuasion attempts due to message wording, then we would expect a negative response. For instance, Feiler et al. (2012) found that providing both collectivist and individualist motivations in an encouragement to generate less participation than just using one framing, because using both revealed the persuasion attempt.

Second, the apparent effectiveness of the neutral encouragement could be at least partly explained by an extrapolation effect: for example, in a marketing context, when a person is told about a product without an explicit value judgment, they might assume that the reason they are told is because the product is good. Similarly, online learners who are simply told about the forum and encouraged to participate might assume that it is beneficial.

Third, the non-neutral encouragements frame forum participation as supporting learning rather than as a primarily social activity, which affects learners' perception and ultimately their usage of the forum. A content analysis of posts and comments authored in each condition could provide insight into whether learners' perception is reflected in their contributions but lies beyond the scope of this investigation.

Finally, most social psychology studies are conducted in highly controlled environments rather than in the field, where participants might feel less pressure to be obedient or to perform the more socially desirable action (Blass, 1991). Moreover, the motivational structures of participants in laboratory experiments are unlikely to match those of MOOC participants. These interpretations could potentially explain the effectiveness of the neutral encouragement but require further validation.

We found no differences in attrition between conditions, despite the significant differences in forum contributions. This might suggest that the direction of causality between forum activity and course persistence does not point from forum activity to persistence. Instead, this suggests that a third variable, such as motivation for enrollment or time constraints, influences both learners' forum activity and persistence in the course.

Study 2: Targeted Encouragement

Methods

Participants

A small subset of learners who enrolled in a MOOC on a topic in Sociology offered by a major U.S. university participated in this study (N = 7,522). Only those learners who had not contributed (posted or commented) on the forum three weeks into the course, and who had logged into the course page at least once after the encouragement intervention were considered. Consent for participation was granted by signing up for the course.

Materials

Each study participant received either no email at all (control) or one of three possible emails three weeks into the course: either a neutral 'reminder' email about the discussion forum, or a collectivist encouragement to use the forum, or an individualist encouragement to use the forum. The lengths of the emails were very similar and each text began with "Hello [name of student]". The email texts resembled those in Study 1, but were adjusted to fit the course topic and the instructor's writing style and tone in emails. Specifically, this is a representative extract from the neutral encouragement: "The more people participate, the more posts there are on the discussion board." Similarly, from the collectivist encouragement, "The more people participate, the more we all learn together," and from the individualist encouragement, "The more people participate, the more they learn."

Procedure

Encouragement emails were sent using the same system as in Study 1. This resulted in four groups of the following sizes: control (n = 5,241), neutral (n = 782), collectivist (n = 799), and individualist (n = 757). The emails were sent out three weeks into the course and all forum contributions (posts and comments) used in the analysis were recorded automatically by the course platform.

Results

There were 830 forum contributions from 252 (3.4%) of the study participants, i.e., the remaining 7,327 did not contribute. In this section, we report results for the same measures as in Study 1, but for four instead of three comparison groups. The control group consisted of those learners who had made no forum contribution three weeks into the course and received no encouragement email. Figure 3 illustrates the proportion of users in each condition who authored a post or comment on the forum (left) and the average number of contributions made by contributing users from each group.

We observe no significant differences between groups in how many learners decided to contribute to the forum, neither one, $X2(3) = 0.56$, $p = 0.91$, nor eight weeks after the intervention, $X2(3) = 3.50$, $p = 0.32$. There were, however, significant differences in the number of contributions made by those who did contribute from each group. One week after the intervention, forum contributors who received the neutral message authored 1.7 times as many posts and comments as those who received no message at all, $z = 2.18$, $p = 0.03$. Although contributors who received non-neutral messages contributed at not significantly different rates than those who got no message (collectivist: $z = 1.13$, $p = 0.26$; individualist: $z = 0.73$, $p = 0.47$), they contributed significantly less than those who received the neutral message (collectivist: $z = 2.40$, $p = 0.017$; individualist: $z = 2.09$, $p = 0.036$). This activity pattern shifted eight weeks after the intervention when the course ended. The collectivist message appears to have significantly discouraged forum contributions relative to the other conditions by a factor of 2.3 on average (control: $z = 3.1$, $p = 0.002$; neutral and individualist: $z = 2.6$, $p = 0.010$).

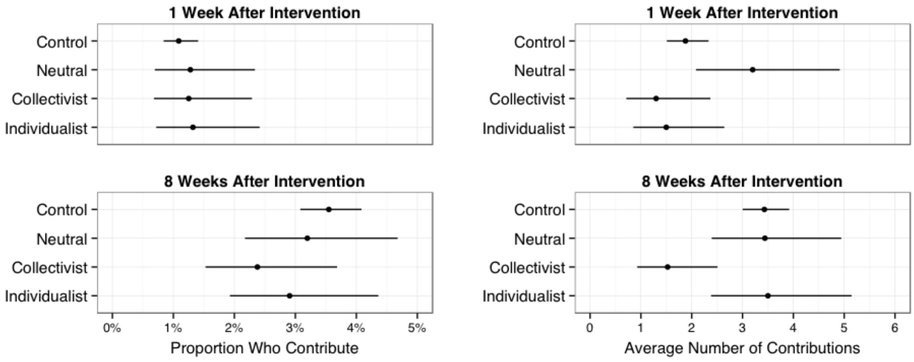


Figure 3. Proportion of contributing forum users in each condition (left) and their average number of contributions (right) one and eight weeks after the intervention with 95% confidence intervals.

From a longitudinal perspective on the average cumulative number of contributions (Figure 2, left), the collectivist message appears to have permanently discouraged contributions, while the neutral message encouraged contributions relative to the control group. The individualist message had almost no impact on contribution rates relative to the control. Note that the neutral message induced steep growth in contributions early on but the trend flattened out after the third week, such that contribution rates were consistent with those in Figure 3 (bottom left) by week eight (except that a smaller denominator is used in Figure 3 by only considering contributing users).

In an analysis of attrition (Figure 2, right), the Kaplan-Meier survival curves for each group followed similar paths. However, attrition for those who received the neutral email appeared to be relatively higher (the dotted line is below the other lines). Using Cox regression with the control group as the baseline, we find this observation to be only approaching significance, $z = 1.88$, $p = 0.061$, with 9% higher attrition for those who received the neutral message.

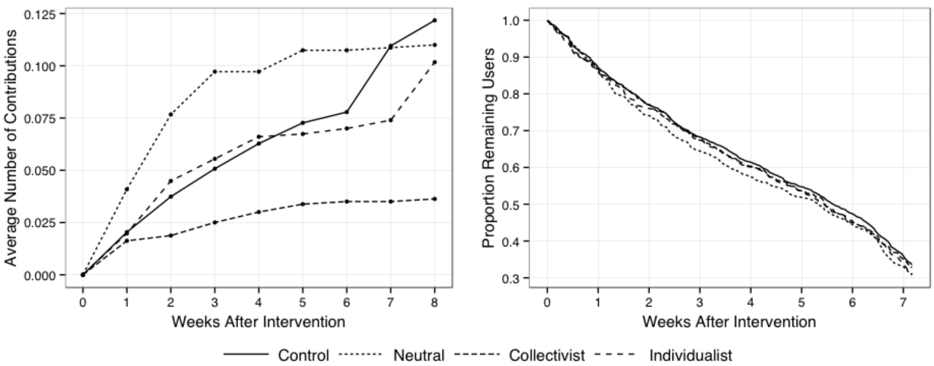


Figure 3. Average cumulative number of forum contributions (left) and Kaplan-Meier curves (right) by encouragement condition or control after the intervention in week three of the course.

Overall, there is again no empirical support for hypotheses H1. The effect of the encouragements is found to change with time: at first, we observe the same reversed effect where the non-neutral framings discourage participation measured by average contributions, but by the end of the course, forum participation is significantly lower for recipients of the collectivist encouragement compared to the other conditions, which also addresses RQ1. There is no empirical support for hypothesis H2, although attrition is marginally lower for recipients of the non-neutral encouragements compared to non-recipients.

Discussion

In the targeted intervention, we found the encouragement email to be ineffective at motivating learners to start contributing on the forum, independent of its framing. About the same proportion of learners decide to start contributing one week and eight weeks after receiving an encouragement or not. This is consistent with our finding for the general encouragement where the different framings did not show differential effect. It is surprising, however, that no significant difference could be detected between encouragement recipients and non-recipients. This might be in part due to the noisiness of the data as we could not observe who actually read the encouragement email.

In terms of the effect on the number of contributions, we found the collectivist message to discourage contributions while the neutral message temporarily boosts contributions relative to how non-recipients' forum behavior. Figure 4 (left) illustrates the progression over time to reveal these trends. By the end of the course, eight weeks after the intervention, average contribution numbers are significantly lower for recipients of the collectivist message relative to all other conditions. It is conceivable that the message with an appeal to collectivist motivations reminded learners of the fact that they are not attached to a community given that they had not contributed to the forum by the time of the intervention. As a result, these leaners are demotivated to contribute more actively compared to the other conditions in which no appeal to community is made. Moreover, the reasons put forward in the discussion of the first study's findings also apply in this context, except that the neutral encouragement does not turn out to be more effective in the long-run.

Finally, the survival analysis suggested that those who received the neutral reminder might be 9% more likely to disengage from the course, although this result only approached significance. If this finding holds up, however, it suggests that the neutral message could have led some learners to be less invested in the course, perhaps because the message was perceived as cold and less caring.

General Discussion

Our findings suggest that while different encouragement framings do not affect learners' decision to participate in the forum, they do affect the contribution rates of those who participate; in particular, in both interventions the collectivist messages discouraged contributions relative to other framings or no encouragement. One interpretation is that an appeal to collectivist motivations in an asynchronous online learning environment with mostly anonymous participant profiles induces resentment, as there is a limited sense of community in online courses, due to their general emphasis on individual achievement and limited duration. Further work is required to uncover what mechanisms might lead to these outcomes. Specifically, heterogeneous treatment effects could occur in an intervention that employs collectivist and individualist framings, such that cultural background and being part of a minority group are likely moderators of the treatment effect.

A limitation of our results is that they are based on two experiments run in two different courses. Extending this research to a wider number of courses would support more general claims about the effectiveness of encouraging messages and could uncover individual differences in course topics or how a virtual community is supported. Another limiting factor in these studies is the missing information on who actually received the encouragement by reading the email. Our experiments can therefore provide an estimate of the intent-to-treat effect, which is relevant for the policy decision of whether encouragement emails should be sent out, but not the effect of the treatment on the treated, where the treated are those who read the email. To this end, emails could be tracked with pingbacks on opening and a monitored link to the forum could be added as an immediate call to action, which would likely increase the overall strength of the intervention as well.

Other variables worth investigating in this context are the number of encouragements and message personalization with course-specific information. For instance, an encouragement with an individualist framing could be supplemented with an example of a forum thread that discusses a question the recipient struggled with in the homework. Moreover, learners could receive positive reinforcement after authoring their first contribution to encourage persistent participation. However, despite the good intentions behind these encouragements, we should be careful not to overload learners with communication to ensure that important reminders in the course receive an appropriate amount of attention.

Our findings highlight the limited, and potentially negative, effect of certain email encouragements and the importance of careful framing of communication with online learners. They also raise concerns around the establishment of a sense of community in online courses. Given our current results, we may recommend sending neutral reminders for participation and continuing to test the framing and dosage of non-neutral reminders.

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MOOC Learning in Spontaneous Study Groups: Does Synchronously Watching Videos Make a Difference?

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***Abstract:** Study groups are common approaches for students to study together at schools. However, little is known about how this approach is suited to MOOC-based learning, where learners watch and discuss MOOC lecture videos in a collaborative manner. Watching MOOCs with peers creates learning experiences that blend the way students learn in classroom with learning through a computer. Students have the chance to 'pause' the professor as well as to discuss with other learners. In this paper, we explore this type of MOOC-based learning. Findings from our longitudinal study on spontaneous collocated MOOC study groups suggest that groups tend to stick to a certain kind of study style. A strong positive relationship was found between how often students pause and replay the videos and the synchronicity among groups. Further, synchronous groups tended to better perceive group learning experience, in terms of self-assessed quality and mutual participation. Future MOOC designers as well as schools that offer courses in a flipped classroom format can use the insights to provide guided support for MOOC group learners.*

Introduction

Online education has boomed in recent years in the form of MOOCs, and the main initiatives such as Cousera and edX continue to embrace new partner universities worldwide. This new trend democratises education, making high-quality education accessible for learners from all over the world. Most popular MOOCs are offered as xMOOCs that are built upon the knowledge duplication model (Siemens, 2012). Traditional pedagogical approaches are augmented with digital technologies through video presentations and quizzes. Different from traditional classrooms, MOOCs attract a large number of learners, which poses many new challenges for education researchers (Yuan and Powell, 2013). One direct consequence of massiveness is the demolishing of the traditional manner of instructor-learner interaction. MOOC learners do not acquire direct learning feedback from instructors (Kop, Fournier & Mak, 2011). Instead, automated processes of algorithm-driven as well as peer assessment are employed to assign grades. Online forums are created in the MOOC platforms, and allow learners to help each other so that "the learner is the teacher is the learner" (Siemens, 2006). However, learners are diverse and loosely coupled and their discussions are autonomous and asynchronous. These facts limit the learner's potential to learn, so novel MOOC pedagogical or organisational approaches are required to improve their learning experience.

Research has revealed that the more open an online course is, the more the learners seek to engage in groups as opposed to an open network (Mackness, Mak & Williams, 2010). Groups have the potential of fostering discussion, argument and clarification of ideas (Gokhale, 1995). Traditional group-based learning has been investigated intensively over the years, and the results are widely published. Its two major formats, collaborative learning (Dillenbourg, 1999) and co-operative learning (Slavin, 1983), can aid students in the learning process (Tsay & Brady, 2010). Both group-learning formats in the literature are usually initiated and structured by teachers with designated activities. Even without teachers' intervention, students commonly form spontaneous study groups in order to discuss courses and assignments. It may be true that not every student can benefit from such groups (Boud, Cohen & Sampson, 1999), but research has shown that a spontaneous group of students will generally deliver more valuable output that a student working alone (Tang, 1993).

In the context of online learning, people naturally think study groups refer to asynchronous, remote collaborative groups. This group-learning format was explored by Curtis & Lawson (2001) in a small course (24 students). Students suffered from asynchronous discussion and collaboration with strangers of diverse background. Face-to-face group learning seems to be a theoretical solution to the aforementioned problems, though many may claim that it is impractical when applied to online courses. Considering the massive scale of MOOCs, geographical clusters are likely to emerge. This trend can be seen from the Coursera Meetup website, where students that are geographically close to each other have the opportunity to study together. Furthermore, many universities are offering MOOCs to campus students as their full/partial course schedule (Martin, 2012) in a flipped-classroom teaching format (Tucker, 2012). The proliferation of flipped-classroom teaching has opened even greater opportunities for students to form face-to-face MOOC study groups at school. Current MOOCs emphasise individualising learning (Mazoué, 2013), so group activities are rarely designed and enforced. However, the central MOOC learning activities (watching lecture videos and solving quizzes) can also be done in groups, fostering arguments and discussions that are potentially beneficial to the learners. Our research aims to explore MOOC learning in the vein of spontaneous study groups. Traditional spontaneous study groups usually meet in public places such as cafeterias or seminar rooms. These places are also suitable for studying MOOCs together. MOOC learners usually have their own computers and may want to study at different paces. It is then a natural practice to allow students in a group to watch videos at their own paces, while a group atmosphere remains to foster ad-hoc discussions. In this paper, we explore how students in groups study together, as well as the role of their study styles with respect to their perceptions towards group learning. In the upcoming sections, we will present our findings from a longitudinal study of four groups of flipped-classroom students at our institution.

Research question

Spontaneous groups do not study with guided instructions. The MOOC videos regulate their collaborative learning processes. Therefore different study styles may emerge in terms of how videos are watched and when discussions are triggered in groups. An important aspect that reflects the different study styles is whether individuals in groups watch videos synchronously, given that each individual is allowed to watch at his/her own pace. The more the students in a group watch videos synchronously, the more chance they have to foster discussions.

Our research focus is not based on comparing the learning outcome of different groups. Instead, we are interested to know how MOOC learners regulate their study styles in groups and how they feel about their learning styles. The main research questions in this paper are listed below:

(1) What group learning styles emerge with spontaneous MOOC study groups? Do they watch lecture videos synchronously?

(2) Do the study styles affect students' perception of their group learning experience?

Method

<u>Participants</u>

We recruited 18 undergraduate students at our own institute to participate in the study between the second and sixth week of two engineering courses, Numeric Analysis (NAS, in French) and Digital Signal Processing (DSP). The recruitment of subjects was group-based. We randomly selected volunteered groups of 4-5 students that fitted our experiment schedule. Due to time and resource constraints, we managed to recruit 3 groups for NAS and 1 group for DSP. Each subject was compensated by 150 CHF plus a print textbook. Among the students, 13 (8 males/5 females) were attending NAS in their first year, the rest (5 males) were following DSP in their second year. Only 1 subject had previous MOOC experience, and all subjects had group study experiences. Since we organised the study groups and the student subjects receive reimbursement for their participation, the groups were not strictly spontaneous. They did however shared several key 'spontaneous group' properties including no teacher intervention, autonomy in choosing group members and how they study together.

<u>Procedure</u>

Each group met once a week to study the lecture materials in that specific week for at most 3 hours. Students could leave if they finished earlier. Each week, there were usually 6 videos for DSP (each of around 20 min) and 10 videos for NAS (each of around 10 min). They also had 3-4 sets of quizzes to complete. Students in a group gathered around a table and each student was given an iPad to watch videos independently within his/her group. Students were always free to decide when and how to watch videos and discuss problems. The quizzes were also done during the study sessions. Breaks were not granted for students, unless asked for.

<u>Measures</u>

Each session was videotaped. The iPads logged the students' video navigation events, including when and where they viewed, paused, stopped and replayed videos. At the end of each study session, we asked students to fill in a questionnaire to assess their perception of group learning. Responses were made on 5-point Likert-scales. Semi-structured interviews were also conducted at the end of each session.

Analysis

<u>The video navigation pattern</u>

Visualizing how students played lecture videos is important for us to get intuitive impressions on how students worked in groups. We designed video navigation plots to parallel illustrate individual student's video interactions for each study group. From the plots, we found that some study groups watched videos more synchronously while others chose to work in a more individualistic manner. Two extreme examples are illustrated in Figure 1. The horizontal axis represents the timeline of a study group session and the vertical axis denotes the timed positions within a video. A clear straight line-segment with a non-zero slope indicates a video was played without interruption; a straight horizontal line-segment indicates a pause; jitters depict jumps within a video, and the gaps between series refers to the between-video pauses (solving quizzes or discussion). No students asked for a break, and so the full series including gaps give us a complete picture of their on/off video group study processes. The plot on the left shows how NAS group 1 worked in almost perfect synchronisation in the first week, and the right plot expresses that the DSP group was quite asynchronous in the fourth week – group participants were mostly at different video positions or even watching different videos.

Figure 1. Sample video navigation patterns of study groups from both courses.

Linearity and synchronicity indices

The two plots presented before visualised how group students interacted with videos and how synchronous and asynchronous group patterns appeared. To quantify these patterns, we introduced a linearity index and synchronicity index.

(1) 'Linearity index': this refers to the ratio between the total length of all video content that is watched in a week and the amount of time spent on them. Possible values range between 0 and 1. An index of 1.0 indicates that the full videos were played exactly once without being paused or replayed. This index gives us a rough idea of video interaction intensity. Both pausing and rewinding videos decrease the value,

while searching forward and stopping in advance lead to an increase. Therefore the lower the values are, the more additional time has been spent on the videos and the less linear the video watching behavior is. We are interested in an overall pattern of linearity. When we computed an index value for a certain week, videos in that week were taken into account as a whole. Having said that, there is only one value per group per week. If a student did not finish all the videos, we only take into account the videos that have been watched. In our experiment, NAS students generally watched videos in a more linear way (M=0.832, SD=0.113) than DSP students (M=0.334, SD=0.125), indicating that the DSP course is potentially of a higher difficulty level.

```
GET TotalTime as the duration of a study group session
SET SynchronousTime to 0
FOR each second in TotalTime
    FOR each neighboring second ranges within ±T
        IF the state of student A is the same as student B THEN
           INCREMENT SynchronousTime
        END IF
    END FOR
END FOR
SET PairedSynchronicity to SynchronousTime divided by TotalTime
```

Figure 2. Pseudo code for Computing Paired Synchronicity Indices

(2) 'Synchronicity index': this index is another float number between 0 and 1. It quantifies how synchronously a MOOC study group watched video together. The higher the value is, the more synchronised the group was. We define 'paired synchronicity index' as the proportion of time during which one student was doing more or less the same thing as compared to another student. The average of all possible paired synchronicity in a group is the 'group synchronicity index'. If the average is made on paired synchronicity with respect to the same student, it is called the 'individual synchronicity index' for that student.

The 'paired synchronicity index' is computed by dividing the accumulative synchronous time between the pair by the total length of the study session. Synchronous time actually means that two students are either simultaneously watching the same video content or not watching anything (e.g. they may have a discussion). Perfect synchronisation accurate to a second is not necessary. We introduce threshold value 'T' (measured in seconds). For each second of a study session we look at the T seconds both ahead and behind to see if the pair of students was or will be watching the same thing. In other words, we are checking if one student can catch up with the other in T seconds. If the answer is yes, then they are synchronised. The algorithm is described in pseudo code in *Figure 2*.

Different T values result in different synchronicity indices. Figure 3 illustrates how synchronicity indices for all groups in each week change by varying T between 0 and 600 (10 min). As we see, the larger the T is, the larger the synchronicity indices are. The index values may converge to one with large Ts. A close-to-zero T would only have a theoretical meaning, because in reality we don't expect different people to watch the same video frame simultaneously. We finally chose T = 50, where variances among all possible synchronicity indices of different sessions reach maximum (0.088). The largest variance indicates that this T is the value that maximises the differences among all the groups. This value also makes real sense. Within 50 seconds, the teacher usually explains the same topic so students are synchronised on the same ground.

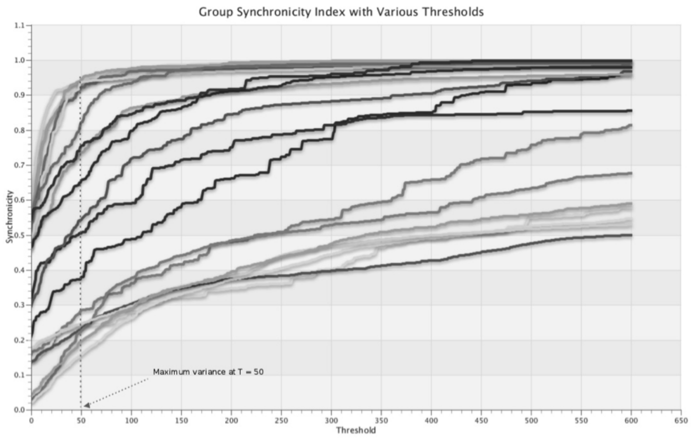


Figure 3. Computing Group Synchronicity Indices by Varying Thresholds

Results

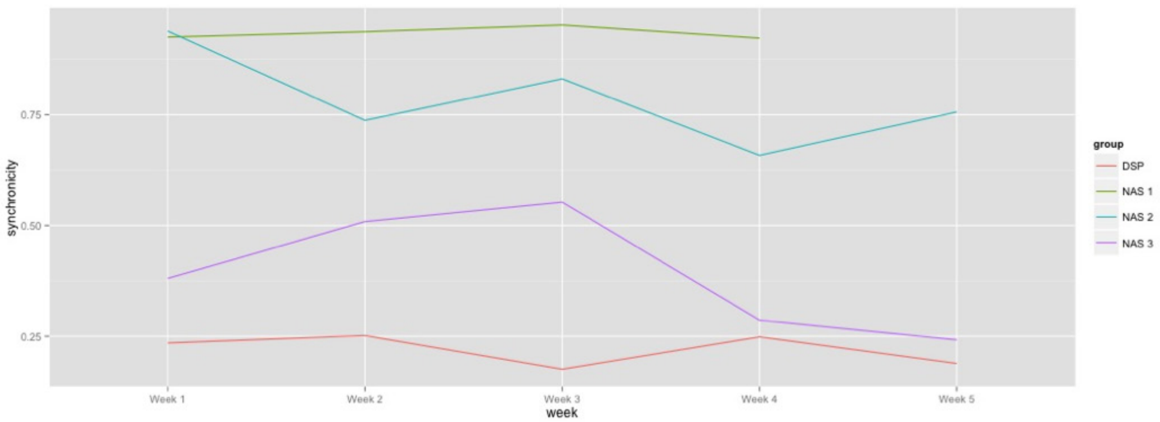
The group learning patterns

While the linearity indices suggest individual video interactivity, the synchronicity indices indicate group dynamics. The synchronicity indices for different groups over a 5-week period are illustrated in Figure 4. The data for NAS group 1 was missing due to technical problems during the study session. In this chart, four distinct time series stand out, each representing a different group. We can see that some groups always stayed synchronised, while others tended to work independently. A clear cut is seen in the middle range of the synchronicity index axis, which separates more synchronised groups from less synchronised groups. The series for each group fluctuates with relatively small ranges, and the data almost does not intersect, indicating a stabilised pattern. We built a mixed-effect linear regression (MELR) model to test each group statistically, with time (in terms of weeks) as the predictor and group synchronicity indices as the response. The group variable introduces a random slope effect. No statistical evidence showed the synchronicity index for each group change over time (p>0.1 for all groups). This suggests that the group learning style, once used by a group, essentially persists throughout the remaining study sessions.

Predicting individual synchronicity

Group synchronicity indices tend to be stabilised while individual synchronicity indices may vary. What factors may affect an individual's attitude towards synchronous learning? Our first hypothesis is the difficulty level of the videos, since students might be more willing to keep synchronisation for discussion. We have asked each student to rate how difficult the videos were on a 5 point Likert-scale. Remember that only one DSP group was recruited, and they were least synchronised among all groups. All following statistical tests in this paper were conducted solely on NAS groups. We built a MELR model by adding another predictor variable: the video difficulty to a model that is similar to the previous model. The difference is that we use individual synchronicity instead of group synchronicity, and the data is from all NAS groups. As a result, no significant correlation was found, indicating that students react differently to difficult videos. There are no systematic reactions of individual students to difficult situations.

Figure 2. Pseudo code for Computing Paired Synchronicity Indices



A second hypothesis is that the linearity index may influence synchronicity, since the less a student engaged in videos individually, the more chance they may have to remain synchronised. A MELR model, with both time and linearity index as predictor and individual synchronicity index as a response variable was built to test the correlations between linearity and synchronicity. The student variable nested in groups introduces a random slope effect. The result is given in Table 1. Linearity indices showed a significant positive correlation with synchronicity indices. The Pearson's correlation coefficient value is large, indicating that the linearity index is a strong predictor of synchronicity. A smaller linearity value indicates that the student has been pausing or replaying the videos and therefore spent more time on them. This makes it difficult for students to stay synchronised.

Table 1: Correlations between linearity and synchronicity index

	Estimated β coefficient with MCMC	95% HPD credible interval	Pearson's R	p-value
Linearity	0.3355	0.1408 ~ 0.5890	0.951	0.0005

Predicting perception of discussion

The next set of analysis aims at exploiting the relationship between synchronicity and the perception of group discussion. We examined the perceived levels of equal contribution and quality of discussion, which were acquired from the questionnaire. For spontaneous groups, these are important measures for gauging the effectiveness of their study patterns.

Table 2: Correlations between synchronicity and perceived level of equal contribution and discussion quality

	Estimated β coefficient with MCMC	95% HPD credible interval	Pearson's R	p-value
Equal contribution	1.591	0.0962 ~ 3.3603	0.462	0.049
Quality of discussion	1.6323	0.0060 ~ 3.4530	0.667	0.021

Another two MELR models were built, with time and individual synchronicity as a longitudinal predictor. Likert-scales of equal contribution and discussion quality were response variables in each model respectively. Again, the student variable nested in groups introduces a random slope. The results are shown in Table 2. Synchronicity indices showed significantly positive correlation with both of the perceptional scales with moderate correlation coefficient values. It signifies that synchronous groups tended to perceive better group learning experience in terms of discussion quality and balanced participation. However, the R2 values (0.213 and 0.445) of the two correlations are relatively small, indicating that synchronicity do not contribute much to the variations in the respective measures. This is not beyond our expectations, as many other factors may contribute to subjective perceptions.

Discussion and conclusion

In summary, our first finding is that the linearity of video interactions is a strong predictor of synchronicity, which in turn correlates with students' perceived balanced participation and quality of discussion in collocated MOOC study groups.

Less individual engagement in videos leads to higher synchronicity. This is simple to interpret, since fewer video interactions increase the chances for students to watch and digest the same topic at the same time, offering common ground that fosters arguments and discussions. Linear watching does not always imply lack of independent thinking. Highly synchronous groups, according to our semi-structured interviews, reported that they usually noted down the problematic video moments while watching the videos, and brought out every question in group discussion after the video had finished. The groups were self-regulated and students intentionally started and finished video watching more or less simultaneously.

As regards students' perceptions towards their group learning experience, although we found that synchronicity correlates with students' perception towards the quality and even distribution of their discussion, causality is not assumed. Synchronicity itself is not a condition, but a result of many group processes. It turns out that synchronous groups perceived better group learning, in terms of self-assessed quality and mutual participation. The message behind this result is more important, i.e. we should encourage synchronous video watching for MOOC study groups.

If we now revisit the results of the correlation between linear and synchronous video watching, we will find ourselves in a compromising situation. A deeper interpretation of this correlation indicates that interacting with videos on separate devices breaks synchronicity, or in other words, synchronous video watching hinders individual video engagement. Although we want to encourage synchronous video watching, we may not reduce their chance in navigating videos, which is a natural way for students to learn from their teacher. Perhaps a better way of forming MOOC study groups is to engage the learners with synchronised displays, if conditions permit.

Another important finding in our research is that groups may work with different styles, but they were shown to stick to the initial pattern. This is perhaps because a unique group atmosphere was formed for each group during the first session, and participants grew used to it. The stability of such group patterns in terms of synchronicity has a big implication for organising MOOC-based study groups. Though groups can be spontaneous, good practices (e.g. explicitly asking learners to stay synchronised) should be suggested to study groups, preferably before their first session.

Massive courses by their nature bring together students with diverse backgrounds and skills. Lack of structured support has made MOOC difficult for individuals to follow. On the other hand, this massiveness has the potential to create group study experiences for learners that are located closely to each other. Therefore, understanding the behaviour of group learners is essential to the successful promotion of study groups in MOOCs. This paper studied MOOC study groups by analysing a longitudinal study with real MOOC students from the university. The conclusions about synchronous group watching MOOCs provide an insight into how organisers of future MOOCs might address the design challenge.

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Dropout: MOOC Participants' Perspective

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Abstract: *Massive Open Online Courses (MOOCs) open up learning opportunities to a large number of people. A small percentage (around 10%) of the large numbers of participants enrolling in MOOCs manage to finish the course by completing all parts. The term 'dropout' is commonly used to refer to 'all who failed to complete' a course, and is used in relation to MOOCs. Due to the nature of MOOCs, with students not paying enrolment and tuition fees, there is no direct financial cost incurred by a student. Therefore it is debatable whether the traditional definition of dropout in higher education could be directly applied to MOOCs. This paper reports ongoing exploratory work on MOOC participants' perspectives based on six qualitative interviews. The findings show that MOOC participants are challenging the widely held view of dropout, suggesting that it is more about failing to achieve their personal aims.*

Introduction

Massive Open Online Courses (MOOCs) have already attracted global interest within the few years since their first appearance in 2008. Daniel (2012) claimed that it was "the educational buzzword of 2012", while the New York Times named 2012 as "the year of the MOOC" (Pappano, 2012). There is an increasing interest in MOOCs, both from Universities and other providers. For example, as of September 09, 2013 there are 10 US State Institutes and 77 global partners working with Coursera (www.coursera.org), one of the leading MOOC providers. The UK's major MOOC platform FutureLearn (www.futurelearn.com) has offered courses from over 20 UK universities since autumn 2013.

Completers and 'dropouts'

A small percentage (generally around 10%) of the large numbers of participants enrolling in MOOCs manage to complete the course (Liyanagunawardena, Adams, & Williams, 2013). The two main pedagogical strands of MOOCs: cMOOCs and xMOOCs, have reported large 'dropout' rates compared to traditional courses. Meyer (2012) reported that MOOCs offered by Stanford, Massachusetts Institute of Technology and University of California Berkley had experienced dropout rates as high as 80-95% (Yuan, & Powell 2013). For example, out of the 50,000 students who took the Software Engineering course offered by University of California Berkeley on the Coursera platform, only 7% completed (Yuan, & Powell 2013). According to Jordan's (2013) collated completion rates for 48 MOOCs (as of August 27, 2013), the highest completion rate achieved was 50.7% in MoocGdP#1 by École Centrale de Lille on the Canvas Network (www.canvas.net) MOOC platform. eLearning courses in general, not only MOOCs, are reported to have higher dropout rates compared to on-campus courses (Levy, 2007) but it is worthwhile noting that these are not like-for-like comparisons (Balch, 2013). Considering the number of students in UK higher education who leave after one year of study: full time 7.4%; part time 35.1% and open universities 44.7%, Tait (Commonwealth of Learning, 2013) suggests that it could be qualification-related. For example 45% of Open University students in the UK have one A Level qualification or less and the open universities admit mature students, students with lower qualifications, and students from rural areas. Therefore he argues that dropouts "represent risks and challenges of openness and inclusion".

There is a debate whether dropout rates and progression should be causes of concern in MOOCs (Gee 2012; Yuan, & Powell 2013). In a traditional university when a student fails to complete a course that they have enrolled in, paying high fees, it is bad for all parties involved: the student (possibly even affecting their families), the lecturers and the university. For example, the Higher Education Funding Council for England keeps a close eye on the number of full-time PhD students completing within the allowed 4 years as a benchmark (HEFCE, 2013) and a student failing to do so may reflect adversely on the university's research profile.

Yuan, & Powell (2013) argue that whether these rates matter depends on the perceived purpose. They go on to say that if the main aim of offering a MOOC is to provide the opportunity to learn from high-quality courses (offered by world class universities and world experts of subjects) without incurring a charge, these rates should not be of primary concern. MOOCs inevitably attract many more enrolments than those that would have been on a fee-paying course because it is easy and free to register on a MOOC; sometimes it may be all too easy and by a student may register for a course by accident; there may not be an un-enrol button (author's personal experience). Some participants who enrol on a MOOC may never return.

Defining dropout

Tinto (1975) argues that inadequate attention given to defining dropout in higher education has led researchers "to lump together, under the rubric of dropout, forms of leaving behaviour that are very different in character" (p89). He claims that research on dropout has failed to distinguish between various forms, for example dropout resulting from academic failure and voluntary withdrawal. This often seems to be the case with MOOCs; it is not clear what dropout means apart from 'all who failed to complete'. MOOC participants could have joined the course to follow a specific topic and completion of this may have triggered them to voluntarily withdraw from the course. Categorising these participants as dropouts in MOOCs may give rise to misleading implications.

There is also a concern whether the traditional definition of dropout could be directly applied to MOOCs (Liyanagunawardena, 2013). For example, paying enrolment and tuition fees in a traditional course makes a student commit themselves to participating in the programme. In a MOOC on the other hand, because both registration and enrolment are free, there is no binding commitment from a student. A definition used in distance education and/or eLearning could be a better candidate for defining dropout in a MOOC. In the context of eLearning, Levy (2007) defines "dropout students (or non-completers) as students that voluntarily withdraw from e-learning courses while acquiring financial penalties" (p.188) for his study. However, application of this definition to MOOCs is hindered by the use of financial penalties in the definition, because MOOCs generally do not require an upfront payment from registrants. Unlike most traditional courses and/or eLearning courses that freeze registration at the start of the course, MOOCs generally allow registration while the course is being offered (1). Effectively, then, a learner can join a MOOC that was running on the final week, which would still count as a registration, but this may not provide sufficient time for completion. There is also the possibility that some learners may enrol on a course to follow only a specific topic of their interest. Some participants may enrol to 'audit' MOOCs (Chung, 2013) while others may be 'lurkers', 'drop-ins', active or passive participants (Hill, 2013). Koller, et. al. (2013) show that "the ease of non-completion in MOOCs can be viewed as an opportunity for risk-free exploration", a similar analogy would be a free taster or test drive. This makes it difficult to measure the dropout rate in a MOOC by only considering the enrolled number and 'completed' number.

Furthermore, Koller et. al. (2013) show that in general a typical Coursera MOOC (in 2012) attracted 40,000 to 60,000 enrolments but only 50-60% of these students actually returned for the first lecture. Out of these huge enrolment numbers only about 5% of students earned an official statement of accomplishment. In contrast out of the students who registered for 'Signature Track' scheme, paying US$30-100, with the intention of obtaining an identity verified and university-branded certification, the completion rates are much higher. This seems to suggest that learners' intention for the course, for example whether to use it as a taster class, drop-in and drop-out for interesting topics, or to earn a verified certification has had a profound effect on their 'engagement' in the course (2).

Due to the nature of MOOCs discussed above, it is reasonable to question whether defining 'completion', 'dropout' and 'success' in a similar way to their equivalent in the traditional measurement or in fact eLearning counterpart is acceptable or appropriate. In fact, Koller, et. al. (2013) show that "retention in MOOCs should be evaluated within the context of learner intent" (p62). However, the word 'dropout' seems to be used very loosely when referring to MOOCs.

In the realm of MOOCs, theorising about dropout processes can only be possible once a proper definition for the term is identified and accepted among scholars. The researchers believe that in identifying the meaning of dropout in the context of a MOOC, it is important to understand the participants' perspective because of the voluntary nature of participation. However there has been no research to date exploring MOOC participants' views on what success, completion and dropout mean to them in the context of a MOOC. This paper presents an overview of an ongoing research project exploring MOOC participants' perspectives on the issue of dropout. The research team hopes to develop this exploratory view to understand the true nature of a MOOC dropout.

Research Methodology

This qualitative research project is investigating MOOC participants' perspectives using an ethnographic approach, where researchers themselves are MOOC participants and they are exploring other MOOC participants' perspectives on 'dropout', 'completion' and 'success.' Semi-structured interviews are used as the data collection instruments in this research. Structured interviews pose a pre-established set of questions in a sequence allowing little or no variation, expecting the interviewer to be neutral. In contrast, semi-structured interviews, which are guided by a set of questions but nevertheless place much interest on the participants' views and where the overall direction of the interviews is influenced by the interviewees' responses, was favoured in this research because of the constructivist standpoint of the researchers. Each face-to-face interview (30-35 minutes) was audio recorded with permission and later transcribed in full. The interview transcription was shared with the participant via email where clarifications were required. This respondent verification is hoped to have increased the quality of data used in the analysis.

This paper presents some initial findings of an ongoing research and this paper focuses on participants' perspectives of 'dropout' in a MOOC.

Population

The population for the research is MOOC participants, who have registered and/or participated in one or more MOOCs.

Sample

In order to scope the project, it was planned over several phases. The first phase was to explore MOOC participant views among the staff at the University of Reading. Thus the research team initially advertised the project via email within the University of Reading and recruited participants who replied to this invitation. However, due to participants' enthusiasm to voice their views, some of them had passed on our invitation to their former colleagues and family, creating a snowball effect. In general qualitative research projects use purposive (non-random) sampling and this project also adhered to this. The initial phase employed face-to-face interviews and email interviews with participants who volunteered to participate in the research project. The interview extracts presented here are anonymous.

Research Ethics

This project has been subject to ethical review according to the procedures specified by the University Research Ethics Committee, and given a favourable ethical opinion. Each participant was provided with an information sheet and a consent form to be completed prior to being interviewed. When interviews were conducted via email, the participant was sent the information sheet and consent form to be completed and returned (via email). A raffle draw, which offered a book voucher worth £25 was advertised in the information sheet. The winner would be drawn from the names of interview participants who wished to enter the draw. This incentive was offered to show the recipients that their time and participation was valued. At the same time, a raffle draw was decided to avoid anyone participating in the research solely to claim the incentive.

Data Presentation and Analysis

Three interview transcripts were chosen at random and were independently analysed by the first and second authors for themes. The identified themes were then noted and clarified for consistency in coding. The remaining transcripts were coded according to the initially identified themes and were checked for consistency by all authors. New themes were also considered. NVivo 10 and MS Excel 2007 software tools were used for the analysis.

Participant Demographics

This paper presents some initial findings from a sub-sample of six interviews with MOOC participants, four females and two males, conducted in August-September 2013. These include four face-to-face interviews and two email interviews. Email interviews were conducted with two participants: one participant at the time was working on an overseas project while the other participant was working in a different campus and preferred email communication to a telephone interview. At the time of interviewing the six participants have registered in 27 MOOCs and have participated in 21 MOOCs among themselves. The number of MOOCs registered in ranged one to seven and the number of MOOCs participated in ranged one to six among the interviewees with an average of 4.5 and 3.5 respectively. The educational qualifications of the participants varied from PhD (1), Masters (2), Undergraduate (2) to Certificate in Higher Education (1). Participants' age ranged from 36-55 with an average of 46.7 years. A recent pre-course survey for the 'Begin Programming: Build Your First Mobile Game' course (offered by University of Reading through the FutureLearn platform) showed that 35-55 year olds represented 45% of several thousand respondents thus suggesting that the sample is representative of MOOC learners. Equivalent statistics from other MOOCs have not been widely reported, and the organisations which run the platforms restrict access to their demographic information.

Dropout in a MOOC

When asked who they would call a dropout in a MOOC, participants had various responses. However, despite this initial response of a dropout, they later clarified their views further, which drew interesting perspectives.

Initial Responses

> "Someone who doesn't make it all the way through to the end" (Ann, 42).

> "Not starting. Giving up on week one…" (Joyce, 53).

> "Not completing" (PM3, 47).

> "If you are not still watching the lectures or doing the activities when the last week comes along" (RM, 55).

> "Time invested is not worth the learning accrued" (Roy, 47).

> "Registering then not starting... mmm, also starting and not finishing." (Terry, 36).

Not completing

One participant held a view similar to Levi (2007) where she identified a dropout as "not starting or giving up in week one". Observing the initial responses it can be seen that most participants seemed to consider someone 'not starting' and/or 'not finishing/completing' as a dropout.

In most writings dropout seem to refer to all who failed to finish the course. This view was mentioned by study participants, perhaps influenced by the media attention given to the dropout in MOOCs. However, in clarifying their views of a dropout interesting dimensions emerged – there was an apparent desire on the part of the interviewees to challenge this view and express alternatives.

Continued effort

If a MOOC participant was still working through the course but fails to finish at the time course concludes, this participant was not categorised as a dropout. For example:

> "People have joined throughout and have been quite frustrated that they haven't been able to do the assignments for week one because they joined in week seven or so, and I wouldn't consider them dropouts because they haven't completed the assignments. But the fact that they're there working, through the lectures I think, means that they haven't dropped out. Just because they haven't necessarily watched all of the lectures or completed any of the assignments doesn't mean they've dropped out. […] you still are working on that subject, so, and still participating in that way, so, yes you're not a dropout" (Ann, 42).

> and similarly:

> "I think [dropout is] if you are not still watching the lectures or doing the activities when the last week comes along. So you might be behind and so... but you haven't dropped out you are trying to keep going till the end in the allocated time period. I don't think that if you don't do the quizzes you have dropped out or if you haven't watched all the lectures you are dropped out. It is really a time thing. […] You may still drop out before you finish watching all the lectures. But that may be because that is no longer available. That is because it is taken away from you. But if it is still there, and you intend to go back to them, then you have not dropped out" (RM, 55).

Both these participants' view is that if one is continuing or has the intention to go back to the resources they are not dropouts. The fact that MOOCs are open to be enrolled at anytime even after they are started could leave someone enrolling in the program after the offering began unable to complete all activities. These ideas suggest that timing is a crucial factor because they concentrate on the course ending point to determine whether a participant is a dropout or not. The view also suggests that the status of dropout is a matter of choice, an intention to stop participating, which will be revisited in the analysis.

Learning something new/useful

Another point of view is that as long as a MOOC participant was able to learn something from the MOOC, reflect upon it and bring a closure to the learning, the participant is not a dropout. This takes into account the fact that there are many who dip in and out to learn specific topics who are not necessarily interested in the whole offering. For example:

> "I think you can finish your engagement with the MOOC before it ends without dropping out from it if you are able to learn something from it reflect on that and you know turn it in your own terms into a neat package something that you have done and finished and that you don't need to worry about. […] As long as you can get a closure from it you have not dropped out from it as such" – (PM3, 47).

This was further supported by another participant (Roy, 47) who described dropout as:

> "People are making their own life choices. Dropout = time invested is not worth the learning accrued. In comparison the engagement contract with a MOOC is totally different. It's free I can dip in and out. I hurt no-one by dropping out. I can drop in anytime. This makes another sort of engagement contract. I therefore suspect relative to traditional learning the dropout rate is higher (it is easier to flirt with a MOOC or try and buy if you will), but that a higher proportion of people join to start".

Thus the timing of a dropout becomes unimportant while learning something new and/or useful takes prominence. Dropping out due to peoples' life choices was brought up by another participant:

> "Registering then not starting... hmm, also, starting and not finishing. But that might also, that is personal, because it might be that person has got what they wanted from that MOOC, so that isn't a drop out at all, it's just what they wanted – they've got, they don't feel they need to go any further – so I don't feel that's a drop out, it's just a personal choice. So it depends whose perspective you are looking at, whether it's the person who's created the course or the person who's doing it" (Terry, 36).

These perspectives of a dropout show that despite initial view of a 'dropout' as someone who failed to complete a course, participants are aware of the nature of MOOCs. Comparing this with the traditional measure of dropout is contentious.

Discussion

At this early stage of enquiry it can be seen that despite the media attention given to the number of participants registering in a MOOC versus the number of participants who complete all activities and/or assignments as dropouts, people who engage in MOOCs do consider that this crude classification is not fit for purpose. In fact they challenge the definition (if there is one) generally used for dropouts. This small study suggests the need to look at dropouts in a new perspective considering situational factors of participants such as when they have joined the course and their intentions for the course. This supports the arguments put forward by Koller, et. al. (2013).

The free voluntary participation of a course allows participants to visit the MOOC for topics of their interest. This gives them the chance to learn something new and/or useful rather than being tied in for topics that they already know. It also allows them to have a taste of the subject without committing to it. As can be seen in one of the quotes a participant suggests that given the voluntary nature of the engagement it is likely to see more dropouts in MOOCs. This is an important point that seems to be overlooked in comparing MOOCs to other courses not comparing like with like.

Limitations

This paper presents work in progress and the small sample described here is not a random selection. Participants in the sample were highly educated. However, according to the findings of Christensen, et. al. (2013), 79.4% of the respondents (out of 34,779) who participated in University of Pennsylvania's Coursera courses have a Bachelor's degree or higher level of education, suggesting that many MOOC participants are highly educated. The sample for this research was drawn by publicising the research in a UK Research University, thus the findings here cannot be applied to the general population. However, they do provide interesting avenues to explore in better understanding MOOCs dropouts.

Future Work

It would be interesting to know, for instance, whether people from other educational sectors and the general public would have the same broad ideas about what constitutes being a 'dropout'. Does the media coverage of the alleged high rate of 'dropouts' impact on individuals' choices about joining a MOOC? Is it possible to identify those who achieve their goals versus those who 'drop out', and can this influence support mechanisms to help people get the most out of the courses that they choose?

The research team has developed a questionnaire using the insight of participants' perspective into MOOCs and this is currently open for anyone who has participated in MOOC(s) to take part. Focus groups are planned with a variety of groups including school pupils (16-18 year olds) known to have taken a MOOC.

Conclusion

The word 'dropout' seem to have been used (misused?) to refer to 'all who failed to complete' a MOOC. At this early stage of exploration it is evident that MOOC participants are challenging this widely held view of 'dropout' suggesting their alternatives. From current evidence, it can be seen that for MOOC participants, 'dropout' means achieving their aims (or not) in a course rather than finishing the course by completing all parts. This alternative view of 'dropout' among MOOC participants raises further questions for exploration. What do 'success' and 'completion' mean to MOOC participants? Are they applied the same way as in traditional higher education or are they different? The authors believe this work will pave the way to helping define these terms for use in the MOOC context.

Notes

(1) Some MOOCs close registration to participants who wish to obtain verified certificates once they have started. For example, Social Network Analysis course offered by University of Michigan through Coursera closes registration for Signature Track option after three weeks, allowing MOOC participants to receive a verified certificate jointly issued by Coursera and the partner university offering the course.

(2) Engagement is used here in the sense of time-served, with a focus on completion.

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Reflections on Enrollment Numbers and Success Rates at the openHPI MOOC Platform

Christoph Meinel, Christian Willems, Jan Renz and Thomas Staubitz

Abstract: *openHPI is the educational Internet platform of the German Hasso Plattner Institute (HPI), Potsdam. The HPI offers massive open online courses covering different subjects in Information and Communications Technology (ICT) on the platform. Five courses have been concluded after one year of operation in German as well as in English, each with enrollment numbers between 5,000 and 15,000 students. The paper at hand introduces the openHPI MOOC model and presents a preliminary analysis of participation numbers and usage statistics from this first year. We differentiate between total enrollment numbers and students actively taking part in the course, show the respective completion rates and investigate student engagement throughout the course term. We also raise questions on the validity and expressiveness of high enrollment numbers and low completion rates derived from these numbers as well as for a resilient definition of activity in a massive open online course. Finally, we enrich the statements on participation and completion rates with socio-demographic statistics regarding course completion differentiated by age and gender.*

Introduction

With its openHPI platform[1], the Hasso Plattner Institute in Potsdam, Germany, is the first European university institute to offer interactive online courses (MOOCs) in German and English in the field of computer science and IT technology. Due to long experience in e-learning technology topics, including the development of the mobile tele-TASK technology (an easy to use system to record lectures and presentations for e-lecturing, see Schillings and Meinel, 2002), the operation of a large lecture portal[2] in the web, the development of different virtual labs[3], and regular lecture transmissions to the Technical University of Beijing, China[4], the HPI adopted the emerging MOOC concept early and with the implementation of its own learning platform. The key elements of the MOOC innovation for online learning were quickly identified: the synchronization of learners, the possibility of providing the learning materials a little at a time, supplying various feedback tools for self and external evaluations of learning success and linking with a social platform to enable learners the experience of being part of a social (albeit virtual) learning community. Thus, openHPI offers MOOCs of the Stanford kind, known as xMOOC.

As early as 2012 the much acclaimed first openHPI course on "In-Memory Data Management" was launched with Hasso Plattner (SAP co-founder and the founder of HPI) as course instructor (see Fig. 1). In November 2012, Prof. Dr. Christoph Meinel held the first xMOOC in German Ion "Internetworking with TCP/IP". After that, openHPI offered new courses basically every two months (with two breaks during holidays), resulting in five concluded courses after one year of operation.

1 See https://openhpi.de/

2 tele-TASK Portal, see http://www.tele-task.de/

3 See http://www.tele-lab.org/ and http://www.soa-security-lab.de/

4 Information at http://www.hpi.uni-potsdam.de/meinel/knowledge_tech/internet_bridge.html

Conception of the Online Courses

According to Meinel and Willems (2013), the online courses offered at openHPI are didactically prepared in accordance with specific guidelines. Courses have a fixed start date and offer a balanced schedule of six consecutive course weeks. Every course week is prepared in a multimedia format and, whenever possible, interactive learning material is supplied, dealing with a specific aspect of the topic of the course. At the beginning of the week, course participants are offered a series of videos that have been recorded with the tele-TASK system. The videos are supplemented with further reading material, interactive self-tests and homework to complete during that particular week. The self-tests, which alternate with the videos, help participants to check whether they have mastered the most important information from the previous video. The homework exercises at the end of each course week are the building blocks for the performance evaluation of the participants. Here, points can be accumulated relevant to the successful completion of the course.

These offers are combined with a social discussion platform where participants have the opportunity for exchange with course instructors and other participants. Here, they can get answers to questions and discuss topics in depth. But naturally the type of learning activities and their extent is up to the participants themselves.

The learners can make personal contributions to the course, for example in blog posts, wiki pages, mind maps, or other visualizations of the subject matter. Fellow learners can comment on, discuss or expand on what has been said. Through the discussion of the subject matter, the participants become part of a virtual community with each other and with the instructors, thus creating the links of a social learning network.

Upon successful completion of the course, participants qualify for an openHPI certificate. For this they must have earned at least 50 percent of the possible points from the six homework exercises as well as on the final exam. Besides the number of points received, it is also noted on the certificate whether the participant is among the best 5, 10, or 20 percent in the course. Additionally, all participants who have completed at least 50 percent of the course material receive an ungraded certificate of participation.

The determination of a 6-week framework for the length of an openHPI online course, with a concluding exam week, was based on a consideration of the necessary time for making the course participants form a virtual "community". Additionally, the focus was on limiting the burden placed on course participants. The offer applies not only to students but to anyone interested whether it be a professional person, high school student, or retiree.

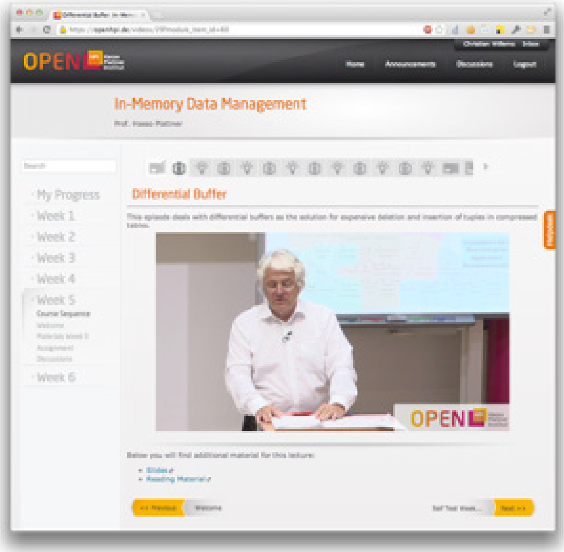

Figure 1. Screenshot – Prof. Hasso Plattner lecturing on openHPI

openHPI Course Curriculum

The subjects addressed in the courses on openHPI originate in the courses of the HPI IT Systems Engineering curriculum. The HPI professors and senior researchers address topics on the latest developments and research results from the area of computer science. At the same time, broad basic knowledge is also conveyed, such as how the Internet works. The subject matter taught in an online course cannot encompass an entire lecture program, based on time restrictions alone. Furthermore, the courses are not intended to be lecture substitutes but rather aim to teach essential knowledge to a wide, general audience. The concluded courses from the first year are listed in *table 1*.

Table 1: openHPI courses from the first year of operation

Course	Lecturer	Language	Term
In-Memory Data Management	Prof. Hasso Plattner	English	2012-09-03 to 2012-10-28
Internetworking mit TCP/IP	Prof. Dr. Christoph Meinel	German	2012-11-05 to 2012-12-24
Semantic Web Technologies	Dr. Harald Sack	English	2013-02-04 to 2013-04-01
Datenmanagment mit SQL	Prof. Dr. Felix Naumann	German	2013-04-08 to 2013-05-27
Web-Technologien	Prof. Dr. Christoph Meinel	German	2013-06-03 to 2013-07-22

Course Statistics – Analysis and Discussion

The analysis of course enrollments, student activity, and course completion and the relation of these numbers raise questions regarding the expressiveness and validity of communicated enrollment numbers and completion rates for massive open online courses. In this context, a discussion of the definition of "active users" in the context of an online course is triggered. Section II-B investigates student engagement during the course based on the submission of mandatory assignments, while section II-C adds socio-demographic data (age and gender) of successful participants.

Course Participation and Completion

As already explained, courses on openHPI have a fixed start and end date. Participants can only complete a course with a graded certificate during that period of time (the course term), since homework assignments and the final examination can only be submitted according to the submission deadlines during the course term. The following sections will always refer to graded certificates when using the term "certificate", "completion" will always mean completion with a graded certificate.

Table II shows the participation statistics, where the following three different values (all expressing the enrollment count) are given for each course:

- The participants who enrolled to the course during the course term and were therefore at least theoretically eligible for certification5,
- The number of active participants, where all users are counted that submitted at least one homework submission or one forum contribution (plus percentage of active users in relation to course term participants) and
- The current total number of enrolled participants, including students who registered for self-study after the course term.

Table 2: Participation and Certificates (data accessed on 2013-09-27)

Course	Participation (term)	Participation (active)	Participation (total)	Certificates
In-Memory Data Management	13,126	4,068 (31.0%)	19,036	2,137
Internetworking mit TCP/IP	9,891	2,926 (29.6%)	13,325	1,635
Semantic Web Technologies	5,962	2,440 (41.0%)	7,167	784
Datenmanagment mit SQL	6,967	3,100 (44.5%)	8,234	1,641
Web-Technologien	7,350	3,171 (43.1%)	8,426	1,727
TOTAL	**43,296**	**15,505 (38,8%)**	**56,188**	**7,924**

Comparing the numbers of enrolled students (during course term and in total) with the active participants actually questions the high participant numbers that providers of massive open online courses publish. The values indicate, that roughly between 55% and 70% of all enrolled students in a course never submit any contribution to the platform. These users either register for the course before the start date and back off when the course starts or just take a sneak peek into the first week's content and then decide to not take the course at all. The reasons for this behavior must be investigated in future user studies.

This observation raises the question, should completion rates for (massive open) online courses be calculated against the total number of participants eligible for certification? – Participation (term) in table II, should the rate be the quotient of the certificates issued and the actually active participants. The motivation for MOOC providers to state high enrollment numbers is an obvious sales argument. Nevertheless: when it comes to refunding (e.g. through paid certificates), the enrollment numbers become obsolete.

Table 3 shows a comparison of the two outlined options for completion rates as it concerns the so far concluded courses on openHPI. The column Completion (term) takes the rate as quotient of the number of certificates and the eligible participants, while Completion (active) only takes the active participants into consideration.

Table 3: Completion Rates

Course	Certificates	Completion (term)	Completion (active)
In-Memory Data Management	2,137	16.28%	52,53%
Internetworking mit TCP/IP	1,635	16.53%	55.88%
Semantic Web Technologies	784	13.15%	32.13%
Datenmanagment mit SQL	1,641	23.55%	53.94%
Web-Technologien	1,727	23.50%	54.46%
Total / Average	**7,924**	**18.30%**	**51.11%**

Even though the traditionally calculated completion rates of openHPI courses between 13% and 24% compare quite well against an average completion rate for MOOCs of less than 10% (according to Jordan, 2013), the expressiveness of theses numbers must be considered relatively low as a metric for the quality of the course concept and content. This is because the set of participants serving as basis for the calculation of these rates also incorporates the group of users who never really got in touch with the learning material – the above mentioned "sneak-peekers" and those who enroll and never come back. Udacity is taking a leap forward here following another approach: students can preview nearly any course content (including practical programming exercises, e.g. in the course "Introduction to Computer Science"6) without having to join the course – openHPI, Coursera and others follow different rules, i.e. users can only see general course information and introductory material before actually enrolling in a course.

[5] Actually, these participants enrolled prior to the release of the final exam; since openHPI certificates are issued when a participant reaches at least 50% of the overall score and the final exam is worth exactly this 50%, they could still qualify for certification.

Another point for further discussion and investigation is the "arbitrary" definition of active users used in the paper at hand. Definitions of activity must not be based on submission of graded, mandatory assignments or contributions to discussions since there can also be active users who neither intend to go for certification nor post in the forum, but are of a passive user type (i.e. belong to levels 0 or 1 in Fischer's (2011) "ecologies of participation," also see Grünewald, 2013). Future work must analyze usage patterns of different participant groups more precisely and try to identify attributes and thresholds to distinguish active users, lurkers, and users that do not actually take part in the course.

Participants' Engagement during Courses

We also observed the participants' engagements throughout the seven course weeks – taking the number of submitted homework assignments as measured value. Fig. 2 presents the submission numbers for all mandatory assignments (weekly homework and final examination) for all openHPI courses and takes the submission number for the first week's homework as reference (100%).

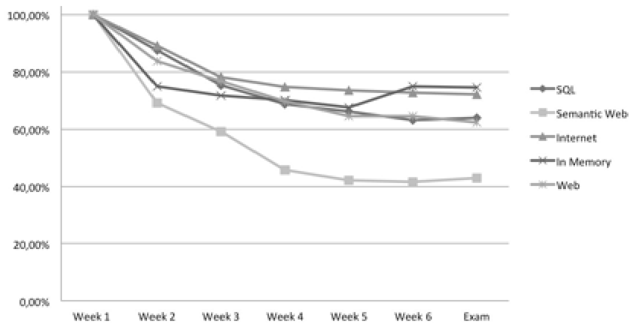

Figure 2. Participant engagement throughout the seven course weeks

The figure shows that the dropout rate at openHPI averages to about 16.5% after week 1 and falls to 8% after week two. If we take the Semantic Web course out of the equation[7], the numbers even get as low as 13% after week one and 7% after week two. After week three, there are another 3-4% dropouts but for the rest of the courses the participants' engagement is steady and the dropout rate low at about 1-2%.

In summary: participants who complete two or even three weeks of an openHPI course are most likely and willing to follow the course until the end and take the final examination. This insight highlights the importance of the course weeks one and two for course designers and instructors who are challenged to pick up as many participants as possible during these first weeks.

Success Rate by Age and Gender

The age structure of openHPI participants shows a clear peak in the age groups from 20-30 and 30-40 (approx. 27% and 29%). Also the group of learners between 40 and 50 is relatively strong with ~20%. Remarkably 15% of the users are older than 50, no fewer than 5% are even older than 60 years.

This information also corresponds with collected data on the career state and professional experience of the openHPI users:

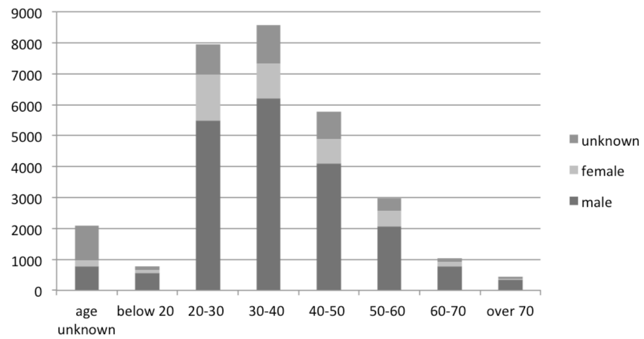

Figure 3. Age and gender of openHPI participants (absolute numbers)

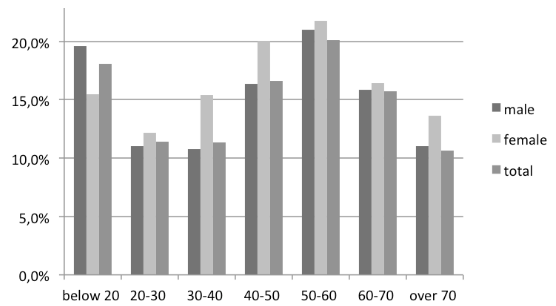

Figure 4. Completion rates on openHPI by age and gender

- 56% claim to work as professionals (13% students, 4% academic/research, 10% other, 17% unknown)
- 34% state that they have more than 10 years of professional experience (15%: 5 to 10 years, 26%: up to 5 years, 25% unknown).

Regarding gender, there is a clear surplus of male participants, which is not surprising for courses on ICT topics with > 50% of German users[8].

When looking at the success rates (defining success as completion of a course with a graded certificate) in *Fig. 4*, there are basically two major observations: there is no significant difference between the success rates of female vs. male participants and there is a difference in successful completion by age groups:

- Participants younger than 20 and between 50 and 60 years complete courses successfully with a rate of about 20%
- Participants between 20 and 40 as well as over 70 years show a success rate of about 10%
- The age groups between 40 and 50 and between 60 and 70 succeed with about 15%.

An interpretation of these numbers without further data for correlation (qualitative data such as motivational reasons for taking courses or quantitative numbers like time investment grouped by age) would hardly be meaningful. However, these data will be collected systematically during future openHPI courses.

[7] The course "Semantic Web Technologies" was been offered straight after the completion of the first course "Internetworking mit TCP/IP", which was lectured in German. While the course "Internetworking" targeted a wide audience with only basic knowledge in ICT as a prerequisite, the "Semantic Web" course was designed for at least advanced students with a solid knowledge in logics and theoretical computer science. We learned from the discussion forum that many participants of "Internetworking" also enrolled for "Semantic Web" and quickly realized that they could not follow the course. This explains the relatively high dropout rates for that particular course offering.
[8] Graduation rates of female students in computer science in Germany are typically between 10 and 20 percent (Schinzel, 2005)

Conclusion and Future Work

The paper at hand highlights the insufficient clarity and missing comparability of MOOC offerings from various platforms (i.e. openHPI vs. Coursera vs. Udacity) and shows the effect of these numbers on the expressiveness and validity of completion (or success) rates. We raise the question of how to count enrollments for courses with a massive audience and suggest abolishing the need to enroll for a course before being able to (at least passively) preview content. The obligation to enroll for a course would be necessary at the point when a participant wants to use active course content (i.e. quizzes) and contribute to the forum. Another point for further investigation is the definition of an active user and the differentiation between those, lurkers and enrolled users who never show up – including the analysis of reasons for enrollments that happen but are never used. openHPI defines an active participant as a user who submits at least one mandatory homework assignment or contributes to the discussion forum, but admits that this definition is slightly arbitrary and no better or worse than many other imaginable definitions.

The analysis of our students' engagement over the term of courses points out the importance of the first and second course weeks (at least for the overall duration of seven weeks as in the openHPI course model) when it comes to course design and instruction. Future work should investigate the validity of these numbers for longer (or shorter) course terms and find suggestions for course designers on how to keep up users motivation from the start.

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The SIRET Training Platform: Facing the Dropout Phenomenon of MOOC Environments

Sergio Miranda, Giuseppina Rita Mangione, Francesco Orciuoli, Vincenzo Loia and Saverio Salerno

Abstract: *The SIRET project aims at the definition of a recruiting and training integrated system able to represent the professional competences of users and to understand the supplies and demands in order to find optimal agreements in the job market. In this scenario, a crowd of users is looking for new professional competences able to give them new opportunities. Of course, these many learners may have common learning goals but very different knowledge backgrounds. For all aspects related to the training, we are realising a MOOC platform that aims to address this requirement and simultaneously face one of the main MOOC problems: the dropout. The cause is the difficulty to guarantee the provision of one-to-one tutoring for many learners. The proposed training platform, in particular, exploits the adaptation and personalisation features of IWT to mitigate this cited problem.*

Introduction

Progress in the development of Massive Open Online Courses (MOOC) is compelling universities to re-evaluate their formative offers by exploring new educational methods (Yuan & Powell, 2013) able to value massive models and flexible learning paths to hold up lifelong and adult learning (Vazquez et al., 2012). The most common method of education is the 'monitorial method' where the teacher should "fill students' heads with knowledge and provide them with the information that they needed in order to improve cognitive and metacognitive process" (Bloom, 1956). Moreover, "regressive pedagogy" (Siemens et al., 2013) is abundant in MOOCs that emphasise a teacher-centred approach difficult to transpose into online learning environments. MOOC design should thus benefit a learner-centred approach and provide strategies that change the perception of learners as active participants in the establishment of individual goals and a personal trajectory. In the MOOC environment this kind of control is imbalanced to the students who feel isolated in the process of choosing courses, closed to their learning needs and work objectives. Moreover, students also perceive that they have to play the role of monitoring their progress with respect to calendars, fruition and assessment results.

What the students look for in the MOOC environment is mainly to enrich professional competences and earn formative credits and certifications, improving their employment prospects. This motivation supports both empowerment and engagement, but leaves the learner to control him/herself, deciding what time to allocate to study and choose what to learn from a formative offer or a set of suggestions automatically driven by previous selections (Mangione, 2013). However, the statistics do not correlate with this (Chapman & King, 2005): there is a high level of desertion, poor results and few final certificates are issued.

This is why this disengagement of 'non-completing' students is the subject matter of this research. A positive starting engagement is often followed by "but not earning a statement of accomplishment" (Holohan et al., 2005). There are two main reasons for this. Firstly it is difficult to guarantee a teaching presence in courses with thousands of learners of differing experience and knowledge who require continuous one-to-one guidance in order to orient themselves to different learning goals, real needs and how to fill their skill gap (Anderson et al., 2005). Secondly, families with financial difficulties "look to MOOCs as a way to offset high tuition rates" (Park and Lee, 2003), but few organisations issue formative credits on MOOC completion. For example, the American Council on Education only recognises credits issued for five Coursera MOOCs (Lederman, 2013). Intrinsic motivation clearly decreases and students leave courses with no useful certificates or credits (Kolowich, 2013).

The problem of useful credits is related to quality and assessment methods for a meaningful learning process, considering objectives and providing feedback for the construction of individual learning paths. The learners need new educational environments for MOOCs in a new "heutagogic" view (Ausubel, 1962), where adaptive tutoring methodologies are welcome and able to overcome the 'one size fits all' approach.

In (Gaeta et al., 2011 and Chapman & King, 2005) differentiating learning is a point of view of teaching rather than a method. It is an educational culture able to recognise diversities inside a classroom. Adaptive learning is an innovative research field synchronised with the guidelines, research funding of Horizon2020 and evolutionary trends of the learning technologies. We are moving from the 'Scholè' (metaphor for 'learning for the elite') to the 'Schooling' (metaphor for 'learning for all') by reformulating learning events as dialogue processes (Tizzi, 2008) and approaching the obvious problems of paying attention to each person and his/her needs inside the MOOC spaces. It is necessary to rethink technologies for supporting development and being fulfilled in social or classroom learning contexts. The combination of MOOCs with the Adaptive Learning delivery platform (Vazquez, 2012 and Mulwa, 2010), where delivery happens by means of individual learning preferences and providing them continuous intelligent tutoring with self-graded content, examination and assessment, opens new perspectives for adaptive learning in adult education. The Adaptive MOOCs (a-MOOCs) analyse students' interactions with the learning environment in order to adapt it their individual behaviour. AMOL and CogBooks are two of the first Adaptive MOOC solutions to be released.

AMOL is an adaptive environment adopted by UMass Boston for the course 'Molecular Dynamics for Computational Discoveries in Science', of Prof. Sonwalkar (University of Massachusetts Boston). Its approach is macro-adaptive as well as that described in Park & Lee, 2003).

At the beginning of the course learners receive a diagnostics quiz that consists of a few questions about how they learn. This will identify each learner's preferred learning strategy, based upon which the learner will be guided on an adapted learning path throughout the course, for fastest learning and best score results. During the course at the end of each quiz attempt, learners receive feedback through the adaptive learning system in the course. Sonwalkar, 2013 underlined that "the MOOC assumes no prior knowledge and virtually will hold the students' hands as they go through the materials, analysing learning strategies then adapting a teaching approach to raise each student's level of success. This accessible MOOC is the first of its kind". CogBooks is an adaptive MOOC environment based on neural network theory. "By knowing what you've done, what others have done and where you need to go, adaptive learning can guide you through a network of content" (Clarke, 2013). The micro-adaptive approach of CogBooks (Park & Lee, 2003) uses analytical techniques to provide a unique level of detailed data on user behaviour and performance. CogBooks tracks each individual's actions at a granular level, building up a detailed profile on how they respond with different materials and different adaptive feedback or routes. These solutions, although they are first releases, have already given us insight into the "absence of serious pedagogy in MOOCs" (Vardi, 2012).

The proposed MOOC environment for the SIRET project

The SIRET project

The project aims at the realisation of a Recruiting and Training Integrated System. The enabling technology of the project for training aspects is Intelligent Web Teacher (IWT), a trademarked product by MOMA (www.momanet.it) (Capuano et al., 2009), that is an innovative solution able to create personalised and adaptive learning experiences. The prototype system will be able to represent, in a unified and efficient way, the professional competences of users, to support recruiting actions (i.e. finding right-fit professional skills for a specific job and vice-versa), and to offer personalised training for goals defined by means of Skill Gap Analysis, optimisation or forecasting algorithms integrated with IWT.

The main idea is the realisation of a social networking system that helps citizens and enterprises in the employment process, by efficiently cross-referencing professional supply and demand, by supporting political and social institutions, foundations, welfare, in monitoring, controlling and addressing initiatives related to the employment issues.

Since the project pays attention to the different needs, social features, culture and motivations of the public as a whole instead of specific groups of users (classrooms, workgroups, etc.), it is natural to conceive an extension of IWT versus a MOOC environment where, prior to starting activities, there are no classes or groups of users.

As stated in the previous section, MOOC environments have a set of limitations that often cause the dropout of incoming users. The proposed solution takes advantage of IWT to face typical limitations and MOOC problems. The features of IWT related to personalisation and adaptation are a very important starting point from which to approach the problem of the lack of one-to-one tutoring in these environments.

First of all, IWT, in respect to specific learning goals, identifies gaps in students' knowledge and then generates remedial paths of learning objectives personalised to fill in these gaps and meet individual preferences. The platform evaluates the gaps by means of tests and the results on these tests allow adapting courses for each user. In this way, IWT operates as a tutor in a one-to-one relationship because it aims at bringing students' difficulties out, analysing their performances and suggesting remedial works ad hoc created by taking into account the personalisation and adaptation strategies.

The main strategy of IWT is to create personalised learning courses by using ontologies to model the treated domains and emphasise the assessment phases to evaluate the gaps.

These aspects are obviously time-consuming but this effort is justified by better results in the learning experience for users and, we hope, efficiently and effectively tackles the problems raised in MOOC environments.

MOMA (a small enterprise) has developed and released the commercial product MOMAMOOC (accessible at http://www.momamooc.com/index) by re-engineering the prototype defined during SIRET and other research-projects. The most recent version is to be tested during the evaluation activities of the project by involving job-seekers. After contact with employment exchanges and agencies, these jobseekers will have access to the platform and, if they wish to gain new professional competences, may take part in learning and training experiences delivered by MOMAMOOC.

The enabling technology: IWT and the pedagogy-driven approach

IWT is an innovative technology, providing adaptive and personalised learning environments, whose theoretical framework responds to a pedagogy-driven approach: the focus is on the learner and his curricular planning and technology is the key enabler of multiple functional educational opportunities for the specific cognitive context. IWT supports different pedagogical models and integrates formal and informal activities through numerous educational strategies (e.g. lesson, tutorial, storytelling, etc.). As an added value, IWT provides different types of access and various types of delivery formats (blended learning, mobile learning, etc.) for the target educational experiences. The benefit lies, first of all, in the ability to define and execute the learning experience that best represents the context and the disciplinary domain. In addition, the framework implements the principles of the educational systems' individualisation and provides personalised experiences as a function of the cognitive state and the learning style of the individual learner. The formalisation of the learning experience in fact relies on the definition of a learning environment and the proper configuration of related services so the platform may manage and organise the learning activity flow for a specific teaching method. IWT guarantees the delivery of experiences with the following benefits:

1. Completeness. The teaching / learning process includes:

- A tailored integration of teaching resources (objects and services) during the learning activity;

- Support for individual and group learning models;

- Support for mixed mode (blended learning) and online learning.

2. Pedagogical expressiveness. The experience is designed to respond to the aforementioned pedagogical method, and at the same time characterises educational functions for the various elements and services.

3. Personalisation. The experience is the result of a reasoning process on methods, learning styles and learning objectives. Content and activities are adapted on preferences, objectives, prior knowledge, teaching and learning needs for a given user.

Lastly, from the technological viewpoint, IWT provides its distinctive features by exploiting a semantic web-based approach. In particular, IWT allows representing specific didactic domain knowledge by using a kind of lightweight ontologies, namely 'Subject Ontologies' (Miranda et al., 2013). These subject ontologies are used to share domain knowledge but mainly annotate learning objects/activities described by using IMS metadata schema. A set of algorithms are applied to generate and adapt personalised learning experiences on the top of this semantic representation.

Our MOOC proposal

IWT not only offers all the necessary basic tools common to the most commonly-used MOOC platforms, but also extends the experience with a set of advanced functionalities. A MOOC allows access to video lessons of professors belonging to some of the most prestigious universities in the world (Berkley, MIT, Stanford), and offers students an interactive experience. It involves students in the planning of teaching activities and immerses them in an important social dimension that is made up of geo-located communities of interest.

By relying on easy availability of tools and the ability to combine them in heterogeneous scenarios, this solution provides great flexibility and is able to instantiate all types of well-known MOOCs (e.g, network- based, task-based and content-based). In particular, MOMAMOOC follows the so-called xMOOC paradigm where technologies extend the conventional university education model, so it can be used for the general public.

<u>Basic tools</u>

With regard to the basic features of a MOOC, IWT provides all the common features of a VLE/LMS such as-course management, course catalogues and classes.

Figure 1. Access interface MOMAMOOC.

In particular, a course (consisting of video lectures, lectures and interactive quizzes) may be presented through a video/introductory text and by described through a syllabus and prerequisites.

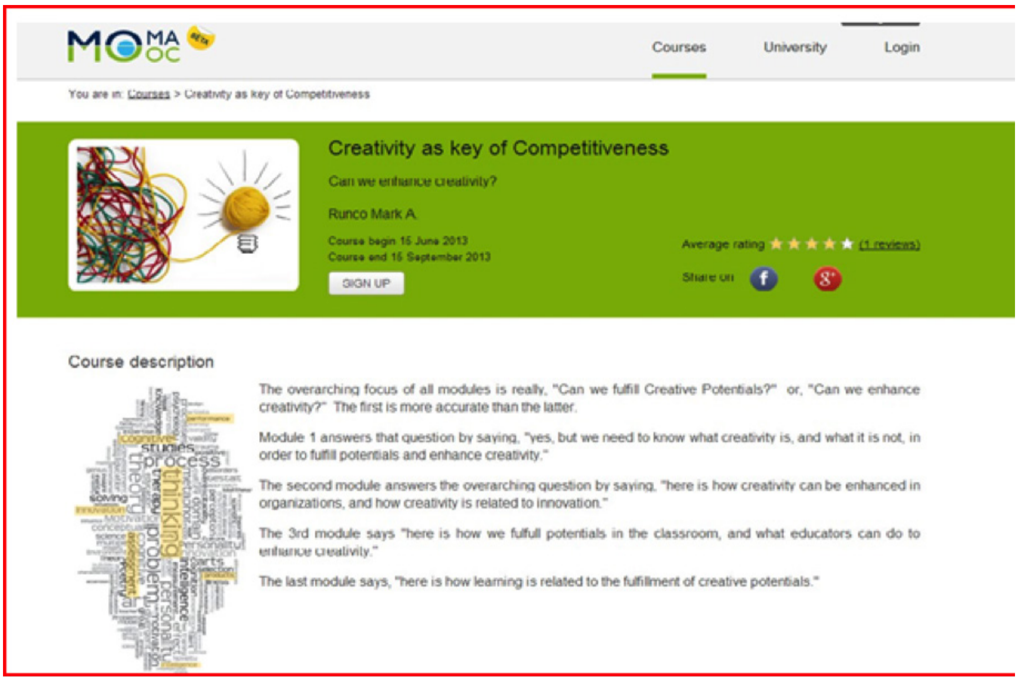

Figure 2. Introductory text.

Links to content within the core platform or external material allow students to acquire knowledge that is preparatory for the course. It is also possible to schedule specific course modules within a class, articulate the material related to each lesson (e.g. video lessons and exercises) and manage homework and quizzes (exams needed to obtain a certification). In fact, MOMAMOOC offers the possibility of authoring and executing different types of test. It is also possible to manage discussions through a forum for Q&A within a class. The forum becomes a support mechanism for dialogue and debate, 'triggered' by the study of material related to the presented video lessons (or exercises). A Wiki section structured by the teacher according to their teaching approach may enrich the classroom environment.

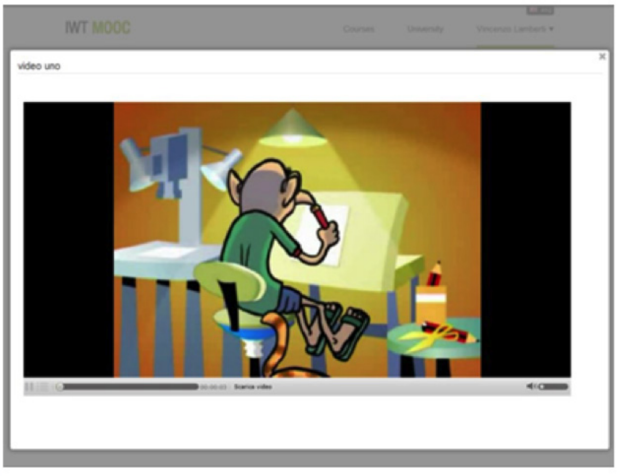

Figure 3. Video lecture player.

To support this environment, MOMAMOOC offers tools to aggregate links to external resources and RSS feeds and the ability to perform surveys that may be useful to the teacher who wishes to assess the quality of lessons and their suitability for enrolled students. It also provides the opportunity for students to monitor their progress as part of class exercises. Finally, MOMAMOOC is able to issue certificates conditioned upon the occurrence of events such as, for example, exceeding 80% of the tests proposed in the examination sessions.

Distinctive features

In addition to the basic functionalities described above, MOMAMOOC provides a set of distinctive features that enrich the MOOC with innovative tools useful to support students in their learning journey and to give them something that, while not exactly one-to-one tutoring, still takes their needs and profiles into account, creating tailored and adaptive learning experiences. The first two features are based on the ability of IWT to describe the domain by using light ontologies and the ability to bind them to learning content by means of standard metadata (IMS). MOMAMOOC provides personalised learning paths that allow the individual student to evaluate his/her knowledge related to one or more topics and subsequently receive a recovery plan based on assessment results. This feature enriches the experience of evaluation tests on important course concepts. Once the student has answered the test questions, the system evaluates the student's knowledge and, where necessary, proposes a remedial path (sequence of learning content) that aims to bridge the gap revealed by the test. The experience of recovery continues until the student has demonstrated that he has covered his 'gap'. The second distinctive feature of MOMAMOOC is the so-called OFAL (high level learning goals). In particular, the OFAL is an environment in which students can express their learning needs in natural language and receive a learning path (sequence of learning objects) adequate to meet the expressed needs in response. Briefly, OFAL is a kind of semantic Q&A system, in which the expressed needs that the system cannot answer are taken over by the teacher (or possibly by the whole class) who can respond to it and update a knowledge base that can later respond to similar requests. The system can also leverage this collective intelligence to feed on new content. This functionality offers the learners the opportunity to refine their learning goals by simply writing what they are looking for in terms of a theme, a concept, a problem to solve or a professional competence to acquire. All these aspects are similar to the training scenario developing within the SIRET project. Lastly, an additional MOMAMOOC feature is the ability to offer online tutoring sessions by using an integrated videoconferencing service. This virtual classroom provides desktop sharing whiteboard, instant messaging and co-browsing.

Conclusions and future works

This paper proposes a MOOC environment able to tackle the dropout phenomenon. The idea is to fill the lack of one-to-one tutoring in MOOCs by providing an adaptive environment. This will be achieved by extending IWT, a semantic web-based platform able to deliver personalised learning courses by respecting user needs and profiles.

The IWT approach should be more effective than the usual approach taken by other MOOC environments and should result in improved performance when related to the main problems we have raised.

This extension, realised in the context of the SIRET project, is to be tested during its evaluation activities. The users to involve are the ordinary jobseekers who are hungry for new competences that enhance their professional opportunities.

The employment exchanges and agencies will receive personal requests. They will collate candidate profile information and engage them in recruitment processes.

During these processes, the exchanges and agencies will give them instruction on how to access MOMAMOOC and leave them to freely interact with the platform, using all available functionalities and services.

The platform will track all activities related to the learning experiences and performance in terms of acquired competences. These details together with the information collected at the beginning of the process are useful to evaluate the real benefits of the proposed solution. The results of this experimental phase will be analysed and presented in future works.

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MOOCs in fragile contexts

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Abstract: *Learning in fragile states is essential for conflict-resolution, peace-building and development, but represents challenges that relate mainly to educational content, cultural and linguistic sensitivity, on-site infrastructure and appropriate pedagogical models. As the transition from humanitarian aid to development is increasingly fluid, and with education considered to be a major enabler in lifting people living in fragile contexts out of dependence, educational initiatives are needed that address these challenges. This paper reports on a case study involving two refugees living in Dadaab Refugee Camp (Kenya) taking a MOOC offered on the Coursera platform together with the author. The study documents the constraints encountered by these learners, describes temporary solutions adopted as the course evolved, and proposes long-term solutions to be envisaged for MOOCs to provide a viable higher education contribution in fragile environments.*

Education in fragile states – charting the territory

Article 26 of the Universal Declaration of Human Rights states that everyone has the right to education which should contribute to the strengthening of respect for human rights and fundamental freedoms, promote understanding, tolerance and friendship among nations, and contribute to maintaining peace. However, wars and natural disasters disrupt the provision of education, as chronic crises and early reconstruction focus primarily on core humanitarian objectives such as food, water, health, sanitation, security and shelter. Faced with formidable challenges in both acute, protracted and complex emergencies, and a global refugee population of over 15 million at the end of 2012, humanitarian actors are obliged to focus on the immediate crises at hand and on core objectives, rather than on the provision of education, especially at post-secondary and life-long learning levels.

And yet, education represents a vital protection mechanism, contributes to political stability, and develops leadership potential in fragile states, so as to manage the transition from conflict to recovery and the transformation from fragility to stability. While the integration of education as an enabler in humanitarian action is of relatively recent origin, recognition of the importance of education for refugees has a long history going back to 1951 when the Convention Relating to the Status of Refugees was adopted which outlines in Article 22 the right to primary education for refugees. This was followed, in 1984, by the signing of a Memorandum of Understanding between UNESCO and UNHCR that allocated the responsibility for refugee education to UNHCR. The World Declaration on Education for All (EFA) identified conflict as a major barrier to meeting education needs, especially for displaced persons and refugees. In 2000 the Dakar Framework for Action re-emphasized the barrier that conflict poses to reaching the goals set out in the EFA and launched Education in Emergencies as one of its major programs. Shortly thereafter the Interagency Network for Education in Emergencies (INEE) was founded as a global, open network of members working together within a humanitarian development framework to ensure all persons the right to quality education and a safe learning environment in emergencies and post-crisis recovery. The founding of INEE contributed greatly to increasing awareness of the need for non-formal and formal education programs in emergency situations. INEE's focus was twofold: identifying ways of ensuring a certain level of quality and accountability in emergency education; and on mainstreaming education as a priority humanitarian response. Their efforts culminated in the development and adoption, in 2004, of the INEE Minimum Standards for Education in Emergencies. By drawing on the Convention on the Rights of the Child, the Dakar Education for All Framework, the UN Millennium Development Goals and the Sphere Project's Humanitarian Charter, the Minimum Standards represent the first global tool to define educational quality in emergencies. In 2010 INEE issued the revised version of the Minimum Standards for Education, Preparedness, Response and Recovery; these remain the fundamental tool for quality and accountability in the field of education in emergencies.

Education as a humanitarian response – working on the ground

Of the three approaches applied by the United Nations High Commissioner for Refugees (UNHCR), the humanitarian approach, which views education as a component of a rapid response, providing immediate protection to children and preventing human rights abuses, is certainly the one closest to the organization's mandate; the second, the human rights approach, actually aligns even more closely to the core mandate, but is less consistently implemented. The third, developmental approach, is the most forward-looking in that it views education as a long-term investment and focuses on integrating refugee children in national schools and rebuilding national education systems. This approach also features more clearly in the Message on International Cooperation 2013-2016 of the Swiss Agency for Development and Cooperation (SDC) in the Federal Department of Foreign Affairs of Switzerland. The first two approaches in particular, integrate formal, non-formal and informal education; but with formal education being more difficult to provide in fragile contexts, non-formal and informal education is becoming increasingly important, not least as a result of the promise of open learning initiatives in general, and in light of the emerging MOOC paradigm in particular.

One of the first impressions upon setting foot in a refugee camp is that of bare survival. This is closely followed by a sense of awe regarding the extraordinary resilience refugees exhibit in the aftermath of trauma and in the face of protracted displacement from their home communities. Their resourcefulness often masks a sense of hopelessness and lack of purpose with many refugees having spent the better part of their lives in camps. Of the few options available to them - remaining in camp, being resettled either in another part of the country or abroad, and repatriation - for many the silver-lining on the horizon remains the prospect of rebuilding their own communities and societies. Irrespective of which option they prefer, education is by far the only asset they own, and at the same time the most promising prospect for bettering their lives and for improving their livelihoods. Motivation thus drives their desire to learn, especially at the secondary and life-long learning levels. But there is also considerable uneasiness with regard to the sustainability of new educational initiatives; thus, initial contacts with new groups of learners require patience and a willingness to invest in building trust and confidence in the learning community before scaling up the actual learning activities.

Despite the great promise of virtual learning and mobile technology, motivation to learn remains less sustainable if this initial period of confidence-building is not given the attention it deserves. Experience with all-virtual courses delivered to learners in fragile contexts has shown that learners do not engage regularly, nor sufficiently, with the learning materials and that learning outcomes are often not reached, or that learners simply drop out. The distance in distance learning becomes infinity if all that connects learners in the field to teachers and tutors posted hundreds and thousands of miles away is a computer or mobile interface (Moser-Mercer, Kherbiche, & Class, 2014). Understanding and sharing the realities on the ground, being close to the experience of life in the camp, listening to the people at the receiving end of aid (Anderson, Brown, & Jean, 2012), lays the foundation for learners staying on course and successfully completing a course. While motivation is an integral part of learning in any kind of learning environment, it assumes much greater importance in the refugee context. One of the core humanitarian principles relates to not doing harm; raising refugees' hopes about an educational initiative that ultimately flounders due to a lack of understanding of life in the field and realities on the ground would definitely violate this core humanitarian principle. Engaging in educational initiatives, developing education offers and piloting education projects in the field must respect not only traditional research ethics requirements, but also International Humanitarian Law. Design, development and implementation of education projects on the ground thus require an intimate knowledge of the legal framework (International Refugee Law, International Humanitarian Law), the ability to benefit from protection offered by a humanitarian organization on the ground, requisite training regarding security in the field, a strong sense of purpose and the willingness to adapt quickly to changing circumstances.

The case study

Materials and methods

During the preparatory visit to Dadaab Refugee Camp in the lead-up to launching the InZone Basic Course (InZone, 2012) for humanitarian field interpreters working for UNHCR in the five camps (Hagadera, Dagahaley, Ifo 1, Ifo 2, and Kambios), the author established an inventory of connectivity options by visiting education centers set up by UNHCR, the Windle Trust for Kenya and the Norwegian Refugee Council. The InZone Basic Course for humanitarian field interpreters, a blended higher education course, combines a short initial period of several days of face-to-face training in the field, followed by several months of on-line learning in a dedicated learning environment built on the pedagogical principles of collaborative learning and expertise development. This course had already been successfully delivered in other fragile contexts in Afghanistan, Sudan and refugee camps in Kenya. Yet, each new context is carefully studied prior to launching the InZone Basic Course as no two fragile environments are exactly alike. Connectivity is considered not merely in its technical and technological expression, but in fragile contexts is very much embedded in organizational hierarchies that determine access options for learners. Studying connectivity options in Dadaab then served the dual purpose of preparing a new edition of the InZone Basic Course and exploring the potential for a MOOC-style course to be accessed in the camps.

In consultation with UNHCR two male refugees, aged between 24 and 28, had been identified as keenly interested in following a MOOC-style course and collaborating with the author with a view to gaining an improved understanding of the potential and constraints of such course offerings. Both refugees had completed secondary education and obtained a 2-year higher education diploma in their respective home countries, one in marketing and management, the other in commerce. They each mastered several languages, one spoke French, English, Kiswahili and Lingala, the other English, Amharic and Oromo. Their level of English was good, although one appeared to express himself better in French than in English. Both were computer-literate and owned basic cell phones. Neither had substantial experience in on-line learning, both had been considered too old to qualify for a scholarship to study abroad. Thus, formal and/or informal on-line courses remained the only higher education alternative if they wanted to pursue their education. The author met with them twice in the camp to discuss the case study, obtain their consent for documenting the experience, agree on the type of MOOC to be chosen for the study and to identify any immediate needs in terms of learning materials and internet access that could be met while the author was still in Dadaab.

The author's suggested course choice was a course offered on the Coursera platform (www.coursera.org) entitled Foundations of teaching and learning. Introduction. The course was developed and delivered by the Commonwealth Education Trust (CET), made reference to contexts of teaching and learning on the African continent, and deemed an appropriate cultural choice; it ran from August 4, 2013 through September 5, 2013, with a one-week extension for peer assessment, bringing the end of the course to September 12, 2013. This and two other course options were discussed with the two refugees, and both agreed that the CET course was a good choice as both had some experience as teachers and felt that such a course would support their future teaching activities, and also because it could be completed in five weeks. This represented an important step in the direction of respecting humanitarian principles and preparing the ground for successful collaboration.

Having already inspected the learning material for the CET course, as well as those for the other options, prior to arrival in Dadaab, the author was aware of the fact that learning materials were composed of a total of 16 video-lectures of between 9 and 14 minutes each, of additional web references and PDF-files, including 4 quizzes, and that the course required on-line peer-assessment of a total of 6 essays as well as one's own two essays. The author knew that the video-lectures represented an insurmountable obstacle for fragile contexts and negotiated with Coursera and CET to download all video-files while still in Kenya, and to be allowed to furnish the two refugees with these learning materials on a USB key prior to the official launch of the course. This represented yet another important step in respecting humanitarian principles, as the two refugees were keen to take this course in order to obtain a course certificate to further their own livelihoods, and it was thus critical that the author not do any harm by pursuing this project merely from the perspective of an educational pilot.

It was agreed that the two refugees would follow the course either on their cell phones or via access to a computer in the UNHCR compound while the author would participate and document the case study from a high connectivity environment, that there would be regular contact between the two refugees and the author in order to resolve any issue that would represent an insurmountable obstacle for completing the course, without such support infringing upon the honor code that all participants of the course were expected to abide by. It was also agreed that a debriefing session would be scheduled once the course had concluded, so as to allow the author to review the different challenges encountered during the course and discuss with the refugees the implementation of some of the implemented and proposed solutions in greater detail.

Results

Based on fairly extensive experience with virtual learning in fragile contexts the author anticipated the learners' challenges to fall essentially into three main categories: 1) technological (T), 2) cultural (C), and 3) linguistic (L). For the purpose of this case study, technological challenges are defined as comprising any and all technical and organizational constraints that complicate access to the virtual learning platform, or make access entirely impossible. Cultural challenges refer to dimensions of learning content, learner exchanges (forums) and of intellectual approach that prevail in the learning environment. Linguistic challenges relate to the level of proficiency required in English (the course chosen for this case study did not offer subtitles in other languages) to work with the learning materials and to satisfy the criteria laid down by the course organizers for assessing learning outcomes (essays).

It was decided to track each challenge in a running log, record the temporary solution that was found to swiftly resolve each problem as time was always of the essence, and to propose more long-term solutions with a view to preventing future problems from arising whenever MOOC-style courses would be offered to learners in fragile contexts. Table 1 presents challenges in a chronological order, as they arose during the case study. This presentation format was chosen bearing in mind that producers of MOOC-style courses will often take a more linear approach to course development, and being able to identify challenges as they will present themselves chronologically may help producers identify more closely with how learners navigate the course. Each challenge is coded following the categories identified above.

Challenge/constraint	Interim solution adopted for case study	Final solution
Video lectures (T) Length (download speed/volume)	Negotiate advance copies, save on USB key, forward key to learners.	Less reliance on video lectures, use of short podcasts produced for low-bandwidth environments and with variable pixel choices, as even at 8 frames/s, a static speaker can be viewed without problems; store files on local servers (e.g. Nairobi for the Horn of Africa); distribute files ahead of time to select locations.
Signing up for course – signature track (T) Requires picture ID, web cam, etc. On **Signature Track**, each assignment requires resubmission of picture ID with web cam and keyboarding recognition.	Local support through UNHCR was needed to register participants for signature track. The first essay assignment had to be manually submitted to Coursera staff for recording in the course learner database.	E-mail template, cell phone picture (self-picture), cell-phone photo functionality for ID. MOOC platforms should develop alternate ways of learner identification and re-identification, possibly in collaboration with humanitarian organizations on the ground.
Readings/videos (T) Additional readings and videos announced as the course progressed.	Skip if not mandatory for assignments.	Create database of all course files as local back-up for reference and/or include all materials on USB keys.
URLs (T) For further reading and research (time-bound).	Skip if not mandatory for assignments.	Preference should be given to screenshots, rather than interactive work with URLs. Allow learners to take advantage of burst connectivity to explore URLs.
Quizzes (T; C; L) Require reliable connectivity while quiz is taken. Phrasing of questions and pedagogical approach of multiple-choice, with often only fine semantic distinctions between choices requiring high levels of proficiency in English.	Back-up file of all quizzes negotiated with course provider and made available locally; randomization of answers to multiple choice questions during retakes of the same quiz were signaled to learners.	Non-interactive static document; create different versions of each quiz for retakes; Wording of questions must be much clearer (no double-barreled questions, no focus on shades of meaning whose comprehension relies on highly advanced levels of language proficiency).
Peer assessment (T; C) Requires extensive log-in time in order to read and assess multiple peer essays.	Assess only one essay at a time; no satisfactory temporary solution was found.	May create anonymity problems in fragile contexts; search for other pedagogical tools to achieve similar learning objectives (e.g. use of problem-case scenarios).

Criteria for peer assessment (L) Lack of clarity in defining different criteria upfront and lack of consistency in application of these criteria by learners.	The quality of the language cannot be dissociated from the notion/criterion of *readability* and *content*. Learners in fragile contexts come from oral traditions and their written language skills are often wanting. Ensure that English is not graded.	Instructions must be clear and not intimidating; in challenging connectivity environments time spent on-line is costly and instructions must be well-tested in advance and applied consistently. Search for other pedagogical tools to achieve similar learning objectives.
Desktop and mobile approach (T) Learning environment did not scale to mobile devices.	Anticipate what scales to cell phones and advise learners accordingly.	Scale to cell phones (responsive design), limit functionalities in the learning environment that will be used in a mobile rather than a desktop context; feature important content prominently.
Forums (T; C; L) Chaotic organization of forums makes participation for those in fragile contexts impossible; these forums are not visible/readable on cell phones; require extensive and regular connection time with questionable contribution to learning outcomes.	Ignore if connectivity is poor. Only one comment posted by one of the two refugees during the CET course, and only after both learners had obtained access through UNHCR desktop computers.	Structured forums; threads should not be freely created by learners; impose forum and thread format/labeling to clearly relate to assignments/discussion points. This requires advance planning and close moderation. Content tagging (produce tag cloud) may shorten connection time requirements and steer learners to relevant content faster.
Pedagogy (C; L) Learners in fragile contexts come from traditional teaching cultures; transition to new pedagogical models can be abrupt and disorienting.	Running commentary offered by researcher on specific pedagogical dimensions allowing learners to anticipate problems and supporting them in finding solutions.	Careful adaptation to modern forms of learning; there has to be a transition from teaching to learning, with more content provided up front and learner autonomy progressively increased as the course evolves.
Connectivity (T) Limited, irregular, subject to interruptions, costly.	Ensure back-ups are created with the help of local support; learners used course USB provided by the researcher to back-up and "carry" their course when not connected.	Ensure that each learning activity fits into a 10-minute learning space; write recommendations for creating back-up versions of activity uploads to guard against data loss. Respect video/podcast constraints, produce to low-bandwidth and/or multiple-bandwidth standard, offer different pixilation formats that respect download speeds for different fragile contexts. Store back-up files locally (computer lab, if available) as MOOC platforms often do not open in fragile contexts or on mobile phones, even when located in 3G networks.

Time-zone differences > Deadlines unclear (T; L)	Negotiated directly with support from Coursera, manually transmitted refugees' essays to Coursera for direct uploading to peer assessment section.	Indicate deadlines more clearly for different time-zones; include time-zone functionality on platform.
Time management (C; L)	Refugees indicated that they had little time to take the course. Workload of 3-6 hours/week is a maximum. By indicating potential constraints immediately and offering solutions in advance, the trial-and-error approach could be limited to a minimum. Taking the course alongside the refugees as a registered learner was essential for the researcher in terms of anticipating problems and solving them before refugees stumbled over them.	Time management takes on a different dimension in refugee camps due to the very difficult transport and security situation. Learners cannot shift smoothly from work to learning, it takes hours to get around, daylight hours are limited, curfews are imposed and access to internet points thus severely limited. The notion of learning after work hours is largely untenable. Negotiating with NGOs for whom refugee learners work in order to make time for learning available during work hours is theoretically an ideal solution, but rarely works out in practice, given the harsh reality of fragile contexts.
Financial constraints (C) Cost of signature track; Cost of connectivity (related to download volume).	Negotiated scholarships with Coursera. Offered to purchase additional credit on cell phone subscription (top-up). However, one cannot top up cards of other subscribers from abroad.	Negotiate expected data volume with telecom providers. Estimate total download and upload volume per learner for entire duration of course in order to submit scholarship requests to funding agencies. This approach has worked for InZone courses delivered to Kakuma Refugee Camp in 2012/13.

Summative evaluations: The two refugee learners achieved very good results in the 4 quizzes and on their two essays. Each of the 4 quizzes was made up of 10 questions, with one point awarded for each question answered correctly. The two learners achieved an average score of 8.25/10 on the 4 quizzes. In addition to one quiz per week, two essays of about 700 words each had to be submitted for peer and self-assessment. Essays were graded on a scale from 1-10, with one being the lowest and 10 the highest score. Each essay had to be assessed by three peers and ultimately self-assessed for the final score to be computed as an average of the points awarded by all four assessors. The average score for the 4 essays assessed during this course for the two refugee learners was 8.5/10.

Learning support: Regular e-mail communication was deemed most efficient in providing remote learning support to the two refugee learners. During the 4.5 weeks of the course, the researcher received a total of 21 e-mail messages from the two learners and sent out a total of 26 e-mail messages (replies, encouragements and inquiries about learning progress); the researcher also exchanged a total of 23 e-mail messages with the UNHCR community services officer who ensured contact with the refugees on the ground. The refugee learners themselves worked on average 6 hours over the duration of the course with the UNHCR community services officer on locally resolving signature track, web cam, and assignment upload problems and implementing the solutions suggested by the researcher. Both learners also spent on average 8 hours over the duration of the course with other refugees in the camp with whom they would discuss essay topics and share their newly acquired knowledge.

The debriefing session was carried out via Skype and scheduled to follow the official release, on the Coursera platform, of the course results. The debriefing session was hosted by the supporting community service officers of UNHCR to allow learners to rely on good connectivity for the duration of the session, which lasted one hour and a half. The debriefing topics had been sent to the learners ahead of time in an effort to remain efficient in a low-connectivity environment.

Debriefing questions related to the three main categories of challenges - technological, cultural and linguistic -, and were designed to solicit additional information that would be useful to complement the information logged throughout the course.

With regard to technological challenges, more precise information was supplied as to the use of mobile devices compared to that of desktop computers. Both learners used their cell phones 75% of the time to complete work on the course. The phones in use were not smartphones and the screen display thus very small and ill adapted to managing learning activities. Neither had access to one of the few computer labs (secondary schools, Youth Education Project - YEP-Centers) distributed in the various camps that make up Dadaab and thus could not engage with the learning material after work hours. It had thus been necessary for the author to negotiate access to a desktop computer in the UNHCR compound to allow the refugees to compose essays and take quizzes, as this was where both refugees had day jobs. In light of the fact that transport back to the actual camps is organized immediately after the work day ends, only short lunch breaks could be used to gain access to a desktop computer, leaving all additional course-related work to be carried out on cell phones. This had significant financial implications as telecom access cost is almost prohibitive for refugees. Their recommendation was for course providers to use applications such as WhatsApp Messenger, a cross-platform mobile messaging application that allows for the exchange of messages without having to pay for SMS, or to use Skype in order to circumvent high mobile access charges. It emerged clearly that without the delivery to the field of pre-loaded flash drives containing all required learning and assessment materials, refugees would not have been able to stay on course, as the Coursera platform did not load properly on cell phones due to slow download speeds. An additional advantage for locally available course material was highlighted by both refugees: learning materials downloaded by anyone in the camp was always liberally shared locally so that for the cost of one download a larger number of interested and motivated learners could be reached.

With regard to cultural challenges, refugees indicated that at times the level at which the course was pitched was rather high, but that this was often more a question of contending with linguistic challenges, such as dealing with shades of meaning in answering quiz questions, or composing essays within the framework of an intellectual culture that was not their own, and also due to the fact that their written proficiency in English did not match their oral proficiency. One challenge both referred to as being considerable was the shift from a teacher- to a learner-centered pedagogical model. This was most pronounced when they were asked to generate ideas instead of staying in receptive mode. Both mentioned that the learning materials, while sometimes referring to the global south, still were anchored in the global north and that considerable effort had to be expended at times to transform examples to the African context in general, and to their fragile context in particular. One way both learners managed to cope was to engage in local discussions with other teachers in the camp, thus creating their own small discussion groups. This allowed the researcher to raise the dimension of peer support and peer tutoring and to assess the extent to which her own involvement in the course and the support that had been provided was considered too extensive, adequate or insufficient. The author's support and mentoring remained deliberately limited to anticipating and solving problems of access and the meeting of deadlines, to providing regular email or text message encouragement with regard to completing assignments and quizzes, and to regular short messages that signaled that she was there to provide assistance if need be. While contact was very regular during the first 10 days of the course due to significant access problems described in Table 1 above, refugees became increasingly autonomous knowing that technical issues would be promptly identified by the researcher and resolved in time for them to meet deadlines. During the debriefing, however, it emerged that although the researcher's overt support decreased, both refugees clearly indicated that having a reliable support/mentoring system was decisive for their motivation to complete the course. Constructing such support systems was considered an essential ingredient to rendering MOOC-style courses accessible for refugee learners. Clearly, having thousands sign up for a course and accepting drop-out rates of up to 90% and more, would not represent an ethically acceptable practice in a humanitarian context. Relying solely on the ingenuity of learners, as appears to be common practice with MOOCs that are not framed by a socio-constructive pedagogical model, is clearly not in keeping with responsible education in emergencies.

Moving forward

MOOCs are disruptively innovating higher education around the world. Most platforms are configured for course delivery to learners in highly developed countries, and pedagogical models depend heavily on the notion of "re-creating" a live classroom experience by segmenting live lectures into bite-size portions as streaming media. They are predominantly offered in English and largely reflect Western intellectual and cultural traditions. With informal education models representing an important educational alternative in fragile contexts, a careful analysis of learners' needs and the development of context-appropriate solutions will go a long way towards leveraging these informal education offerings in higher education in emergencies. In order to serve students living in fragile contexts with limited and often interrupted connectivity, MOOCs that aspire to engage learners from these environments need to consider offering suitable engagement tools such as lower resolution versions of videos and/or podcasts of short duration, facilitating the use of offline burst connectivity tools that download the minimum text-only information during connection, allow offline reading and composition of replies, and then manage up-load interaction in a second burst. They need to be built around responsible pedagogical models that engage learners to interact with each other on the ground, that leverage non-mainstream intellectual approaches, are offered in several languages (English and at least one other local language), allow learners sufficient time to engage asynchronously with the learning material, provide for the design of learning materials with a view to re-use in local and other fragile contexts, and deploy significant efforts to ensure learner retention through peer mentoring and tutoring. Such courses should be configured for short periods of time, such as 4-5 weeks, so as to maintain motivation by setting achievable goals. Linguistic diversity would enhance cultural expression and promote cross-cultural communication, the lack thereof being often at the root of conflict. While fragile contexts and zones of active conflict feature a diversity of learners, similar to what would be found in any other context, the humanitarian dimension of conflict zones requires that design, development and delivery of education respect International Humanitarian Law. Accountability is an essential pillar of any and all education initiatives in emergencies: Once a course is launched, not one refugee should be left behind.

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Cultural Translation in Massive Open Online Courses (MOOCs)

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Abstract: *This paper discusses how MOOCs are made relevant to students in their respective cultural settings. Practices that enable such contextualisation, or cultural translation, are investigated in five Coursera MOOCs. I collected data from lecture videos, quizzes, assignments, course projects and discussion forums, using a cultural translation observation protocol I developed for this study. I found that cultural translation was enabled in the course design of two MOOCs and in the forum discussions of all the five MOOCs. The MOOC design that enabled cultural translation included activities, tasks, assignments and/or projects that are applicable to students' own settings and gave students freedom to choose the setting of their projects and people with whom they worked. As for forum discussions, students in the five MOOCs created informal study groups based on geographical locations, languages and professional disciplines. Findings in this study can inform best practices in designing and learning courses addressed to a culturally diverse group. The study is particularly important to MOOC designers and students.*

Key words:
MOOCs, cultural translation, learning setting, student-oriented design, study groups.

Introduction

The theme of Massive Open Online Courses (MOOCs) has recently dominated the debate in higher education, and educational technology in particular. These courses addressed to the global masses have triggered polarized discussion in academia, the media and the blogosphere. On the one hand, there is optimism that MOOCs are transformative for higher education (Thrun, 2012; Koller, 2012; Anderson, 2013; Horton, 2013). MOOCs are also perceived as a possible way to open access to education (Koller, 2012; Anderson, 2013), especially to learners from developing countries (Koller, 2012; Thrun, 2012). The potential contribution of MOOCs to educational development in developing countries seems to be perceived by important stakeholders. In October 2013, the World Bank signed an agreement with Coursera to provide MOOCs addressed to learners in developing countries (World Bank, 2013). On the other hand, it has been argued that MOOCs, in their original format, are not ready to be used for improving quality and access to higher education at the global scale (Daniel, 2012; Bates, 2012). MOOCs that are currently taught to students from almost any corner of the world need to be flexible enough to enable cross-cultural relevance. Without cross-cultural relevance, meaningful learning is significantly reduced, especially for students that take MOOCs developed in foreign settings.

Practically, a perfect cross-cultural relevance is quite difficult to achieve in MOOCs since the courses are open to anyone who has access to the Internet. This openness enables students from different cultural backgrounds to enrol and take the courses. The Hofstede Centre suggests six cultural dimensions on which various countries can be compared (http://geert-hofstede.com/dimensions.html). These dimensions are power distance (PDI), individualism versus collectivism (IDV), masculinity versus femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IND). Taking the example of the IDV dimension and comparing the United States of America (USA), Sweden, the Philippines and Tanzania, the dissimilarity between countries, especially the developed countries and the developing ones, stands out. While the IDV indices for the USA and Sweden are high (91 and 71 respectively) those for the Philippines and Tanzania are low (31 and 25 respectively). Hence, some business ideas from an individualist society might not be compatible in a collectivist society.

MOOCs can, however, be designed with some flexibility to allow students from diverse cultures to adjust the courses to their specific settings. Such a recontextualisation of MOOCs is not a brand new idea. D'Antoni (2007) advocates cultural translation as an important feature of Open Educational Resources (OER) to enable the adoption of these resources in foreign educational settings. Various institutions in Europe, namely University of Jyväskylä (Finland), Josef Stefan Institute (Slovenia) and The Universidad Nacional de Educación a Distancia (UNED) (Spain), have already been engaged in cultural adaptation of OER (Holtkamp et al., 2011). Mikroyannidis et al. (2011) argue that a collaborative adaptation of OER in the OpenScout project was enabled by social networking. Equally, Wolfenden et al. (2012), Lane & Van-Dorp (2011) and Kanuka & Gauthier (2012) recognize the critical importance of the possibility of adjusting OER to other settings. However, while OER allow no-cost access, use, repurposing, reuse and redistribution (Commonwealth of Learning & UNESCO, 2011) to increase the cross-cultural relevance of the resources, most MOOC materials are copyrighted under licences that prohibit such practices. These licences restrict making the original versions of the courses relevant and easily understandable to audiences from other cultural, geographical and professional settings. Tailoring MOOCs for a diversity of worldwide audiences has, indeed, been pinpointed among the challenges facing MOOC providers (Leber, 2013). The more students' culture is distant from the MOOCs' original culture, the more likely they are to find the courses difficult to understand. According to Jhunjhunwala (cited in Bartholet, 2013), language and cultural issues are challenges to many Indian students' comprehension of American MOOCs. Therefore, flexibility that allows students to adjust MOOCs to their everyday life and learning setting would make their learning more meaningful.

A low level of cultural translation or recontextualisation of MOOCs affects course management. Liyanagunawarderna et al. (2013) argue that cultural misunderstandings are likely to occur, especially in MOOC forum discussion. According to these authors, students can unintentionally make use of culturally embedded humour or expression and exclude learners that do not share their culture. Equally, students who are not highly competent in the MOOC language, especially those that have learned that language informally, might unknowingly use slang expressions. This might hinder the understanding of other participants who are not from their regions. They might even innocently use inappropriate language. Distinguishing slang and formal language might be one of the difficulties encountered by foreign language learners, especially when informal learning has been a significant component of their language learning. It has also been noted that although cultural diversity is an invaluable resource in MOOCs, it might easily trigger the feeling of being offended for some students (Liyanagunawarderna et al., 2013), even a clash of cultures (Severance & Bonk, 2013). That is why multicultural literacy and tolerance of different perspectives are critical ingredients for an effective discussion in such a diverse environment. Besides difficulties that might occur in MOOC learning, the disparity between MOOCs and local context and culture has also emerged as one of the potential hindrances to the uptake of MOOCs in foreign settings (Young, 2013; Sharma, 2013). Suspicion of foreign MOOCs, especially those imported to developing countries, is often triggered by the lack of empathic orientation in seeing the local problem. Claims that MOOCs open access to education in developing countries seem to be not supported by convincing evidence that pioneers understand the local situation. The lack of such evidence leads to criticism of colonial attitudes against those who say they improve education in developing countries through MOOCs (Sharma, 2013; Liyanagunawarderna et al., 2013). Hence, cultural translation enablers need to be an integral component of MOOCs if these courses have to accommodate learners who enrol from a broad diversity of cultural backgrounds.

While no one size can fit the entire global body of MOOC students, best practices help students to adjust to the course in ways that make sense to them. One of many such practices has been the translation of MOOCs into foreign languages. According to Thrun (2012), CS221 Artificial Intelligence, which is the first MOOC he taught at Stanford University in 2011, was translated into 44 languages. According to the author, this translation was made by 2000 volunteers who were enrolled in this class. Another good practice toward cultural translation in MOOCs consists of starting local study groups or geographical clusters for collaborative learning (Blom, et al., 2013). According to these authors, collaborative learning in such groups was required from students enrolled at École Polytechnique Fédérale de Lausanne who took MOOCs offered by this institution. Such groups are also initiated in various Coursera MOOCs. Alternatively, students might create study groups based on disciplines or fields of interest if the MOOCs they are taking can be applied to various disciplines. For instance, knowledge and skills learnt from a MOOC on entrepreneurship and innovation can be applied in the fields of education, computer science, business and others. For this reason, MOOC students who are employed as educators might want to study together and those who are employed in business likewise. Unlike translation into a foreign language which requires the intervention of a translator, who can be seen as a third person, the development of study groups based on geographical location or field of study requires engagement of students. The final practice discussed in this paper consists of including projects in a MOOC (McAndrew, 2013). Such projects can be designed in a way that requires students to find a solution to a real life problem. Cultural translation is enabled when students are given freedom to choose the problem in their respective societies. Implementing this practice is mainly the responsibility of the course designer.

The current study discusses MOOCs students' and instructors/designers' best practices that enable recontextualization/cultural translation of the courses. It investigates how activities oriented to solving problems in students' respective societies are incorporated in MOOCs. It also probes how students make their MOOC learning relevant by learning through the language they are comfortable with and formulating study groups and/or geographical clusters for collaborative learning. Two research questions underpin the study:

- How were activities oriented to solving problems in students' respective societies included in MOOCs?
- How did students make their MOOC learning relevant to their context?

Research methods

I conducted this research as a multiple case study that involves a cross-case analysis (Thomas, 2011). The study is based on qualitative data collected from five Coursera MOOCs. Table 1 lists the MOOCs that I investigated.

MOOC	University	The run time
Artificial Intelligence Planning (AIP)	University of Edinburgh	28 January-3 March 2013
Internet History, Technology and Security (IHTS)	University of Michigan	1 March-28 May 2013
Leading Strategic Innovation in Organisations (LSIO)	Vanderbilt University	Vanderbilt University 5 March-6 May 2013
Inspiring Leadership through Emotional Intelligence (ILTEI)	Case Western Reserve University	1 May-12 June 2013
Competitive Strategy (CS)	Ludwig-Maximilians-Universität München	1 July-11 August 2013

Table 1: MOOCs investigated in this study

To be able to collect relevant and detailed data from these MOOCs, I enrolled in the courses and took them with full engagement, like other students that were committed to studying them. Prior to the data collection phase, I sought ethical approval for the study from the University of Leicester. After securing approval, I collected data using a MOOC observation protocol (Table 2) I had developed for this purpose. The data were gathered from MOOC lecture videos, weekly quizzes, exams and assignments as well as discussion forums. Focusing on lecture videos, weekly quizzes, exams and assignments enabled me to identify activities that provide students with opportunities to apply what they learn from the MOOCs to finding solutions to problems in their respective settings. As for discussion forums, this is where I identified study groups for collaborative learning that had been created and the rationale behind their creation.

Table 2: MOOC cultural translation observation protocol

MOOC/Aspect	Design			Study groups			
	Lecture videos and in-lecture quizzes	Weekly quizzes	Assignments /project	Discipline	Language	Geographical location	Others
AIP							
IHTS							
LSIO							
ILTEI							
CS							

I aimed to maintain construct validity and reliability in my study. To this end, I applied Yin's (2009) principles: using multiple sources of evidence, creating case study databases and maintaining a chain of evidence. Multiple sources consisted of the five MOOCs as well as various MOOC components discussed earlier: quizzes, final exams, assignments and discussion forums. I saved all the materials relevant to this study on two external hard drives for later reference. The folders that contain these materials on the two hard drives constitute the case study database.

As for maintaining a chain of evidence, I used a cross-sectional reference to link the research problem, questions, research methods and evidence, from my introduction to my conclusion.

The MOOCs I analysed in this study were delivered by various universities. To be able to engage in these MOOCs, I selected the courses in which I was interested. This engagement with MOOCs of interest to me reflects most students' engagement with their courses. Since I wanted to approach cultural translation from a student's perspective, I tried to simulate how students engage with courses, from the course selection to the course completion level. The more courses respond to students' interest, the more students tend to engage with their learning. Had I not taken MOOCs I was interested in, I might have dropped out before I had finished the courses, and my feeling about the courses would be unlikely to reflect that of other students who seriously engage in their learning. As an engaged MOOC student, I was a participant observer. Yin (2009) defines participant-observation as a mode in which the observer assumes various roles and actively participates in the phenomenon that is being studied (p. 111). He notes the researchers' ability to see the reality from the point of view of someone who is inside the case study rather than external to it as one of the major advantages of participant-observation (p. 112). In my case, I could see cultural translation from the MOOC students' point of view rather than from the perspective of an external commentator. Hence, interest-based engagement with the courses enabled me to sympathise with other course takers.

Findings

At least one study group was created based on geographical locations, languages and fields of study. There were two attempts to create study groups based on students' age in IHTS. However, these initiatives were not successful. Some of the language-based study groups functioned in foreign languages I was not familiar with. To identify these languages, I used Open Xerox (http://open.xerox.com/Services/LanguageIdentifier), which is an online tool for language identification. The findings in this study are presented in the order the research questions were asked.

Research Question 1: How were activities oriented to solving problems in students' respective societies included in MOOCs?

The five MOOCs share various aspects, mainly similar video lectures, and in-lecture quizzes for formative assessment, weekly quizzes and forum discussions. However, there are disparities concerning how students are placed at the centre of some of these activities. In-lecture and weekly quizzes in all these MOOCs were content-oriented. Similarly, the final exams for AIP, IHTS, ILTEI and CS focused on the content. However, LSIO and ILTEI incorporated reflective activities and projects that required students to apply the MOOC concepts and theories in their own settings and workplaces. How these two MOOCs included activities that are applicable in a diversity of students' settings is detailed below.

The LSIO MOOC included innovation constraint diagnosis surveys in its activities. In these surveys, the student had to evaluate her/himself, the organization or school s/he works for or s/he got service from vis-à-vis innovation constraints at the individual, group, organizational, industry/market, society and technological levels. These evaluations were done using constraint diagnosis surveys developed by the instructor. Then, the student had to keep a copy of the completed survey to use it as a reference for reflective writing, which was submitted to peers for feedback. At least three peers provided feedback to this writing and other peer-graded assignments. To receive feedback from their peers, students had also to provide feedback to at least three classmates.

Moreover, the course had two tracks: a standard track in which students were not required to work on an innovative project, and a studio mastery track in which students had to complete an innovative team project. The studio mastery track project deliverables were submitted for peer feedback across six stages. The project had to start in a team of three to six people. In the first stage, each team member suggested an innovation project to the team. Then, the team discussed and agreed on one project to work on and created a project design brief, which was the output at this stage. Considering the high rate of drop out in MOOCs, the instructor tolerated drafts of the projects done by only two people in subsequent stages. In the second stage, each individual student generated and shared 101 ideas on the group project. In the third stage, the teammates shared one another's 101 ideas and distilled all this collection of ideas to formulate four solution concepts. Then, they defined each concept, presented the four concepts graphically and identified challenges and opportunities. In the fourth stage, each team member reviewed the feedback on their Stage 3 deliverable, chose the solution concept s/he personally thought was the best and completed a concept assessment worksheet that enabled her/him to evaluate the concept relative to the six categories of innovation constraint highlighted earlier. Then, s/he had to identify two most compelling constraints and devise strategies to mitigate them. In the fifth stage, the team came back together to determine the most promising of the four solution concepts they had formulated in Stage 3 and evaluated in Stage 4. Using a project prototype template developed by the instructor, the teams defined the information-generation experiments they would use in addressing remaining questions as they moved toward the execution of their project. The final stage had a video presentation of the entire project as a deliverable.

Similar to LSIO, ILTEI had reflective activities that the instructor referred to as personal learning assignments. These activities were student-centred in that they required students to reflect on how various course concepts apply to their lives. For instance, one of the personal learning assignments required students to think of a leader they worked with who was so inspiring that if s/he moved to another company the employee (MOOC student) would want to seek a transfer and move with them or volunteer there. Then the students had to write specific things the leader did or said and reflect on how that leader made the employees feel. Finally, students shared their reflection notes and their feelings during the reflection experience.

ILTEI also had a practicum track that is comparable to LSIO's studio mastery track. Each student that followed the practicum track was required to conduct three practical tasks in his/her setting or workplace and write a report on each of them. The first task required the student to identify two volunteers to participate in coaching sessions. The student assumed the responsibility of a coach with compassion and the volunteers were coachees. The student/coach had to ask coachees questions about their future dreams or ideal self (vision or hope), their current value and virtue (mindfulness), the person that helped them most become who they are (compassion) and their desired legacy, experience or achievement (playfulness). The coach would use such questions to maintain coachees in a positive emotional attractor (PEA) state characterized by happiness, smile, energy or similar tipping points. Then the coach (MOOC student) had to write an essay that reported how the coachees moved between PEA and Negative Emotional Attractor (NEA) states, strategies used to bring the coachees back to the PEA state and the result of the conversation. The second task asked the student to interview ten to twenty people who were close in her/his life or workplace about the time s/he was at her/his best. Then, s/he had to look at the interviewees' responses and identify recurring patterns as well as emotional and social intelligence patterns. Finally, s/he had to submit a report of at least 500 words on this activity. As for the third task, which was similar to the second one, it required the student to ask her/his colleagues at work to pinpoint the time in which they were proud of the organization or team as well as when they were at their best. Then, s/he had to identify recurring patterns or themes from the colleagues' responses, which would constitute the elements of the shared vision for the organization or team. Based on these elements, the students had to draft a vision statement of at least 500 words for their organization or team.

Research Question 2: How do students make their MOOC learning relevant to their context?

In LSIO, students could take advantage of the freedom they were offered and choose projects that were relevant to their cultural settings. For this to happen, students would choose teammates from the same setting or ones who were familiar with that setting. Alternatively, students could work on a project that would be transferable to their jobs, or applicable to their fields of employment or study. This could be especially valuable for MOOC students interested in multicultural literacy development. Such students preferred to work in teams whose members were from various cultural backgrounds. It was possible to form project teams based on one of the two criteria or both. Similarly, students in ILTEI could choose coachees and interviewees from their workplace or families. They could also choose volunteers among people who shared their professional interest. The freedom offered to students to choose their projects was a great enabler of cultural translation.

Students also made their MOOC learning relevant to their respective contexts through the way they engaged in the five MOOCs' forum discussions. In this respect, they created informal study groups based on geographical locations, fields of study/work and languages. Table 3 summarises study groups in the five MOOCs.

MOOC/Aspect	Study groups based on			
	Discipline	Language	Geographical location	Age
AIP	5	4	5	0
IHTS	0	7	16	2
LSIO	14	6	40	0
ILTEI	3	7	41	0
CS	0	5	26	0

Table 3: Rationale behind the creation of study groups in MOOCs

As indicated in Table 3, study groups based on geographical location generally dominated in IHTS, LSIO, ILTEI and CS, but they were only five in AIP. ILTEI and LSIO had a higher number of study groups based on geographical location than other MOOCs: 41 and 40 groups respectively. This was probably because contributions in the forum discussions counted toward the overall grades in both MOOCs. In addition to study groups based on geographical location, each of the five MOOCs had study groups based on language. Study groups based on disciplines of work or study were created only in LSIO, AIP and ILTEI. The number of such study groups was far higher in LSOI than in the other two MOOCs: 14, 5 and 3 respectively. As for study groups based on students' age, this was attempted only in IHTS. Two students started threads in attempt to discuss the content with peers of their age group: under 21 and under 16 respectively. However, these age-based threads could not attract other students: they received only three and five responses respectively.

Discussion

The way assignments and projects in LSIO and ILTEI were flexibly designed demonstrates that it is possible to tailor MOOCs to individual learners' needs, in their own cultural settings. Project-based activities (McAndrew, 2013) constituted a significant component for students in the studio mastery track in the LSIO MOOC. In both LSIO and ILTEI, students could relate their learning to their everyday/professional life. The inclusion of tasks, activities and assessments that are relevant to various cultural and professional settings in courses is what can be termed diversely student-oriented design. Unlike teacher-oriented design in which students work on tasks conceived from the teacher's perspective and setting, tasks in diversely student-oriented design are conceived from the learners' perspective and can apply to various cultural settings. Student-oriented design can be considered narrow if only students from the teachers' settings or other similar contexts can see a direct application of the course to their professional settings or everyday lives. However, in both LSIO and ILTEI, students from any cultural background could apply their learning in their specific settings. In other words, the student-oriented design was culturally diverse in the two MOOCs. In this way, the two courses were designed to allow a cultural translation (D'Antoni, 2007). In other words, students from various cultural backgrounds can adjust their learning to their own setting since they are given freedom to choose the project and beneficiaries of their work. The two MOOCs constitute good examples of how contextualisation (Wolfenden et al., 2012; Lane & Van-Dorp, 2011; Kanuka & Gauthier, 2012) can be achieved. As for AIP, IHTS and CS, opportunities for students to adjust their learning within their setting were limited. It should be noted, however, that the nature of some courses does not allow easy contextualisation for all settings. For instance, AIP and IHTS require students to be in a setting with high technological access and be familiar with at least basic computer and Internet technology to have a grasp of the application of the course concepts. Briefly, activities that enable students to solve real life problems in their respective settings can be included in MOOCs by designing for tasks, assignments and projects that can be made relevant to various settings and by offering freedom to students to choose the setting of their projects and people they work with. This answers the first research question.

Students created study groups or teams for their project based on geographical locations, languages or professional disciplines. Unlike MOOC students enrolled at École Polytechnique Fédérale de Lausanne who were required to participate in collaborative learning groups limited to this institution (Blom, et al., 2013), study groups were not required in the five MOOCs I investigated (except the LSIO project teams). LSIO had far more discipline-based study groups than other MOOCs. This may have been catalyzed by the requirement to work in teams on the project for students in the studio mastery track. Many of these students might have preferred to team up with peers who shared their professional interests. With regard to study groups based on geographical locations, AIP had far less groups than other MOOCs. In AIP, only five geographical location-based groups were identified in the forum discussion. It should, however, be noted that collaborative learning in this course took place in many spaces including the discussion forum, the course wiki, twitter and the Second Life virtual world. These alternative discussion environments competed with the course discussion forum in attracting students' interest. As for the language-based study groups, they were present in each of the five MOOCs. Therefore, students made their MOOC learning relevant to their context by choosing and working on projects that were applicable in their own settings and by discussing the course materials with peers who understood their cultural context. This answers the second research question: "How do students make their MOOC learning relevant to their context?"

Concerns that MOOCs developed in Western societies might not suit other settings (Young, 2013) are partially true, but this is mainly an issue in the course design and students' engagement. As discussed above, some MOOCs are designed to enable cultural translation at a high level, others are not. Equally, students create study groups to discuss MOOCs from their own perspectives. Some MOOCs might not be relevant to students in some settings. However, this tends to be an issue also for students who take other online and face-to-face courses developed elsewhere. This is especially the case when a course was not designed to accommodate students from a diversity of cultural backgrounds. In an earlier paper (Nkuyubwatsi, 2013), I highlighted that international face-to-face students may find their learning not relevant to their own setting, especially when their classes are not internationally diverse in terms of participants. In a class with only one international student, class discussions easily slip into local cultural realities and, therefore, unintentionally exclude the stranger student. Equally, instructors can easily design culturally embedded activities that do not accommodate the minority foreign student. Home students in classes dominated by their colleagues from a single foreign cultural background can have a similar experience. However, if the class cultural diversity is kept in mind in the design process, the course can appeal to all students, regardless of their backgrounds as demonstrated in LSIO and ILTEI.

As noted earlier, the embedding of cultural translation enablers might be quite difficult in some courses, depending on their nature and focus. However, designers of MOOCs and other courses addressed to a multicultural audience who try their best to incorporate cultural translation enablers are more likely to provide a cross-cultural satisfaction towards their courses. AIP, IHTS, and CS could have embedded cultural translation enablers by giving students the opportunity to reflect, discuss and write on how the concepts in these MOOCs apply to their respective settings rather than having all assignments structured from the instructors' perspective. The application of artificial intelligence, the history, technology and security related to the Internet and competition in business can be explored in various settings. Giving students the opportunity to discuss these issues in their respective settings could have enabled them to reflect on problems that are of most concern to them. Therefore, keeping diversity in mind during the course design and stimulating students' engagement in study groups, virtual and face-to-face, can make MOOCs and other courses addressed to international students relevant across cultural backgrounds. The closing statement of the LSIO professor reflects a diversity of mindset in course design:

> So it surely is important to know that [sic] your constraints, in your context, using the language that matters to you. And so I've broken up the world in a way that makes sense in terms of teaching this stuff, but you need to break up the world in a way that makes sense in terms of implementing, in terms of getting the projects done that are important to you.
>
> (Owens, 2013) [Quoted with permission]

The discussion of cultural translation needs to be viewed through a medium-strength lens, rather than a week or powerful one. As discussed earlier, MOOCs developed in foreign settings tend to be rejected because there is the feeling of hegemony of Western education (Young, 2013; Sharma, 2013; Liyanagunawarderna et al., 2013). Those who want to use MOOCs to transform lives of people in developing countries probably need to empathise with local stakeholders and demonstrate an understanding of local problems from local people's perspective. Equally, openly licensing MOOC materials to enable local practitioners to make them relevant and use them in the way that responds to their contexts will increase trust in MOOC providers who want to impact positively on lives of people in developing countries. At the other extreme, a radical rejection of MOOCs, simply because they are not home-made, limits educational exchange that could be beneficial to learners and educators worldwide. Diversity and multicultural learning experience tends to be richer in MOOCs and these two learning ingredients can be beneficial to MOOC students and teachers regardless of their location or cultural backgrounds. The good news for MOOCs and educational stakeholders across cultures is that embedding cultural translation enablers in a course makes it more relevant to students from a diversity of cultural backgrounds. This is a niche that educators and other stakeholders need to exploit to facilitate a cross-cultural and multi-directional exchange of knowledge, skills and expertise.

Conclusion

In this paper, I discussed cultural translation, the process of making courses relevant to students in their respective cultural settings, across five Coursera MOOCs. In two of these MOOCs, cultural translation was enabled by the inclusion of activities that required students to work on projects or tasks that were practical in their cultural settings. Students were given freedom to choose the setting and participants in their projects/assignments. Cultural translation was also assisted by student-created study groups based on geographical locations, languages and professional disciplines. These best practices indicate that MOOCs can be tailored to each individual learner regardless of her/his cultural setting, and require course designers to keep diversity in mind. They also call on students to learn collaboratively via informal study groups created for this purpose. While students in the five MOOCs participated in such groups, only two of the five MOOCs were designed to enable cultural translation. The lack of cultural translation was found to be an issue of course design rather than being a typical feature of MOOCs. Designers of courses addressed to internationally diverse groups can learn from the LSIO and ILTEI designs in order to accommodate all students. If enabling cultural translation is deliberately kept in mind in the design process and students engage in collaborative learning with their peers, the course can be relevant to students regardless of their cultural background.

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A typology and dimensions of a description framework for MOOCs

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Abstract: *the single acronym of MOOC (Massive Online Open Course) refers to many different realities. We mainly infer about the MOOC object from what we can see or read about it. However, these inferences (inductions from partial vision) lead to contradictory assertions. Nevertheless, we need to accurately describe a MOOC. In this context, this research work proposes to build a description framework for MOOCs with the aim of complementing a typology of MOOCs. We have first presented different attempts to classify MOOCs. Next, we show how they are still confusing. Then, we apply some typologies, which were efficient for Technology Enhanced Learning (TEL). For the description framework, we have gathered properties that describe MOOCs. Then, in an abduction approach, we have structured them in eight dimensions. We have also proposed an initial typology that uses simple and concrete name for types.*

Keywords:
MOOC, description framework, typology, TEL (technology enhanced learning).

Introduction

MOOCs (Massive Online Open Courses) refer to many different realities; they involve different teaching methods, and different interaction modes, etc. (Daniel, 2012; Gilliot, Garlatti, Rebai, & Belen-Sapia, 2013; Lane, 2012; Plourde, 2013; Schneider, 2013). It is confusing to designate them by this unique acronym (Hill, 2012). Why is it so difficult to conceptualize the MOOC object? We mainly conceptualize it by inducing from what we can see or read about it. These inductions (from a partial view) often result in contradictory assertions, depending on their authors. Nevertheless, we need to accurately describe MOOCs. We aim to help MOOC researchers and designers to agree on a shared vocabulary. In this context, the research work presented here initiates a process to build a description framework and a typology for MOOCs.

Having a description framework is interesting for research into Technology Enhanced Learning (TEL) for five reasons. Firstly, we can better compare a (past, ongoing or future) MOOC to another one. Secondly, we can also better compare them to other devices designed for distance or blended learning (*e.g.* LMS—Learning Management System, CSCL—Computer Supported Collaborative Learning). Thirdly, we can estimate whether we can transpose results of previous TEL research. Fourthly, it could enable us to capitalize on MOOC research results themselves. For example, can we transfer the results obtained on one MOOC to those of another MOOC if we exactly know what they have in common or in how they are different? Finally, this framework could help to make our administrative staff or colleagues formulate their demands more precisely when they ask us to build a MOOC, for research or teaching purposes.

We need to take a step backward, in order to model a MOOC as an object of study. Thus, how can we propose a description framework, which allows us to quickly and easily identify a MOOC? We have anticipated three difficulties. Firstly, we must develop a framework that will combine the points of view of different academic disciplines and fields. Those disciplines are learning sciences (teaching, learning, and education sciences), cognitive sciences, computer science, information technology, psychology, sociology, communication and information sciences, etc. Moreover, several academic disciplines have already addressed together some fields, such as social networks, learner communities. Secondly, all these points of view result in many criteria and many aspects. Nevertheless, how can we balance between comprehensiveness and relevance in the description framework? Thirdly, not all those who will use the description framework are researchers (some are politicians, some are teachers, some are staff members, *etc.*). We should consider that.

We aim to initiate the building of a typology and of a description framework. We conduct these two sub goals in parallel because they intertwine. Moreover, we do not want to build them from scratch. Hence, we have tried to find an existing typology and an existing framework, which match our goal. Our approach also consists in applying some existing typologies, which were not defined for MOOCs but were efficient for TEL. By doing this, we have gathered properties, which should describe a MOOC well enough, and should be included in our description framework.

We will first present a state-of-the-art version, which contains three parts: some attempts to distinguish MOOCs, some existing typologies, and an existing description framework designed for MOOCs. Then we will introduce our two propositions: a typology and a description framework for MOOCs. Finally, we will discuss our propositions.

State of the art: attempts to define typologies and frameworks for MOOCs

Four typologies of MOOCs

In this section, we present, apply, and discuss four typologies.

Presentation of the typologies:

We studied four attempts to distinguish a MOOC from another one. The first attempt has introduced an historical distinction. Then the following one has addressed the teacher's focus within the MOOC, the third one the learning functionalities of MOOCs. The last one has relied on opening or closing dimensions in MOOCs.

Firstly, the MOOC acronym appeared in the context of connectivism (Siemens, 2005; Kop & Hill, 2008). Then, the distinction between cMOOCs (where 'c' stands for connectivist; in the spirit of the first MOOC) and xMOOCs (where 'x' stands for transfer) emerged (Daniel, 2012). In a cMOOC, the course relies more on the connections between learners rather than on the content they learn together. On the contrary, in an xMOOC a predefined content (*i.e.* knowledge) is the target.

Secondly, Lane meets the objective of the previous paragraph by seeking the focus on which the teacher has designed the MOOC (Lane, 2012). She defines three types of MOOCs:

- *"Content-based MOOCs (xMOOCs)*
- *Task-based MOOCs (tMOOCs)*
- *Network-based MOOCs (cMOOCs)"*

The added type "tMOOCs" refers to MOOCs that focuses on the tasks the learners have to perform; the community and the contents are only a support. In content-based MOOCs, contents (*i.e.* knowledge) prevail. While in network-based MOOCs, the community dominates.

Thirdly, Clark has described a typology based on "pedagogy" ("learning functionalities"). (Clark, 2013) defines eight types of MOOCs:

- "TransferMOOCs are xMOOCs,
- MadeMOOCs implement more crafted and challenging assignments,
- SynchMOOCs are synchronous MOOCs with fixed start days, end days, and deadlines for assignments,
- AsynchMOOCs are asynchronous MOOCs with no (or frequent) start days, and tend to have no or looser deadlines for assignments,
- AdaptiveMOOCs are MOOCs that use adaptive algorithms to present personalized learning experiences,
- GroupMOOCs are MOOCs starting with small and collaborative groups of learners,
- ConnectivistMOOCs are cMOOCs, and
- MiniMOOCs are shorter MOOCs for contents and skills that do not require a semester structure".

Fourthly, in (Gilliot, Garlatti, Rebai, & Belen-Sapia, 2013), the authors asked themselves what dimensions are opened or closed in a MOOC, from the learners' point of view. They explored five dimensions (see first column of Table 1). Thereby, in a cMOOC, "all dimensions are opened" while in an xMOOC "almost all dimensions are closed except of the group organization", which is sometimes free, and sometimes imposed by the teacher.

	cMOOC	iMOOC	xMOOC
Learning goals	O	O	C
Choice of resources	O	O	C
Organization of the learning activities	O	C	C
Organization of the group work	O	O	C/O
Collaborative co-production	O	C/O	C

Table 1: Some opened or closed dimensions, translated from Gilliot and colleagues.

These authors introduced another type of MOOCs: the iMOOC. It has more opened dimensions than an xMOOC and less than a cMOOC. By opening the choice of resources, the organization of the group work and possibly the collaborative production, its main goal is to allow an investigative approach (hence the 'i').

Application to examples of MOOCs

For studying the previous attempts, we applied each of them to four examples of MOOCs, which occurred during 2012-2013:

- "Gamification"(1) (referred to as *"1-G"* in Table 2) was a course taught at the end of summer 2012 by Kevin Werbach of the University of Pennsylvania,
- "Writing in the Sciences"(2) *(2-W)* was a course taught in Fall 2012 by Dr. Kristin Sainani of Stanford University to learn how to write correct scientific publications,
- "Project Management"(3) *(3-P)* was a course taught in French in Spring 2013 by Rémi Bachelet of *"École Centrale de Lille"*, and
- "Digital identity"(4) *(4-D)* was a French MOOC, which ran in early Summer 2013, to teach how to understand and manage one's digital identity.
- Other sessions of the first three MOOCs have occurred since.

The four MOOC examples are xMOOCs according to the typologies described in the first paragraph, in Lane's typology ("content-based MOOCs"), and in Clark's typology ("transferMOOCs"). Yet, these examples of MOOCs differ a lot. However, thing are more complex with the fourth typology. Because these examples are xMOOCs, each column of Table 2 should match the xMOOC column of Table 1.

	1-G	2-W	3-P	4-D
Learning goals	C	C	C	C
Choice of resources	C	C/***O***	C/***O***	C/***O***
Organization of the learning activities	C	C	C/***O***	C
Organization of the group work	C (NA)	C (NA)	O	C/O
Collaborative co-production	C (NA)	C (NA)	***O***	C/***O***

Table 2: Are the four examples xMOOCs according to Gilliot and colleagues?

In Table 2, we highlight (italic and bold) the differences with the corresponding column of Table 1. "NA" means "not applicable". For example, for the gamification MOOC (column 1-G), the teacher decided not to integrate group work in his course. From the learner's point of view, the organization of the group work is closed. Moreover, we put "C/O" when it is closed or opened, depending on what we consider. For example, if the resources are the teaching materials, the choice of resources is closed for our four examples. If the resources are contents on which the learner has to apply his new knowledge on the assessments, then it is opened. Thus, the "choice of resources" dimension definition is too large.

With these considerations, only the first two MOOCs match with the dedicated column of Table 1 and thus are xMOOCs in the fourth typology. Moreover, if we focus on the sequence "C, O, C, O, C/O", the two last columns of Table 2 also match the iMOOC column of Table 1.

In brief,

- "Gamification" is an xMOOC, a synchMOOC, and a miniMOOC (6 weeks),
- "Writing in the Sciences" is an xMOOC (and a transfer-MOOC, and a content-based MOOC), a synchMOOC, a madeMOOC, and a miniMOOC (8 weeks),
- "Project management" is an xMOOC (and a transfer-MOOC, a content-based MOOC), a tMOOC, a madeMOOC, a synchMOOC, a groupMOOC, a miniMOOC (5 weeks), and an iMOOC, and
- "Digital identity" is an xMOOC (and a transfer-MOOC, a content-based MOOC), a synchMOOC, a groupMOOC, a miniMOOC (8 weeks), and an iMOOC.

Discussion

The distinction cMOOCs/xMOOCs of the first typology is the best known. Many authors have often referred to this distinction. Even though it can work at first glance, too many differences remain between two MOOCs of the same type.

One advantage of Lane's typology is: the added words before the acronym are more meaningful than letters. However, as with the previous paragraph, too many differences persist inside one type.

In his typology, Clark mixes diverse points of view:

- Knowledge acquisition mode (via transfer vs. via social connections)
- Assignment types (simple vs. crafted)
- Mode of delivery (synchronous vs. asynchronous)
- Social dimension (small collaborative groups)
- Duration (shorter than a semester vs. a semester long)
- Adaptation (adaptive or not)

All of these features could be components of a type of pedagogy (educational contexts). Moreover, his eight types do not match eight different "pedagogies". In fact, a MOOC can belong to several of Clark's types. Moreover, if we consider only two values for the six points of view, we count sixty-four types of MOOCs (two to the power of six).

For the fourth typology, as in the previous paragraph, with only five dimensions listed in Table 1, we have thirty-two types of MOOCs. Moreover, other authors consider more than five dimensions, e.g. fourteen in (Jézégou, 2010) thus about four thousand types. Even though we think it is interesting to know what dimension is opened (or not) to describe a MOOC (in a description framework for MOOCs), we do not think we can base a typology of MOOCs on openness. It rather is a property of some features in a MOOC.

Existing typologies, which were defined for TEL

We present and discuss three typologies.

Presentation of the typologies

The De Vries' typology. De Vries described the spectrum of learning software available in 2001 (de Vries, 2001). Table 3 lists eight education functions, the type of software, and the education theory she associated to these functions.

The Typology of Gauthier and Colin. Four years later, authors of (Gauthier and Colin, 2005) had the same goal as De Vries. They defined cartographies in order to help teachers to find an ICT (Information and Communication Tools). Each cartography allows accessing the ICTs from different points of view. Thereby, the authors identify

Education function	Type of Software	Educational Theory
Present information	Tutorial	Cognitivist
Provide exercises	Repeated exercises	Behaviorist
Truly teach	Intelligent Tutoring System (ITS)	Cognitivist
Captivate the attention and motivation of the learner	Educational (serious) game	Mainly behaviorist
Providing an exploration space	Hypermedia	Cognitivist, Constructivist
Providing an environment for natural laws discovery	Simulation	Constructivist, situated cognition
Provide an environment for exploring abstract domains	Micro-world	Constructivist
Provide a space for exchange among learners	Computer Supported Collaborative Learning (CSCL)	Situated cognition

Table 3: The eight educational functions and some Features – translated from (de Vries, 2001).

educational paradigms ICTs implement, and educational situations they allow. Their eight educational paradigms underlie various activities and teaching practices, which are combinable:

- Problem solving
- Improvement and progress
- Project, practice
- Training, assessment
- Facilitating, support
- Tutoring, coaching
- Presentation, demonstration
- Discovery, research

The nine educational situations are the areas situated at the intersection of a two-dimensional array. These dimensions are the social dimension (three values: individual, groups and communities) and the time dimension (three values: sequence, module, courses). It defines nine areas. An ICT may occupy several areas.

Hy-Sup. Hy-Sup (Deschryver & Charlier, 2012) was a European research project. It produced configurations for describing blended learning systems (French: "Systèmes *Hy-brides*") used in higher education (Fr: *"Éducation Supérieure"*). Hy-Sup has defined six configurations:

- *Scene* corresponds to a content-oriented teaching, support to face-to-face education, with mainly textual resources,
- *Screen* is scene with added multimedia resources,
- *Cockpit* corresponds to a course organization oriented teaching, guided by the use of tools (and sometimes integrating relational and reflective goals),
- *Crew* aims for learning focused on supporting the process of knowledge construction and on interpersonal interactions,
- *Public space* aims learning centered on the opening of the training device to external resources, and
- *Ecosystem aims* for learning by operating a large number of technological and educational opportunities.

Discussion: are the previous typologies useful to define types of MOOCs?

The De Vries', and Gauthier & Colin's typologies lacks the social dimension of MOOCs. It makes sense because this dimension was almost nonexistent in the ICTs of this period. The six Hy-Sup configurations seem very interesting to keep. Indeed, we can match some categories of MOOCs of this section to Hy-Sup configurations, and make the four following conjectures:

- xMOOCs, transferMOOCs, and content-based MOOCs could at least be *screens*,
- tMOOCs, and madeMOOCs could be from *cockpits to crews*,
- cMOOCs, iMOOCs, groupMOOCs, and network-based MOOCs could be from public *spaces* to *ecosystems*, and
- adaptiveMOOCs, miniMOOCs, synchMOOCs, or asynchMOOCs could be one of the previous three items.

However, MOOCs are not blended-learning devices. Therefore, it is important to take into account the description dimensions on which the Hy-Sup configurations rely, even though we should adapt them.

Existing description framework for MOOCs

Just a few days later, as we presented our research in the LASI meeting (Learning Analytics Summer Institute) in Lyon (France) at the beginning of July 2013, Schneider displayed her framework in an AIED workshop in Memphis (USA). Our approaches are similar. In (Schneider, 2013), the author described a framework that brings together some metadata about MOOCs. It has two levels. The first level, called "general", gathers general information about the MOOC (e.g. name, author, certificate). The second level, called "ILE and Stances" (Interactive Learning Environment), has four frames: instruction (how the knowledge is taught), content (how the knowledge is structured, e.g. in modules), assessment, and community.

These groupings and the properties are very interesting. Nevertheless, Schneider's framework lacks some dimensions we need. We have reused a part of it, and we have enriched it. The levels and properties of Schneider that we have reused will appear in the proposition section.

Propositions: a typology and a description framework for MOOCs

Our aim is twofold. We need to precisely describe a MOOC and we need to easily assign a type to it. We conduct these two sub goals in parallel. Indeed, we think the description framework could help to build a typology of MOOCs, and the typology could help to describe a MOOC.

If we want to take into account the main dimensions or features we have seen in the previous section, the combination of these features leads to too many types. Therefore the resulting typology would be difficult to use, and would be as unclear as the previously cited ones. Our approach is on the one hand to propose a simple and concrete typology, and on the other hand a description framework that specifies some differences between MOOCs of the same type and to describe their main features.

Whose point of view to consider in our framework?

A MOOC involves many people:

- Course designer teaching team (the teaching team that designed the course), referred to later as "teacher"
- Course leading teaching team (the teaching team that actually led the course)
- Learners
- Tutors, graded learners or accredited learners
- University staff
- Researchers
- Political staff
- Parents of learners

Attempting to conciliate all points of view is unrealistic because they may be incompatible. In our framework, we favor the researchers' point of view. Researchers could focus on four axes:

1. MOOCs as a technical and pedagogical platform
2. Use and usability of these platforms and of their courses for learners and teachers
3. Learners' profiles (their knowledge misconceptions or conceptions, or the level or quality of learners' learning)
4. Teachers' point of view or profiles.

Teachers' point of view has import because they take decisions in MOOC design. Hence, researchers could, for example, focus on the following questions about teachers:

- What types of pedagogical or technical function do they want to offer to learners (*e.g.* communication functions, organization functions...)?
- What types of activity do they want to organize (*e.g.* projects, presentation...)?
- What types of pedagogical theory/framework (*e.g.* constructivism, connectivism...) do they choose in their courses or part of courses?
- What social dimension (individual, group, groups, communities) do they want to privilege in their courses or part of courses?
- What feedback would they like to have for themselves or to give to learners (*e.g.* about learners' interactions, learners' results, learners that may drop out...)?

For our propositions, we choose to ignore the first axe and to ignore the MOOC platform on which the MOOC courses run, even though we know it influences some choices because we consider what it is possible to do with a MOOC without considering how it is done technically.

Even though our propositions are mainly for researchers, we strive to make them as simple as possible, hoping other people would be able to take ownership of them.

What to remember from the state of the art?

For the proposition of a typology

We have seen we cannot use the types defined with added letters (c, i, t, and x) or words (asynch, content-based, group, made, mini, synch, task, or transfer) before the MOOC acronym. Moreover, the potential number of types is too big for the typologies of Lane *(op. cit.)*, of Gilliot and colleagues *(op. cit.)*, and of Clark *(op. cit.)* because of the possible combinations. Furthermore, by applying the typologies to four MOOC examples, we found the types intertwine too much and are non-exclusive. Therefore, these typologies result in too many misunderstandings, because too many differences remain between MOOCs that are currently of the same type. They are still confusing, and include many implicit details. Otherwise, the Hy-Sup configurations *(op. cit.)* can help to define a first typology for MOOCs.

For the proposition of a description framework

We gather features to describe MOOCs. We partially or totally reuse:
- The connectionist educational paradigm of Siemens *(op. cit.)*
- The dimensions from Gilliot and colleagues *(op. cit.)* of Table 1
- The focus on which the teacher has designed the MOOC (of Lane's Typology, *op. cit.)*
- The points of view of Clark *(op. cit.)*
- The educational functions, educational theories, and types of software of de Vries *(op. cit.)*
- The educational situations and paradigms of Gauthier and Colin *(op. cit.)*
- The Hy-Sup dimensions Deschryver and Charlier *(op. cit.)* have used to define the Hy-Sup configurations
- The levels and items of Schneider *(op. cit.)*

Proposition 1: using Hy-Sup configurations as cornerstones for a first typology

We aim to propose a first typology that should describe as few types of MOOCs as possible. Each type should have an easily understandable, easy to remember, and concrete name. We do not want to build it from scratch. Therefore, we propose using the six Hy-Sup configurations *(op. cit.)* as cornerstones of a first typology, *i.e.* a typology on which researchers could base the continuing building of a more fitting typology.

We have made this choice for three reasons:
- Hy-Sup configurations are tangible,
- Hy-Sup has few configurations, and
- The state of the art shows us they are compatible with the typing of MOOCs

Hence, our *HySup-based MOOC typology* has six types:
1. Scene MOOC
2. Screen MOOC
3. Cockpit MOOC
4. Crew MOOC
5. Public space MOOC
6. Ecosystem MOOC

We have wondered whether to make educational theories (or paradigms) appear in our typology. In fact, we have decided to ignore them here, because to implement a theory, teachers can choose any of the previous types. For example, in a connectivist course, they can choose a Scene MOOC just for managing their teaching without providing any videos. We have also made the same reasoning for the software functionalities a MOOC can implement.

Proposition 2: a description framework for MOOCs

We first discuss the temporal scope of the description framework. Then we explain its general structure, and partly detail it.

Temporal considerations

If the description framework of a MOOC is filled before the MOOC starts, then it can contain information that has been chosen and anticipated by the teacher. If the description framework of a MOOC is filled after the MOOC has closed, then it can also contain additional data like total number of inscriptions, traces, etc., and can even incorporate data that are calculated from traces or other data.

Defining a framework in the first case is easier than in the second case. We should start by doing the first one, even if we have anticipated some needs for the second one. Therefore, we propose an extendable framework.

General presentation of the framework

In order to make the description framework easy to understand, we should choose as few dimensions as possible; a dimension is a grouping of properties. In this article, we focus on the main dimensions chosen for the description framework. We detail two of them. Further research will publish others. For these dimensions, we explain below how we build them.

Because the number of properties to take into account is huge, we have to find the best rules for grouping those properties. This kind of approach is abductive.

The hugest group of properties concerns instruction. Therefore, we have decided to split the instructional properties into five distinct dimensions:
- One for the places and roles of humans in the MOOC ("human")
- One for the educational (teaching and learning) material ("resources")
- One for the assessments and feedback
- One for the specific technical and educational functionalities the teacher prescribes in the course ("functionalities")
- One for the other instructional properties ("instructional")

Hence, we propose describing a MOOC with the following dimensions:
- General*
- Context
- Instructional*

- Resources
- Assessments* and feedback
- Human
- Functionalities
- Other stuff for researchers

In this list, the asterisk symbol indicates dimensions for which we have the same name as Schneider's one (Schneider, 2013). However, the content of ours is most often a bit different from hers.

In this framework, some properties can stay empty. We define a minimal group of properties, sufficient to describe a MOOC to learners and most people. A second group collects general information about the instructional properties (choices). Then teachers can precise other instructional properties if they want to. Moreover, researchers can fill in the properties, relevant to their domain.

Each dimension refines in sub dimensions, like the branches of a tree. Eventually, a sheet corresponds to a property, which may be valued.

Details of the "General" dimension

The "General" dimension gives general and public information about the course (see Figure 1). It maps the minimal group of properties. This dimension gathers information that usually appears in MOOC adverts. To fill this dimension, we studied Coursera, Udacity, and Canvas course adverts and those of our four examples of MOOCs. We also add our type in this dimension.

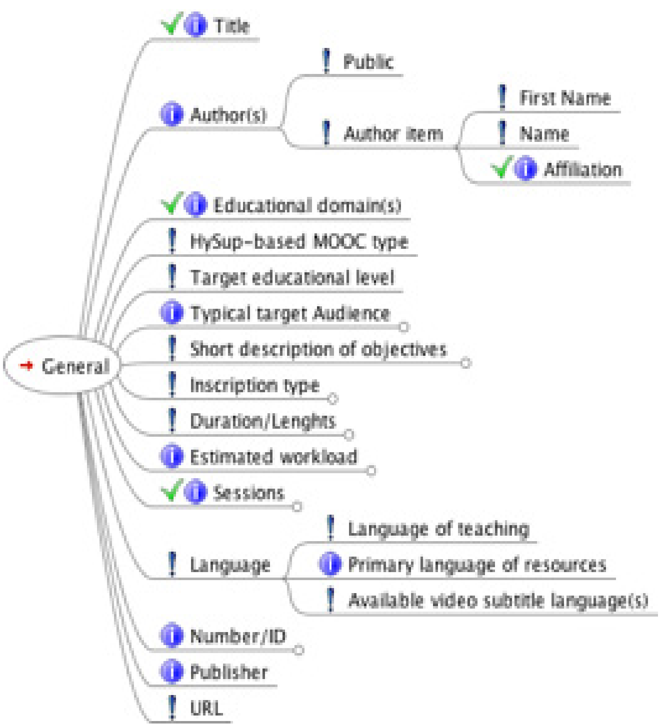

Figure 1. The General dimension.

In Figure 1, properties with a white 'i' in a blue circle symbol are properties, common with the "general level" of Schneider (op. cit.). The ones with an added green check symbol are renamed properties. We added the ones with an exclamation point symbol. We have included neither the "content for wrapped in-person course (location and dates offered)" nor the "pace (cohort-based vs. self-paced)" from Schneider (op. cit.), because they have taken place in other dimensions from our framework. Table 4 details some properties.

Property	Description	Type	Constraint
Title	Name or title of the course		
Author(s)	Author or authors of the courses		One item per author.
Public	Do(es) the author(s) appears in the MOOC advert	Yes/No	
Author item			
First name	First name		
Surname	Surname		
Affiliation	University, institution, or faculty membership		
Educational domain(s)	Teaching domain or domains	Use existing standard	One item per domain
HySup-based MOOC type	The type of the MOOC as defined above		
Typical target audience	The typical learner for which the teacher has designed this course		
Status	The typical learner's status in real life	Student, professional, …	
Entry level		None, pre-collegiate, undergraduate, graduate, expert, or typical age range	
…			
URL	Localization on the Internet		

Table 4. Detail of some properties.

The “Context” dimension

The “Context” dimension stores information that should help to understand the context of use for which the teacher designed the course. Many researches inspire us to fill this dimension. From here, we use the spatio-temporal components of Jézégou *(op. cit.)* and the “pace” from Schneider *(op. cit.)* (“pace” appears both in her “general level” and in the “content” frame of her second level).

The “Instructional” dimension

The “Instructional” dimension collects information about the instructional decisions and choices except those previously explained.

To build this dimension, we have used educational paradigms cited in De Vries *(op. cit.)* and Siemens *(op. cit.)*, the learner’s tasks and the educational activities of De Vries *(op. cit.)*, and the focus of the learner activity of Lane *(op. cit.)*. We have added choices about knowledge acquisition mode and mode of delivery of Clark *(op. cit.)*. We have extended the dimensions of Gilliot and colleagues *(op. cit.)* because we include other properties than openness. We have also added the “instructor involvement”, “lecture”, and “reading” from the “instruction frame” of Schneider’s second level.

The “Resource” dimension

The “Resource” dimension describes the learning material in general. It brings together resources as video, text, etc., and non-palpable resources, which people can bring (*e.g.* knowledge, skills). For this dimension, we use numerous researches about resource description and indexation.

The “Assessment” dimension

The “Assessment” dimension (see Figure 2) describes the existence of an assessment process or not, and if any, what it consists of. In this dimension, we have used the choices of assignment types of Clark *(op. cit.)*.

The “Human” dimension

This dimension describes the personal dimension of the learner: role, status, etc. It also depicts its social interactions (teacher’s prescription): does the learner work in a dyad, a small group, a learner social network inside the MOOC, or an extended network outside the MOOC? Furthermore, it qualifies the scope and the type of these interactions.

The “Functionalities” dimension

Technical and educational functionalities are choices the teacher prescribes to learners. For example, a MOOC can involve an Intelligent Tutoring Systems (ITS) in a specific educational activity. These functionalities can either be built in the MOOC platform or used outside the platform (*e.g.* be in the learner’s PLE – Personal Learning Environment). To fill this dimension, we reuse the types of software and the educational functionalities of De Vries *(op. cit.)* and the category of tools of Gauthier & Colin *(op. cit.)*.

“Other stuff for researchers” dimension

We have put here many things researchers may need like teacher models, learner models, trace model, interaction model, traces, calculi (*e.g.* interest, flow, intrinsic and extrinsic motivation, engagement, feeling of self-efficacy, relatedness), etc. We suggest structuring the traces and calculi with the same dimensions than the ones made for the prescriptions, especially context, instructional, human, and resources. The principle is to consider each property of other dimensions as reference property, and the property of this dimension as actual property. For example, “actual pace” refers to information about the real pace observed during the course.

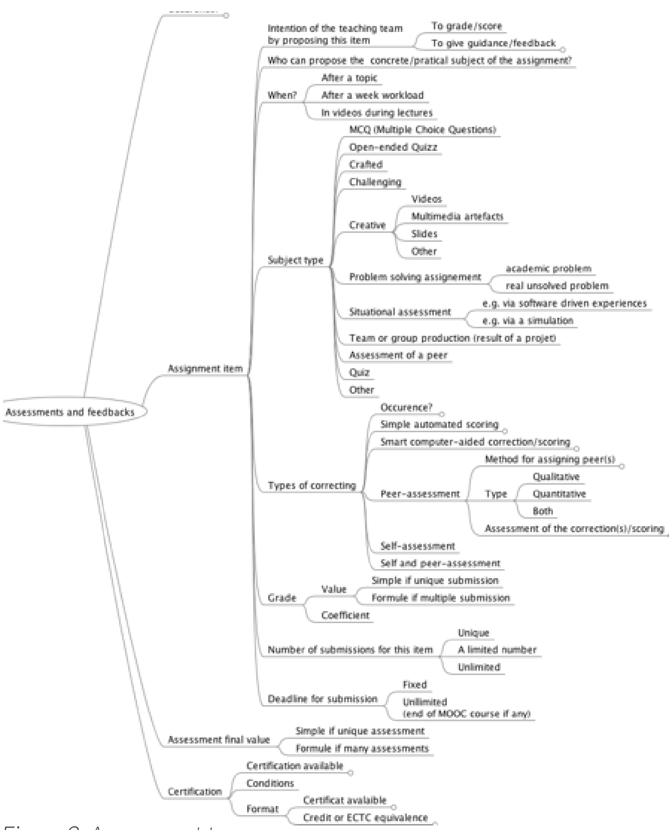

Figure 2. Assessment tree.

Discussion of our propositions

Discussion of proposition 1: HySup-based typology

In this section, we check if HySup-based typology can match different pedagogical paradigms, and different importance given to the community role. The first three types are teaching-oriented, while the last three ones are learning oriented. Therefore, we think it translates into different educational paradigms, where the main role is played by either the teacher or the learner. Moreover, a discontinuous grading exists between the first type and the last one: in the first one, the learner interacts less with the MOOC, the MOOC offers fewer tools to the learners and fewer liberties, and learners interact less with one another than in the sixth type. Thus, it can fit with different importance given to the community.

Now, we apply the Hy-Sup configurations to our four examples of MOOCs.

"Gamification" is a screen, because it uses video. It is not of other types, because:

- it is not guided by the use of tools,
- it supports neither the process of knowledge construction nor the interpersonal interactions,
- the learning is not centered on the opening of the training device to external resources, and
- it does not aim at learning by operating a large number of technological and educational opportunities (only a large number of resources).

"Writing in the Sciences" is crew, because individuals have to interact to enhance each other's productions. It is neither a public space nor an ecosystem because the MOOC device is closed.

"Project management" and "Digital identity" are public spaces, because these MOOCs are opened to external resources and technical opportunities.

Discussion of proposition 2

Property (and its sub-divisions)	Application example
Title	Gamification
Author(s)	
Public	True
Author Item	
Author Item	Kevin
Surname	Werbach
Affiliation	University of Pennsylvania
Educational domain	
Domain item	Information
Domain item	Technology
Domain item	Design
Domain item	Business
Domain item	Management
HySup-based MOOC type	Screen
…	

Table 5: Application of the general dimension to the Gamification MOOC.

Table 5 illustrates how we are assessing our description framework by applying it to our four examples.

This application is only a first step. Indeed, to be valid, we will apply our framework to other MOOCs. Moreover, to be acceptable by other researchers, they should be able to fill it in with as little help as possible.

Conclusion

In this article, we intend to classify MOOCs into as few types as possible, and to define a description framework for MOOCs. We started by studying some attempts to classify MOOCs. Then we applied each of these attempts to four examples of MOOCs, which occurred during 2012-2013. Finally, we studied existing typologies and a framework. This study teaches us these typologies confuse people. It also allows us to collect many properties that can characterize a MOOC.

On the one hand, we propose a typology based on the six Hy-Sup configurations: scene, screen, cockpit, crew, public space, and ecosystem. On the other hand, we structure the properties of a MOOC into eight dimensions: general, context, instructional, resources, assessments & feedbacks, human, functionalities, and other stuff for researchers. This work is a first step that should be refined, based on the feedback and contributions of researchers and people from diverse horizons.

To do that, our future trend consists in publishing the framework on a platform by using semantic web tools in order to allow other interested people to navigate it and to use a search engine on the collection of published MOOC descriptions. In our framework, we will encode properties as metadata. Moreover, both properties and values will use commonly accepted standards everywhere that it is possible.

We also should compare our framework to the one that Siemens (Siemens 2013) announced between the acceptation of our article and its publication.

Finally, with a more stabilized description framework, a pattern (or a set of patterns) in it could correspond to a new type in our initial typology of MOOCs. To identify the patterns, we would place some dimensions of the description framework on the axes of a hypercube; a pattern would be a hyper sphere of the universe defined by the hypercube.

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Characterizing video use in the catalogue of MITx MOOCs

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Abstract: *Lecture videos intended to substitute or parallel the on-campus experience are a central component of nearly all-current Massive Open Online Courses (MOOCs). Recent analysis of resources used in the inaugural course from MITx (6.002x: Circuits and Electronics) revealed that only half of all certificate earners watched more than half the available lecture videos (Breslow et al. 2013, Seaton et al. 2014), with the distribution of videos accessed by certificate earners being distinctly bimodal. This study shows that bimodal lecture-video use by certificate earners persists in repeated offerings of 6.002x, with distribution of video accesses being nearly indistinguishable. However, there are generally two modes of video use spanning the catalogue of MITx courses: bimodal and high use, both characterized via analysis of the distribution of unique videos accessed in each course. For both modes of video use, country-of-origin significantly impacts the measurement of video accesses. In addition, preliminary results explore how course structure impacts overall video consumption across courses.*

Introduction

Short videos interspersed with assessment items are a central feature in nearly all Massive Open Online Courses (MOOCs). This course component enables instructor-participant interaction in the absence of traditional on-campus lecture. Video length and the frequency of assessment items are intended to increase student engagement, and recent research suggests that the general format of short videos provides learning outcomes comparable to traditional on-campus lectures (Glance, Forsey, & Riley, 2013). Research aside, such video formats have proven to be quite popular in a number of non-traditional education settings, e.g., Khan Academy, implying the possibility of a lasting trend. In order to begin the process of measuring overall impact of videos in MOOCs, an analytics baseline must be established for participant-video interactions.

MITx, the Massachusetts Institute of Technology's MOOC division, releases MOOCs through the edX platform (www.edx.org), offering participants a digitized set of course components motivated by both MIT on-campus activities and best practices in digital learning. Although variation in course components exists between courses, lecture videos are present within all MITx MOOCs. Each course is divided into weekly units (or chapters) containing approximately two learning sequences, typically made up of a number of short videos interspersed with content-engaging questions. The format of individual lecture videos differs, ranging from filmed MIT on-campus lectures modularized into short segments, to tablet recordings of instructors appending PowerPoint slides. Although consistently delivered in regard to interface, the total number of lecture videos, their length, and the frequency of lecture questions vary from course to course.

This work was initiated by a finding in the analysis of the inaugural MITx course 6.002x: Circuits and Electronic, namely, a bimodal distribution of unique lecture-videos accessed by certificate earners (Breslow et al. 2013, Seaton et al. 2013), namely, half of the 6.002x certificate earners accessed less than half of the lecture videos. These same certificate earners completed nearly all graded assignments for homework and the online laboratory, but chose not to use many of the supplementary learning components like the textbook and wiki. A number of questions emerge from this observation: Are bimodal video accesses a standard phenomenon in MOOCs? Is this simply an effect of Internet access? Are course features impacting video use? How are learners making decisions about which resources to use? In terms of video use, the 6.002x finding is supported by on-campus analysis of student interactions with online videos: medical school students provided with lecture recordings were found to have mixed usage and varying levels of impact on performance (Romanov & Nevgi, 2007, McNulty, et al., 2009).

The current study seeks to understand the most basic features of video use in MITx courses: unique accesses by participants and variation among courses. The distribution of unique video accesses provides a means of analyzing overall use by course participants; in this case, certificate earners. Metrics ranging from mean videos watched, to Beta function modeling, allow for comparison across courses, as well as for repeated offerings of the same course. As a first step, video accesses in the inaugural 6.002x course are compared against two repeated offerings in which content changes were minimal, revealing remarkable similarity between all three courses. Gained insight is applied to the remainder of the MITx course catalogue, revealing courses whose overall accesses moves into a category of high use. For the entirety of the MITx course catalogue, country-of-origin is shown to be an important factor when analyzing video accesses. Finally, preliminary work explores the impact of course structure (design of lecture sequences) on course-wide video accesses.

Courses and Participants

MITx Massive Open Online Courses (MOOCs) are delivered through the edX platform, with the intention that anyone with an Internet connection can enroll and interact with course content. A typical MITx course aims to recreate the on-campus experience at MIT by providing participants with a number of digital course components: lecture videos, lecture questions (short questions interspersed in lecture videos), homework, an eTextbook, student and instructor edited Wiki, and a discussion forum. Although these components represent the core of a MITx course, instructors have freedom to add supplementary components such as online laboratories (e.g., the 6.002x Circuit Sandbox used to construct and test simple circuits or the 8.02x TEAL visualizations used to model phenomenon in Electricity and Magnetism). Analysis of resource use in the inaugural 6.002x has shown certificate earners utilized course components in terms of overall time spent and unique resource accesses (Seaton et al. 2013).

Although any combination of course components can form the structure of a MITx course, lecture videos are central component within all MITx courses. Each course is divided into weekly units of course work (chapters) containing one to two learning sequences consisting of a number of short videos with interspersed questions. As discussed in the introduction, the format of individual lecture videos can differ, but delivery is consistent across courses. Table 1 contains course information relevant to this study for the MITx course catalogue through Spring 2013. The course names will be an important reference throughout this work. Archived versions of most courses can be accessed via edX (www.edx.org).

MITx courses have been host to massive enrollments as evidenced in Table 1 (total enrollments are often ten times the size of certificate earning populations). These enrollments have varied greatly in terms of their cultural and educational backgrounds, as well as overall level of participation. The impact of diversity on resource use can be found in initial analyses of 6.002x (DeBoer et al., 2013), as well as in terms of performance and participation in 8.02x (Rayyan, Seaton, Belcher, Pritchard, & Chuang, 2013).

Methods

Current technology streamlines the collection of records on participants and their activities within a given MOOC, providing detailed data for a “massive”, and equally diverse, set of participants. A recent report has shown participation varies greatly in MOOCs (Kizilcec, Piech, and Schneider, 2013), e.g., some participants only watch videos, while others complete assignments asynchronous to course due dates. In the case of the inaugural 6.002x course, time spent measures indicate some participants simply take exams (Seaton, et al., 2013). Until future analyses can more generally classify participant-strategies, certification status provides a first-pass filter for those participants likely to interact with the majority of course

Course	Description	Certificates Earned	Number of Lecture Videos	Number of Lecture Questions	Mean Video Length
Spring 2012					
6.002x	Circuits and Electronics	7157	416	109	5.5 min
Fall 2012					
3.091x	Solid-State Chemistry	2061	171	120	6.5 min
6.00x	Intro. To Programming	5761	153	158	8.2 min
6.002x	Circuits and Electronics	2995	416	109	5.5 min
Spring 2013					
2.01x	Elements and Structures (*not analyzed*)	*	*	*	*
3.091x	Solid-State Chemistry	547	242	163	6.2 min
6.00x	Intro. To Programming	3313	150	153	8.1 min
6.002x	Circuits and Electronics	1101	416	109	5.5 min
7.00x	Intro. Biology	2332	142	128	11.9 min
8.02x	Intro. Physics: Electricity and Magnetism	1720	267	229	6.8 min
14.73x	Global Poverty	4608	158	156	7.6 min

Table 1: The MITx catalogue through Spring 2013 is listed in Table 1, providing labels and short descriptions of each course, along with the number of certificates granted, total number of lecture videos, total number of lecture questions, and mean lecture video length.

content relative to due dates ((Seaton, et al., 2013) provides further justification based on time-on-task). Hence, lecture-video accesses are reported here only for participants having earned a certificate. Sample sizes for certificate earners in each course are listed in Table 1.

This study is centered on analyzing the distribution of lecture-video accesses for certificate earners in a given edX course. Click-stream data contain records of all participant-video interactions (pause, play, or loading of a video) and their associated IDs. Other data are also stored within the click-stream, including timestamps, video speed, and participant IP address, but participant ID and video ID are the only fields required to estimate number of unique videos accessed by each participant. After calculating the number of unique lecture-video accesses per certificate earner, overall distributions can be generated for each course. Fraction of lecture videos accesses provides a simple transformation allowing for cross-course comparison.

As stated previously, videos as a resource type serve a number of purposes in MITx courses: "Problem Solving Tutorials", "Welcome or Introduction", etc. Course structure data can be extracted to link each video with a specific course component. Hence, this study focuses only on video interactions classified as "Lecture Videos", or those representing the principal learning sequences found in each chapter (week) of a MITx course.

Plotting distributions of the fraction of unique videos accessed is a first step in understanding video use, but in addition, one can model such distributions using functions with support on the interval [0,1]. Beta functions provide a two-parameter model capable of accounting for floor and ceiling effects associated with the finite interval. Plotting resultant fitting parameters in a simple two-parameter space provides insight into the mean number of videos watched and the shape of each distribution. These modeling techniques have been effective in analyzing the impact of course structure on eText use in both on-campus (Blended, Flipped) and online (Distance, MOOC) settings (Seaton, Bergner, & Pritchard, 2013); although a closely related two-parameter model was employed. Beta functions also provide other unique applications in education research (Smithson & Verkuilen, 2006). All applications of Beta functions in this work have been carried out via statistical libraries in Python (Scipy.Stats).

Figure 1 contains three methods used to scaffold visualizations used in this study: PDF - Probability Distributions (Left), CCDF - Complementary Cumulative Distributions (Middle), and (a,b) - Beta Parameters (Right). PDFs provide a familiar way of analyzing distributions (histograms), while CCDFs allow one to more easily visualize many distributions in a single figure. The measured variable X represents the fraction of accessed videos. Five exemplary PDFs (Left) are plotted and labeled by the Beta Parameters used to simulate them. The two solid curves have identical means but quite distinct shapes: one unimodal (normal) distribution (a=b=4.0), and one bimodal distribution (a=b=0.5). Other example PDFs represent commonly encountered distributions. CCDFs (Middle) are plotted for the same PDFs, where CCDFs weighted toward X=1.0 appear in the upper-right quadrant (a=3,b=0.5), and distributions weighted toward X=0.0 appear in the lower-left quadrant (a=0.3,3.0). Bimodal and unimodal distributions traverse the middle of the graph. Beta Parameters (Right) offer an even clearer representation of each distribution. Four relevant regions containing similarly shaped distributions are separated by dashed lines: bimodal (a,b<1), low usage (a<1,b>1), high usage (a>1,b<1), and unimodal (a,b >1). Within the unimodal region, the proximity of (a,b) to the low and high usage implies a distribution mean shifted toward low or high usage. Beta Parameters provide a framework for classifying usage distributions and are an important aspect of this work.

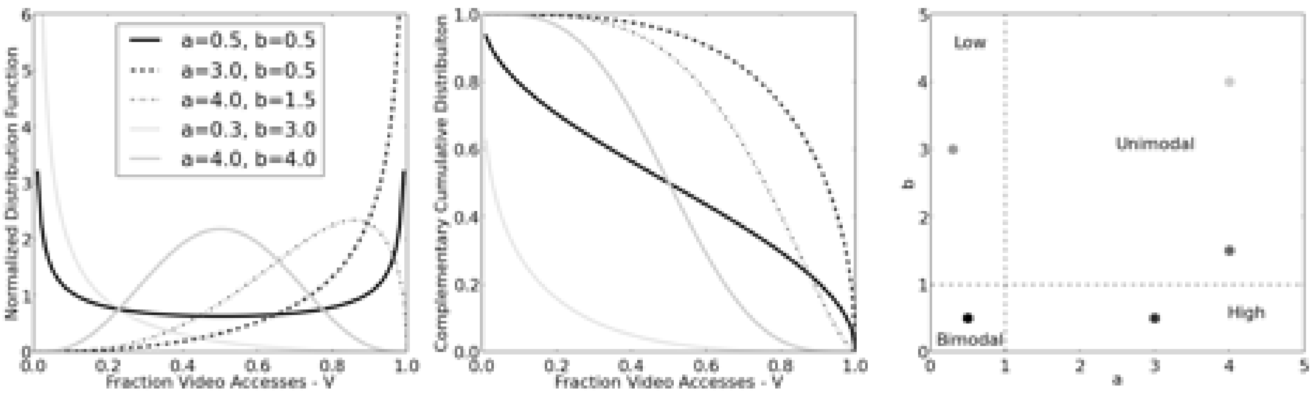

Figure 1. Example distributions for the fraction of videos accessed (left) generated using Beta functions whose parameters are given in the legend. These distributions can be transformed into Complimentary Cumulative Distributions such that features are more easily viewed in a single graph. Beta function fitting parameters can also be plotted (right) to help classify use. Regions are marked as low, high, bimodal, and unimodal.

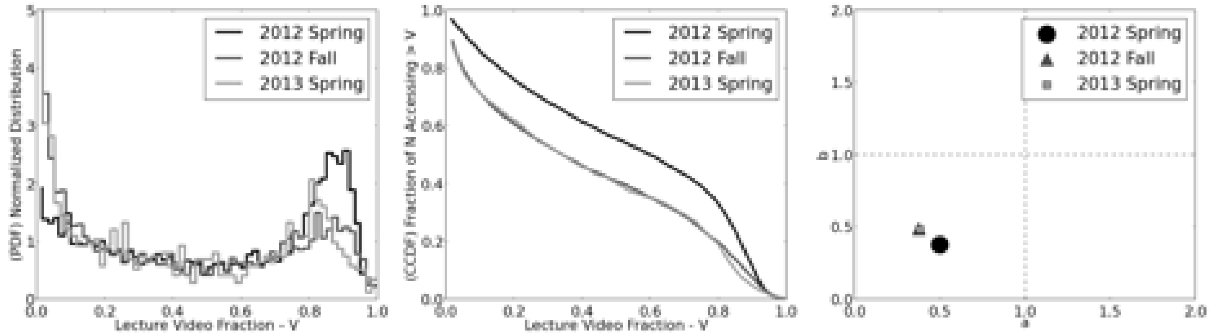

Figure 2. Fraction of videos accessed by certificate earners in repeated offerings of 6.002x plotted as Normalized Distributions (Left), Complementary Cumulative Distributions (Middle), and as resultant Beta Parameters (a,b) from fitting analysis (Right). Symbol sizes for Beta Parameters are proportional to the number of certificate earners.

Results

Persistence of Bimodal Video Use in 6.002x and the Impact of Downloads

The first major goal of this study addresses whether bimodal video accesses persist in repeated offerings of 6.002x. Figure 2 highlights the distribution of video accesses by certificate earners in all three offerings via our described visualization methods. Both the PDFs (Left) and the CCDFs (Middle) show that all three offerings have the same general bimodal shape, but that the inaugural course (2012 Spring) had slightly higher overall video consumption compared to repeated offerings (2012 Fall, 2013 Spring). Again, minimal changes were made to 6.002x content in repeated offerings of the course. Similarity in the shape of the three distributions indicates consistent behavior in how participants interact with course resources. Population sizes (number of certificate earners) can be found in Table 1; symbol sizes for Beta parameters reflect relative population sizes.

Regarding the gap between distributions for the inaugural and repeated offerings of 6.002x, one glaring explanation stems from the addition of the "download video" option added to courses starting in Fall 2012 (inaugural course had no download option). Supporting that possibility is the striking overlap visible in both the CCDFs (Middle) and Beta Parameters (Right) for the Fall 2012 and Spring 2013 courses. In order to account for downloading, video accesses are explored through the lens of country-of-origin (provided via IP country look-up). The hypothesis is two-fold: one, if downloaders can be accounted for, the distribution of video access for repeated 6.002x courses will overlap the inaugural course, and two, country-of-origin provides a proxy for downloading due to potentially poor internet access.

Here, this hypothesis is explored by separating video-access distributions by country-of-origin for the Fall 2012 and Spring 2013 6.002x courses (Figure 3), where the top-four countries for certificates earned in 6.002x Fall 2012 and Spring 2013 (Left) are the United States, India, Russia, and Spain (IP analysis providing country look-up has not been performed for the inaugural course, but may in the future). Separating each video access distribution by country allows for the comparison of country-level data with the inaugural course. CCDFs (Middle) show interesting trends: India has substantially lower video consumption relative to the inaugural course (thick black line), while other countries are close in proximity to the inaugural course. The Beta Parameters (Right) also indicate the differences in video consumption by country. India distributions border bimodal and low use, while all others maintain bimodality, with the exception of Russia in the Spring 2013 course. Although not confirmatory, these results highlight a possible download effect, but at minimum, show that country effects are an important aspect of analyzing resource use.

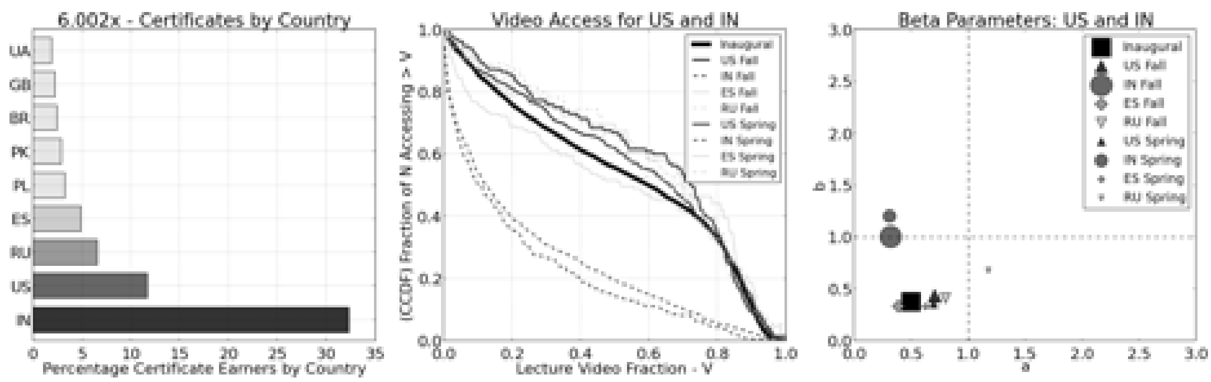

Figure 3. Percentage of certificates earned by country-of-origin (Left) for the Fall 2012 and Spring 2013 repeated offerings of 6.002x (note, metrics currently not available for the inaugural course). CCDFs (Middle) and Beta Parameters (Right) highlight the differences in video access distributions via the top four certificate earning countries. Symbol size is proportional to sample size.

Video Consumption Across All MITx Courses

Of equal interest is the comparison of video accesses across courses. In Figure 4 CCDFs are plotted for all courses delivered in the Fall 2012 (Left) and Spring 2013 (Middle) cycles, along with Beta Parameters for courses from both cycles (Right). CCDFs for Fall 2012 (Left) highlight video consumption in two newly introduced MITx courses: 3.091x, which is bimodal, and 6.00x, which represents high rate of video accesses (6.002x is plotted as a reference).

All of the Fall 2012 courses were repeated in the Spring 2013 with minimal edits to content. The CCDFs for these courses are plotted as dashed lines in the Spring 2013 cycle (Middle Figure 4), while three newly introduced courses are plotted as solid lines (7.00x, 8.02x, 14.73x). The CCDFs for the Spring 2013 cycle show a clear distinction between courses with high video consumption and the two courses with bimodal use, 3.091x and 6.002x. At first glance, all new courses in the Spring 2013 cycle appear to be high consumption, but the Beta Parameters tell a slightly different story. 8.02x appears within the bimodal region, indicating a significant tail toward low video consumption (notice the slight inflection (convex) over the interval [0.0,0.6] in the CCDF). Results from Fig. 4 highlight two distinct modes of lecture video consumption: bimodal and high use. Such access rates for videos stand in contrast to the overall access of eText resources in MOOCs, which were found to be primarily low use resources within selected MITx courses (Seaton, Bergner, & Pritchard, 2013).

In a similar manner to the 6.002x analysis from the previous section, video use is explored through country-of-origin. Figure 5 references the CCDFs (Left) for three courses: 3.091x Fall 2012, 8.02x Spring 2013, and 14.73x Spring 2013. 3.091x has similar bimodality to the 6.002x example, while 8.02x is intriguing due to its proximity to the boundary between bimodal and high use of video accesses. 14.73x represents an example of a high video use course. Separating video access distributions by the top two countries (for simplicity) shows a similar affect seen in the 6.002x case study: India has much lower video consumption relative to the US. Accounting for this effect causes the 8.02x US distribution to be classified as high use, while 3.091x maintains bimodality for both countries, although each point shifts closer toward the low (IN) and high (US) use regions. 14.73x maintains high video use for the US, but the IN distribution moves into the bimodal region. These results implicate country-of-origin as an important effect when describing participant video accesses.

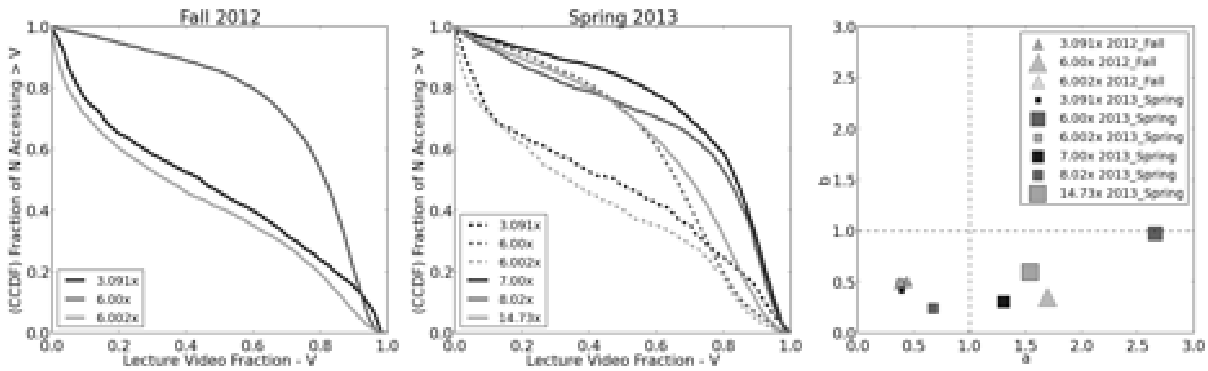

Figure 4. Fraction of videos accessed by certificate earners in all MITx courses from Fall 2012 (Left) and Spring 2013 (Middle). Beta Parameters (Right) indicate the overall shape of each distribution. Symbol sizes are again proportional to the number of certificate earners in each course.

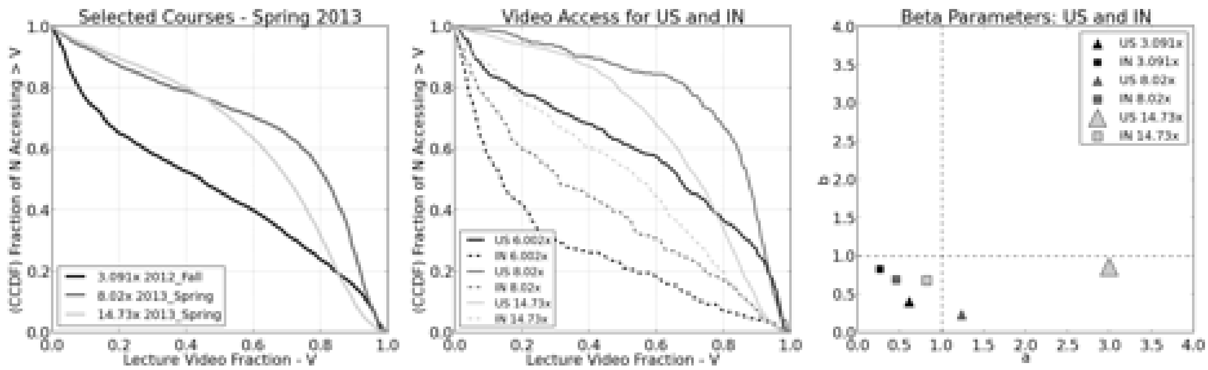

Figure 5. Fraction of videos accessed by certificate earners in 3.091x Fall 2012 and 8.02x Spring 2013. CCDFs (Left) are presented as a reference for comparing the separation of access distributions by the two largest enrolling countries (Middle): United States (Solid) and India (Dashed). Beta Parameters are plotted for each CCDF.

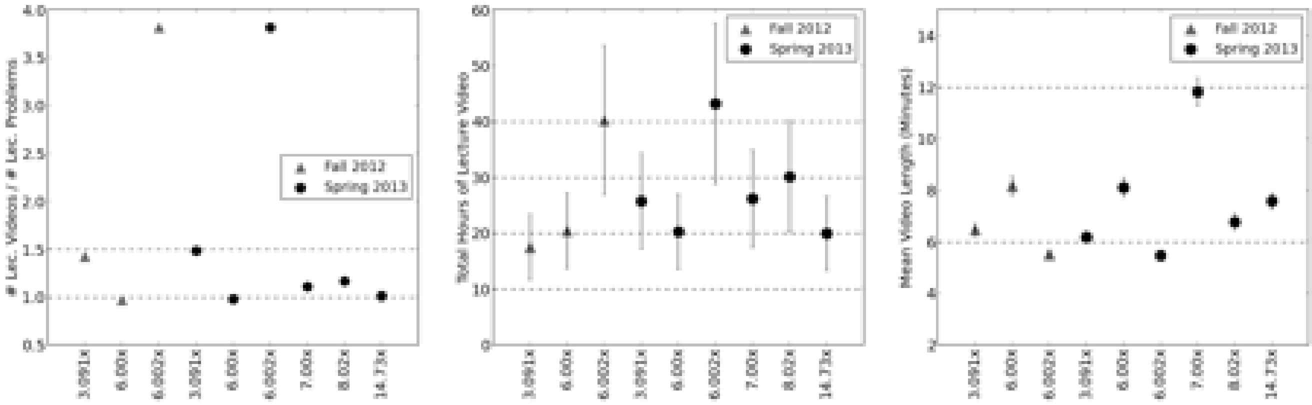

Figure 6. Visualization of Lecture Video features in all MITx courses: the ratio of Lecture Videos to Lecture Questions (Left) and the Total Duration in hours of all Lecture Videos watched in real time (Right). Error bars on total hours of lecture video denote the time difference in watching all videos at 0.75 or 1.5 times the normal speed. Error bars on Mean Video Length represent standard error of the mean. Dashed lines in both plots serve only as visual references.

Course Structure Considerations (considering removal)

Course structure refers to the type, order, and weight of various resources within a course. As a preliminary step toward understanding how course structure impacts video use, the following metrics are analyzed for all previously discussed MITx courses: the ratio of total lecture videos to lecture questions (frequency of occurrence), total hours of duration, and mean length of each video.

Figure 6 highlights these lecture video metrics. The video-question ratio (Left) gives perhaps the most compelling connection between bimodal video use and course structure. 6.002x has a tremendous number of lecture videos (see Table 1), leading to an inflated ratio, while 3.091x (the other bimodal course) has the next highest ratio of approximately 1.5. All other courses have video-question ratios near 1.0. Total time required to watch all videos (Middle) could potentially provide context into fatigue and time constraints, however, the connection between this metric is not as clear as that found in the video-question ratio (however, this metric will likely be more important in understanding temporal habits in future work). The mean video length (Right) as described here also lacks any strong connection between overall video accesses and course structure.

Discussion and Conclusions

Through the lens of unique lecture-video accesses, this study has provided a general overview of video use by certificate earners in MITx MOOCs. Bimodal video use measured from the inaugural 6.002x course has been confirmed to persist in repeated offerings utilizing the same content. In exploring this bimodality, country-of-origin was found to be an important factor influencing video use. However, country-of-origin did not account for the overall bimodal shape of distributions for all 6.002x offerings. For all MITx courses, two modes of video use have been observed: bimodal and high use. Country-of-origin was again shown to have significant influence on video use across courses, particularly for those courses with associated beta parameters existing near the boundaries of bimodal, high, and low video use.

Participants from India accounted for a large portion of certificate earners within MITx courses. Lecture-video use by participants from India was quite low relative to other countries in nearly all MITx courses. One aspect explored the simple idea that downloading videos due to poor Internet access may play a role in these observations; the reader is reminded click-stream data currently provide no information on participants that download lecture videos, instead, only indicating those participants streaming videos through their respective courseware. Downloading videos likely has some effect on low-video use in India, but other possibilities dealing with culture and learner preferences are not ruled out as contributing factors. Future efforts will be aimed at such effects.

Another important feature of this work involves the striking similarities in video use between repeated offerings of the same course. Minimal content changes were implemented in each course cycle for repeated course offerings, and behavior (interactions with videos) followed the same trend. Considering the certificate earning populations were still in the thousands of participants (barring 3.091 Spring 2013), this similarity makes a strong case that course structure impacts much of the student behavior. Courses with bimodal video use present an ideal setting in which to implement an experiment aimed at increasing video use through changes to course structure, i.e., the type, order, and weight of various resources within a course. Analysis of such experiments for on-campus physics courses using eTexts has begun (Seaton, Bergner, & Pritchard, 2013).

One promising result not directly addressed in this study involves the evolution of MITx courses. As new courses are introduced within each cycle, the overall number of videos being consumed is increasing. One might speculate that such an improvement is meaningful, but the value, whether toward learning or content delivery, must be better defined. Such metrics as those presented in Figure 6 are a first step in exploring how course evolution impacts video accesses. The relationship between the video-question ratio and bimodality presents a number of intriguing hypotheses for understanding video engagement. However, this work needs to be extended in order to account for the many types of possible engagement throughout a given course. Other important features not discussed here relate to content within each video, presentation style, and instructor effects, all of which could play an equally important role in overall video use. Recent work has implemented a deeper analysis involving the "in-video" interactions of MOOC participants, focusing on in-video dropouts and click activity (Kim, et al., 2014).

Much work remains in terms of identifying video access patterns in MOOCs. This work has taken a baseline approach that involves using participant-video interactions to count the number of unique videos accessed. Future work will likely incorporate improved metrics for analyzing video interactions, such as time-spent measures that monitor whether an interaction was meaningful (not simply clicking through to lecture questions), or measures of weekly video accesses that provide insight into changing habits over the roughly 16 weeks of an MITx course.

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How Students Learn using MOOCs: An Eye-tracking Insight

Kshitij Sharma, Patrick Jermann and Pierre Dillenbourg

Abstract: *We present the results of an eye-tracking study on a Massive Open Online Course (MOOC) lecture showing the relation between gaze variables and students' performance and learning strategy. 40 students watched a MOOC lecture while their eye-movements were being recorded. We present a method to define stimuli-based gaze variables that can be defined for any kind of stimulus. The advantage of using stimuli-based gaze variables is that the relation of the gaze indicators with performance measures and behavioral measures can be interpreted differently for different kinds of stimulus. MOOCs are very diverse in nature; having such a variable description enables the researchers to have a common measure for the different kinds of stimulus present in different MOOCs. The long-term goal is to create student profiles based on their performance and learning strategy using the stimuli-based gaze variables and to provide the students with gaze-aware feedback to improve the overall learning process.*

Introduction

In the present decade, off-the-shelf mobile eye-trackers have become readily available. These devices provide researchers and software designers with unprecedented access to users' attention. With further developments in webcam-based eye-trackers, the cost of technology will also be brought to a non-significant level. This will make the eye-tracking methods available to the world outside research labs as well.

Through this contribution, we address the topics of "student experiences and outcomes". We present a method to use physiological (eye-tracking) data to understand learning process in a deeper way. We also present a method to use stimuli-based indicators to qualify performance and learning strategy indicators. Our working hypothesis is that there exists a relation between behavioral indicators, performance, and the probability of dropping out of a course. The general question we address is "how can we help students to watch videos more efficiently (e.g., with deeper attention)".

The advantage of using stimuli-based indicators to derive variables is that we define generic variables

to be computed for any kind of stimulus and relation between performance and behavioral indicators with such variables can be explained according to the stimulus type. Our long-term goal is to be able to create students' profiles based on their performance and learning strategy and provide them with feedback to improve the learning process.

The rest of the paper is organized as follows: the second section presents the previous research contextualizing the present research; he third section highlights the main features and the questions addressed in the present study; the fourth section presents the experiment and different variables; the fifth section presents the results; the sixth section discusses the results; the seventh section concludes the paper.

Related Work

Video-based Learning

Existing research on video-based learning resembles many features of today's MOOCs. Volery and Lord (2000) identified 3 success factors in online education: usable and interactive technology design, instructors' enthusiasm and interest in the tool and students' exposure to the web. Tobagi (1995) developed an online distant learning system to capture lectures in real time, compress them, store them on an on-demand system and transmit the videos to an internal server. The on-demand video system server eliminated distance limitations and provided time independent access to study material.

Tobagi (1995) compared different modalities of video lectures (interactive video, instructional television and television) and preconceptions of difficulty for different modalities and found that there was no significant difference in the learning outcome but there was a significant difference in the level of preconceived difficulty in television and interactive videos. Cennamo (1991) studied the effect of video-based instruction on students' problem solving skills and attitude towards mathematics and instruction, and concluded that there was a significant improvement after the treatment in students' problem-solving skills and in mathematical as well as instructional attitude. Chio (2005) compared learning outcome and learners' motivation (attention, relevance, confidence, satisfaction) in video based learning to traditional textual-instruction based learning and found no difference in learning outcome for the two conditions. However, the students were more attentive in video-based learning condition than the textual-instruction condition.

Paivio (1971, 1991) argued that information provided by both auditory and visual channels should increase recall and retention. Studies by Mayer (2003) have also shown that visual information helps to process and remember verbal information and vice versa. This argument was strengthened by cue-summation theory showing that learning performance in the combined audio and pictures was better than in the combined audio and text, if the numbers of available cues or stimuli are increased (Severin, 1967). Schwartz (2007), Bates (1985) and Doerksen (2000) listed more benefits for video as a facilitator of educational content. The major benefits include presentation of detailed information (harder with text and image), efficient grabbing of students' attention, stimulating discussions and providing concrete real-life examples with visualizations.

Eye-tracking and Expertise / Task-based Performance

Previous research provides insights about the relationship between the gaze patterns and the behavioral and task-based performance indicators in diverse scenarios. Existing results show a clear relation between gaze patterns and expertise. Hasse et al. (2012) in an air traffic monitoring task found that the expert looked less at the scenario-specific information than novices. Eivazi et al., (2012), Tien et al. (2010) and Law et al. (2004) studied the effect of expertise on the gaze patterns in different surgical tasks and concluded that experts look less at the instruments than the novices, instead they focus more on the task specific areas. Reingold et al. (2001) showed that expert chess players pay more attention to the relative positions of the pieces, rather than the individual pieces, than novice chess players. Blignaut et al. (2008) also studied the difference between experts and novice chess players in a checkmate avoidance task and concluded that the experts have more gaze falling on the important squares than the novices. In a program debugging task Sharif et al. (2012) showed that the expert programmers scan through all the lines in the program faster than the novices. In a collaborative Tetris game, Jermann et al. (2010) showed that experts pay more attention on the stack of Tetronimoes while novices allocate more attention to the new pieces falling from the top.

Existing results also show a clear relation between gaze patterns and task-based performance. In a pair- programming task, Jermann et al. (2012) showed that the good pairs have more synchronized gaze on different parts of a program than the bad pairs. In a similar task, Sharma et al. (2012) showed that the will performing pairs pay more attention to the data-flow of the program than the poorly performing pairs. Moreover, Sharma et al. (2013) showed that while describing the functionality of a program, the well performing teams had more gaze on the variable modification parts in the program while poorly performing teams have equal distribution of gaze on different parts of the program during similar phases of the task.

Learning Strategy and Performance

In the learning context, Bidjerano and Dai (2007) and Pintrich and De Groot (1990) showed that the personality and learning strategy of an individual have an impact on his/her achievement. Montague and Bos (1986) studied the effect of a cognitive strategy on math problem solving performance and concluded that students who received the training on the strategy performed better than those who did not receive the training. Wolters (1999) studied the relation between learning strategies and the classroom performance for high school students and found a strong correlation between strategy measures and classroom performance. O'Malley et al. (1985) also found a strong correlation between learning strategy and performance in learning English as a second language. This encouraged us to link gaze not only with the performance but also with the study process and personality factors.

Present Study and Research Questions

We present the results of an eye-tracking study contextualized within a MOOC class. We chose MOOC videos as a stimulus for the eye-tracking because the effectiveness of video as a medium for delivery of educational content is already being studied and established in literature (see section "Related Work"). Through this contribution we propose to use the stimulus-based variables (introduced in the section "Experiment") to differentiate between the levels of expertise, performance and learning strategy. The benefit of using stimulus based variables is that these variables are generic enough be computed for any kind of stimulus. Moreover, the relation between performance and other behavioral constructs with such variables can be explained according to the stimulus type. The MOOC videos are very diverse as per the content of the video considered. Using stimuli-based variables in the analysis enables the researchers to analyze diverse content of the MOOC videos in a similar manner. The present study addresses following methodological question:

1. What are the stimuli-based variables that can be computed for a variety of stimulus and can be related to the performance and behavioral indicators?

Apart from the methodological question, through this contribution we addresses the following research questions:

1. What are the relations between the expertise, performance and learning strategy in the context of the present study?

2. How are the stimuli-based variables related to expertise and performance?

3. How are the stimuli-based variables related to different learning strategies?

Experiment

In this section we will describe the experiment, procedure and different variables we defined for the analysis presented in the current paper.

Participants and Procedure

In the experiment, the participants watched two MOOC videos from the course "ANONYMUS" and answered programming questions after each video. Participants' gaze was recorded, using SMI RED 250 eye-trackers, while they were watching the videos. Participants were not given controls over the video for two reasons. First, the eye-tracking stimulus for every participant was the same which facilitates the same kind of analysis for each of the participants. Second, the "time on task" remains the same for each participant.

40 university students from ANONYMUS, ANONYMUS participated in the experiment. The only criterion of selecting the participant was that each participant has the Java course in the previous semester. Upon their arrival in the experiment site, the participants signed a consent form, then they answered three self-report questionnaires for a 20-point study processes questionnaire (Biggs et. al., 2001), 10-point openness scale (Goldberg, 1999) and 10-point conscientiousness scale (Goldberg, 1999). Then they took a programming pretest in Java. In the last phase of the experiment, they watched two videos from the MOOC course and after each video they answered programming questions based on what they were taught in the videos. In the following subsections, we describe different variables related to the present analysis.

Participant Categorization

1. **Expertise:** We used median split on the pretest score (max=9, min=2, median=6) and we divided the participants into "experts" (more than median score) and "novices" (less than median score).

2. **Performance:** We used median split on the posttest score (max=10, min=4, median=8) and we divided the participants into "good-performers" (more than median score) and "poor-performers" (less than median score).

3. **Learning Strategy:** We used median split on the study process questionnaire score (max=42, min=16, median=31.5) and we divided the participants into "deep-learners" (more than median score) and "shallow-learners" (less than median score).

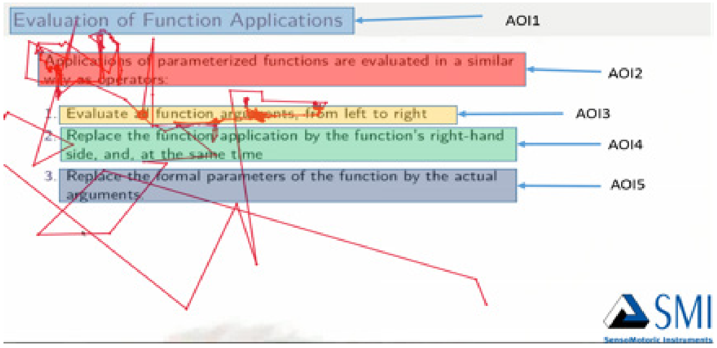

Figure 1: Example of a scan-path and Areas of Interest (AOI) definition. The rectangles show the AOIs defined for the displayed slide in the MOOC video and the red curve shows the visual path for 2.5 seconds. We compare AOI misses and AOI back-tracks across the levels of performance and learning strategy.

Process Variables

1. Area of Interest (AOI) misses: An area of interest (AOI) is said to be missed by a participant who does not look at that particular AOI at all during the period the AOI was present on the stimulus. In terms of learning behavior AOI misses would translate to completely ignoring some parts of the slides. We calculate the number of such AOIs per slide in the MOOC video as a scan-path variable and compare the number of misses per slide across the levels of performance and learning strategy (for details on areas of interest see Holmqvist et. al., 2001).

2. Area of Interest (AOI) back-tracks: A back-track is defined as a saccade that goes to the AOI which is not in the usual forward reading direction. For example, in the figure 1, if a saccade goes from AOI3 to AOI2 it will be counted as a back-track. AOI back-tracks would represent rereading behavior while learning from the MOOC video. The notion of the term rereading in the present study is slightly different than what is used in existing research (for example, Mills and King (2001), Dowhower (1987) and Paris and Jacobs (1984)). The difference comes from the fact that in the present study the students don't reread the slides completely but they can refer to the previously seen content on the slide until the slide is visible. We calculate the number of back-tracks per slide in the MOOC video as a scan-path variable and compare the number of back-tracks per slide across the levels of performance and learning strategy.

3. Attention Points: Attention points are computed using the heat-maps (for details on heat-maps see Holmqvist et. al., 2001) of the participants. We divided the MOOC lecture into slices of 10 seconds each and computed the heat-maps for each participant. From heat-maps we computed the attention points using the method described in figure 2. Attention points typically represent the different areas where the students focus their

attention. The number of attention points will depict the number of attention zones and the area of the attention points will depict the total time spent on a particular zone. We compare the number and the average area covered by attention points per 10 seconds across the levels of performance and learning strategy.

Figure 2: Steps for computing attention points from the heat map. (a) A slide with the 10-second heat-map overlay. (b) A slide (same as (a)) without the heat-map overlay. (c) Resulting on image after subtracting image without the heat-map from heat-map overlaid image. (d) Applying connected component on the image (c) gives us attention points.

Results

1. General Statistics: We observe no clear relation between the three variables. There is no significant relation between expertise and performance (χ^2 (df=1) = 9.72, p > 0.05). There is no significant relation between expertise and learning strategy (χ^2 (df=1) = 3.12, p > 0.05). There is no significant relation between learning strategy and performance (χ^2 (df=1) = 4.18, p > 0.05).

2. Expertise vs. Process variables: We also did not observe any significant relation between expertise and other variables. Expertise has no relation with the number (F(1,38) = 1.00, p > 0.05) or the average area (F(1,38) = 1.17, p > 0.05) of the attention points. Moreover, expertise has no relation with misses (F(1,38) = 2.06, p > 0.05) or back-tracks (F(1,38) = 4.00, p > 0.05) of the attention points. In the following subsections, we report the relationships for the heat-map and scan-path variables with learning strategy and/or performance.

3. Attention Points vs. Performance and Learning Strategy: There is no difference in the number of attention points for good and bad performers (F(1,38) = 1.00, p > 0.05). Moreover, there is no difference in the number of attention points for deep and shallow learners (F(1,38) = 1.00, p > 0.05). However, the good-performers have significantly more average area for the attention points than the poor-performers (F(1,38) = 5.47, p < 0.05). Furthermore, the deep-learners have significantly more average area for the attention points than the shallow-learners (F(1,38) = 4.21, p < 0.05), figure 3 shows the difference margins. This suggests that the good-performers spend more time reading the content than the poor-performers and the deep-learners spend more time reading the content than the shallow-learners. To confirm this we also measured the reading time for a 2-way ANOVA showing two single effects. First, the good-performers have a significantly higher reading time than the poor-performers (F(1,36) = 9.99, p < 0.01). Second, the deep-learners have a significantly higher reading time than the shallow-learners (F(1,36) = 4.26, p < 0.05); figure 4 shows the difference margins.

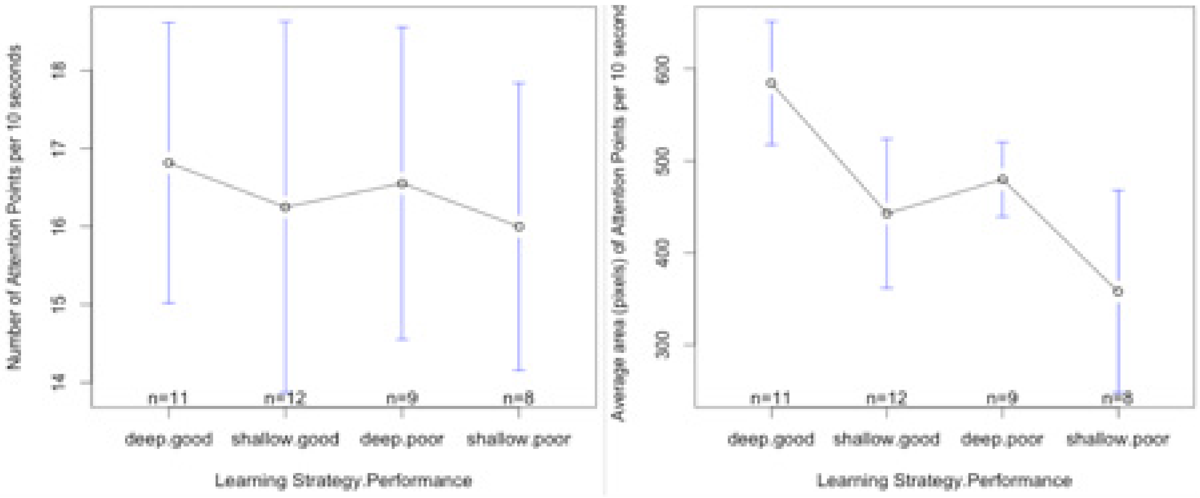

Figure 3: Difference margin for number of attention points and their average areas per 10 seconds for different levels of learning strategy and performance.

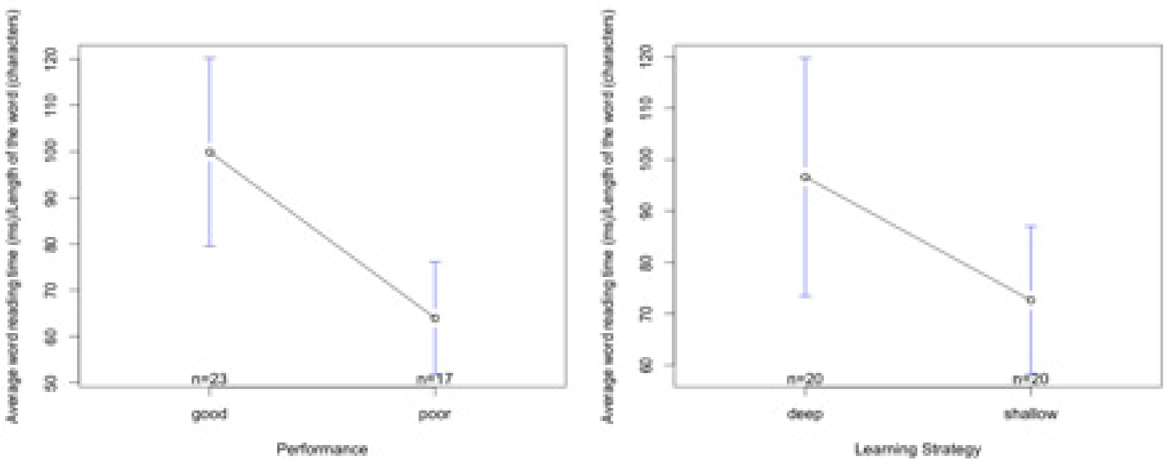

Figure 4: Difference margin for reading time levels of learning strategy and performance.

4. AOI misses and AOI-backtracks vs. Learning Strategy: There is no significant relation between the learning strategy and the number of area of interest (AOI) misses ($F(1,38) = 0.04$, $p > 0.05$) as well as the number of AOI back-tracks ($F(1,38) = 0.21$, $p < 0.05$).

5. AOI misses and AOI-backtracks vs. Performance: The poor-performers miss significantly more AOIs per slide than the good-performers ($F(1,38) = 35.61$, $p < 0.0001$). Whereas, the good-performers back- track to significantly more AOIs per slide than the poor-performers ($F(1,38) = 44.29$, $p < 0.0001$), *figure 5* shows the difference margins. This suggests that the good-performers miss less content on the slide and reread more content than the poor-performers. We looked at the AOI misses every slide of the MOOC lecture and used a median cut on the number of AOI misses per student. We divided the AOI misses intohigh-misses and low-misses and compared the AOI misses across the performance levels. We observed that 65% of the poor-performers have low misses as compared to 87% of the good-performers (χ^2 (df=1) = 28.9, $p < 0.05$).

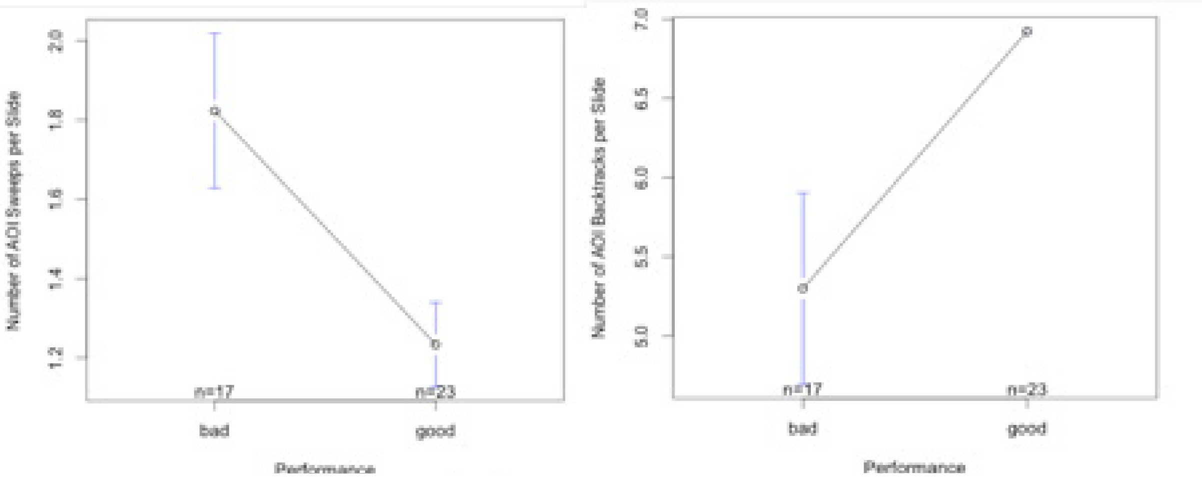

Figure 5: Difference margin for number of AOI misses and AOI back-tracks per slide for different levels of performance. AOI back-tracks for good-performers have a special distribution because all the good-performers have average back-tracks equal to the average number of AOIs per slide.

Discussion

We presented the results from an eye-tracking study. Through this contribution we emphasize the fact that the diversity of the MOOC videos should not have an effect on the way the related data is analyzed. We present a method to define stimuli-based variables as the process variables. These variables essentially correspond to attention measures and how much students connect different knowledge points. Moreover, these measures also indicate how much content on a slide students miss and how much they refer back to previously-seen content.

The attention points, derived from the heat-maps, are indicative of the students' attention both on the screen space and time. The area of the attention points depends on the time spent on a specific area on the screen. Higher average area of the attention points can be interpreted as more reading time during a particular period. The well performing students, having a deep learning strategy, have the highest average area of the attention points per 10 seconds among all the participants, despite having the same number of attention points during the same time period.

However, more reading time does not always guarantee higher performance. Byrne et. al. (1992) showed the inverse in a longitudinal reading study by proving that the best performing students were the fastest readers. On the other hand, Reinking (1988) showed that there is no relation between performance and reading time. As Just et. al. (1980) put it: "*There is no single mode of reading. Reading varies as a function of who is reading, what they are reading, and why they are reading it.*" The uncertainty of results about the relation between performance and reading time led us to find the relation between the reading time, performance and learning strategy. We found that the well-performers have more reading time than poor- performers and the deep-learners have more reading time than shallow-learners. Thus, we can interpret this reading behavior, based upon the reading time differences, in terms of more attention being paid by the well performing students who have a deeper learning strategy than the other student profiles. The attention points are important because we can use attention points to give feedback to the students about their attention span. Moreover, one could also use the attention points for student profiling based on performance and learning strategy.

The area of interest (AOI) misses and back-tracks are temporal features computed from the temporal order of AOIs looked at. We found that good-performers have significantly less AOI misses than the poor- performers ($F(1,38) = 35.61$, $p < 0.001$). AOI misses are important because they can be an important factor in providing students with the feedback about their viewing behavior just by looking at what AOIs they missed.

The AOI back-tracks are indicative of the rereading behavior of the students. We found that the good performers have significantly more back-tracks than the poor-performers ($F(1,38) = 44.29$, $p < 0.001$). Moreover, the ell-performers back-track to all the previously seen content, this explains the special distribution of AOI back-tracks for well-performers. Mills and King (2001) and Dowhower (1987) showed in their studies that rereading improves the comprehension. In the present study, the scenario is somewhat different than Mills and King (2001) and Dowhower (1987). In the present study, the students did not read the study material again. Instead, the students referred back to the previously seen content again in the duration the slide was visible to them. Thus the relation between rereading of the same content and performance should be taken cautiously; clearly further experimentation is needed to reach a causal conclusion.

One interesting finding in the present study is the fact that the attention points have significant relationships with both the performance and learning strategy. Whereas, the AOI misses and AOI back- tracks have significant relationships only with performance. This can be interpreted in terms of the type of information we consider to compute the respective variables. For example, the attention points computation takes into account both the screen space and the time information and the attention points computation requires only the temporal information. However, in the context of the present study, we cannot conclude the separation between spatial and temporal information and how it affects the relation between the gaze variables and performance and learning strategy.

Conclusion

We found interesting relationships between the stimuli-based gaze variables and indicators for performance and learning strategy. The well-performers with a deep learning strategy had the largest average area for the attention points whereas the bad-performers with the shallow learning strategy had the smallest average area for the attention points. The wells-performers have less AOI misses and more AOI back-tracks than the bad-performers. We also found that the aggregation of different types of information (spatial and/or temporal) can affect the relation between stimuli-based gaze variables and indicators for performance and learning strategy. The results reported are only interrelationships between the variables and there is no causality claimed in the present contribution. Another important point worth mentioning here is the limitation of having stimuli-based gaze measures. The measures are independent of the content, which makes it difficult to compare the distribution of the gaze over the areas of interest, which are important for the understanding of the educational context.

The results also contribute towards our long-term goal of defining the student profiles based on their performance and learning strategy using the gaze data. The attention points can server the purpose of a delayed feedback to the students based on their attention span, while AOI misses can be used to give feedback to students about what they missed in the lecture. Moreover, AOI back-tracks can be used to give feedback to students about their rereading behavior. However the results reported here are to be taken cautiously and certainly more experimentation are needed to find any causality. In a nutshell, we can conclude that the results are interesting enough to carry out further investigation in the direction of using the stimuli-based gaze variables to define student profiles and to provide them feedback to improve their overall learning process.

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A Platform that Integrates Quizzes into Videos

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***Abstract:** In most current xMOOCs and similar online courses, quizzes are detached from the video both visually and in terms of content, and break the flow of the learner's experience. Hence, the authors of courses may hesitate to use a large number of lightweight quizzes in their courses, even though research in didactics suggests beneficial effects in doing so. As such, we have developed a platform that enables the fluid integration of quizzes with videos by overlaying arbitrary HTML elements. The platform offers streamlined but flexible functions to author quizzes; it presents the videos as part of a course as well as a searchable multimedia encyclopedia, whose individual lessons can also be embedded into other websites. This paper describes the requirements, the resulting design and implementation of our platform, and the first results from an open beta test for a remedial math course taken by 350 registered stu-dents.*

Tags:
Formative assessment, educational videos, multi-ple-choice tests, HTML5

Quizzes as Key Enablers of Learning

Vince Cerf, one of the inventors of the TCP/IP protocol, oOne major step forward that xMOOCs made in comparison with plain recorded lectures is the interleaving of videos with quizzes. Depending on the MOOC, a quiz may appear every half an hour or every two minutes. Quizzes in MOOCs have been shown to enhance the users' mental focus (Szpunar, 2013). What's more, the "lean back" experience of traditional lectures - in particular, videotaped ones - has long been known to provide a poor learning environment as opposed to more "lean forward" experiences. An active learner is a far better learner. Studying the effects of films and texts, Salomon (1984) has introduced the term "amount of invested mental effort" to characterize the beneficial effect of mental elaborations, which may, however, be considered strenuous by the learners. Bjork & Bjork (2009) have coined the term "desirable difficulty" to describe the phenomenon that impeded recall (among which is delayed testing) tends to enhance learning. Simple recall can already have a superior effect over re-reading, a phenomenon that is known as "test-induced learning" (Little et al., 2012).

To better employ such effects of quizzes, we have built a platform that enables using a massive number of quizzes. Our target figure is a frequency of one quiz about every 30 seconds. Hence, the platform must enable highly efficient authoring and it must present quizzes in a way that does not unduly impede the experience of "flow". The latter requirement means that quizzes no longer mark boundaries between videos; they rather have to become an integral part of the video, concerning both the user interface and the train of thought. Part of our ongoing research concerns the didactic integration of quizzes into videos, for instance by asking which step should be taken next in a mathematical derivation. This paper focuses on the technology behind this: the design and implementation of our platform and what we have learned along the way.

Requirements

The main purpose of the platform is to present quizzes (that may contain mathematical notation) as visual layers over videos. Initially, multiple-choice tests (with a selection of single or of multiple items) and text input that may or may not be parsed as a mathematical expression are to be supported. For pre- and post tests at the begin-ning and at the end of units, specific larger series of quizzes are needed. The learner has to be presented with feedback for wrong answers and may be referred to a different unit that covers basic topics to catch up and then automatically return to the quiz. Such "redirections" can also be used to suggest worthwhile excursions.

Whereas the platform supports building full-length courses, its main use may be to offer a well-searchable and cross-referenced encyclopedia of short units: imagine a Wikipedia for short learning videos with integrated quizzes. These can - but need not - be combined to form a course or several different courses. To enable a broader use of the short units, these are embeddable as HTML iframes to be reused and recombined in content management systems such as Wordpress or in learning management systems. Among many other tech-nical issues, this means that the quizzes and videos need to be graphically scalable, since the unit needs to fit into the page structure of the system into which it gets embedded. The two ways of using the system with cours-es on the one hand and small, embeddable units on the other hand resembles that of YouTube itself with its playlists and individual videos.

For reasons of wide access, privacy, and embeddability, the platform does not require learners to regis-ter and log in. In addition, by default no personal data of users are saved on the servers; server-side statistics are only stored cumulatively so that one can compute the mean and the standard deviation of parameters over all users.

To gain insight into existing models for the use of quizzes and the interaction with them, we looked at existing related solutions. Among the major MOOC providers, Udacity comes closest to the look of our plat-form, as it often uses the final image of a video as a backdrop for HTML radio buttons, checkboxes and text input fields in an ensuing quiz. Outside the MOOCs sphere, there are several solutions to create rigidly tem-platized quizzes, such as YouTube's Video Questions Beta, educanon.com, ed.ted.com, zaption.com, and the video editor that is part of the screen recording software TechSmith Camtasia. The latter is also noteworthy be-cause the generated Flash files (which admittedly represent an outdated format) can communicate the quiz re-sults to a learning management system using the SCORM standard. This type of data transfer is of future inter-est for embeddable learning objects served by our platform. In a similar vein, the huge range of "multimedia" quiz types offered by learningapps.org comes close to our aim of embeddable units. Further inspiration stems from HTML5 animation editors such as Adobe Edge Animate, Google Web Designer, Mozilla PopcornMaker, and Tumult Hype.

Functions of our Platform

Given that the videos we want to equip with quizzes are hosted on YouTube, the obvious solution for putting quizzes as layers on to top of the videos was to use the YouTube API in combination with CSS3 to control which element is placed on which layer. We wanted to keep the design and structure of the quizzes as flexible as possible, so they are encoded in plain HTML. This provides the quiz author with a rich functionality. For in-stance, CSS3 allows defining animations, which are frowned upon by many, but – when used judiciously – can for instance counteract the change blindness that occurs when a small text field is displayed for the user to enter the result of computation that is going on in the video, see Figure 1. Other HTML elements include lines such as those shown in Figure 2.

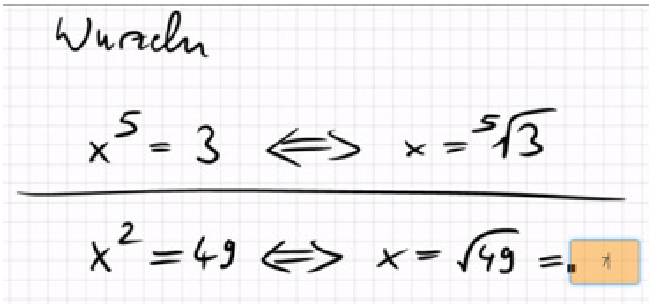

Figure 1. The quiz asks the user to complete a computation before the lecturer does so.

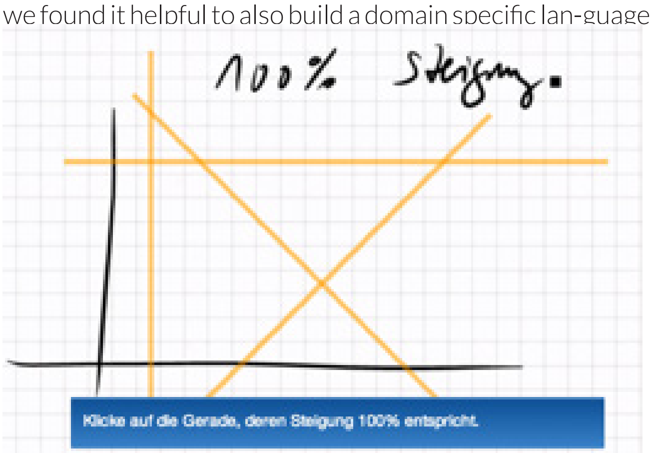

Figure 2. This quiz draws four lines as HTML code over the video. The user is asked to click on the one with the specified slope.

As we are focusing on mathematics and related subjects, we found it helpful to also build a domain specific lan-guage (DSL) to evaluate a string entered by the user in a text field as a symbolic mathematical expression. This enables the author to create much deeper tests. Our DSL is basically a Java port of an interpreter for Standard ML, a functional programming language. We use this interpreter to parse strings consisting of mathematical expressions. In addition, it possesses much syntactic sugar to get closer to the mathematical syntax that students are used to.

The author enters the expected answer as an expression in the editor, say (a+b)^2. If the user types in $a^2+2ab+b^2$ instead of that (with superscript ^{2} for the square and no asterisk * for the multiplication), our DSL can assert that those expressions are semantically equivalent. Furthermore, the DSL can also check for a lower-level match, that is, whether or not the user has simplified an expression to the fullest extent. In this mode, the DSL for instance finds that a(b+c) is equivalent to (b+c)a, but not to ab+ac, since this would require a transformation of higher order.

Our focus on mathematics also led to the decision to support LaTeX. For this purpose we integrated MathJax since it supports a clean rendering of equations in all modern browsers. Hence, the system can render complex mathematical expressions on top of any video, see Figure 3. We expect the quiz authors to be familiar with basic LaTeX syntax.

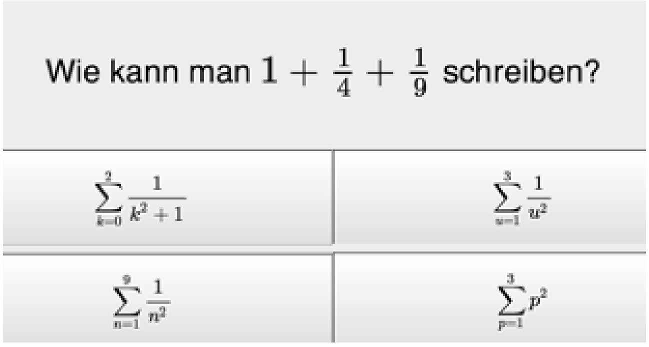

Figure 3. Thanks to MathJax, quizzes can comprise almost any mathematical expression.

The centerpiece of the platform is an efficient and intuitive "what you see is what you get"-style editor used to build the quizzes in a web browser, see Figure 4. Placing a quiz every 30 seconds in a course of ten hours of video playtime would mean having to create 1200 quizzes. As one major step to reach the efficiency required to achieve this target, we implemented a template mechanism. The templates are created simply by saving any existing quiz, as a template and can be reused from the template gallery. In the optimum case, the author just needs to alter the captions of the elements.

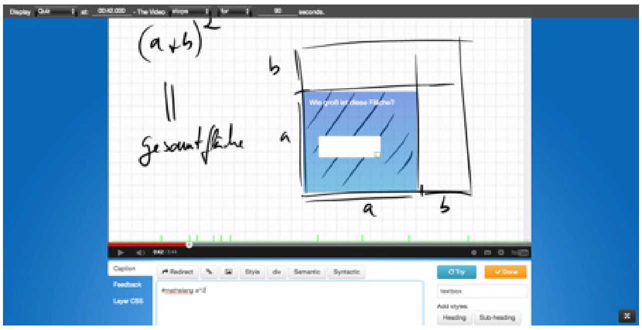

Figure 4. To build a quiz, basic elements are arranged in a layer over the video. These can then be edited in terms of HTML, CSS, LaTeX and the proprietary DSL for checking mathematical expressions.

Implementation

Our platform is built with the Google Web Toolkit (GWT), which allows writing highly structured web applica-tions in Java as common programming language for both the server and the client. GWT includes a Java-to-JavaScript compiler that generates the appropriate JavaScript for the browser on the client side. This compiler produces highly efficient JavaScript and also caters for the different versions of JavaScript code required to support all major browsers. We have chosen GWT over other frameworks for four main reasons: First, large-scale development in JavaScript is troublesome as it is a scripting language. Since Java is (in opposite to JavaS-cript) strongly typed, development helpers such as code completion, refactoring, unit testing, code synchroniza-tion in a team can work much better. Second, GWT has been strongly supported by Google for more than six years; hence it is one of the most mature web development frameworks available. Third, Java is adopted widely in the academic community; hence it was easy to find well-experienced developers. Fourth, we are using - like the Khan Academy does - the Google AppEngine (GAE) to host our services. The GAE is easy to use, serves 100,000 users per month for about US-$ 20 and offers almost infinite scalability as it is build on Google's infra-structure.

All personal progress is saved locally in the user's browser using the HTML5 Storage API. Since we are using YouTube to host the videos and the GAE to host our application, we cannot ensure that there is no personal data saved by third parties. We can assure, however, that the personal learning progress cannot be easily related to any personal data by third parties because the access to HTML5 storage is protected by a same-origin policy.

The main remaining technical problem is the compatibility with the wide range of browsers. In a first approach we used the regular Flash-based version of the YouTube API. We had to learn, however, that some implementa-tions of Flash for Linux cannot display HTML as a layer above the video. Hence, we switched to the HTML5 version of the YouTube player. This and our use of modern features of HTML5 and CSS3 such as full screen mode or transformations to scale the quizzes with the size of the video means that we only support up-to-date browsers, in particular current versions of Google Chrome and Mozilla Firefox.

A different compatibility problem occurs on mobile devices. They do implement HTML5 and CSS3, but many of them do not implement video playback in the same manner as desktop browsers do. For instance, Apple's Safari for iOS opens videos in the QuickTime player, which is separate from the browser. With our current ap-proach there is no way to overcome this problem in the browser; the only way to get our platform to work on iPhones would be to write a native app. On Apple iPads we have to work with Webkit CSS extensions, other-wise the native browser displays the video within the browser, but the video player captures all touch events so they are not propagated to our HTML displayed above. This problem does not occur with Google Chrome on the iPad; however, most users do not have installed this browser. On the iPhone, even Google Chrome opens videos in the QuickTime player. It is hard, anyway, to support our platform on smartphones due to the small screen size: There is hardly enough space to show both an embedded quiz and an on-screen keyboard in a usable manner.

GWT is great at dealing with JavaScript differences between browsers. One cannot, however, hope for any framework to automatically deal with quirks in a browser's interpretation of HTML in a layer above a video or in a browser's implementation of the HTML5 video player.

Observations Made During the Beta Test

The platform is currently used for 89 Khan-style videos (heavily edited to remove slips of the tongue, mistakes, repetitions and pauses; total playing time: 8.5 hours) with 450 embedded quizzes, to be found under www.capira.de. This content formed the basis of a remedial course in mathematics for approximately 350 stu-dents at the last author's institution. The course was conducted in flipped-classroom style (Loviscach, 2013) with face-to-face sessions of at most 15 participants working with a student tutor. The course was offered on different parallel schedules: two weeks with three hours of daily face-to-face time (Monday through Friday) or four weeks with 1.5 hours of daily face-to-face time.

The Google AppEngine smoothly served every traffic spike (we saw a maximum of eight requests per second) without any noticeable increase in the latency of requests. We expect the AppEngine to work smoothly with a much higher traffic load.

When we interviewed the students about their experience after two weeks of using our system, the majority con-firmed that the embedded quizzes helped them to stay focused while watching the videos. The quizzes may feel annoying at times; however, questions that occur naturally within a video - such as asking about the result of an algebraic transformation currently being applied - were received well.

Almost all of the students watched the videos with embedded quizzes on our platform rather than without quizzes on YouTube, even though we have pointed them to both sources. Those students who used YouTube direct-ly were mostly confined to a smartphone. About 5% of the students complained about our lack of support for mobile devices. This percentage is comparable to the current (end of 2013) percentage of views of the last au-thor's YouTube videos on smartphones (8%) and tablets (6%).

In an anonymous survey among the students, three quarters of the participants said they watched more than half of the videos; almost the same number said they did not skip more than half of the quizzes in the videos they watched. Only 5% of the participants reported to have only watched up to one quarter of the videos, but 20% indicated the same level of use for the quizzes in the videos they watched. We found a correlation between the reported percentage of use of the quizzes and the students' appraisal of the difficulty of the problem sets handed out to do in the face-to-face sessions: Students who experienced these problems as easy took virtually all of the embedded quizzes; students who reported the difficulty of these problems to be appropriate or difficult took far fewer embedded quizzes.

In an open-ended part of our interviews, the majority of the students told us they like learning by teaching and encouraged us to build in features to support this in further versions.

Open Questions

How can we get more quizzes into the videos?

We learned that the efficiency of the author's workflow is crucial. Equipping the videos of the remedial mathe-matics course with five to ten quizzes each, required about 70 hours of work. This is still too much for our target of one quiz every 30 seconds at a cost that is manageable for a small institution. Hence, our next development cycle will focus on lecture recording and quiz authoring in front of a live audience, on further increasing the editor's efficiency, and on enabling crowed-sourced quiz authoring. The latter requires a user-role system, a version manager, and a workflow for quality assurance, similar to the system employed by Wikipedia.

What is the right web development framework for our purposes?

There are literally hundreds of other web development frameworks, ranging from Adobe AIR to Microsoft ASP. Since our core team was already experienced in building large-scale applications in GWT and we wanted to implement our proof-of-concept quickly, we did not focus on finding the "best" framework for our purposes. For our next version we are currently pursuing deeper research in particular on dart lang and AngularJS since they are strongly supported by Google (which indicates a minimum degree of longevity), support more modern features like data binding and web components, and in total get along with much less development overhead.

How can we integrate aspects of gamification in a meaningful fashion?

We are currently supporting some simple aspects of gamification. For instance, the quizzes are timed, to further focus the user's attention. Gamification, however, has much more depth and breadth (and comes with a load of issues as well). In terms of content, for instance, it is important to steer on a fine line between too easy and too stressful, that is: to be challenging but not too much. In terms of support by the platform one may think of dif-ferent ways of showing his or her progress to the learner in a playful way. Here, we are researching ways to mo-tivate learners but not demotivate them (think about the effects of bad grades in school.) Another central area of gamification is when to give which kind of reward. Our platform includes (simple as this may be) "optimistic" sounds for correct responses, but this may only be the start. In any case, we want to make sure that the detri-mental effects of such external motivation are kept under control.

How can we bring together people in person to learn?

We want to encourage students to learn by teaching. Therefore, we are working on functions to offer and seek private tutoring in a virtual (or no longer virtual?) community. We consider implementing peer-to-peer support: A user with excellent performance may sign up to automatically be recommended as an online tutor. This could be achieved by promoting Google Helpouts as well as tutoring in person. In addition, we want to integrate communication channels such as forums, chats and instant messaging.

How do we teach best with quizzes?

The vital question in education that we can now begin to address with our platform is which type and which level of quiz is to be used at what point. Some aspects include whether to insert delayed quizzes in the spirit of "spaced practice" (Williams, 2013), possibly with personalized spacing (Lindsey et al., 2014). This is particular-ly challenging, as such an intervention seems to contradict the idea of "flow". Addressing the application of our platform in universities, we also want to examine whether we can foster higher-order thinking rather than the memorization of facts and skills.

Conclusion and Outlook

We have built a platform for integrating quizzes with videos that has successfully stood a test with several hundred users. Shortly, several other courses will be added and announced to the general public. Whereas we have achieved a density of quizzes that is beyond that of regular MOOCs, we want to support the real-time produc-tion of quizzes, further improve our editor, and to open the platform for crowdsourcing. Concerning educational outcomes more directly, we are now starting to conduct experiments on the optimum usage of quizzes.

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Designing Video for Massive Open Online-Education: Conceptual Challenges from a Learner-Centered Perspective

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Abstract: *Following new paradigms for using (audio)visual media and tools in modern knowledge communities, an important question arises relating to video usage in MOOCs: How can videos effectively be integrated into MOOC designs in terms of learning support? How can video tools be employed for advanced collaborative tasks? In the present contribution, we report on an original experimental study investigating collaborative video-based online-learning with a web-based video tool. Two contrasting types of tasks (discussion vs. design) are compared, both performed with exactly the same materials and technology and within the same lesson unit. Results indicate that in our study, students with a discussion task were supported in collaborative learning activities better than with a design task. In contrast, the design task supported deep elaboration of the visual materials better than the discussion task. The results are discussed with regard to their implications for video development in MOOCs.*

Introduction

In Massive Open Online Courses (MOOCs), core components include the connectivity, peer-to-peer relations and the emphasized role of the participants. In contrast, the videos in MOOCs remain mainly on a level of mass communication and individual consumption and therefore echoe somewhat outmoded forms of video usage in the classroom: Students can watch online video lectures in MOOCs, showing how their professor is talking to them explaining topics or tasks, together with slides presented in the lecture. Or they can watch video-based course materials like explanatory videos and animations, or documentaries and historical film documents (e.g., in politics or history lectures). There is a big gap between the core components of MOOCs and how these are not applied when using video. In the light of this limitation, it seems unsurprising that initial empirical findings indicate only limited student engagement with the videos in MOOCs. For instance, a recent analysis of video use by students revealed, «…that only half the participants are watching the majority of course videos» (Seaton, Rodenius, Coleman, Pritchard & Chuang, 2013, p.57).

These findings go along with our observation of limited task paradigms for framing videos provided in MOOCs: Specifically, video usage in MOOCs is often limited to an implicit task of passive watching and goes mainly without use of interactive video tools (e.g., hypervideo functions or video authoring tools, cf. Pea & Hoffert, 2007; Zahn et al., 2005). This reminds one of previous criticisms concerning traditional learning contexts: suboptimal video usage, as, for example, known from school-based education (Hobbs, 2006).

Indeed, designing video for learning purposes is known to be a conceptual challenge: Research has shown that videos used in a mere presentation mode foster passive watching instead of reflective-learning activities as would occur when studying printed text (Salomon, 1984). Thus, in order to be effective for learning, video usage must extend beyond the classic TV-like presentation approach for individual learners and target meaningful collaborative tasks like joint observation and inquiry (Smith and Reiser, 2005), guided noticing (Pea, 2006) and understanding of complexity (Spiro, Collins, and Ramchandran, 2007). When mapped with clear learning goals, video can be a most powerful tool for learning (Schwartz & Hartmann, 2007; Zahn, Pea, Hesse & Rosen, 2010).

How could scenarios of collaborative learning in MOOCs then be combined with a MOOC approach to active use of video? In order to answer this question we first need to understand the full range of potentials of video for learning. Then consider existing empirical results from related research in the learning sciences that sheds light onto the details of the complex interrelations between videos, tasks and online learning. The current contribution relates to theory on video usage for learning and original results from a study on collaborative online-learning with video, which compares in-depth the effects of two different tasks on the success of online-learning with videos and video tools that can potentially be scaled up to the level of a MOOC.

Setting the Stage for Learning with Videos

Schwartz and Hartmann (2007) provide a seminal framework mapping the terrain of possible video uses and outcomes for learning: In a first step, they distinguish four basic classes of possible learning outcomes – "seeing", "doing", "engaging" and "saying" – thereby differentiating specific learning targets, on the one hand, and mapping these targets to specific video genres and tasks on the other. We provide selected examples for each class: 1) When learning targets the support of "seeing" as the primary task, then the goals can include either noticing familiar things that we know, but usually cannot observe in nature (like animals from a distant country) or noticing details we would otherwise overlook (like a small scene in a Breughel painting). In the first case we would need a video portrayal to be watched as our genre, in the second case we would need functions for active point of view editing with zooming in and highlighting. 2) When video targets "doing", then this outcome could be related either to skills (like learning to tie a knot) or to attitudes (like learning to use words instead of violence when interpersonal conflicts arise). In the first case, we would need a step-by-step modeling video with detailed shots of the hands tying the knot. In the second case, we would need movie scenes showing a role model to identify with. 3) When video targets "engaging", then the goals might be either to raise interest for future-learning preferences (like a preference for science) or to contextualize a specific topic (like presenting a real world problem to be solved by means of Newton's laws). 4) When video targets "saying", either memorizing facts or understanding explanations may be addressed and we would use a genre showing analogies and associations in the first case, and expository video in the latter. There are specific research traditions associated with each of these basic dimensions, too extensive to be reviewed in this paper (e.g. concerning seeing the research strands related to guided noticing (e.g., Pea, 2006; Pea et al., 2006), or concerning doing the body of research by Bandura (e.g., 1989; 2004)).

Here, however, we will consider these dimensions additionally in relation to adequate task contexts. Schwartz and Hartmann (2007) emphasized the necessity of situating designed videos in a meaningful task that further supports the desired learning goals mentioned above. The authors describe, for instance, an inquiry task, where video is used within an inquiry-design circle supported by multimedia tools (see p. 344). Similar to this approach, collaborative design activities involving videos and web-based video tools have proven to be effective both in lab research and in traditional educational settings, as was summarized in earlier related research on traditional university courses (Stahl, Zahn & Finke, 2006 ; Zahn et al. 2013) or school-based education (Zahn et al. 2010a, b, 2012). In addition, research has specified on the theoretical and empirical level how activities of designing for an audience – in this case: student teams producing a video-based information structure – contributes to participation in peer interaction that facilitates and stimulates cognitive elaboration, discussion and learning success. Further on, examples were provided on how advanced (hyper)video technologies can be utilized to support both video-based design and discussion tasks. And finally, an educational concept for constructivist approaches to learning in schools and higher education was proposed, which was labeled collaborative visual design (Zahn, Krauskopf, Hesse & Pea 2009, Zahn, et al., 2010a).

How can such diverse processes of active and collaborative learning with videos be supported in a MOOC scenario? And should they be supported? In the remainder of our contribution we add original results that – instead of focusing on the structural features of MOOCs and questions of technological implementation – provide some insights on more basic questions of effective task framings for using online video tools before scaling-up. We believe this research and its implications can be an important contribution for specifying a more goal-oriented video usage in and further research on MOOCs.

Experimental Study

The purpose of our study was to investigate in detail how different task contexts framing the active use of video in an online learning setting would produce differential effects on student dyads' online-collaboration processes and learning outcomes. To do so, we relied on a previously made theoretical distinction between participation in discussion and participation in design concerning use of video for learning (Zahn, et al. 2009) and distinguish between discussion and design tasks as our independent variables in the study. We expected that the tasks would stimulate differential collaborative learning activities and have differential effects on student learning.

Our test domain was the domain of history, because especially here, task assignments and tools are of utmost importance to stimulate students' knowledge, intensive reflection and interpretation of historical sources, while watching or reading of the sources is in most cases not sufficient for deep learning. In this domain, we adapt a well-established experimental paradigm developed earlier in our previous research for studying collaborative learning with video tools in different task contexts (Zahn, Krauskopf, Hesse & Pea, 2012). This experimental paradigm uses a history lesson where learners are asked to analyze and interpret a historical newsreel (about the airlift established in postwar Berlin/Germany in 1948 by the Allied forces) by commenting on scenes of the video in collaboration with a partner. To accomplish this, students are provided with the video and text materials on the historical context and the filmic style of newsreels and are asked to integrate these aspects in their analysis. The learning goal —and a special challenge for the students—is to understand that the newsreel is not only "showing" the history topic (Berlin 1948), but that the newsreel itself is a history topic (i.e., a newsreel as an historical means for propaganda). Or to put it in cognitive terms: students have to integrate knowledge on both history content and the filmic style of the newsreel. This goal is aligned with criteria for the use of audiovisual and film sources in German history education.

Method

Sample. Participants were 72 students (86% female, age M = 20.49 years, SD = 1.9). For the experimental sessions, the participants were randomly combined into dyads for online collaboration (25 same sex, 11 mixed sex dyads) and also randomly assigned to one of two experimental conditions (design assignment n = 19 dyads, discussion assignment n = 17). Data were analyzed on the aggregated dyad level, as independence could not be assumed. Random subsamples were used due to the time-consuming procedure for the coding of written comments (content analyses: 12 dyads for product related indicators, and 10 for collaboration related indicators, respectively). These subsamples do not differ from the whole sample with regard to control variables (see results section).

Experimental Design and Procedure. We varied two different task instructions assigned within a video-based online history lesson: Students received either a discussion task or a collaborative design task. In the discussion condition, participants were asked to *discuss the content and style of a specific video (showing a historical newsreel, see below) freely but thoroughly*. In the design condition, participants were asked to *collaboratively design a hypertext-like document on the content and filmic style of a specific video (showing a historical newsreel) for an audience of peer students who intend to learn about this topic*. Please note: Both assignments aim at constructivist, collaborative activities whose benefits for collaborative knowledge construction have been addressed in earlier studies. We assume both assignments to be sensible ways of approaching the analysis and interpretation of historical materials; we are, however, interested in fine-grained effects of the instruction to discuss vs. the instruction to design with regard to online-collaboration and learning outcomes.

In a pre-test phase, participants were introduced to the procedure and the task of the condition to which they had been randomly assigned. They next completed a questionnaire assessing socio-demographic variables, previous knowledge of and interest in the historical content as well as computer skills. In the inquiry phase which followed, participants watched a historical newsreel. Subsequently, they read texts on the historical context and general use of filmic style and codes. To ensure that all participants would become familiar with the video tool used in the study, they were given time to practice briefly the use of the digital tool on a sample video about an unrelated topic. During the collaboration phase, participants in each condition first received a detailed assignment description: Dyads in the design condition were asked to design a hypertext-like product that contains analyses and comments on the digitized historical newsreel, so that other student learners could come to a good understanding of both the content and the form of the historical newsreel. Dyads in the discussion condition were asked to analyse and comment on the video within an online-discussion, again focusing on both the content and the style of the newsreel. Then participants were given a time limit of 45 minutes for their collaboration and were seated in front of separate laptops without being able to monitor another participant's screen. Additional text information on the history and newsreel was available in printed form during this phase. In the final post-test phase, participants completed measures tapping recognition, factual knowledge and attitudes toward the task and the team work. In the end, participants were thanked and released.

Tools and Materials. Participants were guided through the experimental procedure by a web-based environment created with ZOPE 3© (version 2.1), which presented all materials and started additional applications automatically (WebDIVERTM, Video player-software). The video used in this study was a digitized version of a newsreel on the Berlin Blockade and the Air Lift from 1948. It had originally been produced by the Allied forces (US/Great Britain), consisted of 95 single b-w-shots and lasted five minutes. Collaboration in our study was situated in a web-based video analysis environment called WebDIVERTM (see Figure 1). WebDIVER™ is part of the DIVER™ system, a digital environment for video collaboration developed by the Stanford Center for Innovations in Learning (SCIL, see Pea, 2006). It is based upon the metaphor of collectively "diving" into videos, that is, several users can simultaneously watch a digital "source video", extract sequences or screenshots they are interested in and then edit each of them by writing captions and comments or rearrange them in sequence using a drag & drop feature (Pea et al., 2004). Furthermore, a selection frame allows for selecting details within an image or sequence. The workspace consists of one or more source videos and a Dive, as the authors term it (Pea, Lindgren & Rosen, 2006). The dive consists of a collection of re-orderable panels (see Figure 1), each of which contains the extracted clip and a text field for annotation, comment or other interpretation. Specific parts of the source video can be extracted, which enables a user to direct the attention of other users to what he or she is referring to. This process has been termed 'guided noticing' (Pea, 2006). Each panel with its comments constitutes a permanent external representation of specific information within the dive, to which users can resort whenever they decide to.

Figure 1. Screenshot of the online learning environment WebDiver TM (Pea et al., 2004).

The test materials consisted of a factual knowledge test and a picture recognition test. The pre-test and post-test of participants' factual knowledge of the historical context were created from information taken from secondary school history textbooks. These tests were given in a multiple choice format, where either one (pre-test) or multiple options (post-test) per item were correct. The picture test consisted of 28 pictures, half of which were scenes taken from the original newsreel and half of which were distractors from a different newsreel (same genre and period).

Measures. To assess learning outcomes in terms of general content knowledge acquisition, we administered the factual knowledge tests (pre- and post-test) and the picture recognition test after the collaboration phase. Total test scores were computed, resulting in a theoretical maximum of 12 points in the pre-test and 45 in the post-test. To assess task performance, the participants' contributions from the saved panels (WebDIVER™ protocols, see below), including their selections from the video, annotations and comments, were analyzed. Precisely, our analyses were based on the overall number of the created panels, the number of panels, where details were selected by using the WebDIVER's selection frame, and the number of comments including their length in words. Additionally, we analysed the quality of the dyads' comments by coding (a) aspects of contents covered in relation to the learning goal and (b) aspects of collaboration quality. For coding of the comments, we developed two coding schemes. The first one – coding scheme I (see below) – was developed to assess the quality of the panel comments. The second one – coding scheme II (see below) – was developed to assess the overall quality of interactions within dyads. Here, screen videos were viewed in addition to examination of comments to determine which comment was written by which collaboration partner thereby counting panels created in partnership by both participants of the dyads together, and for categorizing different kinds of social interaction in the comments. All comments were coded by two observers.

Coding schemes. Coding scheme I for the quality of the comments consisted of the following categories: utterances addressing historical content of the newsreel, utterances addressing filmic style of the newsreel, and utterances integrating aspects of historical content and filmic style, respectively. Units for the utterances were defined as sentences or sentence fragments. On the basis of these categories, Diver protocols were coded by two independent, trained raters. Interrater-reliability ranged between Cronbach's α = .80 and .98. Coding scheme II rating the comments exchanged within dyads was developed in two steps: First, two observers analyzed and discussed the WebDiverTM protocols and considered relevant literature (e.g., Stahl, Koschmann & Suthers, 2006) in order to derive indicators for establishing different categories of collaboration, including coordinating and communicating activities. Second, a collaboration index was calculated. The categories applied in analysis were: 1) double references as an indicator of collaboration in general; 2) proposals for work structuring as an indicator of coordination activities; and 3) referencing one partner's utterances or directly addressing the other partner as an indicator for communication. The coding results were then integrated by weighing the number of utterances of category 1) by factor three, because they were considered the strongest indicator of collaboration. The result was then added together with the number of utterances in categories 2) and 3) to form the collaboration index. This collaboration index and the number of panels created in partnership were used for further analyses. Again, two independent raters performed the analysis. Interrater-reliability ranged from Cronbach's α = .92 and 1.0.

Data analyses. For data analyses, we grouped the dependent variables into three levels (see Table 1): First, a cognitive level with regard to knowledge acquisition, ensuring effectiveness of online-learning in the two conditions (factual knowledge and picture recognition performance). Second, a surface level of effects on collaboration and learning, where we compared the two conditions with respect to the variables describing overall collaborative activities (number of comments, length of comments, number of panels created in partnership, and collaboration index). Third, pointing at deeper level effect on collaboration and learning we looked at quantitative and qualitative indicators for more knowledge intensive collaborative activities (panels referring to details, and utterances addressing either historical content or filmic style of the newsreel and utterances integrating aspects of historical content and filmic style).

Table 1. Measures grouped into three levels .

Level	Variable	Measure
1: Cognitive learning outcome	History content knowledge acquisition	Factual Knowledge Test Picture Recognition Test
2: Surface level effects on collaboration and learning	Performance, collaboration and learning	Number of panels created in partnership Number of comments Length of comments Collaboration index
3: Deeper level effects on collaboration and learning	Performance, collaboration and learning quality	Number of panels referring to details Number of utterances in comments addressing historical content Number of utterances in comments addressing filmic style Number of utterances in comments integrating aspects of historical content and filmic style

Results

Comparability of the Conditions. To ensure comparability of the two conditions a number of control variables were investigated prior to analysis. Participants in both conditions did not differ with regard to age, expertise in technological and film/media production, interest in the historical content, or factual knowledge of the historical context (all $p > .10$). Similarly, chi-square tests on gender and gender composition of dyads (same gender vs. mixed) did not yield significance ($p > .10$). Thus, conditions were considered comparable.

Furthermore, we examined the named control variables, to investigate whether participants on average exhibited medium level values as we expected. With respect to domain-specific knowledge, dyads' pre-questionnaire scores were above average with a mean of $M = 9.0$ ($SD = 1.3$) correct answers out of 12. Similarly, participants' interests in the historical content ($M = 3.5$, $SD = 0.4$, theoretical maximum = 5) and participants' prior computer experience ($M = 3.5$, $SD = 0.5$, theoretical maximum = 5) were also higher than average. Their self-reported expertise in film and media production, however, was very low ($M = 1.8$, $SD = 0.7$)

Knowledge Acquisition. We compared the conditions with regard to participants' performance in the post-experimental factual-knowledge test on the historical content. Test performance was in general above average ($M = 33.1$, $SD = 2.4$, theoretical maximum = 45). We did not find a significant difference between conditions, $t(34) = -0.80$, $p = .43$. This indicates that in both conditions, participants were equally successful in understanding the content of the video and the historical material. Yet, marginally significant differences between the conditions were found with regard to the visual recognition test. A t-test revealed a marginally significant effect, $t(34) = 1.79$, $p = .08$, $d = 0.60$, showing a better performance in the picture recognition test for the dyads in the design condition ($M = 25.7$, $SD = 1.3$ compared to the discussion condition, $M = 24.9$, $SD = 1.4$, respectively). Although just a trend, this might indicate that the students with a design task instruction, seemed to have paid more joint attention to visual information than the students discussing the visual content.

Table 2: Between group comparisons of indicators for cognitive learning outcome.

	Design-condition (n = 19 dyads)		Discussion-condition (n = 17 dyads)		Total (N = 36 dyads)		t-Test		Effect size
Indicator	M	SD	M	SD	M	SD	t(34)	p	d
Factual knowledge	33.4	2.5	34.0	1.7	33.7	2.1	-0.85	.40	
Picture recognition	25.7	1.3	24.9	1.4	25.3	1.3	1.79	.08	0.7

Surface level effects on collaboration and learning. Results for variables describing the collaborative processes on a surface level are summarized in Table 3. Concerning the collaboration index computed from the three coding categories as described above, a between group comparison revealed a tendency for higher collaborative activity in the discussion condition (M = 33.6, SD = 21.9) than in the design condition (M = 12.3, SD = 10.6), t(8) = -2.08, p = .07, d = 0.7. A significant difference was found with regard to panels created in partnership (discussion, M = 12.0, SD = 6.9, and design, M = 4.2, SD = 4.2, respectively), t(8) = -2.26, p = .05, d = 1.3. Concerning the numbers of comments, dyads given the discussion instruction wrote more comments (M = 36.1, SD = 10.6), which were also longer (M = 610.6 words, SD = 290.61), than dyads given the design instruction (M = 28, SD = 8.7, t(34) = -2.4, p = .02, d =. 0.8, and M = 426.7 words, SD = 161.1, t(34) = -2.4, p = .02, d =. 0.8, respectively). Similar findings result from the coding of the WebDIVERTM protocols of a subsample. In other words, the results show that in our study the discussion task led to more collaborative activity in general, compared to the task of designing a product collaboratively.

	Design-condition (n = 19 dyads)		Discussion-condition (n = 17 dyads)		Total (N = 36 dyads)		t-Test		Effect size
	M	SD	M	SD	M	SD	t(10)	p	d
Number of comments	28	8.7	36.1	10.6	32	9.6	-2.5	.02	0.8
Length of comments (in words)	426.7	161.1	610.6	290.6	518.7	225.9	-2.4	.02	0.8
	n = 6 dyads		n = 6 dyads		n = 12 dyads				
Collaboration index	12.3	10.6	33.6	21.9	22.6	16.3	-2.08	.07	0.7
Dives created in partnership	4.2	4.2	12.0	6.9	8.1	5.6	-2.26	.05	1.4

Table 3: Between group comparisons of surface level dependent variables.

Deeper level effects on collaboration and learning. Variables we considered to reflect a deeper level or knowledge intensive collaborative activity are summarized in Table 4. The total number of panels where zooming in on specific elements of a scene was an indicator for the detailedness a dyad aspired to in the process of analyzing the source video was more than twice as high in the design condition than in the discussion condition; however, due to the small sample size and severe positive skewness a Mann-Whitney-U-Test did not yield significance (see Table 4). From the coding of the comments of a subsample, we considered the number of utterances referring to either the newsreel's historic content or aspects of its filmic style. Paired-samples t-tests showed that all participants focused more on the analysis of filmic style (M = 15.3, SD = 4.9) than on historic content (M = 5.2, SD = 2.4), t(11) = 6.28, p = .00, d = 2.6. In addition, between group comparisons revealed that in the discussion condition, dyads addressed filmic style more often (M = 18.1, SD = 2.9) than participants in the design condition (M = 12.7, SD = 5.2), t(10) = 2.8, p = .049, d = 1.3. There was no difference with regard to the number of utterances addressing historical content (p > .10). In contrast to the results with regard to participants' consideration of either content- or style-related utterances reported above, here, utterances integrating both aspects of filmic style and historical content, occurred significantly more often in the design condition (M = 5.6, SD = 1.5, for discussion condition M = 3.3, SD = 1.2), t(10) = 2.23, p = .05, d = 1.3.

	Design-condition		Discussion-condition		Total		t-Test		Effect size
	(n = 6 dyads)		(n = 4 dyads)		(n = 10 dyads)				
Indicator	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*(8)	*p*	*d*
Utterances integrating historic and filmic aspects	5.2	1.7	3.3	1.2	4.3	1.5	2.23	.05	1.3
Utterances addressing historical content	5.8	3.1	4.6	1.7	5.2	2.4	0.87	.41	
Utterances addressing filmic style	12.7	5.2	18.1	2.9	15.4	4.1	-2.24	.05	1.3
	n = 19		n = 17		N = 36				
Number of details	2.2	2.8	0.6	1.5	1.4	2.2	116[a]	.16	

Table 4: Between group comparisons of deeper level dependent variables.

Note. a Results of Mann-Whitney-U-Test reported because of severe positive skewness.

In sum, the results show that students instructed to discuss freely the source video (discussion task) created more panels in partnership, wrote more and longer comments, and were mainly focused on exchanging knowledge about the filmic style, indicating more collaborative activity – at least on a surface level. In contrast, participants in the design condition did integrate aspects of historical content and filmic style of the newsreel more often. Students in the discussion condition did not engage as much in knowledge intensive collaborative activities on a deeper level as the students in the design condition. In addition, even though the latter were not so focused on "talking" about filmic style, they revealed a slightly better elaboration of visual information and considered visual details about twice as much, which suggests a more intensive consideration of the source video on a deeper level.

Discussion

In our study we contrasted two task contexts framing the active use of video in an online learning setting – discussion vs. design – and investigated in detail how they would produce differential effects on student dyads' online-collaboration processes and learning outcomes. We assumed that the different task instructions would stimulate differential collaborative learning activities and effects on student learning and we were interested in revealing how exactly these would differ regarding cognitive outcomes, surface-level and deeper-level indicators of collaborative learning. We contribute this research in order to provide a basis for specifying goal-oriented video usage in MOOCs.

Two main results are important from this point of view: First, the discussion task stimulated significantly more collaborative activity on a surface level than the design task. Second, the design task stimulated for more knowledge intensive elaboration on a deeper level than the discussion task, especially concerning visual information from the video - such as paying more joint attention to visual details and integrating different aspects of video content and style. These differences occurred while overall content knowledge acquisition (measured by multiple choice questions in a post-test) did not differ significantly between conditions. In other words, under the surface of apparently similar learning outcomes obtained within the same overall lesson paradigm, fine-grained differences in group knowledge processes and specific aspects of online learning became explicit. Such fine-grained differences – as subtle as they may seem – are important because they can give first hints for designers of online-learning environments concerning how to meet the challenge of deciding what students may learn.

Our study addressed online learning and we worked with real students. In this respect we consider our results also valuable for the present context of MOOCs. Yet, the study has its limitations. It was a lab experiment and the learning environment was not a real MOOC, but a single private online course (SPOC), thus, results need to be replicated in a field setting in future research. The study was conducted in the domain of history, so we must be hesitant to generalize the results to other domains before they are replicated there. However, we would like to discuss some implications of our work for MOOCs. On the one hand, we would like to invite designers to consider the conceptual challenge of using more varied tasks around digital video in MOOCs and thereby map video potentials for learning with clear learning goals on a very fine-grained level. It is important that the targeted outcome is clear. Should the students elaborate on the video images? Or does the teacher want them to exchange knowledge about filmic style as in a film analysis? Does she want them to dig into visual details or lead a vivid discussion? On the other hand, we would like to provide a basis for future research on the well-reflected design of tasks in relation to the large number of participants.

As our results show, it is the combination of different tasks in union with the affordances of a technology that create powerful learning environments. Small changes in video-based tasks should be easily implemented in MOOCs. Yet, in the current study we had the benefit of not having to deal with varying student backgrounds and low retention rates. It would be important now to extend this research to MOOCs where the results are likely to be different: Our results could be the basis of future research works about how task changes will make a difference for fostering the intended learning processes in real massive online courses. A first step could be to evaluate our findings under MOOC conditions. Experimental manipulation would need to be compared to standard solutions today. A second step would be to consider different backgrounds of future students facing MOOCs. For instance, the backgrounds of students who grow up as the social media generation, where all age groups of children on all continents possess mobile phones and use digital tools and platforms fluently to create and post their own content for others. Which tasks will be appropriate for them?

There is increasing popularity of user-created content e.g., within YouTube's popular culture (Burgess & Green, 2009), and students entering the scene of higher education tomorrow might feel awkward when sitting back like a "couch potato" and watching a "talking heads video" provided by their professor in a MOOC. Instead, if we do not provide them, they might also seek tools by themselves to work actively on video content or for peer-created clips with higher potential for discussion, communication of their own knowledge and collaboration. We hope our paper contributes to stimulate future research addressing such possibilities.

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Designing your first MOOC from scratch: recommendations after teaching "Digital Education of the Future"

Carlos Alario-Hoyos, Mar Pérez-Sanagustín, Carlos Delgado Kloos, Israel Gutiérrez-Rojas, Derick Leony, Hugo A. Parada G.

Abstract: *Massive Open Online Courses (MOOCs) have been a very promising innovation in higher education for the last few months. Many institutions are currently asking their staff to run high quality MOOCs in a race to gain visibility in an education market that is beginning to be full of choices. Nevertheless, designing and running a MOOC from scratch is not an easy task and requires a high workload. This workload should be shared among those generating contents, those fostering discussion in the community around the MOOC, those supporting the recording and subtitling of audiovisual materials, and those advertising the MOOC, among others. Sometimes the teaching staff has to assume all these tasks (and consequently the associated workload) due to the lack of adequate resources in the institution. This is just one example of the many problems that teachers need to be aware of before riding the MOOC wave. This paper offers a set of recommendations that are expected to be useful for those inexperienced teachers that now face the challenge of designing and running MOOCs. Most of these recommendations come from the lessons learned after teaching a nine-week MOOC on educational technologies, called "Digital Education of the Future", at the Universidad Carlos III in Madrid, Spain.*

Introduction

Higher education institutions are overwhelmed by the appearance of Massive Open Online Courses (MOOCs), which are a disruptive alternative to traditional education (McAuley et al. 2010) that has become very popular in the last few months. MOOCs enable teachers and institutions to provide high quality courses, generally free of charge, to students worldwide. Many MOOC initiatives have recently emerged across the globe, such as Coursera, edX and Udacity in the United States, FutureLearn in the United Kingdom, iversity in Germany, FUN in France or MiríadaX in Spain.

MOOCs entail several challenges for institutions and educators. New teaching methods (Kop et al. 2011, Sharples et al. 2013) and assessment methodologies for large groups of students (Sandeen 2013), appropriate certification mechanisms (Cooper 2013), and solutions to include MOOCs in current higher education structures (Fox 2013) are examples of MOOCs open research challenges that still need to be addressed. Another of these open challenges concerns the design of MOOCs. MOOCs are very demanding compared to traditional courses and therefore efforts should be made at design time to plan them properly. For instance, Kolowich (Kolowich 2013) estimated the workload of making a MOOC from scratch to be 100 hours, plus 10 more hours weekly on upkeep. This workload depends, for instance, on the duration of the course, the kind of materials that need to be generated, and teacher involvement in discussions about the course topics in the social tools of the MOOC. In any case, this additional burden is not acceptable in most universities, where educators typically already handle traditional teaching and research duties.

Some strategies to reduce this burden are to seek help from institutional services, to reuse open content generated by third-parties, to limit the number of social tools that are supported during the course, or to share the teaching of the MOOC with other colleagues (König 2013). But these are just a few examples of design decisions that must be taken before launching a MOOC. In fact, a well-thought design is essential to minimize the risk of trying to run overambitious MOOCs. This design should be agreed upon by the teaching staff and take into account previous experiences of other teachers that have created MOOCs in the same area. There are already several frameworks in the literature, such as the MOOC Canvas (Alario-Hoyos et al. 2014) or the design and evaluation framework (Grover et al. 2013) aimed at helping teachers reflect on and discuss the issues and dimensions that surround the design of MOOCs.

This paper brings the experience of the professors that participated in the creation and running of a nine-week MOOC on educational technologies, deployed on the platform MiríadaX in early 2013 and called "Digital Education of the Future" (DEF – "Educación Digital del Futuro" in Spanish). The aim of this paper is to advise teachers and institutions with no experience in running MOOCs, by indicating the main design decisions that were taken in DEF and how these decisions were received by the different stakeholders. The decisions that were most highly assessed and the lessons learned are provided as recommendations for the community of MOOC teachers.

"Digital Education of the Future"

"Digital Education of the Future" (DEF) (https://www.miriadax.net/web/educacion_digital_futuro) was a multidisciplinary MOOC on educational technologies delivered at the Universidad Carlos III de Madrid from February to April 2013. DEF was created from scratch, since professors wanted to offer a MOOC that addressed the latest trends that are changing the education system. All the contents and activities in DEF were generated a few weeks before the course started. This approach has two counterparts. On one hand, this kind of MOOC satisfies those that want to learn about the latest in the area and cannot do so through traditional undergraduate or postgraduate programmes, which are less able to quickly adapt to the latest trends. On the other hand, this kind of MOOC requires a big effort, as it involves generating a lot of new materials from scratch in a short time. Furthermore, a MOOC that addresses recent trends could quickly become outdated, which implies a serious burden when updating the materials (particularly the video lectures).

Five professors participated in the design and deployment of the MOOC. The fact that five people were part of the teaching staff allowed for sharing of the teaching workload of the MOOC and made it possible for everyone to contribute to the areas where they were experts. On the negative side, there was an extra non-negligible coordination effort to make decisions on how to design and run the MOOC. There was also a full-time facilitator in charge of solving questions related to the less academic aspects of the course, fostering debate on social networks around the MOOC and acting as intermediary between professors and participants.

DEF was created within a Higher Education institution and therefore it had the support of several services belonging to the University. Among them, audiovisual technicians helped record some of the more elaborate videos, advised on the recording of video lectures (e.g. lighting, sound quality…), and did the video post-production (e.g. adding the University logo to them). Also, library staff helped subtitle all the video lectures, which turned out to be a very burdensome task. Subtitling may seem unnecessary for some MOOCs, especially when most participants speak the language natively (as was the case in DEF). However, noises or linguistic differences between countries may hinder proper understanding of the explanations, and this can easily be addressed by transcribing the speech.

DEF was delivered in Spanish, targeting a Hispanic audience - a market for which there were very few MOOCs in February 2013 compared to those for English speakers. The teaching staff decided to deploy DEF on the platform MiríadaX, which was developed a few weeks before by Telefónica Learning Services and Universia, to allow higher education institutions from Spain and Latin America to deploy MOOCs in Spanish.

DEF was structured in three modules, the first of which addressed the use of educational technologies from the pedagogical point of view, and the other two from the technological point of view. In particular, the first module covered the concept of interaction and its evolution through the years in parallel with the development of new hardware devices and interfaces. The second module addressed the use of mobile technologies in education (m-learning), presenting the most current technologies, applications and projects in the area. The third module explored the MOOC world, delving into the generation of multimedia contents as well as into the most common assessment methods, gamification strategies and learning analytics approaches that could be found in MOOCs at that time.

Each module was divided into three lessons, and each lesson was delivered in a different week (9 weeks in total). Each lesson contained nine video lectures of about ten minutes long, a multiple choice test at the end of each video, a multiple choice test at the end of each lesson, and recommended readings (i.e. links to related information selected by the teaching staff). At the end of each module, participants had to carry out an individual assignment that was peer reviewed. At the end of the course, participants had to fill out a multiple choice test with questions about the three modules. There was also a presentation module ("module zero"), which was released one day before the MOOC started. The purpose of the "module zero" was to introduce the course and provide general information about the course structure, the assessment system, the use of the platform, and the social tools offered through the MOOC. Figure 1a shows the structure of one of the lessons in DEF.

Learning contents were offered in the form of video lectures. On the grounds that the platform did not support video hosting, all videos were uploaded to YouTube, linked to MiríadaX, and preceded by a brief description. DEF professors always appeared in the videos, although two different formats were employed in these videos. Most videos in module 1 had the teacher explaining in the foreground with an illustrative picture in the background. Most videos in modules 2 and 3 had the teacher explaining in the lower right corner with supporting slides in the background; these supporting slides were uploaded to MiríadaX as PDFs, so that participants could use them to review the concepts explained. There were also weekly interviews with national and international experts in the area to complement the lectures. Figure 1b shows an example video lecture from module 3, with a short description of the video on top, and a link to a PDF file with the slides to be downloaded by the MOOC participants at the bottom.

The assessment system included formative assessment activities and summative assessment activities. Formative assessment activities could be completed at any time, but summative assessment activities had to be completed at scheduled intervals according to the calendar published during the first week of the course. Specifically, the multiple choice tests after each video lecture were part of the formative assessment, providing immediate feedback to the participants about the concepts explained in the related video. The end-lesson multiple choice tests were part of the summative assessment, with a maximum score of 5 points each (9 tests). The end-module peer assessment activities were another part of the summative assessment, with a maximum score of 10 points each (3 activities). The final multiple choice test was also part of the summative assessment, with a maximum score of 25 points. In total, participants could get up to 100 points in DEF. They needed 50 points to pass the course. The selection of an assessment system based only on multiple choice tests and peer assessment activities was conditioned by MiríadaX, as these were the only two assessment tools offered by the platform at the time when the MOOC was run. At the end of the course, certificates of participation were provided with participants' final scores. These certificates included a clause in which it was explicitly stated that it had not been possible to verify the users' identity or the authorship of works.

In addition, five social tools were employed during DEF to promote social learning, foster discussion and share additional materials. Two of these social tools were natively provided by the platform MiríadaX (built-in social tools), and three others were provided by third-parties (external social tools). The two built-in social tools were Questions and Answers (Q&A) and a forum. The three external tools were Facebook, Twitter and MentorMob, which is a tool for sharing lists of resources related to a given topic. Of the five social tools, the forum was the one with a highest number of contributions, although there were also large communities of participants around Facebook, Twitter and Q&A (Alario-Hoyos et al. 2013). Three other non-social tools were also employed by the teaching staff during DEF: Storify to share a collection of the most relevant tweets each week, a built-in blog to post announcements and the latest news related to the course, and Google Drive to deliver questionnaires related to participants' profiles, performance and degree of satisfaction with the MOOC.

Recommendations after teaching DEF

Recommendations from the professors after teaching DEF are collected in Table 1, highlighting in bold the most important ones. Recommendations are organized in the following eight categories: (1) Platform, (2) Overall Course Structure, (3) Teaching Staff, (4) Learning Contents, (5) Assessment, (6) Social Support, (7) Certification, and (8) Other Related Aspects.

Conclusions and future work

This paper has presented a set of recommendations distilled from the experience of the professors involved in the design and running of a MOOC about educational technologies called Digital Education of the Future. The most important recommendations are: to careful study the features offered by the platform in which the MOOC will be deployed; to not underestimate the time needed for the preparation of learning materials (particularly video lectures), or for their upload to the platform; to support the discussions and queries in social tools, but indicating from the beginning the degree of commitment of the teaching staff (in order to reduce the number of complaints from participants); and to advertise the course as soon as possible, making use of social tools and creating attractive campaigns in order to catch the attention of potential participants. Such aspects increase the complexity and workload of creating a MOOC from scratch, demanding teachers make more reflections and agreements at design time.

Of course, this is a particular example MOOC, and thus MOOCs in other areas that are deployed on different platforms should be analyzed in order to confirm and extend the recommendations presented in this paper. The ultimate aim is to create a community of practitioners that define generic best practices for designing and running MOOCs.

Acknowledgements

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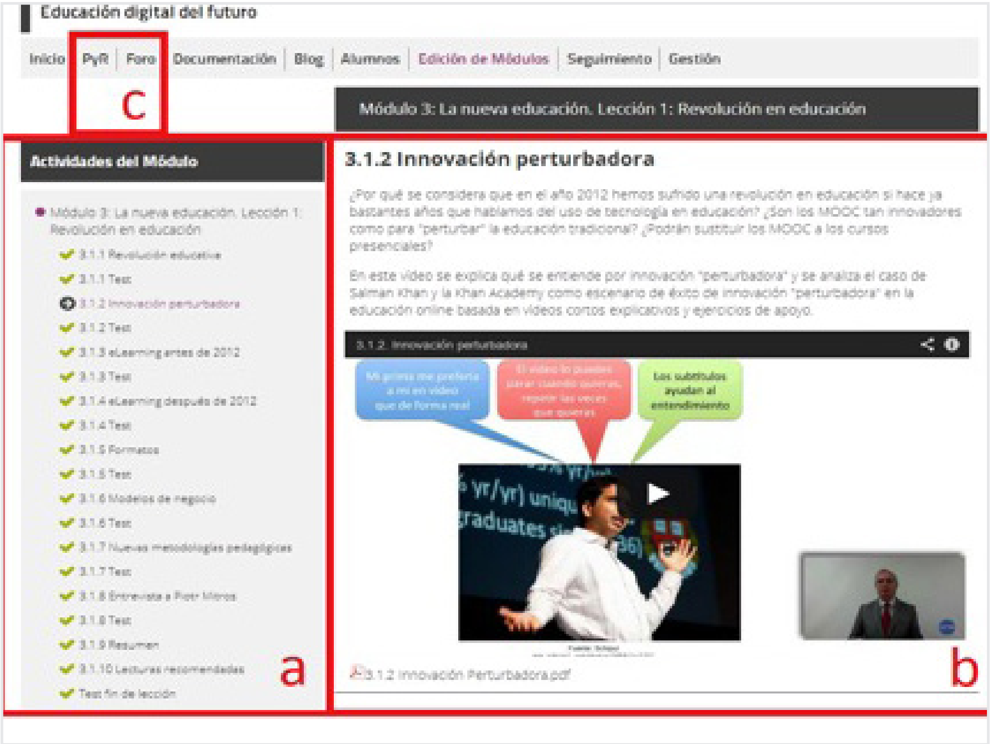

Figure 1: Screenshot of the MOOC "Digital Education of the Future" deployed in MiríadaX: a) Structure of one of the weekly lessons (module 3, lesson 1); b) Example of video lecture with the teacher in the lower right corner and slides in the background; c) Built-in social tools supported by the platform MiríadaX (Q&A and forum).

Table 1: Recommendations after teaching DEF, design decisions in DEF and additional related notes

	Recommendations	Design decisions in DEF	Notes
Platform	To choose the MOOC platform based on 1. institutional agreements with popular initiatives or 2. target learners.	At design time, there were no institutional agreements between Universidad Carlos III de Madrid and major MOOC initiatives. Teachers selected MiríadaX in order to target the Hispanic community of learners.	More than 100,000 learners (mainly from Spain and Latin America) were registered in MiríadaX at the time DEF started. 57 courses from 18 universities were simultaneously taught in MiríadaX from February 2013 to April 2013.
Overall Course Structure	To study the platform constraints before creating the course structure and learning materials.	MiríadaX constrained the type of assessment activities that could be added to the course and led to the use of YouTube to host video lectures.	-
	To be aware of the workload required for the creation of the course structure and the upload of learning materials to the platform.	The teaching staff and the supporting facilitator shared the burden associated with the creation of the course structure and the uploading of learning materials.	Setting the course in the platform once the learning materials were generated represented an additional workload of 15-20 hours due, among other things, to the lack of features to automatically upload multiple choice tests.
	To define a flexible schedule so that interested latecomers can still enroll in the course.	Users could join the course while it was being taught. Summative assessment had a greater weight towards the end of the course, so that participants who registered up to 5 weeks late could still pass the course.	On day 1 there were 3105 registered users with 5455 participants after week 6 and 5595 participants at the end of the course. Latecomers could follow the course normally, accessing all previously released materials.
Teaching Staff	To have several teachers, which enriches the contents, allows greater heterogeneity of topics and splits the workload, but demands a more complex coordination.	Five professors with different backgrounds on humanities and engineering participated in the course. One of the professors played the roles of coordinator and director of studies.	The heterogeneity of topics attracted people from different backgrounds: 32% of learners had some technical background, 31% some background on humanities, and 46% some background in education.
	To moderate the participation and awareness of the teaching staff by sending regular e-mails reporting the pending tasks and latest news.	The facilitator was responsible for sending regular communications, and acting as a link between learners and the teaching staff.	Every professor agreed that the inclusion of regular communications was necessary to be aware of what was happening in the course and to have continuous contact with the participants.
Learning Contents	To create original video lectures explaining the concepts easily and clearly, with appropriate tone.	Professors employed videos of about ten minutes each. The advantages and shortcomings of different video formats were studied before starting to record. Video interviews with experts gave deeper insight.	MOOC participants reported overall positive comments about the video lectures and the explanations of professors.
	To use additional materials that learners can follow easily to complement teachers' speech and study offline (e.g. slides).	Videos in modules 2 and 3 employed supporting slides, following an agreed template. Explanations in module 1 were accompanied by a supporting book.	69% of the people preferred a video format based on slides with the teacher in a corner, while 23% of them preferred the teacher in the foreground without slides.
	To plan when video lectures need to be ready, leaving enough extra time to add subtitles. Not to underestimate the time required to generate videos.	Videos in modules 1 and 2 were created with a few weeks in advance. Videos in module 3 were created with a lower time frame. All videos were subtitled for easier understanding.	Professors estimated the time to record 10 minute videos to be 60-90 minutes, including preparation of the speech, recording the video, correcting errors, and setting and checking the final version.
Assessment	To define the competences that participants must acquire during the course.	Competencies were defined beforehand and included ICT competencies, time management and self-discipline. Learning objectives matched these competencies.	-
	To define formative and summative assessment activities from the beginning. To inform clearly on assessment policies, and how final scores will be calculated. To provide immediate feedback.	Participants needed 50 out of 100 points to pass the course. In each module they could get 25 points considering the end-lesson multiple choice tests and the peer review activities, plus another 25 points in the end-course multiple choice test.	There were no complaints about the general assessment policies. There were some complaints about the tight schedules to resolve the assessment activities. Professors detected some participants revealing the answers to tests in the social tools. This suggests the need for more efficient assessment mechanisms in MOOCs.

	Recommendations	Design decisions in DEF	Notes
Social Support	To promote social learning. Giving support to several social tools is burdensome for teachers, but allows people to choose the tools they feel most comfortable with.	Five social tools were supported and people employed them for different purposes (e.g. forum and Facebook for discussions, Twitter and MentorMob to share extra materials and Q&A to post queries related to the course).	The forum was the most popular tool for learners to contribute and participate in discussions, followed by Facebook, Q&A and Twitter (Alario-Hoyos et al. 2013). MentorMob did not receive the attention expected by the teaching staff.
	To define from the beginning the degree of teachers' commitment regarding their activity with the social tools, and announce it to participants.	There was a facilitator dedicating about 3-4 hours per day on weekdays, and 1 hour per day on weekends. Professors hardly interacted directly with social tools but were informed about the hot topics by the facilitator.	Despite the dedication of the facilitator, participants complained, particularly at the beginning of the course, about the lack of support by teachers in social tools.
Certification	To define from the beginning the type of recognition people will get for completing the course, what they will need to obtain such recognition and when they will receive it.	Participants got a certificate if they had obtained 50 or more points out of 100 at the end of the course. The certificate included the name of the course and University. Nevertheless, the certificate also had a clause indicating that it had not been possible to verify the identity of the learner or the authorship of works.	Many questions regarding certification were posted in social tools, especially at the beginning of the course. The teaching staff had doubts about this issue until the end of the course, because the platform was responsible for generating and distributing the certificates.
Others	To establish and start the marketing strategy as soon as possible, since registrations steadily increase even after the course begins.	The marketing strategy was carried out by MiríadaX, Telefónica Learning Services and Universia, especially through social networks and media, and took place during the month prior to start of the course.	32% of registered users found out about the course in social networks, 22% of them through advertising campaigns on the Web, and 37% of them through friends and colleagues.

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"A hostage to fortune?" – Validating Massive Open Online Courses (MOOCs) for University Credit

Peter Alston and Ben Brabon

Abstract: Over the last few years, the intense interest in Massive Open Online Courses (MOOCs) has opened up a range of possibilities and pitfalls for Higher Education Institutions (HEIs). Many universities have seen the opportunities that MOOCs present and working with education companies, now offer learners the opportunity to earn university credit. Using a case study approach, this paper examines the experience of validating and delivering the UK's first undergraduate MOOC for credit. Focusing on the validation process, including issues of teaching and assessment, student engagement and the delivery platform, it explores the impact of accreditation and quality assurance on existing MOOC pedagogies. In so doing, the paper reveals the 'disruptive' potential of this 'one of a kind' module, while highlighting how the regulatory framework that assures quality can transform our understanding of MOOCs.

Introduction

In recent years, there have been a number of critical discussions around the 'disruptive force' that MOOCs present to Higher Education (HE) (Daniel, 2012; DiSalvio, 2012; Kirschner, 2012; Yuan and Powell, 2013). Yuan and Powell draw upon Bower and Christensen's conception of 'disruptive innovation' (1995), describing them as 'innovations that develop a new-market disruption or take root at the low-end of an existing market offering a low-end disruption with a performance that is less than currently available products, but at a cheaper price to customers who find this attractive – "overshot" and "non-consuming" customers. Over time, their performance improves and they move up-market, eventually competing with established market leaders (2013, p.4). MOOCs have certainly been conceived in this context and as a result, many Higher Education Institutions (HEIs) have reconsidered their online provision, 'blended' approaches and the ways in which they deliver 'traditional' degree programmes. However, arguably the 'disruptive innovation' that MOOCs epitomise has been undermined by the emerging commercial partnerships that seem to foster brand identities based upon links between elite institutions, contrary to 'low-end disruption' and to the detriment of niche learning providers.

This study illustrates an instance of this by analysing MOC1001 Vampire Fictions, the UK's first undergraduate credit-bearing MOOC. Lasting for twelve weeks in total from September to December 2013 and convened in two discrete blocks of six weeks, this Framework for Higher Education Qualifications (FHEQ) Level 4 20-credit module covers the topic of vampire fiction from the eighteenth century to the present day. Developing out of the research interests of Dr Ben Brabon, his teaching on an existing FHEQ Level 5 20-credit campus-based module on vampire fictions and his work on a UK Higher Education Academy (HEA) grant entitled e-Gothicist, MOC1001 aimed, first and foremost, to open up the study of vampire fiction to a broader range of learners and to share the successful experience of the on-campus version. The development of the MOOC was driven by the desire to utilise the positive aspects of connectivist pedagogies (cMOOCs) while being mindful of the institutional context and the process of accreditation. In this way, there was a pre-existing tension between 'openness' and 'containment' that had to be navigated at every stage of the process of planning and delivery. For example, the choice of assessment was designed to foster a 'social constructivist' approach, while embedding 'latent' prerequisites into a course with no entry requirements in order to meet UK Quality Assurance Agency (QAA) guidelines. If aiming for credit, students were required to complete two pieces of coursework. First, they had to produce a ten-minute podcast that discussed a set piece of critical material relating to topics studied on the module. The nature of this assignment served to test key Level 4 critical skills while indirectly confirming the required English language aptitude skills. Secondly, students had to create a 1500-word critical blog post relating to a prescribed topic relevant to vampire fiction, plus at least 300 words of commentary on issues raised by other bloggers. Again, the design of this assignment served to promote 'connectivism' at the heart of the module and open up opportunities for informal learning, while focussing the assessment on the module's validated Learning Outcomes (LOs) in order to meet subject benchmarked statements, guarantee alignment and assure quality. What emerged was a hybrid MOOC or 'hMOOC' that aspired to a 'cMOOC' format, but due in part to the process of validation, was haunted by 'xMOOC' pedagogies and more traditional teacher-focused learning structures.

Within this context, this paper explores two unique aspects to this module: The first is that it was delivered online as a MOOC, allowing students to participate for free without any entry requirements or prerequisites. Secondly, the module was validated against the UK's FHEQ, giving students the opportunity to achieve 20-credits at Level 4. This makes the MOC1001 Vampire Fictions 'one of a kind' as there are to date no other such courses available offering similar rewards upon completion. This paper examines the outcome of the university validation process, exploring the regulatory framework and the relationship between MOOCs and credit, as well as reflecting upon the experience of delivering the module and making recommendations for the accreditation of MOOCs.

2. Methodology

Case study research is used when an in-depth understanding of an event, process or phenomenon is required (Cresswell, 2002; Yin, 2003). Providing the opportunity to study single and multiple cases, it allows for a rich description and understanding of a unique case, or the ability to corroborate and qualify findings reported in a single case. (Walsham, 1995; Yin, 2003). The single case for this study is considered to be exploratory in that whilst it is not uncommon for MOOCs to reward students with university credits in the US and German university systems (Coursera, 2013; Gaebel, 2013; Parr, 2013), there are no such examples offering 20 credits upon successful completion. In addition, this MOOC is offered directly through a university, which in the emerging MOOC market is not the 'norm' for the delivery of credit-bearing MOOCs. In keeping with traditional case study research (Yin, 2003), the nature and size of the sample does prevent the findings to be completely generalizable to other similarly designed. However, the findings obtained observing the validation event afford 'particularisation' (Stake, 1995) and 'specification' (Patton, 1990) in that they can offer an insight into potential areas of concern that others may encounter in the process of validating a MOOC for university credit.

3. Data Collection

The university validation event comprised of a number of people: 1) a representative from the faculty who acted as the Chair; 2) a secretary who took minutes; 3) an individual member from each of the Computing, Criminology, English, Health, Media, Psychology and Sport departments; 4) the module designer; 5) the faculty TEL (Technology Enhanced Learning) advisor; and 6) two other faculty members who solely observed the event. All participants consenting to be audiotaped during the event, which lasted for roughly 45 minutes and interactions between participants recorded via field notes.

A reflexive approach was adopted during analysis by the first author since he attended the event as an observer and also in an advisory capacity to the panel regarding TEL aspects, but had no impact on any decisions that were made. Whilst emergent themes were noted during and after data collection, with consideration of the QAA guidelines for module design and approval (QAA, 2011), subsequent iterations took into account areas that prompted contentious discussion by referencing the audio transcription, field notes and module documentation. An initial case narrative developed from the transcription and field notes was refined to include quotes from the event, providing an insight into the potential concerns.

4. Validating a MOOC for University Credit

Three issues were discussed at some length when deciding whether to validate MOC1001 for university credit: 1) scalability of teaching and assessment; 2) student engagement; and 3) delivery platform and capacity to approve. Findings are reported using pseudonyms (with the exception of the authors) to ensure anonymity.

Scalability of Teaching and Assessment

Whilst the module had been designed to follow what Ben (Module Designer) suggested was a "tried and tested formula in terms of the technology used [and followed] a standard rubric in terms of module delivery", there was a concern in regards to how well the teaching and assessment could be scaled up and whether the existing staff base could support large numbers of students. Ben was quick to clarify that he wasn't "dumbing-down" the course because of the lack of entry requirements as he wanted the course to be "open and free". Some latent pre-requisite skills existed, in that you had to be able to write to complete the assignments. Daniel, who has a background in Computing and is also a senior fellow in teaching and learning, described his own experiences of MOOCs: "One of the key things of MOOCs is scalability. I'm interested in reading how scalable is the teaching and assessment. The MOOC I completed was entirely computer assessed as there were 27,000 students. I can't see anything about how it [the module] might be scalable."

Ben referred to the low completion rates of MOOCs of "typically around 7-9%" and said that there would be no written feedback for students. He envisioned a limited number of students paying for credit and decided that he would record the feedback in audio format. Daniel was a little uneasy at this, as he did not believe Ben had thought enough about scalability: "You can do 300 assessments? Ok, but that still puts a limit on it. Let's suppose it's spectacularly successful after that, what will you do? Have you thought about how you will make it truly massive, instead of just a [laughing] medium sized course?" (Daniel). Ben had already thought about this, particularly in relation to the discussion aspect of the module: "In terms of a discussion, I can certainly facilitate that plus the project linked to this module has three e-learning mentors that will also be facilitating discussion. I think with any programme, you put an estimate on how many will participate. [Students] can participate for free and then at that point [where they want credit], you would pay and that would be the point where these problems would kick in if the numbers were above 300".

Ben's hesitance to use computerised assessment was that he did not think it "suits the humanities discipline". He believed his approach was better suited as it "flies in the face of convention" for MOOCs and the use of computerised assessment contributes to low completion rates since they adopt a "stand-off" approach. Andy (Psychology background) again pressed home the issue of scalability and asked if it was possible to put a limit on students paying for credit: "I've just worked out, and please take this seriously, assuming 300 students each submit a ten minute presentation (assuming the kept to time), that is over 50 hours solid. That's over two days, not allowing for sleep, eating or anything else" (Andy). Ben believed that this was manageable, but that would be his upper limit: "You can spread 50 hours; it could be a four-week turn around [for marking]. I'm happy with that scale of assessment because at Level 4, not much of an onus on cross marking although we do sample, so I don't see that as a problem". Steve (background in English and also Ben's line manager) was very supportive, suggesting "the more students that opt to go for credit the more money is in the pot, therefore the more we can use to staff it". It was clear that Ben considered his module to be similar to others delivered at the university and by suggesting a maximum of 300 students he wanted to provide assurances to the panel.

Student Engagement

One of the features of the assessment in the module was that students would be required to actively comment on each other's blog, which Ben had used before. There was some confusion though over how students would actively engage with the process: "What if they don't get anyone commenting on their blog?" (Daniel). "That's a good question! I think that's where I have to have a role in this and ensure there is a spread of commentary across all the blogs [refers to previous examples where a couple of students did not have comments]" (Ben). "[Doesn't that] give a dissatisfied feeling in terms of their experience?" (Daniel). "I can see where you are going with this; you obviously want 30,000 students doing assessment [and] it could happen, but I'd be surprised if it did. I don't think it's a problem if everyone didn't get commentary [because] they're not being assessed on receiving commentary; they're being assessed on providing commentary on other blogs" (Ben).

Daniel also raised a concern about how students would participate in the discussion sessions each week, with students expected to engage in the two 1 hour webinars each week: "I'm really worried about that. I ran with small numbers of only about 80 students with asynchronous discussion boards and students got demotivated because there were so many posts from so many people they couldn't be bothered to read/do things" (Daniel). Ben responded by explaining the approach he had adopted with the Level 5 version of the module: "I literally had detailed worksheets for the sessions [and] students literally worked their way through a session. There were obviously initial responses to the lecture, but then there were tasks which structured the discussion so all the threads of a discussion were hinged on four or five other threads".

Delivery Platform & Capacity to Approve

When Ben first devised the module, he wanted to make use of the university's virtual learning environment (VLE) as the delivery platform. Before the event, Peter had offered to find out if the VLE could 'stand up' to supporting the MOOC and spoke to the team responsible: "The initial response was yes, but quickly a no as well [laughing from group] and this was because of numbers. One thing they did say is that the VLE provider hosted large courses, which can have guest accounts and [I] was going to ask if they could host this. Ben and I have already discussed the alternatives, as the idea of a MOOC is to be open and free, and use your own platforms, write content anywhere and share. [We had already] suggested using WordPress for the blogs and YouTube for uploading podcasts" (Peter). "And I've already used Edublogs [in pilot study for another project] so I don't think it's beyond my skills to go to a WordPress option" (Ben). Daniel was a little hesitant at this stage, suggesting that a more concrete decision had to be made at this point: "Ok, so you've said that this is what you could do, but this is a specific proposal that the university is putting its stamp on, so what are you going to do?".

Ben admitted he wanted to use the VLE for delivery, but it had never been tested to support large numbers of students. Daniel asked how students would register and pay on such a course, whilst Andy was worried about the uncertainty in delivery and asked Laura (the Chair) what they could actually do: "I wanted pay linked to each assignment. I don't know whether that is possible, will have to discuss with higher management [outside of panel]. I'd like it that way; free at the point of entry then [for] CW1 you pay a percentage, same for CW2 […] I think it comes down to two things; how much are we going to charge and is [VLE] happy for it to go this way; or, do we go with the alternative option. I think there are practical issues that are in part informed by the business model, how much it will cost and how it's going to be handled" (Ben). Andy inquired as to whether the panel where in a position to approve such a module given the uncertainties around the delivery. Laura quickly responded: "We can approve [based] on the information we actually have, but just subject to the delivery being sorted out by a particular date".

Ben again attempted to provide some reassurance, suggesting that if this was a module modification, then he "wouldn't be asked these questions [and] there's no reason why this shouldn't work in the same way". Daniel re-acted strongly, saying he did not believe Ben's point was "particularly valid" and that doing something as differently as this meant the university needed to start considering things that are implicitly accepted: "But you would still use the VLE in the same way; that's what I'm saying […] we don't know about numbers, no one knows if the system will stand up to it, but that's always the case …" (Ben). "This is what makes it difficult for us to put an institutional stamp on it [and this] is fundamentally a problem Ben, because we are then a hostage to fortune with the university's reputation" (Andy).

Other questions started to emerge regarding the panel's capacity to approve the module, with Laura suggesting that for some of the issue being raised, they would not get involved with. But since they were tied to the delivery, it blurred the boundaries. Laura also suggested that if they [the panel] were happy with the content and the learning outcomes were relevant, the panel can make recommendations to the university since issues regarding delivery mechanics, paying for the module and registration issues were not within the remit of the panel.

7. Discussion

The findings from this study demonstrate that the issues of pedagogy, delivery and support that are considered in 'traditional' modules (QAA, 2011) are also deliberated in the validation of a MOOC granting university credit. Whilst MOC1001 was indeed successfully validated against the FHEQ, many of the issues raised such as delivery mechanics, paying for the module and registration issues where not within the remit of the panel.

It stands to reason that both types of modules are considered against the same principles, since the only differences between them are the wholly online nature of the MOOC and the lack of any entry requirements. Apart from these features, MOC1001 ran in the same way as any other module at the university. It offered the tried and tested 'transmission' based model for the delivery of lecture material, offering the learner a 'personalised learning experience' by allowing them to view them at a time that suits them. The weekly discussion forums, blog posts and critical commentary helped to form learning communities which exhibit key features of networked learning, including knowledge construction through dialogue; a supportive learning environment; online socialisation; learners providing leadership for others; and a collaborative assessment of learning.

At the same time, the processes of quality assurance and the conservative approach adopted by the university framed the learning experience as one in which the teacher remained visible. This was supported by the 'live' synchronous classroom sessions through Collaborate that served to maintain the focus and direction of the learning journey towards the intended LOs and introduce elements of 'containment' associated more readily with 'xMOOC' pedagogies. The result was a movement back towards what might be described as more traditional forms of contact with the tutor via email, akin to the teaching and learning patterns experienced on the campus-based version of Vampire Fictions.

However, the main stumbling block at the validation event focused on the number of students that would partake in the MOOC and more importantly, how many would want to pay for credit. Although there were a number of issues that were left unresolved, the validation of MOC1001 was approved subject to the mechanics of delivery, enrolment and payment issues being addressed at a later date. This surely is a triumph for 'open education' and opens up a number of possibilities for learners around the world. But just how different is the MOC1001 to the traditional module?

It is clear that given the 'massive' nature of the course presents some operational issues; for a university to give it an official stamp of approval, it needs to be supplemented by traditional forms of pedagogy, delivery and support. As evident in this study, the university was uncomfortable in validating a module where there was no limit on numbers. However, MOC1001 does not appear to follow the models of 'extending' the learning or working in collaboration with commercial providers as shown in current implementations. It offers a new business model that reduces the costs associated with university study (alongside the no entry requirements) resulting in a low barrier to entry for students wanting to take up study and achieve university credit. The absence of a 'partner' to support the delivery of the course might place some strain on university resources, but it allows the university to keep control over the delivery, monitor the progress of their students and keep 100% of the profit. By entering at the lower end of the market, offering equivalent credits at (potentially) a fraction of the price, this type of MOOC presents an opportunity to challenge existing provision; an inexpensive, low risk form of provision that can help to address the financial constraints that many universities face, as well as helping to shift the cost of education from the learner to the university (Lawton and Katsomitros, 2012; Carey, 2013).

Reflecting back on the delivery of MOC1001 has revealed the limitations of both xMOOC and cMOOC pedagogical approaches. In particular, while a cMOOC 'connectivist' pedagogy is favourable to nurture self-regulation and personal learning in an open educational environment – utilising podcasts, blogs and Web pages to create and share content – questions surface around fulfilling learning outcomes, quality control and retention. While cMOOC approaches are well matched to the learning environment of open access courses without validated credit options, there are potential risks associated with the effective delivery of a validated, credit-bearing

MOOC via this pedagogical route. For example, the very freedoms associated with 'connectivist' self-regulated learning account in part for the low completion rates of MOOCs. Within this context, the delivery of MOC1001 opened up the need for a hybrid MOOC pedagogy that prioritised the highly effective elements of a 'connectivist' pedagogical approach, such as the collaborative, personal learning journey and networked states of knowledge generation, while drawing upon specific and tailored aspects of xMOOC pedagogies and the 'instructivist' model. In particular, MOC1001 has utilised live webinar sessions and short (3-10 minute) videos delivered by the Module Designer to realign discussion with the validated module learning outcomes and assure a sense of levelness.

The results of an approach that attempted to reconcile these tensions between 'openness' and 'containment', cMOOC and xMOOC forms, in order to maintain levelness and a close alignment with the LOs prescribed through validation, reveals a marked impact upon student numbers and completion rates. Contrary to the concerns raised at the validation event about the scalability and 'massiveness' of the course, only 31 students (approximately 3%) completed MOC1001. In part, this was due to the level of study that made certain demands on the students in terms of critical engagement, knowledge and understanding. As one student noted in module feedback, MOC1001 provides a notably different learning dynamic to other non-crediting-bearing MOOCs: 'I've recently enrolled on [a] MOOC at Iversity [...] Compared to Vampire Fictions, it is impersonal as you don't have any contact with the tutors. It is less intellectually challenging and there is no opportunity to be assessed. It is interesting and enjoyable, but not as stretching as Vampire Fictions.' Here, maintaining levelness, adhering to subject benchmark statements and accounting for the FHEQ as part of the process of validation, all have a significant impact upon the learning experience.

8. Conclusions

People are taking MOOCs for a variety of reasons – from access to university level content with little to no cost, to learning in an environment that suits them – but do MOOCs in the format examined here pose a threat, or an opportunity to HE providers? As the evidence presented here reveals, the processes of accreditation transform the learning dynamic of MOOCs and in part work against the very conception of openness. In this respect, the opportunities that MOOCs offer need to be managed carefully in order to maintain the correct balance between quality assurance and open learning on a massive scale. While it would seem that universities can recruit massive amounts of students and charge them a nominal fee for either a certificate of completion, or subject to meeting the required pass mark for assessment, award credit, the processes of accreditation also impacts upon the economic possibilities of MOOCs. Although MOOCs seem to provide an opportunity to be 'grabbed with both hands', the pathways to credit and degree programme building need to be systematically addressed in order to realise the economic potential of MOOCs without sacrificing quality and levelness. In particular, if MOOCs are going to be more than just 'shop windows' to enhance the brand identity of primarily elite institutions and if they aspire to be truly 'disruptive innovations', then they need to take into account the needs of learners through Individual Learning Plans (ILPs), as well as being mindful of how validation and credit impacts upon the positive aspects of 'connectivist' pedagogies. In this respect, the disruptive potential of MOC1001 Vampire Fictions is that it is faithful to the conception of 'low-end disruption' in its unique approach, while revealing how the robust system of quality assurance provided by the UK's QAA offers a challenge to how we conceive of credit-bearing MOOCs.

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Offering cMOOCs collaboratively: The COER13 experience from the convenors' perspective

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Abstract: *Over the last few years, the intense interest in Massive Open Online Courses (MOOCs) has opened up a range of possibilities and pitfalls for Higher Education Institutions (HEIs). Many universities have seen the opportunities that MOOCs present and working with education companies, now offer learners the opportunity to earn university credit. Using a case study approach, this paper examines the experience of validating and delivering the UK's first undergraduate MOOC for credit. Focusing on the validation process, including issues of teaching and assessment, student engagement and the delivery platform, it explores the impact of accreditation and quality assurance on existing MOOC pedagogies. In so doing, the paper reveals the 'disruptive' potential of this 'one of a kind' module, while highlighting how the regulatory framework that assures quality can transform our understanding of MOOCs.*

Introduction

Open Educational Resources (OER) are sometimes regarded as the most important impact made by the internet in the educational sphere (Brown & Adler 2008) and are promoted to "leverage education and lifelong learning for the knowledge economy and society" (Geser 2007, 12). In German speaking countries, however, the OER movement is still lagging behind international uptake of the OER concept (Ebner & Schön, 2011; Arnold, 2012). This paper describes the design and implementation of a Massive Open Online Course (MOOC) aimed at increasing awareness of OER and reaching a larger audience. The "Online Course on Open Educational Resources" (COER13) was offered in a joint venture in spring/summer 2013 by eight convenors from Austria and Germany with affiliations to five different institutions. The course was planned as a community-oriented cMOOC (as opposed to an xMOOC using the widespread distinction between two different types of MOOCs, introduced by Daniel 2012), i.e. it heavily relied on participants' contributions (reflections, insights, task solutions and questions) and course convenors saw their roles as facilitators as well as content experts. All materials were published with an open license aiming to generate an OER on OER with the course itself.

In their systematic literature review of research on MOOCs, Liyanagunawardena, Adams and Williams (2013, 217) concluded that the most significant gap in the literature was the scarcity of "published research on MOOC facilitators' experience and practices." Likewise, Anderson and Dron (2011) emphasized the importance of studying distance education pedagogy that is grounded in different learning paradigms and contexts. This paper thus presents qualitative data about the experiences of convenors of COER13. To collaboratively design and implement the innovative format of a cMOOC is challenging. To offer a course on an equally innovative topic such as OER to an open audience increases the complexity even more. To do so in an emerging, newly formed project team, comprising different institutional backgrounds, adds yet another layer of complexity to the challenge. Therefore, this paper focuses on the perspective of the COER13 convenors and attempts to unpack the collaboration process, and identify successful practices and lessons learnt during COER13. The results will inform and support future (teams of) convenors of MOOCs.

COER13 – Online Course on Open Educational Resources

Course design and timeline: COER13 ran for 12 weeks in spring/summer 2013. There were no course fees or any other prerequisites for participating. The course comprised an introductory week followed by five thematic units that lasted two weeks each, and a closing week for summarizing and evaluating the learning experiences within COER13. The course was offered entirely online: The central course website provided instructional videos, reading materials and relevant web links for each unit. All materials were gradually added as the course evolved. One or two synchronous "online events" per unit with expert talks or panel discussions, offered via live classroom software, were key structural design elements. An introduction as well as a summary at the middle and the end of each unit was sent as a newsletter to all registered participants and also archived on the website. The interaction amongst students and between students and convenors was planned to take place via the integrated discussion forum or via tweets and blog entries that were aggregated on the course website by means of the course hashtag "#coer13". Additionally, during the course some participants started a COER13 Facebook group (105 members), and others discussed COER13 issues within the already existing OER Google+ group (136 members). Furthermore, each unit presented a clearly circumscribed task that was meant to promote the production and usage of OER across educational sectors. Participants were asked to share their work on the tasks with the course community and to document their work on the course website in case they wanted to obtain online badges. Online badges served as an alternative means of certification and were offered on two different levels.

Collaborative planning of COER13: The idea to offer a MOOC on OER stemmed from prior experiences with open courses in German-speaking countries (Bremer & Thillosen, 2013) as well as from fundamental work on OER through European projects (Schaffert, 2010; Schaffert & Hornung-Prähuuser, 2007) and national initiatives (Ebner & Schön, 2012). An informal discussion about MOOCs and OER at a conference in November 2012, at which four of the eight organizers met, can be considered as the starting point. By the end of 2012 there were eight convenors: three researchers from the e-learning information portal "e-teaching.org", three faculty members from the universities of Munich (Applied Sciences) and Tübingen, and the University of Technology of Graz, as well as two representatives of NGO's involved in promoting OER. The eight convenors joined the team to promote OER, to gain experience in offering a MOOC, or for a combination of the two motives. All planning activities were done via synchronous online meetings that started in January 2013, comprising different members of the team (the whole team could not find a time to meet), accompanied by an email exchange. Decisions and tasks were documented in a closed wiki. Each thematic unit was assigned to one member of the organizers' team so that he or she took responsibility for that unit, including the design and the organization of the online event. Once the course started, organizers occasionally discussed residual questions after the online events but email was the primary communication channel.

COER13 implementation: There were 1090 registered participants from many different strands of the educational sphere (e.g. higher ed lecturers 21%, school teachers 23%, freelancers 18%, students 15%). The website received more than 15.000 site visits and nearly 78.000 page views during the course offering. Course interactions took place on the discussion forum (673 posts), as well as on different social media platforms, e.g. via Twitter (2247 tweets by 363 people), blogs (316 posts from 71 aggregated blog feeds), a Facebook group and an OER Google+ group. The ten online events attracted between 40 and 134 live participants each and between 111 and 2953 views of the recordings. 89 of the participants stated that they were interested in a badge when the course started; 56 of them met the requirements at the end.

Methodology

The convenors' perceptions of collaborative planning and implementation of COER13 are presented in this paper on the basis of semi-structured interviews with five of the eight convenors. The semi-structured interview protocol was based on elements of teaching presence in distance education pedagogy (Anderson & Dron, 2011), and contained questions about individual roles, collaboration in the planning and design of the MOOC, implementation, facilitation, and evaluation as well as perceptions of challenges and lessons learnt. The interviews were conducted by a researcher who had not been involved in the design or implementation of the MOOC and did not know four of the five convenors interviewed, which contributed to the trustworthiness of the data collection process. Interviews lasted between 30 and 40 minutes, and were conducted either on Skype or by phone. The researcher transcribed and open-coded (Mayring, 2010) the interviews without input from the participants.

Findings

Interview findings are organized here according to convenors' perceptions of a) collaborative planning of COER13 b) implementation of COER13 and c) lessons learnt.

Collaborative planning of COER13: All the convenors highlighted the planning phase as crucial to the design and implementation of the MOOC. They expressed satisfaction with the planning process during which they took decisions on MOOC design and implementation. They stated that having multiple convenors had worked very well for them. They described the collaboration as "unproblematic," and that it "sometimes involved long-drawn discussions, but was pleasant". It was easier for them to design, implement and manage the MOOC as a group, instead of as individuals, because each convenor brought different strengths to the MOOC - to the extent that some felt they could not possibly have offered the MOOC on their own. For example, one person was able to set up and manage the online learning environment while another took responsibility for Twitter interactions. Decisions about design and content were taken as a group and the first unit was designed collaboratively, but afterwards, each convenor took responsibility for designing and planning content for specific thematic units. This made the MOOC more manageable to one convenor who expressed relief, "I didn't have to do everything. I also didn't have to know everything about everything." Another convenor stated that the exposure to different perspectives was valuable not only for MOOC participants, but also for the convenors themselves.

Implementation of COER13: All the convenors interviewed reflected that the structure (offering two-week thematic units, online events, expert interactions, short videos, and badges) had worked well. The biggest theme that emerged from the interviews about the implementation of the MOOC was the multiple technologies or virtual spaces used for interactions (with participants and among participants). Convenors discussed their choice of specific virtual spaces, their "following" of the content of interactions in those virtual spaces, and the management of those virtual spaces where interactions occurred. In order to address the technical skills of all learners, and based on prior experiences of two of the convenors, a discussion forum was included in the course website for interaction. The convenors mentioned the discussion forum as having worked very well for interactions. This surprised a couple of convenors who felt that the interface was clunky and that participant use of the forum indicated the low learning curve and low familiarity that users had with online discussion forums as opposed to Twitter or Google+. The convenors' choice and use of the virtual spaces depended on their own familiarity and comfort level with the technology used. If a convenor decided not to use a certain technology, such as Facebook or Twitter, they were sometimes unaware of conversations and interactions taking place in the virtual spaces that they did not use, which one convenor perceived as highly problematic. Other convenors mentioned that they would have liked to keep up, but time and workload prevented them from following all conversations and interacting in all virtual spaces. Convenors typically facilitated interactions and "followed" interactions more closely during their assigned thematic units, and only stayed informed using aggregated conversations during the other weeks. This way, some of them felt they were realizing the key principle of cMOOC participation themselves: to select and prioritize which conversations to follow and which not. Facilitation strategies also differed from one convenor to the other, leading to each thematic unit offering a different learning experience despite the basic common design. All the convenors reflected on the challenge of managing multiple virtual spaces and following the conversations that participants had in those virtual spaces. Sometimes, there was redundancy and repetition in the conversations that occurred in the spaces, but including multiple virtual spaces enabled participants to choose their virtual spaces for discussions. Given the nature of an open online course, the convenors could not predict the profile or background of the type of participant who would be interested in the course and thus had to offer multiple options that allowed participants the autonomy to choose.

Lessons learnt from collaboration and implementation of COER13: In terms of lessons learnt about planning a MOOC collaboratively, all the convenors emphasized the importance of the planning phase for a MOOC learning environment where it was difficult to anticipate the type of learner who would participate, as well as learners' expectations, incoming technical skills and content knowledge. In designing such a MOOC, two convenors highlighted the importance of building resources for learners with at least two sets of expectations or two levels - those who wanted an introduction to or overview of the topic and those who wanted to gain in-depth understanding of the topic. Given the diverse group of learners who participate in MOOCs, it was important to consider both those who wanted to learn at a basic level and those who want to learn at an advanced level in choosing resources and structuring instruction.

The convenors had previously identified clear responsibilities for thematic units, but they had only rudimentarily discussed the management of the different interaction spaces (e.g. the discussion forum, blogs, the emergent social media groups and Twitter), they had not clearly defined the roles and responsibilities for managing those interaction spaces and interactions in those spaces. One lesson learned was to clearly define roles and responsibilities not only in terms of design and implementation, but also virtual space management and interaction management. Another lesson learned was that the tools and infrastructure used for the MOOC influence the interactions that take place, therefore it is important to be very thoughtful about the technology and how it would be used. Further, convenors had developed their content for their thematic units individually, and did not have the time to share their units ahead of time with their co-convernors, which led to occasional overlaps in resources or experts who were considered for those weeks. They thus suggested that the pre-planning should involve content development to as large an extent as possible. Likewise, prior discussion about facilitation strategies as well as more active facilitation during the MOOC were suggested by one convenor as a way to decrease the drop-out rate in such courses. With respect to implementation, a regular synchronous meeting of convenors throughout the course was proposed by one convenor who stated that it was important to collaborate intensively during the planning phase, but it was as important to meet during the implementation about how things were going and what needed to be changed.

Discussion

Collaborating: It is not uncommon to have more than one convenor of a cMOOC, but the number of convenors in COER13 was rather high. An informal collaboration across five different institutions is also a special circumstance for collaboration. Taking into account that all planning and implementation was done collaboratively online, it is quite remarkable that convenors seemed to be quite content with the collaboration process and felt that it went smoothly. The initial planning phase seemed to have been of great significance, especially the process of clearly assigning leadership roles for different thematic units. The convenors shared the assessment that it would have been hard (or nearly impossible) for any one of them to offer such a MOOC by themselves. This might also have contributed to a positive perception of the overall collaboration process, in addition to the mutual feeling of belonging to a team that successfully offered a relevant course on a highly relevant educational topic. The wish, mentioned above, for even more intensive planning and exchange of feedback during the course evolution might be related to different participation patterns within the units. As with many MOOCs, participants were much more active in the first units and their engagement decreased somewhat towards the end. Perhaps the different degrees of participants' involvement were also related to the content itself. The initial thematic units targeted teachers and lectures whereas the latter units were more relevant for educational managers, policy makers, and alike. It would be worthwhile to investigate whether these different key audiences might have benefitted from different ways of convening and facilitating. In any case, these differences could have instigated the wish for more or closer collaboration when the course was already up and running. Interestingly, the degree of similarity in convenors' perceptions of both course and collaboration came as a surprise to some of the convenors. They thought that the perceptions within the team would render a much more diverse picture. The shared sense of achievement amongst the team might have overshadowed nuances in perception – or the similarity points to some inherent limitations of our methodological approach: As all interviewees knew that findings would be discussed afterwards, even if anonymously, this approach might have prevented them from raising any points that could have caused conflict. Convenors with an NGO background were the ones who did not participate due to time restrictions. As these interviews are completed, attention will be paid to whether the similarity of opinion among convenors decreases.

"Digital habitats": The frequently mentioned theme of diverse and emergent virtual discussion spaces within COER13 and the challenge of facilitating and convening within them brings Wenger et al.'s (2009) notion of "digital habitats" to mind: The choice of technologies to support online learning is not only a question of choosing the right tools but also of providing a sense of "home" within the virtual spaces they afford. The diversity of virtual spaces planned for in COER13 and the use of emergent social media spaces like Facebook and Google+ meant changed "digital habitats" for some convenors. In particular, those more used to teaching online in clearly prescribed virtual spaces, like closed learning management systems, might have felt somewhat "unsettled" when suddenly exposed to a rather "nomadic" setting for facilitating and convening.

Methodological reflections: Possible limitations of our methodological approach are already mentioned above. In general, the participation of three interviewed convenors as authors of this paper could be perceived as conflict of interest. However, the convenors were not aware of the questions that would be asked during interviews. Furthermore, including an insider view and being able to go through a process of communicative validation after the qualitative interviews added to trustworthiness of the data as much as the systematic, external, non–involved view of the fourth author who led the interviews.

Conclusion

For future convenors of cMOOCs the following issues should be considered:

- An intensive planning phase as to the basic design of the course and assigning leadership roles for certain units eases the process of collaboration, finding one's own role as convenor and the actual implementation of the MOOC;
- A structure for ongoing collaboration or exchange of feedback while the course is running can support the convenors in taking up their leadership roles;
- Virtual communication spaces must be designed carefully, including being prepared for emergent new spaces that are set up by participants;
- It could be helpful to discuss a system of distributed responsibilities for convenors to contribute to different discussions in the various virtual discussion spaces used;
- It might be worthwhile to adapt virtual discussion spaces as well as facilitation methods across different thematic units, depending on the relevance of the content for different sub-groups of participants;
- It remains an open challenge to balance collaborative planning with "playing-by-ear" facilitating in newly emergent situations;
- Further research into any one of these issues seems rewarding – as much as offering a cMOOC collaboratively is a rewarding learning experience.

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TORQUEs: Riding the MOOC wave to benefit on-campus courses

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Abstract: *The discussion concerning MOOCs at ETH Zurich has led the university to develop the TORQUE concept, which focuses on transforming traditional lecture series into 'flipped classroom' sequences by deploying online courses as self-learning preparation. TORQUE is an acronym for Tiny, Open-with-Restrictions courses focused on Quality and Effectiveness. So far ETH has developed three TORQUE courses, all of which started in Fall Semester 2013. The most important lesson learned in their pilot phase was that transforming classroom teaching into something else is infinitely more complex and demanding than simply producing videos. However, because video and online course production precede face-to-face teaching, they tend to dominate the discussion and absorb most of the capacity. In the next round of TORQUEs this will be countered by deploying a prototype approach, where a showcase module that includes face-to-face activities will be developed at the outset of production. Another aspect that needs consideration is how the project will ultimately be embedded in the institution: up to now two different units have been cooperating and managing TORQUE production and integration into teaching. This discussion has potential implications for organizational development at ETH.*

Key words: **TORQUE, video production, transformation of classroom teaching, flipped classroom, organizational development**

TORQUEs as on-campus MOOCs developed at and for ETH

MOOCs still have a huge influence on discussions about the future of higher education (Carey, 2012). However, although they were invented to solve existing problems in the US education system and to cut the cost of attending university, reality checks over the past year have shown that MOOCs are no silver bullet (Biemiller, 2013; Devlin, 2013). On the contrary, to succeed in their distance learning setting students require special learning skills and a motivational background; MOOCs alone will not help disadvantaged young people get a university education. For institutions whose aim is to provide excellent teaching and a sustainable academic education, MOOCs offer nothing more than supplementary material; infrastructure and face-to-face communication between students and teachers have proved much more efficient and effective in student-focused and competence-oriented education (Kolowich, 2013). In this context ETH Zurich's plan is to maintain its focus on the latter aspects, while at the same time following the MOOC discussion and extracting promising components.

In response to the global MOOCs debate ETH decided in late 2012 to launch an initiative for 2013/2014 to gather experience of new web-based course formats. In discussions with ETH stakeholders it became clear that most faculty are less interested in teaching a large online audience than in increasing the quality and effectiveness of courses for ETH Zurich students. One of the main outcomes of the discussion was the development of the TORQUE concept. TORQUEs (Tiny, Open-with-Restrictions courses focused on Quality and Effectiveness) are derived from MOOCs but have a course format that is suitable for ETH. They specifically target ETH students, but are also open to a larger audience. Each course integrates both online and face-to-face elements.

TORQUEs do not differ radically from MOOCs: they have similar formats and both provide additional web-based learning opportunities (for their major differences, see Table 1).

	TORQUE	MOOC
Targeted number of participants	Dozens to hundreds	Thousands
Access	Restricted to members of Swiss universities	Open to all
Face-to-face teaching	Mandatory	Not required

Table 1: The greatest differences between TORQUEs and MOOCs

Both comprise a number of short video clips with inserted questions, quizzes and/or exercise tasks, plus communication tools such as online forums. All TORQUEs are open to all ETH students, and to all students registered at a Swiss institution of higher education. Any TORQUE initially designed for a small group of users can later easily become a course for a worldwide audience. TORQUEs may be regarded as an experimental setting for the production of video-based online courses. They will also provide data for faculty wishing to monitor change processes and test the effects in their teaching.

Production of TORQUEs

In Spring Semester 2013, ETH produced its first three TORQUEs, with the intention of testing out various video types and learning settings (see Table 2). The first TORQUE was an independent learning course that taught the use of a statistical tool. This TORQUE is based on screencasts and tests, and allows students to apply theoretical knowledge in a standard statistics package without any further support. The second TORQUE, on an economics subject, was produced on a tablet where the instructor was able to add handwriting and highlighting to PowerPoint slides. This TORQUE serves students as preparation for each lecture, where face-to-face classes have now been replaced by more interactive and engaging scenarios. The third TORQUE, on solid-state physics, is similar in concept but uses videos produced with a visualizer and handwritten slides. The face-to-face activities of the course now comprise discussions and debates on scientific concepts. Experiments are also performed during classes. All three TORQUEs went online in Fall Semester 2013.

The three new TORQUEs are compulsory courses within BSc curricula. Two are courses for very large classes. The economics course was previously taught in a blended learning scenario, meaning that a relatively large online component plus over 50 tests and a wealth of additional material could be deployed rapidly because many of these resources already existed. The statistics course, on the other hand, comprises the same amount of video time but around half the number of tests, because these were all developed from scratch. In the physics course the exercise series were similar to those previously used in the class, while nine specific quizzes were developed to check theoretical understanding. The initial motivations for producing these TORQUEs differed. They were, for the physics course, the lecturer's interest in innovation; for the economics course, a vision for transforming the face-to-face lecture; and for the statistics course, the wish to achieve a specific learning objective (apply theory to software package R) not otherwise possible. The three TORQUEs deployed completely different video styles. The statistics course used a typical screencast setting, where the course designers demonstrated software functions and introduced exercises on the computer screen and then recorded it all on video. They wanted flexibility, producing material in their offices on their own laptops and on borrowed equipment (headsets, recording software). The economics clips comprise regular PowerPoint slides annotated by the author with the help of professionals in an ETH video studio. The clips for the physics TORQUE were produced using a visualizer setup installed in the designer's office. Setting up and managing these three video types was very time-consuming for the ETH multimedia services unit, which is responsible for video production. The big challenges were the spatial distribution of production and the different needs and expectations of the course designers.

A key lesson from these first TORQUEs is that a successful course requires the tight integration of three main

	Physics	**Economics**	**Statistics, Tool R**
Description of course for which TORQUE was developed			
Number of students	ca. 50	ca. 500	300-500
Face-to-face elements (on-campus)	Lectures 4hrs/week Exercises 2hrs/week	Lectures 2hrs/week	4 courses, each with lectures 2hrs/week and exercises 1hr/week
ECTS credits	7 credits	3 credits	3 credits each
Type of course(s) in curriculum	Compulsory course with mid-term and final exam, BSc level	Compulsory course with exam, BSc level	Four compulsory courses with exam, BSc level
Description of online TORQUE component			
Type of video	Filmed handwriting (visualizer)	Annotated slides (PowerPoint with highlighting)	Screencast (Camtasia movies)
Number of video segments	14 topics, 74 videos	12 topics, 29 videos	9 topics, 22 videos
Number of checking mechanisms (exercises, quizzes, tests)	11 exercise series and 9 quizzes	51 tests	22 tests
Online workload	ca. 14hrs video, rest not available yet	ca. 5hrs video, rest not available yet	ca. 5hrs video, rest not available yet
Integration of online and face-to-face (f2f) activities			
Link to f2f	Preparation for lecture, lecture then held incorporating questions of students	Theory on economic models as preparation and in addition to f2f	Exercises with statistics tool R. Specific and elaborate exercises synchronised with f2f
Reduction of f2f time	Reduction of lecture time by 2 hours per week	50% reduction – lectures only every other week	No f2f time; course is an additional offering. R is not part of an exam
Motivation for TORQUE	Innovation project of lecturer	Free time f2f to intensify teaching scenario	Not enough space in computer rooms for exercises
Main activities in f2f time	Dialogue with students – question-driven approach, few live experiments	Problem based learning, case studies, interactive sequences or group work, exercises, experiments and discussion	Theoretical background in statistics

components: on-campus (face-to-face) activities, online activities, and video clip design. Ideally, the pedagogical concept will combine on-campus and online activities, generating a well-balanced mix of activities and learning goals aligned with the overall goals of the course. In reality, however, the designers of the initial TORQUEs focused strongly on the production of the video clips because this was a new (and time-consuming) element for them. The face-to-face component, with its exercises and lectures, tended to be seen as something that could be left to a second step, even during the semester. In this context, shifting the focus from technical to pedagogical issues was hard, and required expert effort. Once video production starts it is in any case difficult to change the overall pedagogical scenario. These combined realisations led us to introduce a prototype phase in the current production workflow. Here the integration of all components is assessed by creating a small example module before video production even starts. This makes it possible to adjust the overall course concept more easily.

Integration into face-to-face teaching

A main focus of the ETH TORQUE initiative is how web-based courses can be integrated into face-to-face classes at the university, and what the outcome will be. In the above three cases, it became obvious as soon as video production was finished and the semester began that integrating the video component with face-to-face courses is challenging for faculty and those helping them. A blended learning setting based on a MOOC or TORQUE requires much more didactic planning and course redesign than most expected. Enormous faculty effort is required if the quality of teaching is really to be enhanced – without it the MOOC hype will come to little.

It is a pleasure to watch students taking the new courses seriously: they watch their videos regularly, and do all the exercises and homework. When a class begins they are well prepared and expect further challenges. For this reason instructors must design every class carefully: what case study, complementary exercise or interesting experiment will match my students' newly enhanced foreknowledge? This question may generate a new form of interaction between faculty and students. Thus not only TORQUE videos, but also their face-to-face learning material has to be planned and developed in advance.

The faculty involved in all three new TORQUEs are senior, experienced teachers. We assume that it is easier for a senior lecturer with a lot of experience to deal with presence teaching in TORQUE courses, where instructors are more exposed due to more student-driven, interactive, and unpredictable classroom situations. Having a wide range of materials at hand also helps, making it easier to adapt and reuse resources that would otherwise have to be developed from scratch. Working with online materials during the semester also requires detailed didactic planning of classes. In addition, activation of students does not happen by itself and tends to be underestimated in course development.

One of the most popular ways to integrate MOOCs and TORQUEs into traditional lectures is via the flipped classroom (Berrett, 2012; Fitzpatrick, 2012). Although known for years in some disciplines, especially in the humanities, with the advent of MOOCs the flipped classroom has become a buzzword. Also known as the inverted classroom, the term means that students' conventional classroom/home learning sequences are reversed. Traditionally students experience new knowledge and concepts during lectures. There learning and understanding generate questions, but with no means to express these in the lecture hall, the cognitive process is solitary. Later recapitulation or repetition is a solution but does not change the system. Studying at home then offers no way to apply knowledge and acquire scientific skills. By flipping the classroom, however, the gaining of knowledge is outsourced as prior homework and questions are addressed in class. The mechanism thus offers students a time and place to develop further knowledge in discussions with peers and faculty, and allows them to acquire competences by applying learning content (Sams & Bergmann, 2012; Bowen, 2013).

To change learning processes at universities fundamentally, faculty must be willing to undertake this paradigm shift to the flipped classroom. They must be made aware not just of risks and difficulties, but also of advantages and benefits. Most faculty will also need didactic help to redesign their courses according to the flipped classroom concept. For universities, integrating it will certainly require a central commitment and promotion by the executive.

Teaching a TORQUE course means planning and preparing materials for two types of course and integrating them into one. First, video production requires help with the choice of setting, assistance with technology, and pedagogical support with material preparation. A video format and a distribution platform must be established. Questions have to be developed for online tests, quizzes and/or other online activities. Depending on the form of online communication and collaboration, students may also need help with web-based aspects of the course. Then, faculty have to plan each class and provide face-to-face exercises, group work or experiments. They must deal with technical problems and be ready to supervise students during face-to-face time. Here they need knowledge of various educational concepts and a broad repertoire of methods. (Citing current events and recent press developments relevant to class topics is one of the best ways to begin a problem-based learning session.) Student activities (e.g. peer instruction and project or group work) must be planned in advance and require faculty monitoring and supervision. Instructors need to predict where students may have problems and intervene when they need help.

The ETH TORQUE courses described above were all led by experienced faculty who are very able to transform their teaching and to react flexibly to the needs of students. Implementing such courses with less experienced teachers, however, risks expending immoderate amounts of time on development, and inadvertently setting up challenging face-to-face teaching situations. In our experience, it is very important to communicate these risks early to preclude frustration and overload. Circumventing them is also essential to win faculty support for the transformative process involved in integrating TORQUEs into teaching. Faculty will need adequate support and didactic training to be successful in this new multitasking environment.

Institutional and organizational aspects

Multimedia Services (ID-MMS), part of ETH's IT Services, provides video production and lecture recording services for faculty. These services have up to now been associated only loosely with ETH's educational development services: in the past instructors experimented with videos in class on a very small scale, with no special considerations. In the course of the TORQUE/MOOC initiative, however, it has become obvious that (1) video incurs the biggest costs, and (2) that pedagogical aspects need to be considered comprehensively. Two different units have been assisting with TORQUE development: video production issues are handled by ID-MMS, and course design and pedagogical support by Educational Development and Technology (LET). Project organization unites the two to run the TORQUE initiative, which is led by LET. Although the units work together closely, course designers had several contact persons, and they might have profited more from a single point of contact that manages all their needs. The units also had to discuss different conceptions of quality and service. In this context LET and ID-MMS are considering an integrated service for developing the videos used in teaching and learning.

In the above TORQUE courses, face-to-face sessions underwent certain changes. The student workload must remain the same in the flipped classroom as in the traditional lecture setting, so instructors reduced face-to-face hours to allow enough time for students to prepare for classes. The economics class was held every two weeks instead of last semester's weekly session. The physics course implemented a mid-term exam that counts as one-tenth of the final exam and 'rewards' students for their preparation efforts during the semester. The remaining face-to-face hours usually demanded more from the students. Students report the feeling that they have to work more now during the semester than in a lecture scenario, and that there is more questioning and interactivity in general. This is true even for the 300-stong economics class, where students are split into smaller groups to discuss current newspaper articles. Because the class does not fit into one lecture hall, students sit in two separate rooms, which receive simultaneous video transmissions from each other. In any event, it is doubtful that existing ETH lecture halls with long, fixed rows of seats are suitable for flipped classroom settings. Flexible auditoriums and the possibility of making existing lecture halls more flexible to enable intensive face-to-face activities are now being discussed with ETH's infrastructure and facility management services.

Conclusion

Working as an instructor in a flipped classroom environment and coping with the situations that arise there require several competences. For this reason, some degree of pedagogical training will be required to successfully integrate TORQUEs into teaching. Once again a new learning technology scenario – this time the MOOC wave – is driving faculty to invest in their didactic skills.

In the TORQUE context we hope to turn the development process into a support model, founded upon teaching quality and faculty competence. Integrating the flipped classroom into university teaching is generating changes in the organizational structure of support services, together with an evolution in didactic standards. Managing this double process will be a major educational development task. Our proposals would be to design an ETH service that links media production and faculty development; to establish appropriate quality management; and to communicate the commitment of the ETH executive.

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Engineering MOOCs for Future Engineers: Integrating MOOCs into Formal Learning Environments

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Abstract: The discussion concerning MOOCs at ETH Zurich has led the university to develop the TORQUE concept, which focuses on transforming traditional lecture series into 'flipped classroom' sequences by deploying online courses as self-learning preparation. TORQUE is an acronym for Tiny, Open-with-Restrictions courses focused on Quality and Effectiveness. So far ETH has developed three TORQUE courses, all of which started in Fall Semester 2013. The most important lesson learned in their pilot phase was that transforming classroom teaching into something else is infinitely more complex and demanding than simply producing videos. However, because video and online course production precede face-to-face teaching, they tend to dominate the discussion and absorb most of the capacity. In the next round of TORQUEs this will be countered by deploying a prototype approach, where a showcase module that includes face-to-face activities will be developed at the outset of production. Another aspect that needs consideration is how the project will ultimately be embedded in the institution: up to now two different units have been cooperating and managing TORQUE production and integration into teaching. This discussion has potential implications for organizational development at ETH.

Introduction

The launch of multiple MOOC platforms including Coursera, EdX and Udacity marked a pivotal changing point in online education. Although the origins of MOOCs can be traced back much further, in 2012 these platforms collectively generated an unprecedented hype around online education (Hyman, 2012). The initial euphoria surrounding the launch of these platforms has subsided and the MOOC environment is entering a phase of maturity where multiple platforms, methodologies and pedagogical scenarios are flourishing.

As with all ICT for education development and as these online courses make a formal entrance into higher education curricular, it is important to examine the different possibilities, reflecting upon the inherent virtues and shortcomings of the various developments and to propose effective curricular scenarios for the successful integration of MOOCs into traditional formal learning environments (Cruz Limon, 2002). Indeed, it is essential to consider the interest for both teacher and student, the different possibilities that such a venture can offer on a fundamental level and the justification for the implementation of the scenario.

At both the Ecole Centrale de Nantes (French graduate school of generalist engineering) and Télécom Bretagne (graduate school of engineering in information sciences), we explored the integration of MOOCs with the objective of attempting to respond to the heterogeneous requirements of our students who are increasingly searching to personalise their higher education experience (Clegg and David, 2006). In addition, by accompanying our students in their exploration of online environments, we aimed to support them in their development of critical thinking skills as they engage in a constructivist learning process (Huang, 2002).

In order to encourage these processes, Bruff et al. (Bruff et al., 2013) encourage the development of blended learning scenarios when integrating MOOCs into traditional formal learning environments, using præsential sessions in the form of thematic seminars to effectively discuss and analyse material discovered in the online environment. Following the exploration of different curricular scenarios and a conclusive initial experiment in 2012 (Carolan & Magnin, 2013), the institutions are conjointly adopting a similar blended learning approach to the integration of MOOCs by creating a common course that is 'wrapped' around an existing online learning environment, ITyPA (Internet Tout y est Pour Apprendre).

Whilst the nature of the selected massive open online course that is built upon connectivist learning precepts implies a less formally structured approach, the objectives are very much the same. We will be examining the engineering and integration of this MOOC into the specific environment of French engineering schools, developing transferable skills common to many curricula.

The MOOC Ecosystem

We can identify two categories of MOOC within the ecosystem of MOOCs: the xMOOC or extension MOOC, based on a transmissive pedagogical approach that attempts to reproduce elements of classical university courses within a virtual environment, and the cMOOC or connectivist MOOC, based on a less prescriptive approach with the organiser as facilitator and the students building their learning paths based on interaction with both content and other users. These notions were first practiced by Siemens, Downes and Cormier (McAuley et al., 2010).

In addition to these major categories, the learning experience can be sub-categorised according to several other factors including whether they are institutional or individual initiatives, whether they are synchronous or asynchronous, whether they are deterministic or self-deterministic, and whether they involve individual or group work; with all of these factors contributing to their degree of openness. These characteristics are present in the taxonomy developed by Clark (Clark, 2012) who attempted to provide a more comprehensive and inclusive MOOC categorisation. In all, Clark defined eight categories of MOOC that are not necessarily mutually exclusive. This taxonomy can be further exploited by defining the scenarios and modalities that higher education establishments implement for the exploitation of MOOCs in formal learning environments.

In the first scenario, one finds educational establishments that have undertaken strategic infrastructural investments to produce learning platforms that provide extracts or complete courses offered within their establishment and/or the establishment of key educational partners, that we shall refer to hereafter as 'Macro MOOCs'. These platforms are primarily based in start-ups emanating from Ivy League colleges in the United States of America and offer access to a wide catalogue of xMOOCs. As well as providing an important medium for the dissemination of knowledge, these platforms are important communication tools for outreach and are increasingly important sources of revenue (Welsh & Dragusin, 2013).

The second scenario concerns smaller establishments that previously offered a handful of online courses to their students and have taken steps to open them up to a wider public or have specifically created a small number of online courses often referred to as 'Micro MOOCs'. These courses are generally created and managed on the impulse of professors interested in the impact of ICT in education in relation with pedagogical engineers and rarely benefit from sustained financial investment.

The third scenario concerns establishments that allow students to follow pre-identified MOOCs in order to obtain a certain number of the credits required for their course upon completion and are referred to as 'For-Credit MOOCs'. These courses are generally made available to allow students to personalise their learning experience and to gain access to expertise outside of their chosen establishment.

The fourth scenario refers to establishments that allow students to follow pre-identified MOOCs whilst imposing a certain number of additional environmental constraints in order to bridge the gap between formalised physical and virtual learning environments. These environmental constraints generally include additional præsential sessions and/or complementary activities. We shall refer to these scenarios as 'Integrated MOOCs'.

Qualifying learning experiences

Following the initial surge of MOOCs onto the educational landscape in 2012, researchers and educators are now adopting a more critical and analytical approach in examining the integration of these elements into learning sequences. It is important to question whether these courses can adequately meet the demands of higher education where students are expected to go beyond drill-and-practice into a more critical phase of study.

The majority of institutions that provide MOOCs claim that the learning experience of online students is very similar to that of their institution-based counterparts. To encourage this sentiment, they provide certification for users who successfully complete courses. These certificates, whilst representing an achievement for online users, currently have questionable academic value (Bachelet & Cisel, 2013).

On a conceptual level there are many divergences between these virtual and physical learning environments. It is difficult to translate the discreet learning encountered in physical environments into online environments. Traditionally, in a seemingly passive lecture hall, teachers are constantly interacting with learners and adapting the delivery of content in line with their reactions. In addition to these implicit interactions, the social education that these formal learning environments impart is seemingly lost.

In order to counteract these deficits and to enable course organisers to manage the 'massively' participating public and its varied productions, many platforms have introduced mechanisms of peer support and peer assessment, encouraging participants to exchange experience and knowledge. This has a positive effect on the student experience as they find themselves alternately in the roles of both learner and tutor, yet this serves to further discredit the academic value of the student's achievements (Bachelet & Cisel, 2013).

This is particularly well illustrated if we consider For-Credit MOOCs more closely. When an extra-institutional MOOC is integrated into a traditional university course it is difficult for teachers to effectively follow student progress and to evaluate the impact of these courses on student learning. This is particularly hindered by the fact that many of these courses are operated on a pass-or-fail basis and therefore do not necessarily confer a grade. In addition, the majority of student productions are stored on servers which the institutional staff does not have access to.

It is for these reasons that the community is becoming skeptical towards the implementation of MOOCs in traditional university courses. According to a survey carried out by The Chronicle of Higher Education, 72% of MOOC professors believe that students who complete extra-institutional MOOCs should not obtain credit from their institutions (Kolowich, 2013).

In order to put these aforementioned issues into perspective and to better apprehend them, we can collate the defining characteristics of MOOCs with the established MOOC in higher education models as shown in the table below. Consequently, this will enable us to tailor the online learning experience to the specificities of the physical learning environment and the expected learning outcomes.

If we examine the MacroMOOC, the institutional affiliation of the course supervisors and the synchronous nature of the course create a highly structured environment for formal learning. The implication of the participant in the course can be considered as self-deterministic, as there is no formal obligation for the participant to complete the course. Participation in the course is generally on an individual basis with occasional limited and relatively anonymous interaction between participants in the MOOC's forum and through eventual peer assessment. The sheer mass of participants limits all interaction between the course supervisors and the participants.

In relation to the MacroMOOC, the amplitude of the MicroMOOC affords greater interaction between course organisers and participants leading to a greater implication of the participant in the management of the learning experience and instant qualitative feedback for the course organisers. However, MicroMOOCs receive limited public and academic recognition meaning that the learning experience is perceived to be considerably less formalised.

For-Credit MOOCs afford a greater personalisation of the learning experience for the students and allows them to benefit from external competence. However, the impact of this process is hindered by the asynchronous nature of these courses and the limited possibilities for student interaction. Student participation is equally constrained by extrinsic motivational factors that limit the self-determinism of this learning model.

The fourth and final model refers to the Integrated MOOC, a specific online course that provides less freedom for students in terms of choice and may therefore be considered to rely upon extrinsic motivations. However, this is largely compensated by the fact that the Integrated MOOC allows for the greatest personalisation of the learning experience as students are encouraged to explore course content in both the virtual environment and the physical environment of their learning institution.

With these elements in mind we considered it important to question the first three aforementioned scenarios and therefore adopted the integration of the fourth scenario, where the learning experience of the student is engineered in order to capitalise upon the time spent online. This choice was not without its own risks as by engineering student participation in these courses we could interfere with the self-deterministic values of both formal and informal online learning. In order to effectively undertake this process, we developed the strategy that will be described herein.

eITyPA – Engineering the learning experience

ITyPA (Internet Tout y est Pour Apprendre) (Gilliot et al., 2013) is the first Francophone connectivist MOOC. The global objective of this course is to allow users to collaboratively explore and implement 'Personal Learning Environments'. Launched in October 2012, the first edition attracted in excess of 1,300 users. Each week, participants would collaboratively explore one of the pre-defined themes, sharing their knowledge, resources and experience with other users. This would culminate in a weekly hour-long synchronous online intervention that was then made available asynchronously, where the co-creators of the course would discuss the subject with invited experts. Participants were able to interact with the presenters and the identified experts by commenting on the live feed, Twitter feeds and internet relay chat channels.

Characteristics	Macro MOOC	Micro MOOC	For-Credit MOOC	Integrated MOOC
Institutional or Personal Initiative	Institutional	Personal Initiative	Institutional	Institutional
(A)synchronous	Synchronous	Synchronous	Asynchronous	Synchronous
Deterministic or Self-deterministic	Self-deterministic	Self-Deterministic	Deterministic	Self-Deterministic
Individual or group	Individual	Individual	Individual	Group
Relative openness	Highly formatted. Limited occasions for interaction.	Increased proximity between organisers and participants.	Open in terms of choice. Limited in terms of interaction.	Increased potential for interaction and personalisation.

Table 1: General characteristics of the four models of MOOCs *in higher education*

ITyPA 2 was launched in October 2013 and built upon the legacy of the first edition through the creation of a dedicated user platform, where users were able to regroup their resources through the introduction of gamification precepts through badging. The 2013 edition also saw the introduction of regional, national and international partnerships that served as relay sites allowing participants to meet and interact physically and/or virtually based on geographical proximity or in relation to common objectives. The Ecole Centrale de Nantes and Télécom Bretagne were partners of ITyPA 2, providing relay sites for ITyPA participants and, on a more formal level, providing accreditation for participants seeking certification through badging.

These establishments are also training future engineers to meet the challenges of modern industrial environments proposed in eITyPA, an engineered elective version of ITyPA for their fourth year and fifth year students. The elective nature of this course was considered to encourage the students to adopt an intrinsically motivated approach. The course was therefore freely undertaken by around 10% of students, with the course officially representing the equivalent of around 35 hours of classroom time (students generally devoting 3-4 hours per week over a 10-week period) followed by a period of individual and group reflection (Carolan & Magnin, 2013).

Engineering course structure

Following an initial experiment in 2012 involving around 50 students, we were able to analyse the attitudes of learners towards this online course (Carolan & Magnin, 2013). Whilst the majority of students were very positive about their experience, certain students highlighted the difficulties they had in understanding how to position themselves in relation to a connectivist approach to learning. Others expressed the difficulties they encountered due to the lack of structure that is inherent to connectivist environments, echoing the findings of Mackness et al. (Mackness et al., 2010). In order to address these issues we have modified our on-site handling of the course. This is a complicated process because of the aforementioned risk of interfering with the self-deterministic qualities of online learning. We have therefore integrated a certain number of constraints to the course whilst allowing learners a high degree of flexibility in their application.

The first modification that we made to the course was the introduction of a third præsential session within the syllabus. In 2012 students were to attend two formal interactive sessions. The first session occurred at the midterm and encouraged students to reflect together on their experience and to ask questions relating to concepts that they did not fully master or understand. The second session, which occurred one month after the end of the course, engaged the students in an analytical process whereby they were encouraged to question both the pertinence of the learning experience and their positioning within the learning environment.

The aforementioned third session was planned in the days leading up to the course and exposed the students to the variety of online learning environments and associated learning styles in order for them to position themselves within the online learning context with greater ease. It was considered that this would present a social benefit for the students who would be able to identify fellow participants in the physical space, therefore increasing the potential for exchange. This is an essential factor in online learning, underlined by Mackness et al. (Mackness et al., 2010) who stress the importance of moving from connectedness to veritable interaction.

This supplementary session was specifically designed to address the issues relating to appropriation of the online learning environment. In association with experts in the different fields explored during the course, we presented the students with the ecosystem of online learning, attempted to position MOOC ITyPA within this context and explored the notions of connectivism. This session was organised in the resource centre of the establishment that is used by many of these students, allowing them to become conscious of a cornerstone in their personal learning environment. The question of physical space in online learning was raised by a previous study where students would often meet up in order to follow the weekly synchronous sessions together.

Early indications tend to show that this additional session had a significant effect on student understanding of the notions of connectivism and the necessity for them to set personal objectives that drive their participation. Students were able to raise fundamental questions about scientific terms such as mind mapping and strategic intelligence that in our preconceptions we had wrongly considered to be assimilated.

During this session the students were made aware of the importance of tracking their progress throughout the course in order to develop an analytical approach to the course from the onset. The second major modification that we proposed contributes towards this activity. In agreement with the course supervisors, the syllabus was formalised by dividing the nine topics covered across the course into three clearly identifiable three-week long learning sequences. The first sequence encouraged participants to explore the very nature of personal learning environments; the second sequence encouraged participants to engage in meaningful interaction with their peers, and the third and final sequence allowed participants to capitalise on their learning experience and to consider the evolution of their personal learning environment.

Students were then set the task of critically reporting back on online activity related to at least one of the topics of their choice from each learning sequence. This was designed to go some way towards addressing the issues raised concerning the suitability of online courses for developing the transferable skills that a traditional university education provides. It also provides material evidence of the student's implication in the virtual course and the resulting progress they have made.

This is essential when we consider the dynamics of online communities. As a general rule, in online communities about 5% of members are memorably active, about 10% of members are moderately active and the remaining 85% of members follow the activities of the more active members. This natural balance ensures that the ratio between content producers and content explorers remains viable (Waard et al., 2011). It would therefore be logical for the majority of our students to follow the activities of the other members of the group without proposing content. This does not mean, however, that they are not engaged in active learning processes. It is therefore necessary to provide them with a channel for the formalisation of this learning experience.

The final major modification was the introduction of gamification precepts, notably goal-focused activities, to the learning experience (Glover, 2013). At the beginning of the course, students were presented with a series of challenges that they could choose to undertake. The list of challenges included: post a comment on a blog-post of a fellow participant, share three useful weblinks that you have discovered and engage in a meaningful exchange with a participant outside of your educational establishment. These challenges were designed to motivate the students, setting achievable goals and provide supplementary sources of interaction that would encourage them, in turn, to set each other challenges. It was intended that this final modification enable students to surpass the comfort zone represented by the community of institutional peers, a vital precept in connectivism, the importance of which the students often understand at a late stage (Carolan & Magnin, 2013).

Evaluation design

The impact of these modifications on motivation, participation and the acquisition of skills and knowledge is measured through the independent completion of a questionnaire. Organised into five different sections, the questionnaire includes both open and closed questions that cover their participation across the course. The first section entitled 'Preparing for the Course' encourages students to reflect upon their motivations for choosing the course, their awareness of online learning environments before the course and the impact of the first præsential session on their understanding of the course. The second section, entitled 'Your Learning Environment' asks participants to reflect on the spatial and temporal conditions of their learning and the potential impact that external factors may have had on their motivation and participation. The third section is entitled 'Assessment of Your Experience' and asks students to consider their acquired knowledge and skills, the obstacles to their acquisition and how they eventually overcame these obstacles. The fourth section entitled 'Where next?' requires participants to consider how the knowledge and skills that they have obtained during the course will evolve in the months immediately following the course. The fifth and final section is entitled 'Over to You', and allows students to freely comment upon their experience and suggest possible evolutions for future participants.

The results of this questionnaire* will enable us to qualitatively assess the impact of this course and the modifications provided based on the learning experience of our students. Further analysis of the results of our empirical study into motivation, participation and the acquisition of skills and knowledge from a student perspective through their correlation with our previously established results (Carolan & Magnin, 2013) and with the statistics resulting from learning analytics will enable us to qualitatively assess the impact of these modifications. Comparing these results with the teacher-based assessment of student participation and acquisition of skills and knowledge that results from the analysis of student productions will allow us to take this process even further.

Conclusion

The engineering of the ITyPA MOOC experience is allowing us to reach a sustainable balance between the inherent virtues of both online and traditional learning environments. The MOOC environment is allowing our students to engage in self-deterministic learning, developing their autonomy and broadening their horizons within an international context whilst the physical learning environment is allowing them to channel this knowledge with hindsight and in concordance with the requirements of the local context.

Within this context and having explored the different options for the integration of MOOC into traditional formal learning environments, one major question still remains: is it preferable to create a MOOC for the 'massive' public and then subsequently engineer it for the specificities of a learning community (MacroMOOC or Integrated MOOC), or to take existing courses and simply mediate them (MicroMOOC or For-Credit MOOC)? Indeed, it appears that the engineering of MOOCs is more suitable to higher-education environments.

Firstly, the engineering of MOOCs allows for the integration of the essential critical thinking skills that differentiate university education from primary and secondary cycles. Secondly, it ensures a coherent compromise between the need for the student to personalise their learning experience and the need for establishments and society as a whole to impose consistent benchmarks. Thirdly, this scenario allows for the distribution of the MOOC to a wider public, allowing the institution to capitalise on an increasingly important communicational tool.

*Results will be available following the course that ended in December 2013 and be discussed during the 2014 MOOCs conference.

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The Discrete Optimization MOOC An Exploration in Discovery-Based Learning

Carleton Coffrin and Pascal Van Hentenryck

Abstract: The practice of discrete optimization involves modeling and solving complex problems, which have never been encountered before and for which no universal computational paradigm exists. Teaching such skills is challenging: students must learn not only the core technical skills, but also an ability to think creatively in order to select and adapt a paradigm to solve the problem at hand. This paper explores the question of whether the teaching of such creative skills translates to Massive Open Online Courses (MOOCs). It first describes a discovery-based learning methodology for teaching discrete optimization, which that has been successful in the classroom for over fifteen years. It then evaluates the success of a MOOC version of the class via data analytics enabled by the wealth of information produced in MOOCs.

Introduction

Discrete optimization is a subfield of computer science and mathematics focusing on the task of solving real-world optimization problems, such as the travelling salesman problem. Due to the computational complexity of optimization tasks, the practice of discrete optimization has remained more of an art than a science: practitioners are constantly confronted with novel problems and must determine which computational techniques to apply to the problem at hand. As a consequence, the teaching of discrete optimization must not only convey the core concepts of the field, but also develop the intuition and creative thinking necessary to apply these skills in novel situations. Teaching such skills is a challenge for instructors who must present students with complex problem-solving tasks and keep them motivated to complete those tasks.

Over fifteen years, a classroom-based introduction to discrete optimization was developed and honed at a leading U.S. institution. The class assessments were designed around the ideas of discovery-based learning (Bruner 1961) to provide the students with a simulation of the real-world practice of discrete optimization. The course design was successful, and was highly popular among senior undergraduate and graduate students. The recent surge of interest in Massive Open Online Courses (MOOCs) and readily available platforms (e.g., Coursera, Udasity, and edX) makes a MOOC version of discrete optimization technically possible. But it raises an interesting question: will the discovery-based learning methodology of discrete optimization translate and be successful on an e-learning platform such as a MOOC? Technical reports on large-scale MOOCs are fairly recent (Kizilcec 2013, Edinburgh 2013) and have primarily focused on course demographics and key performance indicators such as completion rates. Few papers discuss the effectiveness of different pedagogical and assessment designs in MOOCs.

This paper is an attempt to shed some light on the effectiveness of teaching problem-solving skills in a MOOC by use of discovery-based learning. It begins with some background about the subject area and the class design motivations. It then turns to data analytics to understand what happened in the inaugural session of the Discrete Optimization MOOC, and concludes with a brief discussion of the success and potential improvements of the MOOC version of the class.

The Discrete Optimization Class

Discrete Optimization is an introductory course designed to expose students to how optimization problems are solved in practice. It is typically offered to senior undergraduate and junior graduate students in computer science curriculums. The prerequisites are strong programming skills, familiarity with classic computer science algorithms, and basic linear algebra. The pedagogical philosophy of the course is that inquiry-based learning is effective in teaching creative problem solving skills.

The course begins with a quick review of Dynamic Programming (DP) and Branch and Bound (B&B), two topics that are often covered in an undergraduate computer science curriculum. It then moves on to an introduction to three core topics in the discrete optimization field, Constraint Programming (CP), Local Search (LS), and Mixed Integer Programming (MIP). The students' understanding of the course topics is tested through programming assignments. The assignments consist of designing algorithms to solve five optimization problems of increasing difficulty, knapsack, graph coloring, travelling salesman (TSP), warehouse location, and capacitated vehicle routing (CVRP). These algorithm design tasks attempt to emulate a real-world discrete optimization experience, which is, your boss tells you *"solve this problem, I don't care how"*. The lectures contain the necessary ideas to solve the problems, but the best technique to apply (DP, B&B, CP, LS, MIP) is left for the students to discover. This assignment design not only prepares students for how optimization is conducted in the real world, but is also pedagogically well-founded under the guise of guided inquiry-based learning (Banchi 2008). These assessments are complex monolithic design tasks, a sharp contrast to the quiz-based assessments common to many MOOCs.

The complexity and open-ended nature of these algorithm design tasks allows them to have many successful solutions. In the classroom version, students are often inspired later in the course to revise their solutions to earlier assignments, based on the knowledge they acquired throughout the course. Inspired by this classroom behavior, the MOOC version of the class adopts an *open format*. The students are allowed, and encouraged, to revise the assignments during the course. The final grade is based on their solution quality on the last day of class.

Understanding the MOOC

The previous section discussed the basic design of the Discrete Optimization class and the pedagogical philosophy behind it. This section uses the vast amount of data produced by a MOOC to provide some evidence that the MOOC adaptation of Discrete Optimization was successful and the use of discovery-based assessment design can also be effective in an e-learning context. Before discussing the details of the students' experience in Discrete Optimization, we first review the basic class statistics to provide some context.

Inaugural Session Overview

The inaugural session of Discrete Optimization ran over a period of nine weeks. During the nine months between the first announcement of discrete optimization and the course launch, 50,000 individuals showed an interest in the class. As is typical of a MOOC, less than 50% (17,000) of interested students went on to attend class and view at least one video lecture. Around 6,500 students experimented with the assignments and around 4,000 of those students made a non-trivial attempt at solving one of the algorithm design tasks.

By the end of Discrete Optimization, 795 students earned a certificate of completion. This was truly remarkable as less than 500 students graduated from the classroom version in fifteen years of teaching. The typical completion rate calculation of 795/17000 = 4.68% could be discouraging. However, a detailed inspection of the number of points earned by the students is very revealing. Figure 1a presents the total number of students achieving a particular point threshold (i.e., a cumulative distribution of student points). Within the range of 0 and 60 points, there are several sheer cliffs in this distribution. These correspond to students abandoning the assessments as they get stuck on parts of the warm-up knapsack assignment (students meeting the prerequisites should find this assignment easy). At the 60 point mark (mark A in Figure 1a), 47% of the students (i.e., 1884) remain. We consider these students to be *qualified* to complete the course material, as they have successfully completed the first assignment. The remainder of the point curve is a smooth distribution indicating that the assignments are challenging and well-calibrated. Two small humps occur at locations indicated by mark B and mark C: These correspond to the two certificate threshold values. The shape indicates that students who are near a threshold put in some extra effort to pass it. However, the most important result from this figure is that if we only consider the population of students who attempted the assignments and were qualified, the completion rate is 795/1884 = 42.2%.

Due to the open nature of MOOCs, it is interesting to understand the student body over time. Figure 1b indicates the number of students who were active in the class over the nine-week period. The active students were broken into three categories: *auditors*, those who only watched videos; *active*, students who worked on the assignments; and *qualified*, active students who passed the qualification mark in Figure 1a. The steady decline in total participation is consistent with other MOOCs (ed-

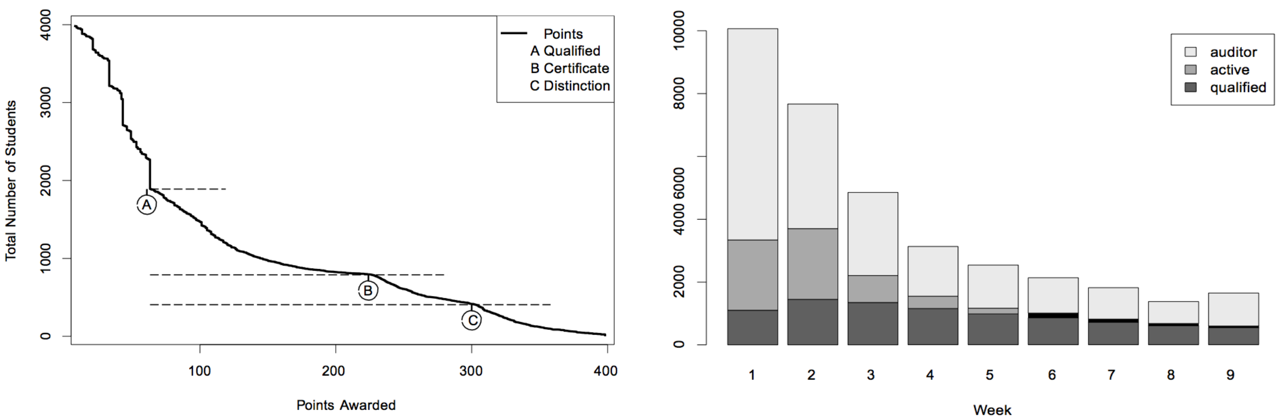

Figure 1. Cumulative Distribution of Grades (left), and Weekly Student Activity (right)

inburgh:2013), but the breakdown of students into the active and qualified subpopulations is uncommon and revealing. In fact, the retention rate of the qualified students is very good and differs from other student groups.

Discovery-Based Learning

The use of discovery-based assignments was effective in the classroom version of Discrete Optimization, but it is unclear if it will translate to the MOOC format. It is difficult to measure precisely if the students learned creative problem solving skills, but we can look at their exploration of the course material as a proxy.

In a post-course survey of Discrete Optimization, the students were asked to identify which optimization techniques they tried on each assignment. Figure 3 summarizes the students' responses and Table 1 compares those responses to the best optimization techniques for each problem. Looking at Figure 3, we can see that there is a great diversity among the techniques applied to each problem. This suggests that students took advantage of the discovery process and tried several approaches on each problem. Second by comparing Table 1 and Figure 3, we can see that there is a strong correspondence between the best techniques for a given problem and the ones that most students explored. This suggests that students are picking up on the intuition of how to solve novel optimization problems and applying the correct techniques.

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However, the most telling evidence for the success of the discovery-based learning appears in the free form text

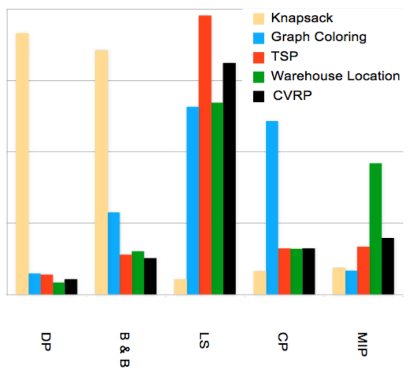
Assignment	Best Techniques	Student Exploration
Knapsack	DP, B&B, MIP	
Graph Coloring	CP, LS	
TSP	LS	
Warehouse Location	MIP, LS	
CVRP	LS	

Figure 2. Techniques Tried on Various Assignments

Table 1: Comparison of the Technique to Assignment Solution Key and Student Exploration

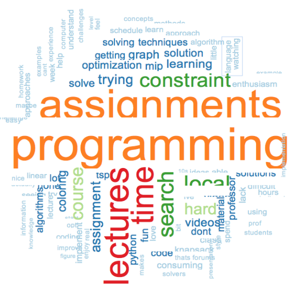
Word	Occurrences	Visualization
assignment	222	
programming	196	
lectures	141	
time	124	
search	84	
local	81	
constraint	75	
course	63	
hard	56	
trying	42	

Table 2: Word Occurrences in Students' Free Form Responses Regarding their Favorite Part of the Class

responses that student produced when asked the open ended question, *"My favorite part of this course is..."* Many aspects of the course were discussed. However, looking at the frequencies of various words in their responses (see Table 2), indicates that the programming assignments were one of the most discussed elements of the course. Even on par with the lectures. This positive response to the assignments is consistent with student reviews of the classroom version of Discrete Optimization, and further suggests that the discovery- based learning approach was successfully translated to the e-learning platform.

Success of the MOOC

Awarding 795 certificates of completion was a great success in itself, but there are many other ways to measure a class' success. The goal of Discrete Optimization was to provide a challenging course where dedicated students would learn a lot. The following statistics from a post-course survey of the students (n=622) indicates that this goal was achieved. 94.5% of students said they had a positive overall experience in the course with 40.7% of students marking their experience as *excellent* (Figure 3a). 71.9% of students found the course to be challenging while only 6.11% thought that it was too difficult (Figure 3b). The students were very dedicated to the challenging material with 56.6% working more than 10 hours per week. Despite the significant time investment, the vast majority, 93.7%, of students, felt that the assignment grading was fair. 94.5% of students said that they learned a moderate amount from the course (Figure 3c) and 74.9% feel confident in their ability to use the course material in real-world applications.

Lessons Learned

Despite the success of Discrete Optimization, there is significant room for improvement in the course design. The vast number of students in a MOOC has the effect of shining light on all of the problems in the course design, no matter how small. For example one forum thread entitled, *"Somewhat torn, don't feel like I'm learning anything"*, discusses some of the challenges students face with discovery-based learning. It is clear that some students found the discovery processes disturbing and would prefer a more structured learning experience. In another thread, *"If you're looking for a new challenge: Find a way to remotivate me!"* a student explains how he became discouraged with the discovery-based learning approach after trying several ideas without success. These comments, among others, have inspired us to improve the class by making the exploration process easier. This will be achieved in two ways: (1) revising the introductory course material to include some guidance on how to explore optimization problems and (2) provide supplementary "quick-start" videos on how to get started exploring a particular optimization technique. We hope, by lowering the burden of exploration, more students will get the benefits of discovery-based learning without the frustrations.

Conclusion

Teaching the creative problem solving skills required by discrete optimization practitioners is a challenging task. This paper has presented initial evidence that teaching such creative skills is possible in a MOOC. The essential idea was to use assignments inspired by discovery-based

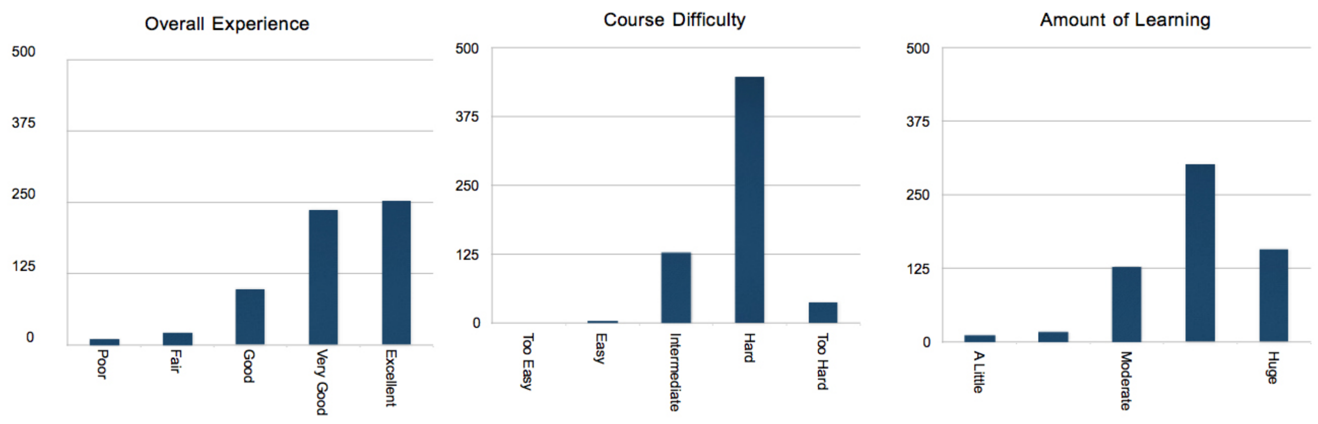


Figure 3: Results from Discrete Optimization's Post-Course Survey on Overall Experience (left), Course Difficulty (center), and Amount of Learning (right)

learning, so the students not only learn the core technical skills but how to apply them to unfamiliar tasks. The success of the course design was demonstrated through data analytics, enabled by the wealth of information produced in MOOCs. We believe the significant resource investment required to make the custom discovery-based learning assignments was a great investment in the course, and we hope our experience will inspire other MOOC practitioners to put in the additional effort try discovery-based learning tasks in their classes.

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Recasting a Traditional Course into a MOOC by Means of a SPOC

Sébastien Combéfis, Adrien Bibal and Peter Van Roy

Abstract: We give a practical approach to recast an existing, mature traditional university course into a MOOC. This approach has two steps. The first step consists of transforming the existing course into a course with two tracks: a SPOC and a traditional track and will be carried out as the course is being taught. The second step, which takes place one semester later, is to make the SPOC available to the world as a MOOC. We have already implemented this approach with the course 'LFSAB1402 Informatics 2,' a second-year bachelor university-level programming course taught to all engineering students (approximately 300 per year) at Université catholique de Louvain (UCL). This approach has four advantages. Firstly it facilitates the design of a SPOC covering a section of the traditional course material. A 5-credit (ECTS), one-semester course has almost twice the material of a six-week MOOC with two/three-hour lessons per week. Second, the workload of the transformation is reduced. This can take place incrementally during the teaching of the traditional course. Third, it allows us to experience the world of MOOCs in a relative painless manner. And fourth, since the transformation is a large step, the risk of experiencing problems in the final MOOC is reduced.

Introduction

Online education supported by new technologies is a recent and increasingly successful development. MOOCs (Massive Open Online Courses) in particular (Cormier, 2008; Downes, 2008) are growing in popularity around the world with companies or associations focused on offering MOOCs with a platform to manage and offer those courses. Examples of such associations include edX, Coursera, Udacity, ITyPA and FutureLearn. UCL notably joined the edX consortium in early 2013 using the name 'LouvainX' and the experience reported in this paper is a consequence of this.

We have taken a traditional, mature course in paradigms of computer programming and recast it in a new course structure containing two tracks: a SPOC (Small Private Online Courses) track and a traditional track. In the new course, the students do one SPOC lesson each week, between two lectures. The purpose of each lecture is twofold: to restructure the material of the SPOC (in the style of a flipped classroom) and to introduce advanced material that is not covered by the SPOC. There is also an exercise session that is held between each two lectures, while the SPOC lesson is ongoing. The purpose of the exercise session is also twofold: first to verify that all students are progressing on the SPOC (again, in the sense of a flipped classroom), and second to provide exercises on the advanced material of the previous lecture.

There are several motivating factors for this organisation. For ourselves the primary motivation is to prepare a standalone MOOC. Since the SPOC is local and private, our students play the role of guinea pigs, and their comments and suggestions are instrumental in improving the quality of the SPOC before it is released as a MOOC. The SPOC was given in the 'Fall' semester of UCL's 2013-2014 academic year as part of the course LFSAB1402. The MOOC will be given by edX in the spring semester, starting in February 2014 and called 'Louv1.01x: Paradigms of Computer Programming'.

A second motivation is to make a first step into the world of teaching using MOOCs. In our case, completely converting the course into a SPOC is neither possible nor desirable. It is not possible because the SPOC does not cover all of the traditional course material. It is not desirable because the step from traditional course to MOOC is large, too large in terms of workload for conversion in terms of risk. We therefore decided to only convert part of the traditional course into a SPOC. The SPOC yields 3 credits (ECTS credits: European Credit Transfer System, a harmonised unit of course size at European level) of material, while the traditional course yields 5 credits.

There are three challenges in creating the SPOC. Firstly, as the MOOC must serve on-site students for the already existing course, its integration as a SPOC will greatly influence its structure and organisation. Secondly, as the main objective of the course is to teach programming, assessing the students in the SPOC must be performed by checking their ability to produce code, which is a big technical challenge. Finally, the last challenge is social, requiring several teams and training staff to collaborate around a common project, each bringing their own skills.

The remainder of the paper is structured as follows. The first section covers the structure and timeline of the re-mastered course which integrates the SPOC. The second section is about technological and social aspects that have been put together to serve the recasting of the traditional course. The final section presents a first evaluation of the re-mastered course and of the workloads of both the training team and students.

Structure and timeline of the course

The developed MOOC is based on an existing traditional course that started in 2005, 2013 thus being the ninth year it has been taught (Van Roy, 2011). The course is taught to all second-year bachelor students in engineering (not restricted to computer engineering students) and also in computer science. Around 300 students take the course every year. As previously mentioned, the idea is to integrate the MOOC with the existing course. The first challenge was therefore to choose a way to integrate the MOOC with the existing course, while keeping the MOOC as an individual, self-contained, relevant course. The chosen solution was to split the material of the course in two tracks: one that is supported by a SPOC, a private version of the MOOC, and the other one that continues to be taught with a traditional course. The SPOC track contains slightly more material than the traditional track. The SPOC track lays the basis whereas the traditional track comes with more examples to illustrate the material covered by the first track and also introduces advanced concepts. The course is split into cycles as illustrated in Figure 1. One cycle corresponds to one week, and the course lasts twelve weeks. Moreover, each cycle corresponds to one SPOC lesson.

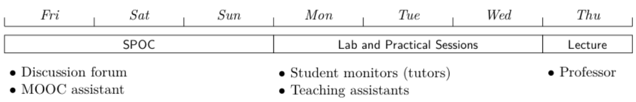

Figure 1. Organisation of a standard week for the re-mastered course.

The first activity of the cycle is the SPOC part. Firstly, the students have to follow the SPOC track on their own. The SPOC track is implemented with the edX Studio Platform; it consists of videos presenting the theory complemented by documents and various kinds of exercises. Videos are kept as short as possible and last between 5 and 10 minutes. Exercises are interleaved with videos (that is, a set of exercises is proposed after each video or small group of videos). Two types of exercise are proposed to the students: 'classical' and 'coding' exercises. Classical exercises consist of multiple-choice questions and questions for which the answer is a word or a few words. Coding exercises ask students to write code fragments that are then assessed by an automatic tool, providing the student with intelligent feedback. Students can consult online discussion forums or MOOC assistants if they encounter problems.

After working on the SPOC section, students have to attend a two-hour exercise session. The first hour is dedicated to the SPOC track. Students are supervised by student monitors and teaching assistants whose goal is to animate the session by following an active learning approach inspired by problem-based learning. The goal of this first part of the session is to ensure that all the students have understood the SPOC exercises and their related theoretical aspects. During the second hour, students receive supplemental on-paper exercises covering the advanced aspects of the traditional course track.

Finally, the last activity of the weekly cycle is a two-hour lecture given by the professor. The lecture is also split in two parts. The first part acts as a restructuring lecture. During the first part, the SPOC lesson is restructured and situated with reference to upcoming lessons. The second part is dedicated to the traditional course track and presents advanced concepts and more examples on the material covered by the SPOC track. Due to the timing of the organisation in two tracks, there is a shift between the two tracks. As shown in Figure 2, the advanced exercises of the weekly practical sessions are related to the material covered by the previous weeks' lecture.

In the first week of the semester, before the first cycle, one introduction lecture is given to students. The goals of this first lecture are twofold. Firstly, it introduces students to the logistic and organisational aspects and explains the precise structure of the course, presenting the whole training team. Secondly, it serves as a brief introduction to the first-cycle SPOC.

	SPOC	Practical Session	Lecture
SPOC Track	*Video + exercises* (i)	*Feedback* (i)	*Restructuring* (i)
Traditional Course Track		*Advanced exercises* $(i-1)$	*Advanced concepts* (i)

Figure 2. Decomposition of the course into SPOC and traditional course tracks.

The MOOC is integrated into the course following the flipped classroom pedagogical model (Lage, Platt, & Treglia, 2000). Indeed, students discover the new materials and are self-training at home. They then interact with the training team when they are on-site. For us an important property of this model is that the restructuring part of the lecture is given in French. It is important since the native language of the majority of the students is French, and because they are second-year bachelor students they are not used to courses in English as it is not a prerequisite. The MOOC is in fact used as a SPOC for the onsite course during this semester, just as it has been at Harvard (Coughlan, 2013). The public MOOC will be open to the world this coming spring. Since it will only last six weeks, online students will have to work on two cycles per week.

The re-mastered course is evaluated exactly as the traditional course. It is impossible to evaluate SPOC performance with the level of identify verification required for traditional courses leading to a diploma. MOOCs that offer this kind of evaluation normally offer proctored examinations in addition to the online course. In our hybrid course, therefore, we give only a small weight to the

SPOC evaluation. We keep the full evaluation structure of the traditional course: a mandatory project completed during the semester, a written midterm exam (one hour), and a written final exam (three hours). Both exams require writing program code. The final score combines the project (1/4) and the final exam (3/4), and the midterm is used only to increase the score using a weighting (max (e, 2e/3 + m/3) where e = project plus final exam and m = midterm). The SPOC intervenes only through an incentivisation scheme: a bonus is added to the final exam based on participation in the SPOC. We do not claim any particular properties for this evaluation scheme, except that it works well for us and is accepted by the engineering school. Of course, another question that is directly raised is how students that will follow the MOOC during the next semester will be evaluated. The idea is to propose a mid-term and final evaluation, composed of classical and coding exercises. This evaluation will already be included into the SPOC during the Fall, and will serve as review exercises for the material covered by the SPOC track.

It is important to incentivise the students to do the weekly SPOC lesson before the lecture. If we simply request their participation, then experience shows the majority of students will not do it. University students have a busy schedule with many courses, labs, and projects, and they also have a busy social life. To incentivise students to do the weekly SPOC lesson with its Pythia exercises, we keep statistics on who has participated and make them public. Completion of all exercises in all 12 lessons earns a +2 bonus on the final exam score (out of 20). Zero participation earns a -2 penalty, and intermediate levels give a proportional bonus. This scheme is based on a similar bonus scheme we have devised in the traditional course to encourage weekly programming exercises. Experience over the five years that this scheme has been used shows that it is highly successful in incentivising our students to do weekly assignments (your mileage may vary: the usefulness of such a scheme depends on the student culture at your institution). Doing regular exercises every week significantly improves the students' understanding of study material.

Technological and social integration

In order to reach all the objectives of the re-mastered course, both technological and social aspects have been taken into account from the beginning. As previously mentioned, developing a MOOC for a course where the students have to produce code requires the ability to assess the produced code. The technological aspect is therefore to provide relevant exercises that can be assessed automatically and for which feedback can be given to the students. The automatic part is important for the scalability of the MOOC and the feedback part is important to support student learning. We use the Pythia platform (Combéfis & Le Clément de Saint-Marcq, 2012) to satisfy both requirements. Pythia is an online platform that can automatically grade programs while providing intelligent and relevant feedback. The platform has the ability to execute programs safely, so malicious code cannot destroy the platform. Creating Pythia tasks is somewhat time-consuming, in particular to identify which mistakes the students will make a priori. Identifying common mistakes is necessary to provide dedicated feedback messages that will drive students toward the right answer. Student use of Pythia during the SPOC stage allowed us to improve the detection of common mistakes.

The social aspect is also very important for the success of the re-mastered course and the MOOC. Several domains of expertise have been combined in order to develop the MOOC and the re-mastered course. First of all, the professor is in charge of creating the videos that are used for the MOOC. This is done without the help of any audiovisual service, with just a personal computer, a Wacom Cintiq graphic tablet, a webcam, a good-quality microphone and Camtasia software. Using the content of our mature course, we find it takes about one full working day for a professor to produce 45 minutes of video. In addition to the professor, a part-time MOOC assistant is in charge of developing the exercises (classical and coding) for every SPOC lesson. The MOOC assistant also animates a discussion forum about the exercises, in order to clarify and improve the Pythia tasks according to the mistakes made by students. Finally, a part-time research assistant develops the Pythia platform, incorporating improvements and to get a stable and scalable version for the MOOC of the next semester. Table 1 summarises all the course staff with their roles (for a class of 300 students). In addition to this staff, the university also offers the part-time assistance of one specialist in pedagogy and e-learning. Finally, a steering committee coordinates the creation of MOOCs at the university level (since our MOOC is part of four MOOCs being developed during the Fall semester for release in 2014).

Table 1: Training staff for the two-track re-mastered course and their roles.

Staff	#	Role
Professor	1	MOOC video creation, l ectures
MOOC assistant	0.5	MOOC exercise creation, discussion forum animation
Research assistant	0.5	Pythia platform development
Teaching assistant	4	Practical session management and supervision
Student monitor (tutor)	11	Practical session supervision

The professor, the MOOC assistant, and the research assistant collaborate closely to regularly provide each other with feedback about the current situation. Indeed, the course is being re-mastered while simultaneously being taught to the students. We find that this situation is workable if the course preparation is at least two weeks ahead of the students. Moreover, the teaching assistants (who are already used to the traditional course) and also the student monitors (who have previously taken the traditional course) need at least one weeks' lead time to prepare their sessions. Even if the technical content of the re-mastered course is the same as last year's traditional course, it is important that all the course staff agrees on the re-mastered course and appears as a unified team to the students.

Evaluation of the re-mastered course and workload

The re-mastered course and SPOC were completed by the end of the Fall semester. We are still in the process of evaluating the re-mastered course and the SPOC, and this evaluation will not be complete until the MOOC is complete. We have made a quick poll among the students to evaluate their workload for the SPOC exercises. The question that was asked to the students is the mean time required for solving one classical exercise and for solving one coding exercise. Table 2 shows the results of the poll. Not all students have replied to both questions.

	Classical exercise	Coding exercise
Less than 5 minutes	36	10
5 minutes	66	46
10 minutes	4	29
15 minutes	0	1
More than 15 minutes	1	25

Table 2: Workload to solve one exercise.

On average, coding exercises do not take much more time for students than classical exercises. This observation can be counter-intuitive at first since coding exercises are more complex for students than multiple-choice questions. One possible explanation is that since programming is the focus of the course, the students are considering that it is indeed an objective to be able to program and therefore students are more careful during the videos and more engaged to solve the coding exercises. Another possible explanation is that their immersion makes them underestimate the time they think they are spending on the coding exercises. A final observation is that 25% of the coding exercises take significantly more time, when students 'get stuck'. This is an unacceptably high percentage and we are working on improving the exercises and the Pythia feedback to reduce this percentage. Our Pythia statistics tell us how many attempts students make for each exercise and the Pythia platform stores all attempts, allowing us to focus on the troublesome exercises.

Conclusion

Building a MOOC, even if based on an already existing and mature course, is not an easy task at all. It requires many staff resources and time commitment However as we explain in this paper, creating a new MOOC from an existing course can be taken as an opportunity for a recasting of the course. The possibility to create a SPOC for on-site students, either to replace the course or to integrate it within the existing course as proposed in this paper, is very useful to test future work and to gain experience with limited risk.

We have created and given the full re-mastered course with the SPOC track to all second-year engineering students at UCL (300 students) as of the end of December 2013. The SPOC has significantly improved during the semester through our growing experience and feedback from students and teaching assistants. For the MOOC that will open in February 2014, we will make a second pass through the SPOC to incorporate these improvements uniformly throughout the whole course. We also intend to make a comparison of student performance with and without the SPOC.

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Evaluation and field trials of MOOC Platforms in the Spanish-speaking community

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Abstract: *We describe the Universitat Politècnica de València's experiences in selecting and testing a MOOC Platform. We have tested Google Course Builder, Sakai and MiriadaX. We have made a pilot course with Sakai (200 students), two course editions with Course Builder (one with two courses and 1100 enrolled and other with eight courses and 6500 enrolled) and one course edition with MiriadaX (with 14 courses and 76000 enrolled). In this paper we explain the process we followed, what we achieved and the problems we found with the different platforms and the results we have got with the students throughout this process.*

Introduction

The MOOC panorama is dominated by three well-financed providers linked to top universities: Udacity, Coursera, and edX. [1]. The use of English as the language of most of the courses and the incorporation of only a few universities, have led many universities in the world to try different platforms and solutions.

In Spain, the Universitat Politècnica de Valencia (UPV) has vast experience in the production of video learning objects suitable for e-learning needs, especially with the Polimedia system [2]. UPV has a database of more than 8000 educational videos, and an administrative support structure to help teachers to achieve both technical and didactical quality in video and online content called "Docencia en red" programme.

This experience allowed UPV to make a head start in the MOOC movement. The pilot UPV MOOC edition was carried in January 2013 with two courses in our platform upvx.es, based in Google Course Builder.

In November 2012, while we were preparing the pilot edition, Universia and Telefonica launched a MOOC platform for Spanish universities, miriadax.net, and a contest with a prize for the best MOOC. The courses started in March 2013 and had to be prepared in three months. We launched a call for proposals to the teachers of our university and 14 courses were presented (including the two of the pilot edition) and prepared (in total there were 58 courses from 18 universities).

In July 2013 a new edition of eight courses was launched in UPV[X]. Six of them were the same as in previous editions, one was an expanded version and other was completely new.

This paper describes the experience that we acquired in the process of creating and running MOOC for the Spanish-speaking community. First we explain the production process that we carried out. Then we will talk about the Google CourseBuilder experience and the Spanish MiriadaX platform. Later we will treat the results we got from our students. Finally we draw some conclusions about that

Development of a UPV MOOC

Our prior experience in using video technologies for education has taught us an important lesson: you have to let teachers concentrate in what they do best, designing instructional material and lecturing, relieving them of the hurdles of multimedia content development and making the process as similar as what they do every day as possible. That is what is behind the Polimedia recording studio concept: the teachers come with their PowerPoint, computer demonstration or physical model and lecture in a small studio as if they were in the classroom, there is no editing and the recording is only repeated if there is a very big mistake, as there is no problem with correcting a small error while on camera. The assistant puts on them the wireless mic, gives them the start sign and that is all that they need to know about video technology. After finishing they give us the title and metadata and in a short time they have their video in the system. This, coupled with the idea: "one concept, one video", that insists in the importance of short videos, lets us achieve a very high productivity in video recording.

After the bandwidth problems we had in the pilot course made for Latin America with our LMS and the videos hosted in our platform, we decided that all MOOC videos should be in YouTube, as it manages very well the client's video bandwidth and most of computers are already well configured to use it, so we developed a set of php scripts to automate the uploading to YouTube of courses from our system with all metadata. The excel file we created for the course has a sheet for the general data of the course

Figure 1. Polimedia studio

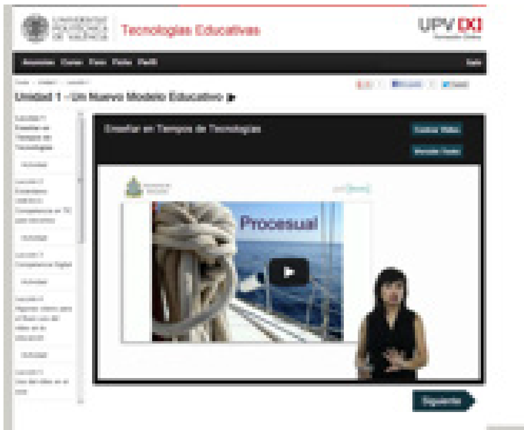

Figure 2. UPV MOOC

(date, time to devote, teacher's biography, etc..), other for the unit and assessment listing, other for the lessons and their quizzes and other for the assessments questions, so it is very easy for a teacher to structure a course information.

Following the same "simplicity for teacher" concept, we incorporated a VBA script to the Excel file to import quizzes from a text file with the same simple format they use to import assessments in our sakai LMS and a query to our database that produces a listing of all the videos in their course with their corresponding YouTube codes, so they can copy and paste it very easily into the lessons and assessments sheets.

We also devoted one information technology student as teaching assistant to help the teachers in the course creation process. With all these, we let teachers to decide which level of support they want. Some of them completed the spreadsheet and uploaded the content to the platform themselves, others fill in the spreadsheet and give it to us to upload, others have an appointment with the teaching assistant to help them fill the spreadsheet and others send us the listings of units and lessons and text or word files with the questions and the teaching assistant fills the spreadsheet. That way we were able to deploy 14 courses in three months with a project manager and a teaching assistant in the project (and the two teaching assistants we have recording in the Polimedia studios). In short, the process we followed to deploy the courses is:

1. Call for proposals from the teachers and search of teachers available to make courses on topics of interest for the institution (for example the UPV was interested in subjects as "Basic Chemistry", "Foundations on mechanics for engineers" or "Mathematical foundations" for first year students)

2. MOOC course selection. Some of them had video material already recorded.

3. Training lecturers. Those lecturers selected take a small training course to learn the guidelines to preparing a MOOC course.

4. MOOC design by teachers. UPV defines a template for their MOOC courses. UPV MOOC courses are divided into units, and then into lessons. Each lesson has an associated video followed by a short quiz. After each unit there is an exam.

5. Content creation. Polimedia video recording for each lesson, and quizzes and exams preparation.

6. Creation of MOOC metadata file. The lecturer (with the help of a teaching assistant) fills a metadata file that contains the syllabus and index of materials for the course. This metadata file is used to automatically generate the MOOC course according to the target platform.

7. Student recruitment. In the case of upvx.es, we used conventional channels such as the institutional web site and mailing lists to call for student participation. In the case of MiriadaX, the companies involved in the creation of the platform (Telefonica and Santander Bank) took over student recruitment and disseminated these MOOC courses through their own channels.

8. MOOC operations

9. Evaluation

Google Course Builder analysis

At the time of selection, Google Course was not really a MOOC platform but a code to put a single MOOC course online using Google resources and apps mixed together. In summary it was a set of python coding oriented to let teachers deploy a course. It uses also some of the Google services as backend; it requires Google authentication, videos have to be stored in YouTube and code is hosted in Google app engine. These characteristics can be viewed both as advantages and disadvantages. In the overall run we have found the platform very solid, simple to administer and scale and we liked the ability to add features by modifying simple python scripts. It is also very cheap, with bills of less than $1 a month for courses with 1800 students enrolled.

On the other hand it completely lacked a teacher interface, meaning teachers had to export their course information in .csv and create their tests in a text file using a pseudo code language, so it wasn't suitable for non-technical users. We took a workaround through the use of a neutral production format, but this is not a solution for the long run.

A lot of the shortfalls we found have been addressed in later versions of CB, and the latest version is prepared for several courses, which lets internet users see the units of a course without being enrolled, has a teacher interface (although it is still too tech oriented) and has incorporated features that we don't have, like peer to peer activities and the recording of all the in lesson activities taken by a student.

However it stills lacks a course information page and, more importantly, the tools for communication with students are very limited. It doesn't have the possibility to send emails to students, and the lack of integration with Google groups and their limited capabilities as a forum tool is a major drawback.

MiriadaX analysis

MiriadaX is a platform developed by Telefonica using Liferay. It is a platform specifically designed for MOOCs. When we used it, it allowed you to use videos from YouTube or upload them, incorporate html only pages and activities (a, b, c quizzes or P2P) and it had its forums and teacher interface.

Its major drawback at the time we used it (first half of 2013) was the very low usability for teachers. The options for activities were limited and the peer to peer activities were very problematic. It was impossible to work with mathematical formulas without making a tedious image cut and paste. There were some screens to follow student progression, but it was impossible to download student data.

So, in summary, we think that the version of MiriadaX we used should be considered a beta edition, with many things to solve (even as some of them were solved during the courses).

Results

To gather demographic data in the upvx.es courses we included an initial form that the students have to fill when they enroll. We asked them: their name, gender, birth year, education level, country of origin, city of residence and how did they know about the course, letting them choose which questions they wanted to answer. In MiriadaX we didn't have access to the initial survey made by the platform, so we included a starter unit in the courses with our own survey that included the same questions plus how much time did they have to dedicate to the course and how good was their previous knowledge on the subject. In the last survey we included the "Which is your motivation to take the course?" question.

To gather satisfaction data from the students we prepared an online survey with questions to evaluate the system, the courses and the platform. In the first edition on upvx.es (the GCB implementation) the survey was only sent to the people that earned a credential as a prerequisite to download it. In the MiriadaX edition the survey was sent at the end of the courses to all students by mail, as we didn't have control on the issuing of credentials. In the second upvx.es edition the survey was sent at the end of the courses to all students by mail and was a prerequisite to download the credential (if the student had passed the course).

We can see that in the MiriadaX edition 75% of the students took the first exam and in the GCB editions only ¼ of them did (is the only way we have to know if they started the course or not). We think that the reason was the lack of email capabilities of GCB that didn't let us reach a lot of enrolled students. On the other hand the % of credential issued is similar in the three editions, so the retention rate of GCB is bigger.

Student demography

Students enroll mostly from Spain (66%), next from Colombia (9%), Mexico (6%) and Peru (5%). When we consider the ones that earn a credential the % that comes from Spain grows to a number between 72% and 79% depend-

EDITION	COURSES	Initial answers	Final answers	Enrolled	First exam	Credentials	Cred/First Exam
GCB 1	2	940	187	1171	295-25,2%	160-13,7%	54,2%
MIRIADAX	14	46341	8095	76459	57098-74,7%	11805-15,4%	20,7%
GCB 2	8	6700	850	5971	1416-23,71%	667-11,2%	47,1%

ing on the edition. In general there are more men than women (60/40%) but this depends on the course, there are people of all ages but most students are between 20 and 40 years old.

Most students have university education and there isn't a prevalence of any group of employment status (28,3% unemployed, 14,7% civil servants, 32,2% company employed, 6,6% self employed, 15,5.students, 0,7% retired and 2,0% other). Their main motivation to enroll is to learn and then to improve at work.

Student satisfaction

As stated, we received the student's opinions via an online survey. We asked them about the courses (length of videos, quality of videos, scheduling of contents, level of difficulty of assessments, quality of doubt answering options and difficulty level of the course), about their learning (if they have learnt and if they like the learning system), if their expectations have been fulfilled, the time devoted to the course and about their experience using the platform (the browser they used, platform speed, platform usability and problems using it).

The results were consistent across the 3 editions Overall, 96% of the students liked the experience. Other important data from MiriadaX ed. are depicted below:

	A lot	**Yes**	**Not much**
Do you feel you have learnt?	25,1%	52,9%	21,55%
Do you like the videos?	23,9%	63,6%	12,5%
Video scheduling (OK/Slow/Fast)	84,2%	2,4%	13,4%
Video length (OK/Short/Long)	89,4%	5%	5,6%
Assessments (OK/Easy/Difficult)	80,2%	16,5%	3,3%
Doubt answering (OK/slow/Not enough)	69,5%	22,6%	7,9%
Difficulty (OK/Easy/Hard)	90,9%	8,2%	0,9%

The mix of people that answered the satisfaction survey was different in every edition. In the first, all passed the course, in the second we had a 11% of people answering that hadn't finished, and in the third we had 38,8% of people answering that hadn't finished the courses. Even though we had a lot more people that hadn't finished the courses, the above results stayed consistent. The only significant difference we observed was in the expectation fulfilment question (from 1 to 5), where the average was 4,2 in the first edition, 4,12 in the second edition if we take into account all the answers, 4,18 if we consider only the ones from people that passed the course and 4,05/4,18 in the third edition. The main cause for not finishing the course was lack of time (89% in MiriadaX and 83% in GCB), and then platform errors (7% in both cases).

Most of the courses are designed to take three hours a week of work. If we only take data from people who passed the course, and don't take into account the Android course of the MiriadaX edition that required quite a lot more work (5,37 hours a week on average), we get an average dedication of 3,3 hours in one edition and 3,6 in other. In the MiriadaX edition and taking into account the Android course the distribution of answers was:

	>10h	7 to 10 h	5 to 7 h	3 to 5 h	Less than 3
Hours you have dedicated	2,7%	7,7%	16,3%	43,3%	30%

Conclusions

Making a MOOC requires a lot of effort on the part of the teachers, so it is very important to let them focus on what they are experts in. Having a system like Polimedia, that relieves all the video technology hurdles from them and adapting every process to what they are used has helped us to be able to create and deploy MOOCs very fast. With Course Builder is very easy to deploy a MOOC, so is a very good option to test and learn, but it lacks a lot of features to deploy a complete MOOC platform. Google App engine is cheap, simple and robust.

Using an intermediate format to save course metadata and scripts to generate each platform's specific code has proved to be a very flexible solution to migrate from one platform to another. It also helps teachers to structure the course information and facilitates giving them the level of support they choose. It is important that the platform used has extensive content exporting/importing capabilities.

We have demographic data and completion rate data that are similar to that of the big platforms. As with them we have a low completion to enrollment ratio. The main reason to not finishing is lack of time. Our enrollments come mostly from Spain; we have to improve our communication strategy in Latin America as we have found a strong interest in the enrolled students from the region. Sharing a platform with other universities increases visibility and enrollment. Over any technical and organizational issue, students like this new way of learning, even if they don't pass the courses.

There is room for improvement in the platform arena. We are planning to migrate to OpenEdX as it has a lot of the features we need and it is creating a very strong community of users. As the Sakai CLE community is planning to incorporate MOOC capabilities to the project we haven't closed the door to use a future version of Sakai CLE as our MOOC platform. Having two different platforms (MOOC and LMS) where the teachers have to deploy courses is not a perfect solution, as we will have to develop translating scripts to use the content developed for one in another without effort on the part of the teacher (the intermediate format will help).

There is also an opportunity for reusing the content developed for MOOCs in formal education following flipped education schemes, and thus maximizing the return that teachers and students can get form these initiatives. Some of our teachers are using their MOOC content in their courses classes this year.

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Learning Electronics through a Remote Laboratory MOOC

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Abstract: This work shows the results obtained by a MOOC devoted uniquely to acquiring practical competences for building basic electronic circuits. It has been running for 5 months under the Spanish UNED COMA platform initiative, and more than 3000 participants have enrolled. The electronics experiments included in the MOOC are based on the remote laboratory platform Virtual Instrument Systems in Reality (VISIR). One of the main challenges was to manage a queue system for accessing VISIR, taking into account the limited number of concurrent accesses to the laboratory. This paper describes the learning objectives and structure of the MOOC, the results obtained in terms of student demographics, drop-out rates and social interactions. We also discuss the main pitfalls we found during the course and the positive and negative aspects of this first running. We also describe the different improvements we will put in place for solving some of the problems found.

A practical oriented MOOC for learning electronics

As said in the abstract, the core of the MOOC, named "Bases de circuitos y electrónica práctica" (Basic practical electronic circuits) is VISIR, a remote laboratory for electric and electronic circuits experiments (Tawfik et al, 2013). It was developed at Blekinge Institute of Technology (BTH) in Sweden and is in use in several universities all around the world (Gustavsson et. al., 2009). The MOOC's evaluation and activities spin around the remote laboratory and the objectives and evaluation are focused on the handling of the instruments and measurements. VISIR is also routinely used in different engineering grade subjects delivered by the Electrical and Computer Engineering Department (DIEEC) of Spanish University for Distance Education (UNED), providing satisfactory results with regarding to either its performance or skills acquired by students. The main advantage of VISIR, when compared with traditional electronic laboratories, lies in its availability that has neither temporal nor geographical restrictions.

The MOOC has been running for five months (May to September 2013), and is one of many in the UNED COMA platform (UNED COMA, 2013). The students have not time limitations to complete the different tasks. The access, as in many other MOOCs is completely open and free and anyone can register and participate.

The acquisition of the competences for analyzing circuits is not an objective for this MOOC. The knowledge, at least theoretical, on analyzing electrical and electronics circuits and the electrical characteristics of most common components are necessary requirements for participants. However, supplementary materials are provided, in each module of the MOOC, in order to facilitate the understanding of the behavior and circuits for those students that fulfill only part of the requirements but are interested in following the course. The MOOC also suggests, for this case, a number of options (for example the possibility of enrolling other MOOC (6.002x Circuits & Electronics MITx, 2013) before continuing).

Learning objectives and structure of the MOOC

The general learning goals, as established at the initial web page are:

- Gaining practical competences in basic electric and electronic circuits, by using a lab with real components. Also gaining practical competences in the use of the usual equipment in such laboratories.
- Improving the knowledge for designing electric and electronic circuits.
- Increasing the use of simulation tools used in the process of electronic circuits design.

The participants that begin the MOOC find a pre-course survey for obtaining some statistics basic data such as age, genre, country of origin and maximum academic level.

Following this survey they must complete a basic electric and electronic exam. This exam is not evaluable, but gives us relevant information on the knowledge of the participants, before beginning the course.

The rest of the MOOC is structured in eight modules, with an estimated workload of 10 hours per module. The contents in each module are a number of short videos, different help documentation and an assessment based on the tasks in the module. All the documentation is written in Spanish. Inside the MOOC there is also a basic forums system that allows the interaction of students and with the teachers and mentors.

The first module is dedicated to electronics simulation and reviews the required knowledge of analysis and simulation software. MicroCap software is proposed, although many other tools are valid. The main idea behind this module is giving the students the opportunity to test the differences between theoretical calculations, simulations results and real (obtained afterwards in the VISIR modules) results.

Module 2 (figure 1) shows the basics of use of VISIR: the components (resistances, diodes, etc,), the breadboard, the instruments (multimeter, function generator, oscilloscope, power supply, etc.). It also presents the students how to access the remote lab and how to reserve time for the experiment. This last point is essential considering that VISIR don´t allows an indeterminate number of concurrent users. The time slot for each reservation is 1 hour and each student has a limit of 16 reservations.

Modules 2 to 8 are dedicated to build real circuits with VISIR and take measurements related tothem, from basic power and current measurements to the different possibilities of operational amplifiers. Figure 2 shows, for example, how to build with VISIR a basic RLC circuit and check the correct measurements.

The assessments in each module are closely related with the experimental results and try to highlight the differences between theoretical, simulated and real results. Also the students are encouraged to use VISIR to build different circuits, not proposed by the teachers, using this opportunity and the different social tools inside (and outside) the MOOC to improve the knowledge of the participants.

The MOOC's design allows the administrator to use several parameters, as the number of slots per turn, time per turn, number of simultaneous turns and total number of allowed turns in the course. By tuning these parameters, we can regulate the remote laboratory availability to the demand of use. This is one of the critical points we wanted to analyze: the adaptability of the remote laboratory VISIR to a MOOC. Unfortunately, the intrinsic limitations of a real laboratory such as VISIR collide with one of the most relevant features that any MOOC should achieve: scalability.

The two last steps of the MOOC are a final examination, again not evaluable, that allows validating the effectiveness of the course, and a post-course survey, that helps us to compare if the students' expectations have been reached.

Although the MOOC is, as many other current MOOCs, almost completely based on self-learning and peer to peer collaboration, there are two different support roles:. The mentor that continuously tracks any possible issue with the reservation system and helps the students to resolve any problems related to the documentation and tools in the MOOC and other general questions; and a teacher who is accessible for helping with basic problems relating to electronics.

UNED COMA is a completely open initiative. Although our course's syllabus warns that this is a non-basic course and the participant must have previous theoretical knowledge in electric and/or electronic circuits, UNED COMA does not impose restriction criteria on those who wish to enroll.

Students get a course certificate by accomplishing two conditions: they must complete all the activities in all the

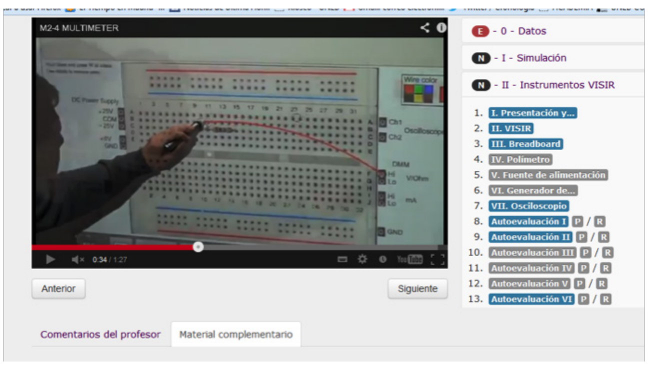

Figure 1. Screenshot of one of the videos in module 2.

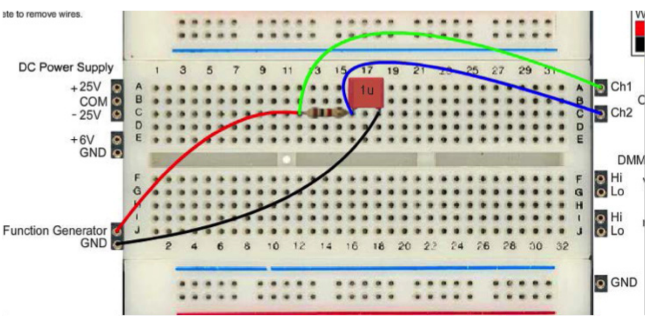

Figure 2. A possible VISIR's breadboard setup for module IV in MOOC.

modules within the MOOC, and the global grade must exceed the cut-off grade point established.

Results, positive and negative aspects

Although we don't have yet a complete analysis of the data obtained at the end of the course, some positive and negative aspects can be deduced from these data.

The MOOC has been running with 3036 participants enrolled. Although the discipline taught at the MOOC is not a very general one, our proposal of learning electronics by using a real laboratory inside a MOOC has raised expectations, especially taking into account that the course has been developed only in Spanish.

We have 1670 responses to the pre-course survey (UNED COMA allows student to continue the course without answering this survey), giving us an approximate snapshot of of participants' social profiles. More than 43% are 36 years old or more, 33% among 26 and 35 years old and only 14% younger than 26 years old. Only 8.9% are female. 73% of the participants declare Spain as their native country, followed by 6% from Colombia, with the rest coming from other countries, especially Latin America.

Related with his working situation, only 37% declare they are working currently. 20% said they are studying at the university (14% in an electronics-related field) and 26% are studying out of the university, in professional learning schools. A significant 17% declare they are neither working nor studying. Also it is relevant that 12% of the total declare they have a qualification related with electric and/or electronic engineering.

In a range between 1 and 5, more than 90% sums up 4 or 5 answering that they wanted to obtain new skills and competences. 80% also answered that the use of a real remote laboratory was one of the main factors to enroll at the MOOC. More than 84% hope their participation at the MOOC help them to improve their competences. Only the 45% declare they have used previously a real electronics laboratory.

Only 920 participants finished the non-evaluable basic electronics initial exam, it. Only 900 participants ended all the videos for Module 2 (the module in which VISIR and its basic operating procedures are presented). The number (365) is even lower for the participants that did the assessments in this module. The rest of the modules are the real lab modules and the assessments are related with the circuits they must build.

We have not enough space here to detail the numbers of participants module by module, but there is a continuous drop in the number of participants as the difficulty in the modules increases. The videos in the last module, related with operational amplifiers, have only being seen by roughly 100 participants and the related assessments only answered by 70 students.

Finally only 70 participants did the final exam and passed. They answered the post-course survey and the results were satisfactory, although clearly the final number is very low to mean anything relevant from the statistical point of view.

We could not get some other interesting data (the time each participant pass in each module and in each assessment, the time they really use VISIR for each practice, the complete time per student dedicated to our MOOC, etc.) because, at this moment, UNED COMA platform do not save these data.

As said before one of our main research objectives was to measure the ability of the queue administration system developed for integrating VISIR that theoretically allows a maximum of 16 simultaneous users. We can say the MOOC had no problems with this system, but it is important to point out that the number of users was low and the maximum time slot allowed was one hour at a time.

As for the activity in the forums, we have observed a great activity at the beginning of the MOOC, even with facebook, twitter or mobile instant messaging apps groups created for the MOOC. But as the number of active participants began to low, also this activity began to decrease. The mentors worked hard only during the two first months and the teacher almost did not have to participate.

Some conclusions and future improvements

A first conclusion is that the idea of building a MOOC dedicated to real basic electronic practices by using the remote lab VISIR was interesting for many different people, as demonstrated by the number of enrolled participants.

Also we can conclude that if we offer a completely open, without prerequisites, non-general, specific technical MOOC, this is really going to be used only by people with the real prerequisites. In that sense, maybe the use of the MOOC only for a selected group of people (for instance, students at an electronics subject in a grade) could be a good idea, as for example the Small Private Online Courses (SPOCs), a term coined by edX President Anant Agarwal (Agarwal, 2013). Following this idea, our MOOC would be a good part of a blended learning solution.

From the pedagogical point of view, if we really want to use the MOOC for giving a better service to participants, if we want to know many more aspects related with the behavior of each student at the MOOC, we need to change the code at the UNED COMA platform. A good example of the parameters and aspects to study at the MOOC is the work of (Kizilcec et al, 2013) that explores many different learning analytics aspects. In that sense, our department has begun a project with the UNED COMA developers to build much more agents inside the platform to obtain these data.

As for future works, UNED COMA is going to open the MOOC again in November, with some of the cited improvements in place. Also we are developing the same MOOC in English, trying to repeat the same 'experiment' but at a worldwide level.

Finally, for taking advantage of the work done, and following the SPOC idea, we are developing a similar MOOC, but with a much more advanced set of practices for doing real practices for power electronics.

Acknowledgments

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abiertaUGR: modelling online learning communities

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Abstract: Massive Open Online Courses (MOOC) have become a trending topic for Higher Education Institutions looking to create online courses for wider student communities. However, in some cases, this approach is another replica of the distance (online) learning model, but with better support for massive communities. Our aims are based on the potential benefits of MOOCs to create active online learning communities using OER, allowing universities to adapt and include non-formal learning in the curricula. Our approach (abiertaUGR) is based on a social approach to creating MOOCs. This framework allows us to construct an online learning community where each user has a personal learning environment (PLE), and also activities for engaging in team-groups and social networks. We developed three courses last semester using this approach with excellent results.

Key words:
online learning communities, non-formal learning, digital competences, OER**, PLE, social networks**

Introduction

Massive Open Online Courses (MOOC) are a current trend for creating online courses with the aim of enabling Higher Education Institutions to have free, good quality teaching initiatives with relevant visibility on Internet. This model has been conducted through inter-institutional platform of courses (i.e. Coursera[1], EdX [2], Udacity [3], as well as MiriadaX [4] in Spain). These approaches should represent new models for open learning [5] as a relevant role for (future) universities. These approaches may overcome the following issues:

- How quality and success of these courses are measured. Sometimes these aspects are focused mainly on student enrolment and completion rate.
- Purpose and outcome of these courses. These methodologies are the same as campus-based courses (content and assessment methods), but lose innovative practices in online education [6].
- Recognition and connection with the pedagogical model of higher education institutions. These courses should be connected with other formal learning strategies offered from universities.

AbiertaUGR [7] is a good example as a case study to understand the relevance of involving universities in MOOC strategies. This proposal has been developed using features that should be taken into account in this scenario:

- Use OER for learning activities and promotion of user-generated contents [8]
- Creation of online learning communities [9]
- Recognition at Universities

The courses have been developed for a wide community in order to acquire transversal competences and skills currently required in graduate titles. Some of the most relevant competences are the following:

- Knowledge and skills for autonomous learning by creating their own personal learning environment
- Enhancing the collaboration and working in groups
- Enhancing the creativity, leadership, and reputation in an online community of learners

These abilities are engaged via a context of social learning, enhanced on the abiertaUGR platform using common technologies (blogs, twitter, groups, bookmarks, debate, etc.). It is conceived as a social community: each user is shown in the platform (figure 1) as a living community with his/her own personal learning environment (figure 2).

Figure1. abiertaUGR social learning platform

Figure 2. User profile with the personal learning environment

Analysis of results

This initiative started in April with a series of courses oriented towards internet technologies for learning, and each one has a four week duration with a recognition of 1 ECTS credit:

- Digital identities. http://goo.gl/yHcam, 8th of April (finished)
- Ubiquitous learning. http://goo.gl/7bCZo, 18 of May (ongoing)
- Creative common and Open Education Resources. http://goo.gl/yV8dC

Up to now, we have the following data from these courses

	Enrolled	Completed	Completion Rate
Digital Identities	1805	620	34'35%
Ubiquitous learning	992	403	40'60%
CC and OER	752	250	33'20%
Community	3549	1272	36'05%(*)

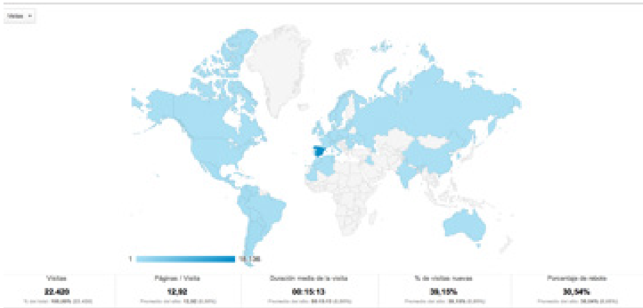
(*) On average

A wide community followed the initiative on the Internet. During these months, we have identified an increasing amount of traffic from visitors. Some of this data is shown below:

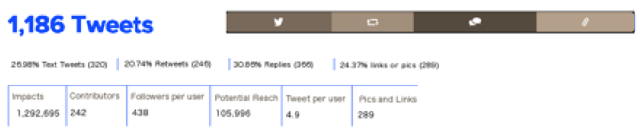
	March	April	May	Total
Num. of visitors	6140	14678	6169	26987
Num. of visits	12045	32289	12155	56489
Average time / visit	465 sec	1281 sec	1291 sec	1012 sec

(*) On average

Distribution throughout the world:



We had activities on social networks such as Twitter. Some data about one week of intensive activity gave the following results:



Evaluation methods are based around activities to promote learning in the community by facilitating tasks and goals to enhance participation, automatic recognition (through badges) from the activities performed, and facilitating the social recognition and reputation as another learning skill. Some activities are done in groups so we enhance the collaboration through the community to develop these results. Some activity indicators in the first course are shown below (activity during four weeks):

Activity indicators	1st week	2nd week	3rd week	4th week
Documentation	1841	1085	641	113
Activities	532	445	358	0
Interviews	926	295	629	0
Debate	1901	993	877	0
Tasks	169	813	285	0
WorkGroup (4 groups)	0	0	0	688
PLE (some data)	689 Blog	1275 bookmark		

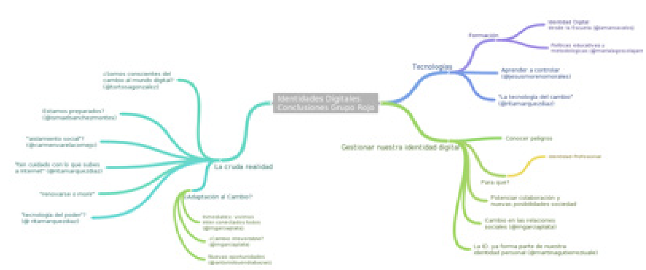
An example of planning a course:

This activity means that a high percentage of the community is 'alive' throughout the four weeks, also with good maintenance of the personal portfolio (PLE) as well as with group activities.

Group Activities

Group activities were very exciting because we created free online groups to discuss and propose the internal organisation of some topics. This activity was developed during the last week for the Digital Identities course and four groups were created with the following criteria:

- **Red Group**: The Experts. 85 active users debating "digital identity and conclusions of the course". The result was this conceptual map (from the conclusions of each member, indicated in the comments)



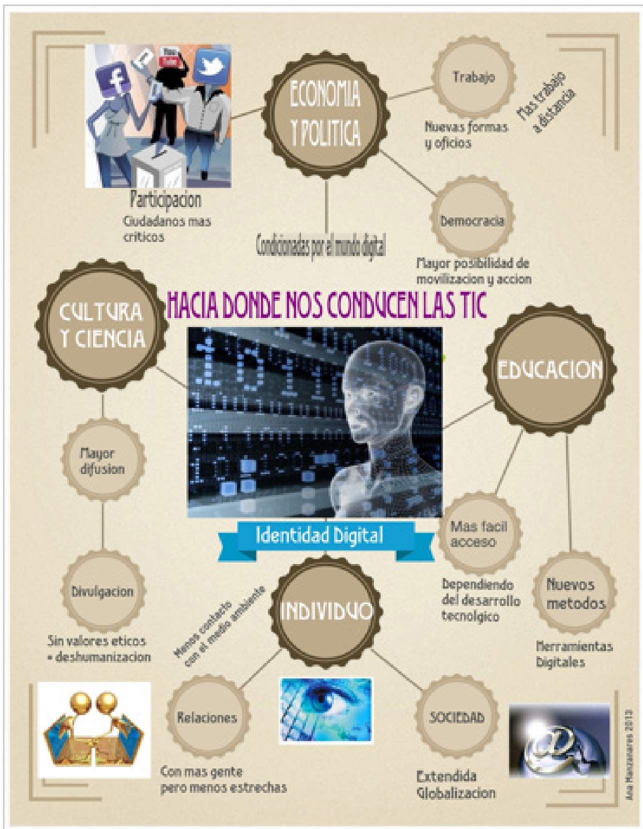
- **Green Group:** New Professions, should we create a start-up? (179 active members). Some of the work done was an analysis of the #abiertaUGR hashtag on twitter

http://www.slideshare.net/YOCOMU/analisis-hashtag-abiertaugr

- **Blue Group.** Where will the future be: The Philosophers (121 active members).

Diagram (from Viviana Lagos, Colombia) explaining the role of social networks, policies and trends.

Also, another infograph explaining TIC and society.



- **Yellow Group**: The Thinking Group (58 users) explaining trends and personal opinions.

User Satisfaction

Finally, other data about user satisfaction on different aspects are shown below.

User Satisfaction from Course Resources					
	Very weak	Weak	Correct	Good	Excellent
Platform	1,3%	10,7%	26,1%	47,0%	15,0%
Workspace	2,2%	13,4%	35,3%	35,8%	13,4%
Contents	1,7%	2,6%	18,6%	45,5%	31,6%
The participation availability	3,0%	3,9%	14,2%	37,3%	41,6%
Course planning	0,9%	8,2%	23,6%	39,9%	27,5%
Tutoring and mentors	2,2%	5,2%	31,3%	33,9%	27,4%
Technical support	3,9%	15,6%	30,3%	32,0%	18,2%
Twitter use	4,0%	9,3%	31,9%	34,5%	20,4%
The community (personal PLE)	3,0%	9,4%	27,0%	42,9%	17,6%
Working groups	3,5%	12,8%	31,0%	37,6%	15,0%

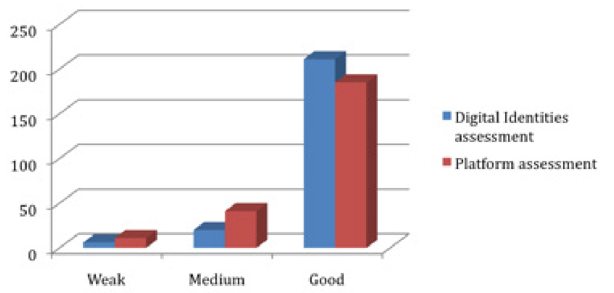


Figure 3. User satisfaction

Conclusions

This paper presents a novel model to create Massive Open Online Courses based on online learning communities. The purpose is to create living communities to learn and acquire digital competences such as reputation, participation, collaboration, critical assessment, use of technology, etc. These issues are connected with Higher Education Institutions via a lifelong learning process in society, connecting these courses with some kind of recognition of informal learning. This study has been supported with the data of the first course using this approach.

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University of London International Programmes' MOOC Experience

Barney Grainger and Michael Kerrison

Abstract: *To the University of London, the world's oldest provider of flexible and distance learning degree programmes (since 1858), Massive Open Online Courses (MOOCs) provide a modern platform for widening access to the academic programmes offered by the University's federal colleges. The University of London International Programmes was one of the first UK Universities to offer MOOCs, through the Coursera platform. There has been much debate about the business models for MOOCs and in this short paper the economics of using MOOCs to highlight study opportunities for students through over 100 higher education programmes offered by the University of London International Programmes is explored. The first four University of London MOOCs were developed and delivered in 2013 and while still too soon to evaluate conversions to full degree programmes early indications provide some interesting evidence, along with important lessons learned in the planning, costing and resourcing of MOOCs for university administrators.*

Introduction

The University of London International Programmes launched four massive open online courses (MOOCs) on the Coursera platform in June 2013, making it the first English Higher Education provider to offer MOOCs. Our four MOOCs each lasted six weeks, attracted over 210,000 initial registrations, over 90,000 active students in their first week, from over 160 countries and lead to 8,843 Statements of Accomplishment being attained. In addition, our MOOC offerings achieved an aggregate student satisfaction rating of 91% (ranging from good to excellent), and so far around 150 students who applied to one of our 2013/14 fee-paying programmes have indicated that they took one of our MOOCs beforehand. This paper provides an early analysis of how the institutional objectives for involvement in MOOCs have been met.

Background

The University of London International Programmes (the International Programmes) is a collaborative venture between the University of London International Academy (a Central Academic Body of the University of London) and twelve federal Colleges of the University of London.[1] This collaborative venture has been delivering high quality University of London awards at a distance since 1858 and is the oldest distance and flexible learning provider in the world.

Coursera was established in April 2012 by two Stanford academics from the Department of Computer Science, Professor Daphne Koller and Professor Andrew Ng. Coursera works with a selection of respected global university partners to provide massive open online courses (MOOCs), short online courses that have the following distinguishing features underpinning its objectives:

1. Courses are open access – anyone can participate, for free; and

2. Course registrations are 'massive' – the learning platform is scalable and courses are designed to support an indefinite number of participants.

In July 2012, the International Programmes invited Professor Koller to make a presentation to personnel from across the University of London and its federal Colleges on the recent launch of the Coursera MOOC platform. The intention of this invitation was to understand more about massive open online courses, the Coursera platform and to establish whether the International Programmes and Coursera had compatibility in terms of vision, aims and provision.

A partnership agreement was signed in September 2012, following Professor Koller's visit, which involved the International Programmes agreeing to launch, in a first phase, up to five MOOCs on Coursera. This agreement was part of the second wave of Coursera partnership announcements. This paper will consider in the first part how the University of London International Academy framed its objectives for MOOCs in collaboration with

[1] The twelve collaborative Colleges (also known as 'Lead Colleges') are: Birkbeck, Goldsmiths, Heythrop, Institute of Education, King's College London, London School of Economics and Political Science (LSE), London School of Hygiene and Tropical Medicine, Queen Mary, Royal Holloway, Royal Veterinary College, School of Oriental and African Studies (SOAS), and University College London (UCL).

Lead Colleges. The second part of the paper will provide an initial evaluation of how the objectives have been met, based on the first phase of MOOC delivery.

A: Managing the MOOC Development

Institutional Objectives for the MOOC Development

The objectives of the University of London International Programmes' MOOCs were threefold:

1. **Mission and Profile.** An opportunity for the University to widen participation of students worldwide in line with its mission.

2. **Recruitment.** Being a provider of flexible and distance learning the University considered the opportunity to attract students interested in progressing their learning and careers without the cost and commitment to attend full on campus programmes in London. With over 100 full programmes of Higher Education, at undergraduate and postgraduate level in over 180 countries worldwide, MOOCs provide an opportunity for showcasing the educational expertise of the International Programmes' collaborative venture. Early indications were that the MOOC providers had a different emphasis in the catchment areas of students enrolling for MOOCs to the territories where most students are enrolled for full International Programmes.

3. **Innovation and Investment.** MOOCs provided an opportunity to explore the capability of the MOOC platforms and to scope the use of learning materials, activities and support at scale. Utilising teams that are involved in 'parent' programmes available as full degrees in flexible and distance learning formats provided an opportunity to innovate and expose academic teams to working with the MOOC platforms.

Project Management of MOOCs

The process of selecting the initial MOOCs was a collaborative decision between Colleges and the University of London International Academy. Major developments in International Programmes follow a process of academic project management which was adopted for the MOOC development. The lead project manager was complemented by two other project managers to support the academic teams. The project managers provided an important interface with the Coursera Operations and Engineering teams, the video production company and learning technologists.

The nature of the collaborative venture between the International Academy and Colleges meant that some of the course teams utilised their own learning technology expertise as part of their resource planning. As part of the selection process a budget was negotiated with each course team, which mirrored the business and financial planning process of a full programme, albeit on a much smaller scale. This process involved agreeing a budget for the resources required and an assessment of the benefits and/or revenues.

For the first phase MOOCs the 'Signature Track' option in Coursera had not been developed at the planning stage, (whereby students can opt for a service that provides a validated certificate of achievement for a modest administration fee of USD $49). The key revenue for International Programmes relates to the conversion of students completing a MOOC to enrolment on the full 'parent' degree programme. At the planning stage it was very difficult to quantify as Coursera itself had only been in operation for six months.

Key milestones and timelines were agreed at the start with each course team along with a target launch date. A key part of the planning for learning content involved the sourcing of as much 'open' materials for each MOOC to ensure that learners would not need to acquire additional materials. Subsequent to the planning phase of the MOOCs, Coursera provided some assistance with sourcing free to access digital materials (through their partnership with Chegg) and the International Programmes' links with major publishers also provided some leverage for agreeing digital extracts of selected materials to be used as learning resources for selected MOOCs.

The project manager role involved remaining in touch with the course teams, Coursera and monitoring the learning platform for student feedback during the delivery of the four MOOCs. The role facilitated the escalation of issues from the course teams, as required and the monitoring of the key student data across each MOOC. International Programmes appointed a person to liaise with the Coursera Operations team to ensure that all data relating to student activity is captured for later analysis.

MOOC Selection and Development Process

Following the announcement that the International Programmes would be offering a suite of MOOCs through Coursera, academics from University of London Lead Colleges were invited to submit expressions of interest in offering a MOOC. The criteria for selection were broad in order to attract as much interest as possible and to encourage innovative subjects. The principal selection objectives were to offer short courses that had a clear link to subjects offered at degree level through the International Programmes, and to assess the enthusiasm, expectations and experience of the submission team.

After some deliberation, the International Programmes agreed to offer the following four MOOC subjects on

Coursera:

- *Creative Programming for Digital Media & Mobile Apps*
- *English Common Law: Structure and Principles*
- *Malicious Software and its Underground Economy: Two Sides to Every Story*
- *The Camera Never Lies*

The four MOOCs fitted well with existing International Programmes full degrees, and provided a good opportunity for the course teams to showcase subject content in innovative and exciting ways. Each course team was asked to develop a six week MOOC with between 5-10 learning hours per week, planning a range of student engagements and engaging content. We asked that teams aim to present no more than 2 hours of lecture material per week, split into 10-20 minute 'chunks'. Pass marks for all MOOCs were set at 40% for a pass and 70% for a distinction, with the exception of the English Common Law MOOC which set pass and distinction marks of 50% and 70% respectively.

As a result of this design decision, our MOOCs used a range of different platform features and learning and teaching styles. As the English Common Law team included a dedicated learning technologist, working exclusively with the law team, it is perhaps unsurprising that this MOOC used the widest range of tools and services in comparison to the others.

Examples of the additional learning resources used by the English Common Law academic team are detailed below:

1. Live video sessions
2. Freely available reading materials
3. A range of formative activities
4. Additional video resources
5. Social media

Use of teaching assistants (TAs) varied between International Programmes MOOCs. Funding was offered to each team to utilise through the employment of students, graduates or researchers of their choosing. The roles and responsibilities of these TAs were discussed with each MOOC team, with the decision whether to employ and what role they would play being left to each instructor.

B: Analysis of the Fulfillment of Objectives

1. Mission and Profile

At launch, registrations across the International Programmes MOOCs totalled 212,110. Figure 1 details the total registrations of each of the MOOC subjects, and also shows the peak registrations (defined as week 3 for the purposes of this report, as from this point onward weekly registrations declined sharply). At peak, total registrations for the four MOOCs stood at 241,075.

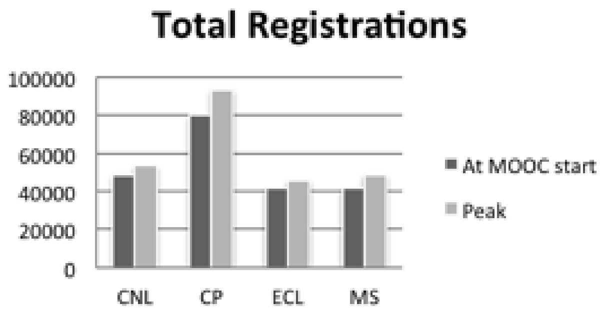

Figure 1: MOOC registrations at launch and at peak (three weeks after launch).

Research[2] into MOOC engagement by learners reveals that most MOOCs shed roughly 50% of their registered students by the time the course starts,[3] and this statistic was borne out in our experience, as illustrated in Table 1. For the purposes of this report, active students are classified as unique users who viewed or downloaded a lecture, attempted a quiz, registered after the MOOC start date and/or posted on the MOOC forums.

	CNL	CP	ECL	MS	Total
Total registrations (at launch)	48,648	80,127	41,715	41,620	212,110
Active students (first week)	23,051	36,268	14,207	20,966	93,468
Conversion rate	47%	45%	32%	50%	44%

Table 1: MOOC registrations at launch and at peak (three weeks after launch).

Table 2 details the Statement of Accomplishment split between the four MOOCs, the overall completion rate against first week active users, as well as the overall com-

[2] See Vanderbilt's lessons learned blog as an example: http://cft.vanderbilt.edu/2013/08/lessons-learned-from-vanderbilts-first-MOOCs/

[3] This could be due to a number of reasons, including change of circumstance between registration and MOOC start date, lack of motivation, change in interests, lack of - or missed - communication from the course team, or simply forgetfulness.

pletion rate against the active learners in the sixth and final week of the course (these figures have been included as the active student in the sixth week are likely to be the This could be due to a number of reasons, including change of circumstance between registration and MOOC start date, lack of motivation, change in interests, lack of - or missed - communication from the course team, or simply forgetfulness. most committed learners, working through the material with the intention of receiving a Statement of Accomplishment).

	CNL	CP	ECL	MS	Total
Earned a 'Pass' SoA	358	1,255	349	1,741	3,703
Earned a 'Distinction' SoA	1,113	976	2,228	823	5,104
Total SoAs issued	1,471	2,231	2,577	2,564	8,843
Completion rate against 1st week active users	6%	6%	18%	12%	9%
Completion rate against 6th week active users	29%	25%	40%	39%	33%

Table 1: MOOC registrations at launch and at peak (three weeks after launch).

In terms of the ranking of territories by enrollment, the US (22%), India (6%), UK (5%), Brazil (4%) and Spain (4%) were the top five countries. Other countries in the top ten rankings for enrolment included Mexico, Greece and the Russian Federation. Top countries for enrolment amongst the 54,000 students enrolled on the University of London International Programmes include Singapore and Malaysia, Hong Kong, Pakistan and Bangladesh. The location of MOOC enrolments therefore exposed students from countries who may not be so familiar with the brand and opportunities to study full University of London programmes flexibly and at a distance.

In terms of the scale of enrolment and raising profile across a range of international territories it is considered that this objective has succeeded in extending the University mission and profile established over 154 years ago. An end of MOOC survey (which yielded over 3,800 returns) was completed and found that of those responding 91% rated their experience 'good', 'very good' or 'excellent', providing further evidence that this objective has been fulfilled.

2. Recruitment

There has been much debate regarding business models for MOOCs. While much of this has focused on the MOOC platform providers it has also been discussed at institutional levels in terms of justifying the cost of investment and engagement in developing and delivering MOOCs. While there are different development models for the various large MOOC platforms – edX, Udacity, Coursera from the US and FutureLearn in the UK – the Coursera process involves a partnership approach with the institution undertaking development and loading content and activities to the platform with technical support from Coursera teams. In this model Coursera undertakes the costs of recruiting students, maintaining and developing the platform, providing operations and technical services to course teams and students.

The costs of developing materials and learning activities for a short course online with significant scale involves a number of considerations regarding risk and return. The University was committed to ensuring a high quality experience for students, which invariably involves a high commitment from course teams particularly for the first instance of the MOOC. The risk of exposing the brand with MOOCs providing a poor learning experience was an important consideration in the commitment of resources. In terms of revenue the Signature Track was only considered initially to provide relatively modest amounts to contribute towards the update and maintenance of each MOOC, from students predominantly interested in evidencing more firmly their career development or continuing professional development with their employer and/or professional body.

An important potential revenue stream to justify the costs of development was the recruitment of students to full fee paying University of London International Programmes. With over 100 programmes ranging from law, economics and business to creative computing, English and theology at undergraduate and postgraduate level exposure to students enrolling on MOOCs provided potential to attract new students to the University of London International Programmes. Ambition in this respect was tapered by the fact that early indications were that many students enrolled for MOOCs were already graduates at first degree or postgraduate level. As the University of London International Programmes' fees are extremely competitive, consistent with its' widening participation agenda, (c£4k for a full undergraduate degree and c£8k-£13k for a full postgraduate degree through independent study), the venture provided an opportunity to recruit students who may not be so aware of the opportunities.

The International Programmes budgeted a direct spend of £20,000 for the additional resources to Instructor time and included design, development and launch of each Coursera MOOC. By far the largest proportion of expenditure was video production, which came out at approximately £10,000 per MOOC. Our intention with this cost was to ensure a good learning experience for students when watching the videos, and to allow the videos to be re-purposed and integrated into the full degree 'parent' programmes.

Signature Track signups: CNL (129, 100% pass rate); CP (546, 99% pass rate); ECL (366, 99% pass rate); MS (376, 100% pass rate). Total Signature Track income = USD$69,433. In total, 1.5% of active users sign up to Signature Track. Coursera undertakes the administration of Signature Track and a relatively small proportion is received by the University, (c15%), which therefore provides a modest sum to help maintain the MOOC.

In terms of the number of conversions from students enrolling for a MOOC to a full fee paying programme of higher education, the early signals have proved encouraging. Since the end of the first four MOOCs in August 2013, over 150 students have been identified as having enrolled for a University of London International Programmes' MOOC and subsequently enrolled on a full higher education programme. In terms of average gross revenue for each student enrolled on a flexible and distance-learning course (at the fee levels previously indicated in this paper), this is c£1,000 per student per year. For 150 students this would therefore convert to c£150k per annum and having taken direct and indirect costs of support into account would more than adequately justify the business case for the investment undertaken.

It is acknowledged that this business model will not work with traditional higher education providers with a predominantly single on campus mode of study. The economics of the conversion rates and relative fees would clearly be quite different. It is also the case that if greater proportions of students enrolled on MOOCs came from a non-graduate background this might also improve the conversion rate. As the MOOCs were delivered to be sustainable and offered multiple times during the year there will be multiple opportunities to achieve conversion of students to fee paying programmes and some programmes which had earlier closing dates may improve on the conversion statistic further over the next few months.

This analysis does not incorporate a qualitative analysis of the impact of the brand impact across over 5 million users of the Coursera platform. The ability of students to study in their own location for the fee-paying programmes and at a very affordable fee level gives the University an advantage over purely campus based MOOC providers who will operate on restricted enrolment numbers. This bodes well for the financial sustainability of further phases of MOOC development. Further work is needed in terms of impact on social networking sites and how the MOOCs have increased brand awareness, alongside more longitudinal monitoring of completion of those students converting. Signature Track revenue shows some promise but is likely that in the near future this will provide for maintenance of the MOOCs to enable future iterations. It is perhaps noticeable that the two MOOCs on IT related subjects provided the most significant enrollments for Signature Track.

Initial assessment of the fulfillment of the objective to recruit students enrolled on University of London MOOCs has therefore indicated very positive signs that this has been achieved at a level to justify the business case.

3. Innovation and Investment

Each MOOC was designed within the parameters described in the first part of this paper, which provided course teams with considerable autonomy to utilize alternative technologies and activities to deliver an engaging short course and provide sufficient opportunity for students to demonstrate their achievement of the learning outcomes. While each course team adopted varying approaches on how their subject content was presented and how tutors and students were expected to engage, one of the core principles was to ensure that the video content and associated learning activities were holistically designed and produced. In particular course teams were encouraged to ensure the videos provided clear links to other learning materials and were not a long monologue, but divided into discrete topics.

The assessment tools used ranged from short quizzes through to the Creative Programming MOOC requiring students to show their mobile application working via a webcam download, which other students were required to peer assess with guidance from the Instructors. On the Law MOOC Instructors interacted with students via breakouts on social networking sites such as Facebook and Twitter, including some synchronized sessions programmed into the schedule. In some cases additional work was undertaken by learning technologists at the University to supplement the functionality of the Coursera platform and support particular question or learning activity formats. As investment into the platform is increased the opportunity to utilize wider tools is expected to grow.

As the full University of London International undergraduate laws programme has several thousands of students enrolled worldwide, the majority of whom have local support, the course team has undertaken to make available the MOOC material for institutions and their tutors supporting students locally as a recognized institution.

While it is still premature to assess fully whether the innovations undertaken by the course teams have been shareable across full fee International Programmes there are early signs that re-purposing materials and approaches to student engagement at scale can be used for future planning of courses. Internal events have been arranged within the University to share practice and the experience and further work will be undertaken in the next year to assess re-usability of materials out with the MOOC delivery.

Conclusion

The International Programmes identified three main objectives in engaging with the MOOC initiative:

1. Mission and profile: the International Programmes saw this initiative as a positive method of continuing to wid-

en student participation, communicating our expertise at distance and flexible learning to a wide audience, and raising the profile of the University of London and its collaborative partners in markets which may not have been aware of our full degree programmes.

2. Recruitment: being a distance and flexible learning provider, the International Programmes was in a potentially strong position to convert MOOC students into University of London students.

3. Innovation and investment: the Coursera platform presented an opportunity to trial new pedagogical models and delivery techniques, which could impact positively on our full degree programmes. Similarly, investment in the Coursera MOOC subjects equated to investment into the 'parent' degree programmes, as we intended to repurpose as much of the MOOC material as possible.

In the second part of this paper we have undertaken to provide an initial evaluation of our success in meeting these objectives. While it is still early to provide a definitive assessment, the early signals are very positive. In particular we have shown that in the early conversions from the University's first four MOOCs indicate a clear business case with annual revenues of £150k to match against the costs of investment and delivery. Further work is needed to assess completely the effectiveness of the objective related to innovation and its wider impact on the University of London International Programmes. In terms of profile, enrollment of over 200k students and almost 9k completers combined with a 91% satisfaction rate from student in over 160 countries is evidence to support some success in raising profile and widening the mission of the University.

What did we learn in planning, developing and running our four MOOCs, and what could we improve? The most significant lesson is the huge amount of input, resource and time required to set up a MOOC. However, this resource requirement is almost entirely front-loaded: once a single MOOC session concludes successfully, we believe multiple subsequent sessions could be run which would require less intensive oversight from the academic team, via teaching assistants managing the day to day running of the forums and escalating issues as and when required. The academic team could interact at advertised predefined points during the MOOC, without the same onerous intensity of the MOOC's first iteration.

MOOC registrations do not necessarily bear a relation to the number of active participants. As a rough rule, MOOC teams should prepare for around 50% of registered learners to actually participate once a MOOC starts. Having said this, in the context of on campus or 'traditional' distance learning tuition the number of active participants is still considerable.

The majority of MOOC users appear to be in their 20-30s, university educated, based in a developed or rapidly developing economy (with the bulk in the United States) and not necessarily interested in receiving formal certification. In light of this demographic, completion rates may not be a useful metric of MOOC success. Instead, there are potentially significant numbers of active users who gain value from accessing the materials, undertaking activities and using the opportunity to dialogue with other students, without feeling the need to attain a Statement of Accomplishment. It will require further investigation on how we might measure this 'value added'; badges or skills markers may provide some potential in this area.

MOOC usage is based primarily on watching and downloading videos (60-80% of active learners), with other learning and assessment methods utilised by between 30-60% of active students and a relatively small minority (approximately 4%) of students participating in the forums. This figure should not diminish the importance of the forums though, as they are vital conduits for student feedback, allow interaction between the academic team and the student body, provide additional opportunities to contextualise the learning (e.g. through local study groups), and can exhibit some of the best behaviours amongst learners in terms of support, moderation and guidance. Conversely, the forums are also a freely accessible public space, and can therefore include some highly negative behaviour, as with most open online networks. In summary, forum management is a key planning consideration and should be carefully thought through before MOOC launch in terms of instructor, teaching assistant and student engagement points and interventions.

Ultimately, our experience in offering four University of London International Programmes MOOCs through Coursera proved to be a collaborative, exciting and positive experience for nearly all involved. Our objectives in terms of attracting fee-paying students to our full programmes, raising awareness of the University of London brand amongst millions of students world-wide, and encouraging innovation in pedagogy and delivery amongst our academic teams appear to have been met, and as such we look forward to continuing to deliver more high quality online courses to an even larger global audience of learners in the future. Plans are in place to complement the existing MOOC offering and for further iterations of the first four MOOCs referred to in this report.

The EPFL MOOC Factory

Patrick Jermann, Gwenaël Bocquet, Gilles Raimond and Pierre Dillenbourg

Abstract: *We describe the MOOC production process and studio design rationale that was developed over a one-year operation of the EPFL MOOC factory, a colloquial denomination for the MOOC production activity of the Center for Digital Education (CEDE) at the Ecole Polytechnique Fédérale de Lausanne (EPFL). Based on our experience, we propose key figures and design guidelines, which could help other universities to set up a production and support center for MOOCs.*

Introduction

We are the Center for Digital Education (CEDE), a unit of the central administration under the vice-presidency for Information Systems at the Ecole Polytechnique Fédérale de Lausanne (EPFL). Our mission is to accompany and support the production and delivery of Massive Open Online Courses (MOOCs) for EPFL. In this contribution, we report our experience in producing 14 MOOCs over the past twelve months.

At the time of writing, EPFL has a catalogue of 25 MOOCs. Our first MOOC was online in September 2012, four additional MOOCs were produced in February 2013 and nine more are starting during Fall 2013. Two courses are not open to the public for their first issue. We are planning ten more courses for 2014 and plan to have 19 MOOCs hosted on the www.coursera.org platform, and six MOOCs on the www.edx.org platform by the end of the year.

We start this account with a general description of the production process, and then focus on the video production and studio design although this corresponds only to a part of the development work in a MOOC. The second part of the development work, which we do not address here in detail, consists of developing assignments and tests as well as integrating the MOOC with on-campus teaching.

Production process

It takes six months from the acceptance of a MOOC by the editorial committee and the opening of the course. During this period the course has to be designed, advertised and produced. We describe each phase and summarize the timing of the production process in Table 1.

Project selection

At EPFL, professors submit a project for evaluation to the MOOC Editorial Committee (step 1 in Table 1). An editorial committee with representatives from each of the five schools reviews the projects. Criteria for acceptation include the scientific standing and teaching record of the applicants as well as the financial and technical feasibility of the course. After a positive decision, professors get support from the Center for Digital Education to develop their course and can hire an assistant from their domain to help them design and run the course.

Course design

The production of a MOOC starts with a design phase (step 2 in Table 1). From an instructional designer's point of view, the goal of this phase is to establish a sequence of learning activities that will enable students to reach given learning objectives. In reality, professors often see course design in a pragmatic way that consists of adapting the content and material they already have, to produce a set of video sequences. However, the MOOC lecture format imposes constraints on timing and format that "force" teachers to rethink their existing lecturing practice and offers an opportunity to redesign the course material. Teachers quickly realize that the preparation of the material for the MOOC involves an in-depth revision of their course. Some of them propose to produce a MOOC precisely because they want to revise their course.

Lecture design consists of segmenting the course into 7 (or 14) weeks that each has a specific structure. For instance, in our introductory physics course, a MOOC week features 2-3 video units on theory, 1 video unit about an experiment and 1 video unit with an invited lecturer who speaks about the application of the basic concepts in research. The creation of small video units of 7-15 minutes that cover 1 concept at the time requires a redesign of the content. When explanations and developments do not fit into less than 30 minutes teachers are invited to record two separate parts.

An important constraint comes with the 16:9 format of the video lecture that is used as well for by the cameras as for the presentation slides. This wide format is especially well suited to present complementary representations side-by-side (in two adjacent square regions). For instance, we encourage professors to start explanations with a figure on one side and to write the corresponding explanations on the other side while giving explanations.

	Time	Milestones	Description
1	D-8 month	Application	Professors propose their project (Further details about the procedure and the forms: http://MOOCs.epfl.ch/applications).
	D-6 month	Editorial Committee	The MOOC editorial committee evaluates the project. There are two calls per year for projects, one in spring and one in Fall.
2	D-5 month	Course Design	Course design includes online lectures and assignments. Teachers segment their course into chunks of appropriate size for the video lectures.
		Media Design	Media Design determines the “mise en scène” of the video lectures. Teachers decide at this point what happens on the screen. We use a Media Template (see links) to structure the way professors redesign their material.
3	D-4 month	Prototype Week	Based on the first trial sessions in the studio, the CEDE produces a sample video that is used in the review meeting.
		Review Meeting	Teachers and production team define the rules for video production. This is also when the CEDE recruits a video editor who will edit the MOOC.
4	D-3 month	Teaser	A short 2-3 minute video is produced to illustrate the content and format of the MOOC.
		Landing page	Professors describe their course on the platform (text + teaser) as well as their profile page. The landing page is made available for the public as soon as possible so as to leave time for subscriptions.
		Production Plan	Professors define more precisely the number of videos they intend to produce, along with the type and number of assignments.
5	D-3 month	Production Weeks 2-7	Studio work, video editing and assignment development. See Table 2 and the rest of this paper for details.
6	D-Day	Course Opening	The opening day is usually scheduled at the beginning of the semester since most of EPFL's courses are linked with an on-site course.
	D+2 months	Delivery	Ideally, by the beginning of the course, the video material and the assignments are ready. The professors post weekly announcements, monitor the forum and supervise assignments for the duration of the course.

Table 1. Production Planning for a 7-week MOOC

The video lecture format also offers teachers the possibility to use their own image (as taken by the camera in front of them) as an ingredient to appear in the lecture. To facilitate the design of video clips we propose a media template that features layouts, or “shots”: a welcome shot where teachers appear full screen, a split shot used for introduction and summaries where teachers appear on half of the screen next to graphical material, and finally a content shot where teachers are not visible (see links).

Since most of the MOOCs produced at EPFL correspond to a course that continues to be taught on campus, an important aspect of design concerns ways to combine the online offering with the corresponding course on campus. Each course also features assignments (multiple-choice questionnaires, peer assessment, programming assignments) and complementary material. Especially the development of programming assignments and connection with existing eLearning systems involve software developments that have to be planned.

Learning to teach in the studio

Most professors are not used to teaching in front of a camera, without an audience. Before starting the production, professors familiarize themselves with the studio during one or two recording sessions (step 3 in Table 1). This is the occasion for them to understand the possibilities of studio recording, namely that it is possible to “cheat” with time since it is possible to edit the sequence of the recording, cut pauses, etc. in post-production. Some of our teachers came 4-5 times to test the studio. The CEDE team produces a prototype video lecture based on the material from these trial sessions, which is then discussed with the teachers in a review meeting.

During the review meeting, the professors and the video editing team sit together to discuss the media design and the acting performance of the teachers. The outcome of the meeting is a set of recommendations for the teacher and a set editing rules for video editors (e.g. where to place illustrations, whether to show the professor, etc.). We invariably encourage the teachers to engage with their material, either by using pointing gestures or by annotating their slides. On a few occasions, teachers have taken some personalized coaching sessions with our cameraman to get acquainted with the studio setting.

Marketing

Part of the massiveness of MOOCs comes from the marketing of courses by the platform providers to their large user bases. Each course has a “landing page” that is used to advertise the course and where students can sign up. The landing page contains a description of the course, a syllabus, and a teaser video (step 4 in Table 1).

Teaser videos are short promotional clips that serve to explain what the course is about. The teasers are quite difficult to produce because they come relatively early in the production process. At that time teachers are often not yet relaxed in front of the camera. Because the teaser plays the role of an institutional display, the pressure is even higher to "doing it right". We chose to produce "honest" teasers, which means that the material presented in the teasers reflects the level of expertise that will effectively be taught in the courses. We also chose to illustrate the teasers with excerpts from the prototype lecture to show the students the format of teaching.

Video Production

To put it straight, everybody underestimated the amount of work involved in producing videos (step 5 in Table 1). The devil is in the details, in forgetting to connect the microphone, in cleaning a bad audio track, in fiddling with color correction, in wearing an appropriate shirt (no stripes), in doing a new take because one makes a mistake or because someone steps into the studio during the take. On the editing side, difficulties include hardware failures as well as video editors (many of which were students) taking vacations during periods of intense recording. Last but not the least, we dedicated a lot of attention to studio design and management. A critical aspect of production planning is to estimate how much video editing and studio time is necessary for a MOOC. We identified two bottlenecks in video production. The studio bottleneck corresponds to the limited capacity of a studio to record the lectures and the editing bottleneck corresponds to the time and personnel that is required to edit the videos after recording. We propose some general figures from our experience that correspond to the overall effort that was required to produce 14 MOOCs in a period of one year (See Table 2).

Studio bottleneck

We have two studios in operation at EPFL. The main studio is situated in the Rolex Learning Center and a satellite studio is situated in the school for Information and Communication Sciences. All but one course were produced in the main studio, which was completely booked for four month between June and October. The graph in Figure 1 shows the number of studio sessions per week as per December 6th. The numbers demonstrate that one studio can handle a maximum of 6-8 MOOCs simultaneously. The last six courses in the figure are starting to record in October 2013 for February 2014. We also ended up booking a non-negligible amount of time for visitors and for maintenance of the studio.

We found that advance scheduling and the definition of regular recording times (e.g. every Friday afternoon) with professors were effective ways to balance the recording load among MOOCs. It is also important to leave several days between consecutive recording sessions to allow professors and editors to detect possible problems in the lectures.

Editing bottleneck

The professors, their assistants and the Center share the production work for Digital Education. Most of the video editing was done by students who worked during summer 2013 at the CEDE.

The editing of a video starts from the video rushes with a preliminary cut. Some teachers pre-select which sequences they want to keep for the final version during the recording session. Other teachers keep the camera

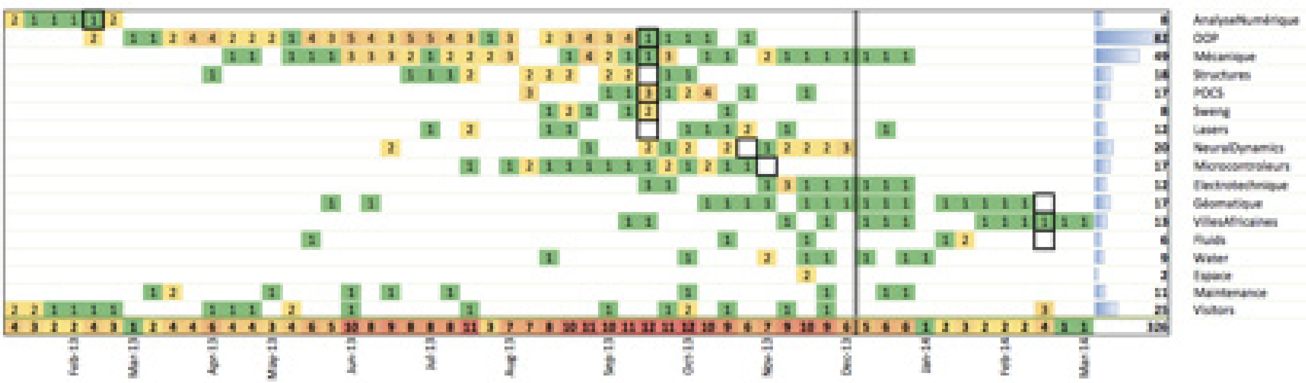

Figure 1. Studio usage from February 2013 to December 2013. Cells with a thick border represent the course starting date. Numbers represent the recording sessions per week. Numbers in the last column show the total sessions required per MOOC. Numbers in the last row summarize the studio occupation for each week. Numbers over 9 indicate overuse of the studio (i.e. more than nine half-day sessions in a week).

running and indicate which takes to keep with written or audio comments. The preliminary cut is then sent to the teachers for review. Teachers (or their assistants) watch the video and propose a list of changes. We have seen that reviewing videos takes a lot of time for teachers. The type and granularity of changes also varies a lot from person to person. Some teachers tolerate small glitches and hesitations, whereas others target a perfect diction. A priori, we favor lectures that retain some naturalness over book-like lectures, but finding the most effective format remains an open question for investigation. Finally, editors implement the changes and the CEDE team finalizes the video by adjusting audio and video quality.

We used a project management tool (www.trello.com) to streamline the editing process. Trello boards allow editors and teachers to visualize and centralize the editing process for each of the videos. A central repository for the state of each course allows an editor to quickly join the editing team of a MOOC, although this also presents some challenges. Indeed, editors negotiate a working procedure and editing rules with the teachers during their first iterations and establish a rather personal relationship. These rules allow the editing to proceed smoothly and efficiently. Changes to the editing team always met with resistance from teachers.

Student editors did a great job. All of them were video enthusiasts who already knew how to edit videos and quickly became efficient with the help and guidance from the CEDE video specialists. The downside of student workers is that they are not steadily available throughout the year. For instance, as exams approached (and the release date for MOOCs), their availability dropped from 40+ hours per week to a mere half day. We now have hired video editors as regular employees of CEDE to better absorb the variability of workforce availability. Students will still complement the team during peak production periods in the summer and the winter (MOOCs are released in Spring and Fall).

Studio design rationale

There are two approaches to designing a MOOC studio. The first approach starts from a TV studio setting and enriches it with teachers and the tools of their trade (blackboard, tablet, etc.). The technical sophistication of the TV studio allows adding drama to the course by placing teachers in virtual sets and by playing camera tricks like zoom in and out, traveling or camera switches. The general look and feel of the videos reminds viewers of the weather forecast or documentaries on TV. The second approach, which we took at EPFL, starts from a classroom setting and equips it with audio capture facilities. We placed the priority on teachers engaging with their content, delivering deep explanations, and accessorily learning to play in front of the camera. Accordingly, many aspects of the video production still have to be enhanced and worked on. Rather than opposing these two approaches, we believe that they are complementary in sustaining motivation and attention on the one hand and giving the content the level of detail it requires on the other hand.

1 Video Unit	
12 minutes video	One characteristic of MOOCs compared to traditional lecture recordings in the classroom is the relatively short duration of videos. We target 7-12 minute video clips. On some online platforms, the format is even shorter and is presented to the learners as a sequence of videos and multiple-choice questionnaires.
30 minutes studio	While it can take an afternoon for the first unit to be recorded, usually by the end of the recording phase, teachers reach a 2:1 ratio for recording time over effective video duration. The ratio depends on the level of preparation of the teachers. The most efficient teachers prepare their presentation offline and almost reach a 1:1 ratio in the studio.
4 hours editing	Editing includes the initial edit (2 hours), the review of the video by the teacher, the corrections (1 hour), and the the color and audio corrections before the file export (1 hour).
1 MOOC Week	
5 units	Teachers have noticed that the duration of the lectures is shorter in the studio than it is in a lecture hall. In general, 1.5 hours of live lecture becomes 1.25 hours of video lecture.
3 hours studio	Teachers record the equivalent of a MOOC week during one recording session that lasts from 3 to 4 hours.
20 hours editing	Color and audio corrections are made for several units at the time to obtain a better homogeneity. A video editor can handle 2-3 MOOCs at the time.
1 MOOC	
7 MOOC weeks	Short MOOCs last for 7 weeks and long MOOCs last for 14 weeks, the duration of a semester.
40 hours studio (1 week)	In addition to the effective recording time for the MOOC weeks, teachers need a couple of sessions to get familiar with the studio as well as some sessions to record corrections and complementary material.
4 weeks editing (1 month)	The minimum time required to edit a MOOC is around 140 hours, which corresponds about to one month of work. The typical production is however spread over a period of two month with one recording session per week and two days of work per week per MOOC for the editors.

Table 2. Key figures for the video production of a 7-week MOOC.

Teacher independence

At a beginning of a recording session, a video specialist from the Center for Digital Education sets up the lighting and the audio. Critical steps include setting the exposure for the camera to over-expose the white background and tuning the audio gain so as to avoid clipping. After the setup, the teachers start and stop the recording by themselves through a button press on the tablet. After each take, they can watch their recording and choose whether they want to keep the take or not. This tremendously facilitates the work of the video editors. A session lasts 3-4 hours during which teachers produce 1-2 hours of useable video material. At the end of the session, the material is copied onto an external storage for further processing.

High quality

We strive for professional picture and audio quality. This requires the use of professional equipment. The price of professional audio and video equipment can become very high depending on the level of quality. Since we are still developing the studio, some of our equipment is not yet up to the standards that we set ourselves. For example, the lighting kits and backdrops that we currently use, work well, but will progressively be enhanced and replaced by more robust and reliable material. A good approach is to rent material to test before purchase. Audio quality has been our main focus during early developments. The use of two decent microphones, a mixer and the isolation of the room with echo absorbent foam have tremendously enhanced the sound quality.

Flexibility

Some teachers want to sit, other want to stand. Some teachers want to appear a lot on the recordings while others simply want to annotate slides. Some want a green screen set because they want appear "standing" inside their content, while others need a white background. The studio has to be reconfigured for each session in a short time frame while retaining full functionality. To facilitate these transitions, we installed an aluminum structure in the studio that allows fixing lighting and cameras on "magic arms" (moveable holders which can be clamped to any structure, see Figure 2). Small custom-built tables are placed on the main table and allow teachers to place their laptop nearby.

Figure 2. The MOOC *studio in the Rolex Learning Center.*

Multisource

One of the "tricks" that is featured on EPFL MOOCs consists of the "invisible hand" effect (see links for a video tutorial). The hand of the teacher is recorded from above the tablet and mixed with the slide content by the video editors. As a result, students see the teacher writing and pointing at the content (See Figure 3). Eye-tracking experiments show that the deictic gestures are very efficient to attract students' attention to the important aspects of the slides (see link for a video demonstration).

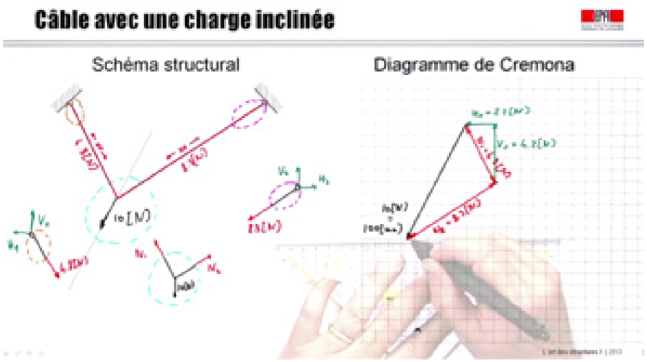

Figure 3. Invisible hand effect. In the course "L'Art des Structures" by Olivier Burdet and Aurelio Muttoni, the teacher is drawing a construction by using a protractor. The image from a camera placed above the tablet is mixed with the screen capture from the presentation software.

The studio we have used to record our first MOOCs is based on off-the-shelf screen recording software that allows the simultaneous recording of a camera and a screen. A single computer was used to produce (i.e. run the presentation software) and to record the course (i.e. run the screen recording). This solution, while economical and simple, has presented some limitations. First, the recording of the teachers' hand and face along with the screen capture involves three video sources and is not suited for a basic screen recording solution. Second, screen-recording software heavily compresses the video stream from the camera, which leads to substandard image quality. Finally, we installed custom software packages for some teachers that led to unstable recording performance (i.e. dropped video frames).

To alleviate these limitations, we are currently designing a multisource ingest solution that is based on the capture of three parallel SDI video sources and a separation of the production and recording units (see Figure 4). This solution will produce an automatic synchronization of the three sources and associated audio will save some time during editing and will also result in a better video quality. Technical details about specific hardware elements are beyond the scope of this paper but are available upon request at the CEDE.

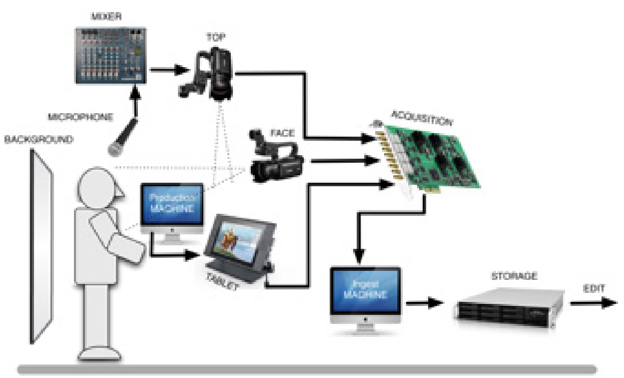

Figure 4. Multisource studio design. Three sources are the FACE camera, the TOP camera that captures the hand of the teacher over the tablet and the video signal from the tablet. Production and recording of the signal are assigned to two dedicated machines.

Reliability

Time in the studio is precious and the studio has to work at all times. From June to December 2013, the EPFL studio has been occupied for more than 230 recording sessions. At the peak of production, three sessions were organized every day, in the morning, in the afternoon and a late session starting at 5pm. Luckily, we did not experience major failures over the summer but it is definitely recommended to purchase extra light bulbs, a backup computer and if possible to have a spare camera.

Efficiency

The size of media files produced during the recording is very large (especially when recording to formats like ProRes) and network transfer rates (100Mb or 1Gb Ethernet) become a bottleneck. Video editors literally had to run around with external hard drives to get the data out of the recording station and take it to the editing stations. The large size of media also makes it unpractical to encode and decode video from and to a variety of formats.

It is most efficient to record the sources in the format that will be used during editing. We are currently setting up a fast networking (10 GbE) and storage infrastructure (32 TB) that will allow several editors to share a common disk space that can hold the large amounts of data. Our largest MOOCs take up 3-4 TB of storage space during editing. After production, we intend to store the rushes and master files for archival on long-term storage systems that require less speedy access. The students finally download 2-3 GB video files from the web to follow a MOOC.

Conclusion

Our first year of activity has helped us identify the main requirements of our MOOC production facility. We are currently consolidating these insights in setting up a production management solution that corresponds to the main stages of video production (record, edit, review, finalize, upload), implementing a multisource video ingest solution and centralizing the editing process around a high capacity storage solution.

The standardization of the production process and the professionalization of the hardware are necessary to produce 10 MOOCs per semester. However, no one rule will fit all teachers, topics and purposes. Producing a MOOC should remain an opportunity for teachers to rethink the way they teach. We have found that adapting to the constraints of the MOOC format helps teachers to redesign their course. This is only the beginning of the story. The biggest change for students following courses on campus is about what will happen in classrooms as a complement to the online MOOC offerings.

Links

Center for Digital Education, http://cede.epfl.ch, http://MOOCs.epfl.ch

Media Template, https://documents.epfl.ch/groups/m/mo/MOOCs/www/EPFL_MOOCs_Template_PDF.pdf

Invisible hand effect, http://www.youtube.com/watch?v=agbe9B5I_VI

Deictic gestures, http://www.youtube.com/watch?v=_8ev-qaA4TM

Open Online Courses in the context of higher education: an evaluation of a German cMOOC

Anja Lorenz, Daniela Pscheida, Marlen Dubrau, Andrea Lißner and Nina Kahnwald

Abstract: The Saxon Open Online Course (SOOC) project started in the 2013 summer semester. Students, university lecturers and informal learners participated in the course and learned by creating and designing the cMOOC by themselves. The main challenge was how to implement this open format in the institutionalized backdrop of participating universities. In addition to the general anchoring in the curricular context, the individual requirements of each institution needed to be considered. This paper discusses questions related to challenges for moderators and is primarily a presentation of results pertaining to student experiences. Based on qualitative and quantitative data, the authors formulate concrete recommendations for cMOOCs in the context of an institutional curriculum..

Introduction

Massive Open Online Courses (MOOCs) are currently one of the most popular trends in the field of technology-enhanced learning and higher education (Johnson et al., 2013). The main focus of the MOOC hype is currently on so-called xMOOCs: courses in the style of a formal lecture supplemented with self-study materials (mostly short videos sequences, with multiple choice tests in-between), (collaborative) tasks and group discussion. But the earlier and namesake course format for MOOCs were so-called cMOOCs (Liyanagunawardena, Adams, & Williams, 2013). cMOOCs follow the idea of connectivism (the first 'c' of cMOOC) and use decentralized communication platforms and channels such as social media to create a setting in which people can learn by sharing materials, discussing thoughts and forming relationships.

Following on from other German cMOOCs such as #OPCO11 (http://opencourse2011.de), #OPCO12 (http://opco12.de) and #MMC13 (http://howtoMOOC.org/), the #SOOC13 (http://sooc13.de/) tries to integrate the open online course concept into institutional structures by combining (previously informal) open online learning with the formal requirements of an institutional course.

The following section describes the course itself and is followed by a discussion of organizational, didactical and pedagogical challenges. First solutions are presented and evaluated by the results of three online surveys among the #SOOC13participants. The paper closes with guidelines for organizing cMOOCs in the context of higher education institutions.

The #SOOC13: Course Concept and Target Group

The Saxon Open Online Course (SOOC) is the first cMOOC format supported by institutions of higher education in the German Federal State of Saxony. Its aim is to investigate the potentials of connectivist MOOCs in higher education. Therefore the course topic 'Learning 2.0 – Individual Learning and Knowledge Management with Social Media' was chosen for the first run (#SOOC13 in summer semester 2013) in order to attract a wide target group consisting of students and teachers from different universities (in Saxony and beyond), as well as informal learners with different backgrounds.

Composition of Participants

With 242 registered users, of which 126 were members of the three participating universities (Technical University of Dresden, Technical University of Chemnitz and University of Siegen), the critical mass was reached (c. f. Downes, 2013). The amount of students enrolled in several courses of studies with these universities was 52.1 %. 75 students planned to earn ECTS credits and 22 of them actually finished the course successfully. Furthermore, 4 university teachers obtained a certificate from the corresponding federal training institution for higher education.

Inner Structure

To support the participants in planning their learning processes and managing their resources, we started and ended with in-class workshops which helped students to get an idea of cMOOCs and understand the #SOOC13course concept. Moreover, we offered a course structure of four sections focusing on different topics:

1. Learning 2.0: Theories and Approaches,

2. Tools for Individual Learning and Knowledge Management,
3. Requirements and Conditions: Legally, Politically and Personally, and
4. Learning 2.0 in Organizations: Future of Education and Training.

Each section lasts two weeks. At the beginning of each week the facilitators provided several texts, videos, links, reflection tasks and short impulses via the central course webpage (http:// sooc13.de) to motivate the individual learning process of each participant. Over the two weeks of the course section, there was further input from students as well as week or section summaries and respective expert talks and discussions.

Challenges of MOOCs in Higher Education: The #SOOC13 shaped by institutional constraints of universities

The conception and organization of connectivist open online courses in the context of higher education represent new challenges on institutional/organizational, didactical and pedagogical issues. Within this section we will give a short overview of the main challenges in these fields (for further discussion on challenges, see Pscheida, Lorenz, Lißner, & Kahnwald, 2013).

Organizational and Institutional Challenges

The implementation of the cMOOC concept into organizational structures of the higher education system can be rather demanding. To attain credibility, a course needs to address different disciplines and examination regulations as well as assessment strategies. Another problem is how to set up an assessment concept that also respects the openness of user-generated content. The main challenge is to figure out what kind of activity and workload is necessary for a given amount of credit points. Participants of the #SOOC13 could receive 1.5, 2, 3 or 4 credit points, and requirements need to be defined for each group.

There are additional costs for personal and technical resources. The preparation and implementation of a cMOOC is an especially time-consuming activity that cannot be realized by a single lecturer. Collecting input material, answering organizational questions, the continuous monitoring of participants' performances and finally reading and commenting on their contributions (blogs or twitter) can be a 24/7 job that needs to be shouldered by several collaborators.

Didactical Challenges

Regarding didactical aspects, difficulties arise in the area of target group orientation, competence orientation and academic approaches. Learners are asked to enhance and vitalize a cMOOC through their own contributions (texts, reflections, ideas, pictures, discussions, comments, etc.). Only vague educational objectives should be defined in advance, which often causes uncertainty for students who are faced with MOOCs for the first time. This challenge is proven within our evaluation: 49.9 % of respondents regard a more structured course as (very) important. Some of them mentioned that they miss formal feedback and prefer more pre-structured information.

The main didactical challenge was the question of the assessment of learning products and competence development of the participants within a cMOOC. A summative evaluation seemed to be inappropriate because participants had to work continuously on course topics. Some overall course objectives, especially participants' reflections on topic-related questions, collecting feedback on the use of course tools and the networks they build with others cannot be assessed by any study. For this reason, we decided to implement an e-portfolio concept, asking participants to collect, create, and reflect on different learning materials and products (see the later section on experiences).

Pedagogical Challenges

In addition to the above, implementing a cMOOC within the context of higher education is a challenge of motivation. Working from remote locations with only virtual contact and often asynchronous communication is still a completely new learning experience for most participants. Therefore it is an important that course facilitators consider how to constantly motivate learners to participate. They can ask about foreknowledge and interests of participants in order to adapt course content; we did this by asking about social media experiences in preparing workshops and initial evaluation. Moreover, the internal structure of the four sections were designed to motivate and to encourage learning activities by initial and summarizing blog post from facilitators, interim blog posts from one or more participants on the course page, lectures given by experts and several suggested learning activities.

The concentration on targeting is important to ensure an accurate feedback culture. Although there was no peer review concept, feedback among participants was motivated and did take place from the very beginning; but feedback was mainly implemented by course facilitators. This meant that participants were sure that their posts were read, a motivating factor that should not be underestimated. Last but not least, this implementation of feedback enhances the instructive role of the course facilitators which, if necessary, could mediate communication between participants. It is important to install a feedback system which supports learners' self-regulation but also underlines the presence of the organizing team.

Moreover, encouragement of the individual learning process has to be focused. According to the idea of cMOOCs, knowledge acquisition is based on exchange and networking, an ongoing activity driven by relationships and different perspectives (Johnson et al., 2013). Communication and collaboration are the main operators. Hosts of connectivist open online courses face the challenge of creating a stimulating learning environment that allows exchange, discussion and access to foreknowledge.

How to manage this? Experiences and evaluation results of the #SOOC13

The #SOOC13 was drafted as an experiment in teaching and learning to develop specialized solutions and approaches based on real-life experiences with a cMOOC in a higher education setting. The following section describes our approaches and experience in dealing with the previously outlined challenges. Furthermore, good or less-good practices are underpinned with results from three online surveys that evaluate the course: one at the beginning (n=99), one mid-course (n=20) and another at the end of the course (n=29).

Participation and Workload: Organizational challenges

A cMOOC is a time-intensive working phase for facilitators as well as for its participants. The main reason for this is the absence of a timetable structure. Participants have to decide on their own when, how often and how long they spend on course activities. There is no weekly lecture or class as there would be in formal study courses. When preparing the course, a weekly workload comparable to the participants' attendance in a 90-minute seminar was suggested, to consist of working with course materials, reading blog posts and writing a blog post. The results of our evaluation (third survey) show interesting differences in time investment (see Figure 1) among students that wanted to earn credit points or the teaching staff aiming to get a certificate for the course (n=16) in contrast to those participants who just take part voluntarily (n=13). While students and teachers normally invested 60 to 120 minutes per week (corresponding approximately with the duration of a traditional seminar), volunteers made very different time investment. Of those who invested more than 120 minutes per week, there were more voluntary participants than students and teachers.

Compared with the workload of a regular seminar (e. g. for a 1.5-credit point module a workload of 3:13 hours per week is calculated, c. f. European Communities, 2009), invested time was considerably lower. Nevertheless, participants perceive the workload as too high (cf. Schulmeister, Metzger 2011). Qualitative data analysis in particular shows that most of the students feel overworked and pressured. For example one participant reported (translated):

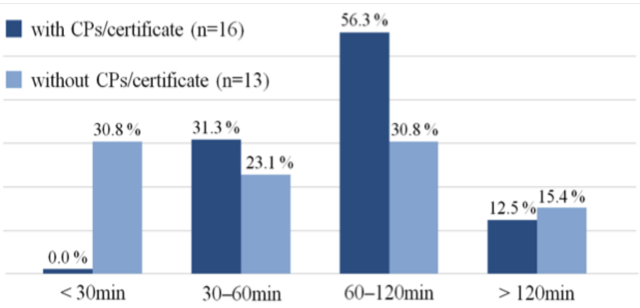

Figure 1. Workload of participants, distinguished by whether they aim for credit points/certificate or not

"What I do not like is the fact that it is not possible for me to keep at it because there are too many blog posts per week. Besides my own blog, I cannot recognize any discussions because I have not enough time to deal with the thousands of posts and comments written by others."

Moreover, the facilitators' workload must also be mentioned. Our team consists of seven persons (three lecturers and four teaching assistants) who planned, performed, maintained and evaluated the #SOOC13. Most of the time was spent searching for and providing learning material relevant to course topics and reading and commenting on blog posts. The workload of the latter depends of course on the number of participants. These staffing needs cannot be supported by the regular university system, because universities do not yet have financing models in place to address these costs.

E-Portfolios and Individual Learning Progress: Didactical Challenges

As mentioned in section 2, one of the biggest didactical challenges of the #SOOC13 was how to document and evaluate the performance of those participants who planned to receive credit points or any other kind of certificate. The evaluation of the participants learning outcomes was achieved by the e-portfolio concept. Participants were encouraged to collect material and write articles reflecting on several course topics. Moreover, some of them wrote introduction posts for the course page. All artifacts were reviewed by the facilitators and used as the basis for end-of-course assessment.

There was a special form on our webpage that was used to document participants' activities where participants had to submit their blog posts or other digital artifacts. This form aggregated all relevant work for assessment and ensured that moderators recognized learning products. Asking participants whether this solution makes sense (in contrast to gathering blog posts via the blog aggregator that collected contributions automatically via once-registered RSS-Feeds), the majority of the participants preferred this concept of using an e-portfolio form (55 %, n=20). At the end of the course, they were asked again about their satisfaction of the assessment via e-portfolios (n=29).

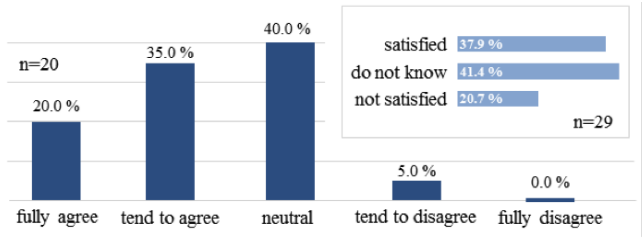

Figure 2. Attitude towards the e-portfolio form from the second survey (n=20) and the after-all satisfaction from the third survey (n=29)

Besides evaluation another important didactical aspect within a cMOOC is to ensure that participants experience a personal learning progress. This should be supported by in-class workshops for preparation as well as the continuous structure of each course section. Learners were later asked about the most helpful learning activities in that context (see Figure 3). As an example, learners rated the reading of official chapter introductions as the most helpful learning activity. 34.5 % fully agreed and 44.8 % mostly agreed that this supports their individual learning process. In contrast, only 3.5 %, i. e. one participant said that he/she could draw little or no value from the introduction chapter.

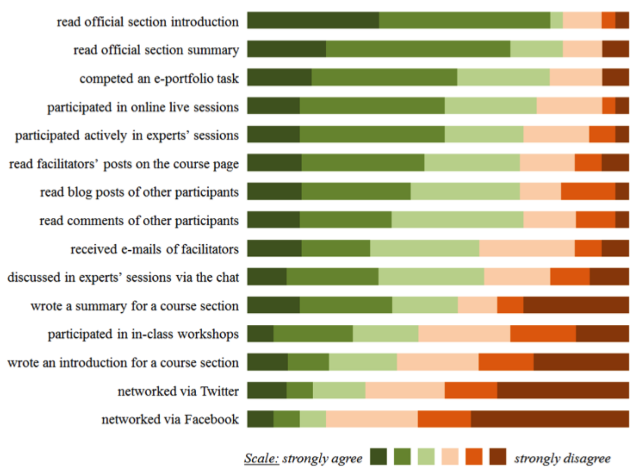

Figure 3. Did these activities support you in increasing your knowledge and experience? (n=29)

Motivation, Interests and Satisfaction: Pedagogical aspects

A basic idea of MOOCs is the open accessibility of the course. Regardless of learners' individual backgrounds and disciplines, the course is free of restrictions for participation which leads to a heterogeneous participant group. Learners had different foreknowledge on the topic 'Learning 2.0 – Individual Learning and Knowledge Management with Social Media:' 37 % had none, 53 % had some foreknowledge and 10 % had extensive prior knowledge on this subject (n=99). This leads to the question of motivation for course participation, as it can be assumed that other factors have influence. The survey results show that most of the participants took part because they were interested in the course format (42.3 %), were interested in the subject 'Learning 2.0' (39.3 %) and/or wanted to learn more about digital tools for learning (41.4 %).

Although the issue of uncertainty was a recurring topic during the course, more than 80 % of the participants mentioned that they liked the course structure (n=29). Only 17.2 % of those who finished the course were critical. Also 79.3 % thought the offered materials interesting. Moreover, 62.1 % said they felt that they met the requirements of the #SOOC13. Most participants (86.2 %) were satisfied with the support of the facilitators. Support from the SOOC Team seems to have been especially useful in clearing up uncertainties surrounding provided information and resources and the course blog, and was much appreciated. The majority (62.1 %) of participants felt well connected to the online community. Final evaluation shows that most of the participants who finished the course learned to deal with the open nature of their studies and used the opportunity to better understand online educational tools.

To summarize, participants should evaluate the performance of this open online course (n=29). 21 % of the learners found that the course was 'performed very successfully,' 45 % opted for the option 'performed successfully,' 24 % for the option 'performed fairly successfully.' The options 'performed rather poorly,' 'performed poorly,' and 'performed very poorly' were ticked by only one participant each (3.5%). About 8% of respondents did not give a response or ticked 'I do not know.'

Outlook: After the #SOOC13, before the #SOOC1314

The results of the evaluation indicate that the didactical and technical solutions used in the #SOOC13 were appropriate for a first run, especially the free text survey answers as they provided the course facilitators with valuable advice for the next course. Based on this feedback, the SOOC Team developed guidelines in four different fields for planning and conducting cMOOCs: communication, topics, assessment and media. Participants' comments are summarized in the following sections and the corresponding recommendations are derived from our conclusions. We have adopted them for our second course, the #SOOC1314, which started in winter semester 2013 and will run until the end of January 2014.

Communication

Transparent course objectives are one of the most important aspects to clarify before a cMOOC is run in an institution of higher education. Facilitators need to communicate topics for the thematic course sections more precisely. Not only do participants expect a clear frame for allotted tasks, they also wish to understand assessment criteria. Study program coordinators will also need a clear course description to decide whether they can recommend the course for their students or not.

The second issue is the need for a weekly topic summary written by the course organizers or, even better, by the participants themselves. The students tend to use the course blog as a starting point of more extensive discussions. In #SOOC13 it seemed as if the course blog was used solely by the facilitators to distribute information.

Topics

Individual interests should be considered and implemented in the thematic structure of the course. That is why it is not recommended to provide course material before the course starts (even though it was requested by some of the participants).

Another request from the #SOOC13 participants who responded was the balance between practical and theoretical issues within a topic. Facilitators should not only provide theoretical information but also present case studies and practical applications. Within the topic of the #SOOC13, the subjects of privacy and copyright as well as the experience of using of different tools for learning and knowledge management should be regarded more extensively.

Moreover, the topic of MOOCs itself is of great interest. Participants want to explore more on institutional consequences. As facilitators we informed the participants of the #SOOC13 that they are part of an experiment participating in a new online course concept. But as the discussion is ongoing we also recommended keeping room for MOOCs as a subject of the first course section.

Assessment

As explained above, participants wish to understand assessment criteria in order to earn good grades, particularly those aiming for credit points or certificates. Most of the participants claim that credit points are important motivational factors and that if there was no institutional certification they would not have taken part or would have been less active during the course.

In the special case of SOOC, where blog posts could be also part of any assessment, a separated form in addition to the blog aggregator can give participants more confidence that their contributions are recognized. IN additional, participants like to be informed regularly how well these subtasks are perceived, i. e. blog posts, tasks and comments.

Media

The results of the survey show that the participants were motivated to further explore or even use for the first time several communication channels and social networks. We therefore recommended Wordpress weblogs and Twitter as a starting tool kit for the #SOOC13. Whereas blogs were adopted very quickly by the participants, the use and concept of Twitter seems to be more difficult to understand. Using Facebook or Google+ might be more common for participants, but Facebook particularly conflicts with the open principle of cMOOCs. We thus recommend making it clear to participants that the online tools required for any given cMOOC are only to be considered a starting point, and that the use of other tools and channels initiated by participants are possible and welcome extensions to this course format.

Video conferencing software Adobe Connect was used for live sessions. Even though it is a commercial tool, it is free to use within German institutions of higher education and as a result has become the tool of choice for this open format. It provides a number of possible settings and features for presentation and discussion. Nevertheless, other examples such as #MMC13 show that other video conferencing tools as Google Hangouts on Air can also be applied to this scenario.

Last but not least, the blog aggregator is one of the most important features for the cMOOC. It supports participants as well as course facilitators by monitoring a huge amount of widely-spread blog posts.

Consequences for the #SOOC1314

The #SOOC1314 is a step forward from the #SOOC13. The structure is similar to the first run but the sections are updated, with some minor adjustments that reflect previous evaluation results. The title has been changed to 'Learning and Teaching with Social Media' to address (actual and future) teaching staff in schools and at institutions of higher education better than before.

Even though the focus added aspects of teaching, privacy and copyright still play an important role in the updated course. The selection of learning and information material provided to participants was updated and their other learning needs have also been taken into consideration.

The assessment process merits special attention as it was completely updated: the course facilitators give regular feedback for each blog post, task or comment via a badge system, whereas each contribution is awarded with

Figure 4. Did these activities support you in increasing your knowledge and experience? (n=29)

a bronze, silver or golden badge (c. f. Figure 4) indicating the quality of content and form of this contribution. Verbal feedback explains the facilitators' judgment.

Moreover, the motivation to integrate more course media and communication channels resulted in participants starting up a Google+ community and Facebook group. It is still demanding to monitor and give feedback on every channel which is only possible thanks to the enthusiastic and active course team.

We are thankful to the Saxony's Centre for Teaching and Learning (HDS) for financial support of the #SOOC13 and #SOOC1314 which will be (for now) the last SOOC run. The next challenge will be to find an appropriate business model to finance further iterations of the Saxon Open Online Course.

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Friendly Handmade Explanation Videos

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***Abstract:** MOOCs have further popularized the informal style of handwriting and freehand sketches that is the hallmark of Salman Khan's video lessons – a style that enables a unique combination of concise content, conversational, seemingly effortless presentation, and inexpensive media production. This paper provides an overview of techniques concerning the didactics and the visual presentation developed and/or used by the author in almost five years of creating thousands of such videos in a range of settings from the flipped classroom to a MOOC, mostly focusing of topics related to mathematics for engineers. This paper illustrates a number of principles by examples, shares tricks and lessons learned, and discusses relevant literature on illustration and on learning research.*

Key words:
Khan-style videos, visualization, sketching

Aiming too High or too Low

"It has the words DON'T PANIC inscribed in large friendly letters on its cover." This outstanding feature of the Hitchhiker's Guide to the Galaxy (Adams, 1979) is rarely found in STEM courses, especially courses in mathe-matics and physics. Explanations given in such classes often appear to be hostile rather than friendly, so to speak. For an example of such an explanation that confuses even people well trained in mathematics, consider what Wikipedia has to say about the set (technically called TxM) of vectors that are tangent to a manifold (which is a generalization of a curved surface) M at a point x: "Consider the ideal, I, in $C^\infty(M)$ consisting of all func-tions, f, such that $f(x) = 0$. Then I and I^2 are real vector spaces, and TxM may be defined as the dual space of the quotient space I/I^2." (Wikipedia, 2013) This is exact and concise and may therefore be appropriate for an ency-clopedia, but it does not provide any intuition on what happens here, particularly in terms of geometry, even though tangent vectors are supposedly highly geometrical objects. Students of engineering or physics tend to be put off by such explanations and demand more vivid presentations. They want to know about the Why and the How. In earlier times, students may have been expected to start from such an abstract presentation and work out the intuitive meaning on their own – which is a valuable exercise, if the students actually accomplish it and don't give up on the way.

Although abstract formal definitions and derivations may be of little value for learning or may even appear frustrating, they are still explanations. Another mistake is to present recipes rather than explanations: "The cross product of two vectors is defined as follows: …" with no hint of an idea where the given equation comes from and why such a mathematical construct makes any sense at all. This teaching style fosters shallow learning and makes students mindlessly plug values into formulas, as they hardly know anything else about those formulas.

Textbooks, as well as lectures, succumb to both mistakes: intimidating abstraction as well as shallow recipes. A third type of issue can be seen in popular science, in particular in television programs: Aiming to at-tract a broad audience (As many MOOCs do nowadays?), such programs tend to suffer from oversimplification and, hence, pseudo-explanations. For example, consider the Higgs boson confirmed at CERN in 2012. In popu-lar media, its particle field is described as "cosmic molasses". A motion in molasses would, however, cause a particle to continuously lose speed, which is in contrast to the behavior of elementary particles. (For a discussion of real-world analogies for the Higgs boson, see Alsop & Beale, 2013).

The New Style of Educational Videos

The advent of user-produced educational videos has opened the floor to new visual and didactic styles, as exem-plified by Salman Khan's success (Khan, 2012) with screen recordings of electronic scribbles resembling a blackboard, accompanied by his voice but no visible face. Publishing houses and some universities are refrain-ing from such a handmade, informal and possibly "cheap" look. Yet MOOC providers – in particular Udacity – have made it a central element. This visual style is a key enabler for concise, easy-to-grasp explanations that look (and often actually *are*) improvised. It would seem odd to see such explanations as printed texts or as high-ly prepared PowerPoint presentations. Many providers of remedial instruction have also adopted this visual style, even though in these cases, it tends to focus on recipes rather than on explanations.

Video has several benefits over text-based material, at least on the surface. (For a number of caveats, see the section "The bigger scope" of this paper.) Video makes it easier to show processes such as chemical re-actions or mathematical derivations; it facilitates addressing the learner in a (seemingly) more personal way; it requires reducing the amount of material to make it fit on the screen; and it hinders skimming through a lecture – which may or may not be perceived as an advantage. Today's technology – comprising inexpensive graphics tablets, screen recording software, and web sites such as YouTube – supports users with little technical training in producing Khan-style videos efficiently, even more efficiently than producing regular text documents: Just imagine having to type mathematical equations and having to create "print-quality" 2D and 3D diagrams. Of course, video also has substantial downsides: In particular, it may lead to students' "unlearning" how to read and understand complex texts; it consumes a huge bandwidth (which is scarce in Africa, for instance); it is time-consuming to review, edit, and translate, even if the translation only consists of subtitles.

Principles for Friendly Explanations

This section presents principles that I developed and applied over the course of almost five years, producing such videos in a range of settings. Most of my almost 2500 YouTube videos are live screencast recordings of lectures and of worked examples from flipped classes (Loviscach, 2013) in mathematics and introductory com-puter science conducted in German in the first and the second year of a bachelor's program in engineering. In addition, my "Differential Equations in Action" MOOC went online on Udacity in September 2012.

Answer: "What for?"

The introduction of terms and/or methods requires an understandable, not too sketchy answer to the question "Why?" early on. In contrast, an apologetic "You are going to need that later." provokes shallow learning. The same is true for hand waving such as "You are going to need derivatives to compute how to shoot a rocket to the moon."

Here are two examples from college algebra and calculus:

Literally, 0^0 mean to multiply zero factors of zero, which does not make much sense on first sight. So why would we *not* leave this expression 0^0 undefined but rather set it to 1? Because we are lazy (a reason well received by students) and don't want to treat x = 0 as a special case when writing expressions such as $3x^2+5x^1+7x^0$.

Why does it make sense to introduce that strange number 2.718… found by Euler? Because it leads to the first exponential function of which we can compute the derivative without further tools; hence, this number is vital for all models of (exponential) growth processes. (This reasoning is best made with diagrams, rather than words; see the next principle.)

"Prove" with Diagrams

Depending on the situation, a diagram may not be proof in the strict mathematical sense, but it can be good enough to make a statement obvious. A diagram can show a vivid idea of what's happening and instill intuition. As a result, a diagram may even be preferable over a formal proof in the context of many explanations. Figure 1 shows such an explanation: In calculus, the product rule for derivatives can be read off from the area of a rec-tangle the sides of which are changing their respective length.

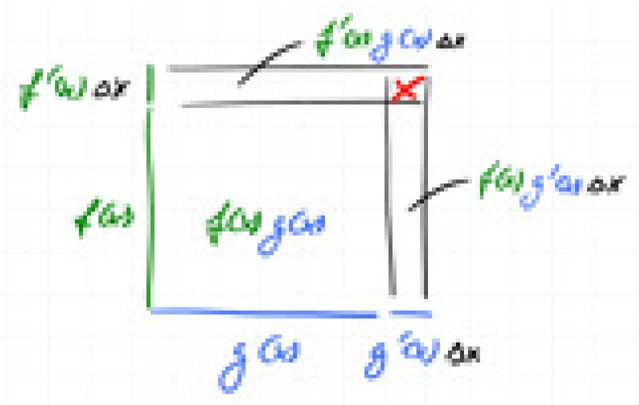

Figure 1. The product rule for derivatives: The product $f(x)g(x)$ can be interpreted as the area of a rectangle with varying side lengths. When these lengths grow by a little, the area will increase by one rectangle on the top, an-other rectangle on the right flat and a negligible rectangle on the top right.

A supposed "proof by diagram" may miss a hidden special case. The instructor needs to point out this fallacy. Finding cases that are not covered by a given diagram may constitute a discovery-learning task assigned to the users of a MOOC.

Think like an Engineer

Formal strictness tends to stifle understanding. Engineers and physicists take far greater liberties when deriving properties or solving equations than mathematicians do. In calculus, for instance, rather than proving the chain rule with the help of limits, one can discuss Figure 2.

Lack of mathematical rigor does, admittedly, come at a price. Richard Feynman, renowned for his informal but insightful derivations in theoretical physics, spent years trying to explain superconductivity by assuming that, as usual in physics, a perturbation analysis works for this

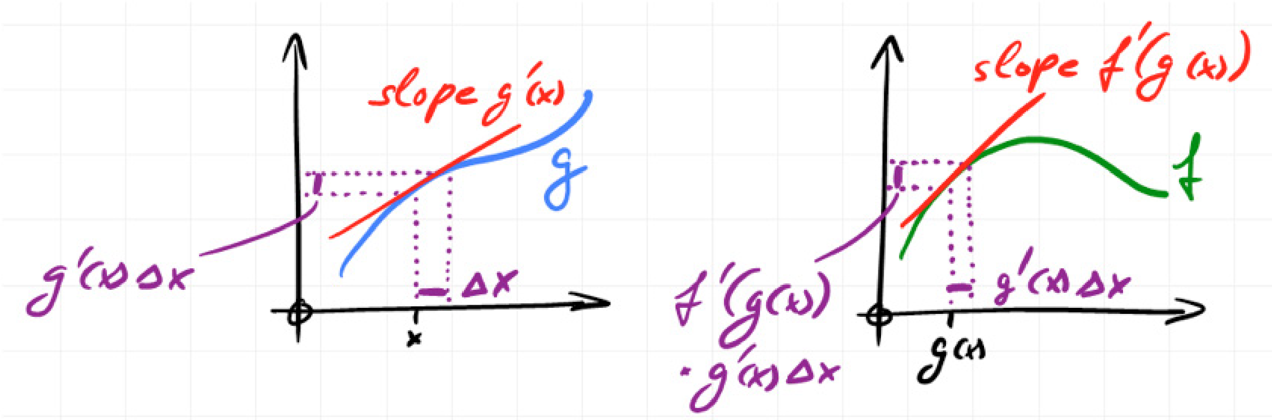

Figure 2. The chain rule for derivatives: The left diagram shows how a small change in x leads to a proportional change in g(x). The right diagram shows in a similar fashion how the resulting change of $g(x)$ affects $f(g(x))$.

problem, too. Regrettably, it doesn't. The Nobel Prize for the explanation of superconductivity went to somebody else (Goodstein & Goodstein, 2000). Luckily, mathema-ticians have invented a number of devices to turn informal, engineering-type explanations into rigorous proofs. In the example shown in Figure 2, the addition of the "little-o" expression $o(\Delta x)$ would make the resulting ex-pressions mathematically correct.

Be Concrete

Could there by anything more prone to provoke math anxiety than algebra with lots of variables and fancy sum-mation signs? In introductory classes, it is far friendlier to discuss how to simplify $3^2 \times 3^5$ rather than to do the same for $a^b\ a^c$. The students can easily generalize the result ob-tained with actual numbers. Of course, the instructor has to make sure to use a generic case that clearly shows the general rule. $3^3 \times 3^3$ and $0^2 \times 0^5$ may be confusing. Quizzes can ask the user to deal with and/or to find such "bad" ex-amples. In derivations that may look overly complex from the viewpoint of the learner, some of the variables can be turned into actual numbers, as shown in Figure 3. Also note how the "unfriendly" summation symbol is replaced by ellipses (i.e., three dots).

Embrace Symmetries and Analogies

Symmetries and analogies are great mnemonic and think-ing devices. They should be exploited to the fullest extent. In particular, visual representations should reflect sym-metries of the depicted objects and/or constructs. Figure 4 shows a Minkowski diagram, which is typically used to explain the special theory of relativity. The Loedel diagram (Amar, 1957), however, makes the equal status of the sys-tems (x, ct) and (x', ct') obvious.

Analogies are (near-) symmetries on a deeper level and can often be presented in a graphically symmetric fash-ion. In physics, one can juxtapose the derivations of the preservation of linear momentum and of angular mo-mentum. In mathematics, integer numbers and poly-nomials can be compared: Both types of objects can, for instance, be divided by the same type of object, typically leaving a remainder; they can be factored into primes. However, analogies are a double-edged sword, as already

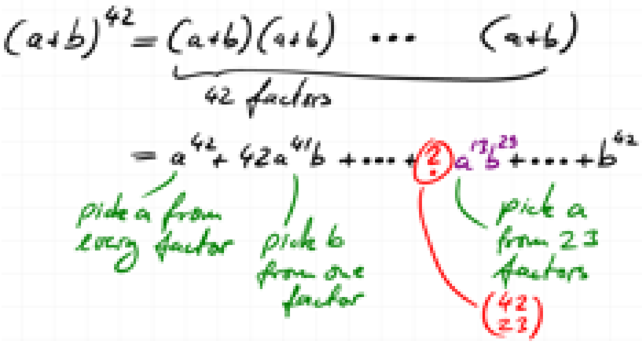

Figure 3. Rather than explaining how to expand an 'arbitrary' power of a sum, it is better to indicate the process with, e.g., the 42th power, thus relieving the learner's working memory of the burden of one additional symbol.

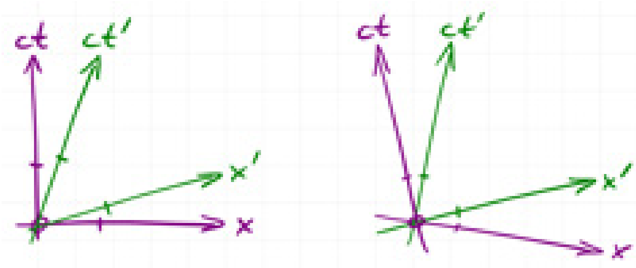

Figure 4. A Minkowski diagram (left) hides the equal status of the primed and the unprimed coordinate frame; a Loedel diagram (right) manifestly shows it.

mentioned for the “molasses” picture for the Higgs boson. Typically, one will have to use a number of analogies to capture a phenomenon to the full extent needed (Harrison & Treagust, 2006).

Explain even if a Recipe would be Really Simple

It is tempting to present recipes rather than explanations to get the teaching done quickly. Mathematics text-books tend to give the simple equations to be memorized for the dot product, the cross product, and the determi-nant. Connections between these three constructions are then pointed out only in hindsight. This way, the con-nections look like more incoherent facts to be memorized, appearing accidental rather than fundamental.

Beware of Elegance

Elegance is one of the tenets of mathematics as a science. “Elegant proofs”, however, tend to feel like watching someone pull a rabbit out of his hat, which is not fostering understanding. As an example, consider this ultra-short proof which is perplexing even for the mathematically trained: “There are two irrational numbers x and y such that xy is rational. Proof: If $a = \sqrt{2}^{\sqrt{2}}$ is not rational, then $a^{\sqrt{2}} = 2$ is.” (Ngo, 2012) Some sleight of hand may, however, be so impressive and concise – once one knows the trick – that it has didactic value. For instance, de-riving the power rule for differentiation is a snap with $x^n = (e^{ln(x)})^n$ and the chain rule. In school, one tends to proceed in a much more clumsy fashion.

Provide Stepping Stones

What’s better than an explanation for some relationship? – One explanation for *several* relationships! For in-stance, one can prove that the sum of the interior angles of a triangle equals 180° by noting that, when walking around the triangle, one makes a full turn. A little diagram shows that one’s total turning angle and hence the sum of the supplements of all interior angles must equal 360°. This can easily be generalized to polygons. An-other example: The circumference of a circle is the derivative of its area with respect to its radius. Once one has understood why that is the case, it’s obvious that one can compute the surface area of a sphere by forming the derivative of its volume with respect to its radius. Such generalizations lend themselves as quizzes for a MOOC that aim at discovery learning.

Graphics and Production

Graphics design offers many guidelines to be inspired by. Obviously, similar things should appear in a similar fashion and dissimilar things in a dissimilar fashion (e.g., draw vectors in green, draw curves in blue; to simplify an equation; use a green squiggle as a placeholder for a longish term written in green in the original equation). Gestalt principles as established in graphics design go much deeper than that. In addition, perspective drawing isn’t so much an artistic challenge rather than the application of simple techniques such as rendering objects in the background with thin outlines that vanish before touching contours in the foreground, so as indicate a “ha-lo”.

Craftsmanship implores the instructor to never show open menus in the screen recording, to never start with a blank screen, to use his or her hand(s) not only for writing and drawing but also for pointing, and to strive for best legibility. The latter demands a decision whether to use cursive handwriting (which has largely disap-peared from schools’ curricula), printed handwriting, or something in between. Freehand, slightly imperfect lines and circles also demand practice but blend better with handwriting than perfect geometric shapes do. A light, coarse grid helps to prevent writing at an uphill or downhill slope. The grid can be removed in post-production simply by slightly increasing the brightness and/or the contrast; it may, however, also be worthwhile to keep the grid as a graphical element in the final version of the video to prevent showing a blank page. In a similar vein, lecturers hesitant to omit material or to garble up their screen layout can create a sort of tele-prompter for themselves: Prepare the text to be written and the diagrams to be drawn in a light color on the screen; then start the recording and redo the writing and drawing in the correct, dark color; finally remove the light color in the video editing software.

When recording screencasts in the studio or in the office, many lecturers (including me) are tempted to redo almost every sentence, aiming for perfection but never reaching it. This easily expands the length of the recording session by a factor of five and demands much goodwill from the person editing the video (in case the lecturer does not do this him- or herself, like I do for my classroom recordings). Recording in front of a live audience, even just an audience of one, goes much faster, leads to better “stage presence”, and allows spotting blunders in content, didactics, or presentation instantly rather than after the video has been edited.

YouTube shows a wide variety of visual styles: Salman Khan’s screen recordings with a black back-ground and colorful writing and drawing; RSA Animates, which are illustrated talks with highly artistic draw-ings on a whiteboard, presented in time lapse; Udacity’s filmed hand that appears behind (!) a screen recording; Common Craft’s blend of drawings, paper cutouts and hands; Vi Hart’s time-lapse recordings of paper and pen-cil. Although the online format allows for ample creativity, instructors can look to the experiences of those in other fields for guidance on the presentation of their material. For instance, the authors of comic books have dealt with highly stylized representations for decades (McCloud, 2006). Much advice also comes from data vis-ualization; for instance, the data-ink ratio needs to be maximized (Tufte, 2001), meaning in particular that empty space is to be favored over dividing rules. Roam (2008) provides guidelines on how to organize ideas into free-hand sketches. Summarizing his extensive research, Mayer (2009) proposes several principles for multimedia-based instruction, most of which are naturally fulfilled by explanation videos as discussed in this paper.

The Bigger Scope

The trend to abandon challenging textbooks and lectures and to embrace easygoing explanation videos has some perils: Students may not learn how to work with less "friendly" material; they may not develop the grit (Duckworth, 2013) needed for advanced tasks. One may even argue that a primary objective of higher education should be to equip the students with the ability to work with "unfriendly" material.

It has long been known in educational research that learning requires work. This is the rationale behind "desirable difficulties" (Bjork & Bjork, 2009) and the "amount of invested mental effort" (Salomon, 1984). However, rather than making explanations indigestible, in a MOOC-style course one can offer quizzes to reach the required level. (A different question is whether or not the audience accepts difficult quizzes as parts of a course, in particular in the setting of a MOOC. This is a tricky issue.) Another caveat: Slick explanations may falsely confirm students' misconceptions if no special precautions are taken (Muller, 2008). And, finally, as huge numbers of "thumbs up" for pseudoscience videos on YouTube demonstrate, a substantial part of the audi-ence may be deceived by a misguided or even malevolent application of principles as the ones described above. Even the (hopefully) reduced content and unconvoluted style of explanation videos may be prone to hiding non-sensical statements behind a seductive presentation as known from the Dr. Fox effect (Natfulin, Ware & Doenn-ly, 1973).

The Bigger Scope

Dead symbols on the page of a book or on a PowerPoint slide – or vivid, conversational explanation videos? To most students, this is an easy choice. This paper has presented a range of ideas how to create such friendly ex-planations by pointing out didactical approaches and sharing ideas for the implementation in terms of graphics. Some of the guidelines can be applied in isolation, for instance in textbooks. Implemented with video, they can help produce explanations that are friendly in terms of both visual style and didactics.

The informal style takes much work out of graphics production and video editing. Thus, hopefully, even more effort can be invested in the content and the didactics. In my view, way too much time is spent on preparing presentation slides and far too little time is used to search for and develop good explanations. As the quote that is (mistakenly?) attributed to Albert Einstein goes, "If you can't explain it simply, you don't under-stand it well enough."

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Designing for the Unknown Learner

Hamish Macleod, Jeff Haywood, Amy Woodgate and Christine Sinclair

***Abstract:** University teachers are faced with the problem of "knowing" their learners when teaching on a MOOC. This paper explores what the University of Edinburgh has come to know about its recent MOOC participants, highlighting one particular course described by some participants as "a cMOOC on an xMOOC platform". The paper draws attention to barriers and enablers from co-existent understandings and expectations of course design, and from an abundance of highly-qualified participants. Demographic data suggest areas worthy of further exploration. Characteristics of people who claim to have found the MOOC a positive experience are compared with those who have not. Mixed messages about teacher presence may have implications that go beyond MOOCs. The authors contemplate whether MOOCs engender a "cohort effect", or whether the participant group should better be thought of as a single massive multivocal entity.*

Introduction

"Know your learner" is a popular exhortation in course design manuals (see for example, Biggs & Tang, 2011). It emerges particularly from a constructivist view of learning: a perspective that recognises that learners bring existing knowledge to their new educational experience and actively build on this to construct their new learning. Constructivist approaches are particularly associated with a technology-supported learning environment (Selwyn, 2011). When that environment supports many thousands of participants, however, questions arise about how well the learner can be "known". The authors of this paper espouse a social constructivist perspective and we explore how this was tested during a recent experience of teaching on a MOOC, while watching the experience of colleagues working on parallel but quite differently conceived and constructed MOOCs.

Course design is inevitably influenced by the designers' underpinning values and beliefs about learning (Toohey, 1999). These may engage different focuses: for example, disciplinary content, student performance, reasoning, knowledge construction, experience, inquiry or social justice. As there may be many different people who have a stake in the design of any course, this can mean that there are tensions between these differing perspectives. The constructivist perspective might be distinguished from a more traditional instructionist philosophy of course design where the curricular content is "transmitted" from the teacher to the learner. Online, instructionist courses will emphasise carefully structured content and frequent testing of learners to check that that the content has been absorbed and retained. It might be performance driven, with an emphasis on very tightly worded learning outcomes or behavioural objectives.

The focus for the constructivist is rather on the nature and needs of the learner, emphasising knowledge construction and accommodating new learning with existing knowledge. Outcomes are then more loosely defined, if at all. The course designer's job is to create appropriate tasks to set before the learner; the role of the teacher is as an "orchestrator of experience" (Caine & Caine, 1994). Further, the sociocultural elaboration of constructivism suggests that this active learning is best conducted within a social context, in which learners work together to explore their developing understanding, through the tutorial engagement of teacher and student, or in an ongoing ballet of reciprocal peer tutoring, in which the learner is supported by a peer or colleague more knowledgeable in the immediate epistemological domain. Author and online activist Cory Doctorow famously and succinctly sums up this pattern of experience: Content is not king. Conversation is king. Content is just what we talk about.

This paper draws on some conversations among MOOC participants, their teachers and the public to explore how those participants are constructing their understandings of the MOOC itself. It considers how teachers and course designers attempt to get to know their learners at scale. This is set in the context of a University supported initiative, enabling us to draw insight from not one but six very different courses, led by academics from across the University of Edinburgh's three Colleges. We explore what we know about learners who chose to participate in MOOCs at the University of Edinburgh – who they are, why they did a MOOC and what they thought of it. We particularly highlight one of these six courses – E-learning and Digital Cultures – where the tensions between a social constructivist perspective and an instructionist-inspired platform have had an impact on both design and delivery of the course. We ask what was distinctive about the participants on this course and ultimately question whether the learners we have started to get to know are similar to those who are likely to come later – and indeed whether they were the students for whom the course was originally designed. As educators, we are having to revisit our own perspectives on course design to take account of this new environment for our work: our first cohort of students has been doing this as well.

Competing models of course design

The idea of the MOOC emerged as a response to the power of networked connectivity as an engine to drive highly motivated, personally relevant and socially situated learning. While this shares some of the precepts of social constructivism, there are those who argue that a new paradigm is required for thinking about learning (and therefore course design) for the 21st century (Siemens, 2005). The theory of connectivism espoused and practised by George Siemens and Stephen Downes in the initial phase of MOOCs has been contrasted with the model of teaching exposed through the burgeoning MOOC offerings coming from organizations such as Coursera, Udacity and EdX. Certainly on the surface these appear to be rather instructionist in their conceptualisalization. Although liberal and inclusive in intent (often promoted as addressing global problems related to lack of access to educational opportunity), their combination of curation of resources and administration of objective testing presents a very different picture of the potential of the online, the open, and the massive from that of the original MOOCs. This has led George Siemens (2012) to coin the distinction between the original cMOOC (connectivist) and the xMOOC (continuing a pattern started by EdX with a more traditional focus on "knowledge duplication").

Thus, although MOOCs are just a few years old, by 2012 there were already many competing pedagogical approaches underpinning their course design. This opened up scope for confusion in terms of expectations and norms in relation to MOOCs. When they signed up to run six distinctive MOOCs through Coursera, managers, teachers and administrators at the University of Edinburgh discovered that there were distinctive participant expectations of how courses would operate. These expectations came not only from previous experiences of MOOCs but also from previous experiences of being a student in more conventional academic settings. In addition, the Coursera platform encapsulated some of the xMOOC practices in the affordances it provided for materials and activities. While very open to new ideas, Coursera were clear about their expectations of professional-level video recordings (usually very content-based), objective computer-marked tests and peer-assessed assignments.

The University of Edinburgh's report on its first run of MOOCs (MOOCs@Edinburgh Group, 2013) draws attention to the different approaches to course design and structure adopted by the experienced teams: two from each of the University's three Colleges. Table 1 is taken from this report and illustrates considerable variation; the E-learning column stands out as particularly different because of the novel curriculum design of the E-learning and Digital Cultures MOOC. Rather than video lectures, the team curated, introduced and questioned freely-available short films and academic literature to form the content of the course.

Table 1: Comparison of course structures employed across Edinburgh MOOCs

Course structure	Equine Nutrition	AI Planning	Astrobiology	E-learning*	Critical Thinking	Philosophy
Number of academics	1	2	1	5	5	7
Number of teaching assistants	4	3 (+ 20 Community TAs)	2		2	4
Total team	5	6	3	5	7	11
Length of course (weeks)	5	5	5	5	5	7
Total number of videos	14	80	32		15	36
Total length of videos (minutes)	211	674	326		109	239
Average length (minutes)	15	8	10		7	7

**E-learning & Digital Cultures used a novel curriculum design. Source: MOOCs@Edinburgh Group, 2013, p.11*

Some experimental use of media and activities occurred across the six MOOCs, but the team for E-Learning and Digital Cultures (soon abbreviated to EDCMOOC) extended the scope of their design well beyond the Coursera Platform. By using blogs, Twitter, Google hangouts and other social media, the team encouraged connection among participants in ways more in keeping with a cMOOC approach. Indeed, the participants connected themselves – and then reported that EDC was a cMOOC on an xMOOC platform: see Sara Roegiers' blog: http://sararoe.wordpress.com/2013/02/27/on-how-edc-MOOC-did-a-cMOOC-on-coursera/

Who comes first to an "open" course?

Sara's blog itself provides an example of how the work extended beyond the Coursera platform, and also points to the fact that many of the participants of the first run of EDCMOOC were students and educators. Though the course was aimed at people interested in education as well as digital culture, it was designed to target a first level undergraduate group. However, an initial survey by the University of Edinburgh of those who had signed up for the MOOCs indicated that 61 per cent of participants on EDCMOOC had postgraduate degrees and 60 per cent were employed in education. Across the six MOOCs, education was an area of employment for just 17 per cent of participants and those with postgraduate degrees were just 40 per cent, though this latter is still much higher than the rhetoric about MOOCs might suggest.

The educational focus of EDCMOOC certainly meant that teachers were attracted who were themselves already engaged in or contemplating MOOC activity. A number of participants reported in blogs and forums that they were not "typical" learners as they were just looking in to find out what all the fuss was about. There was much existing knowledge about the topics presented and even the activities involved were not really new to them. While the openness of a MOOC means that the university does not exclude participants on the basis of low previous academic achievement or experience, it also cannot exclude participants who have the benefits of high levels of previous academic experience. This raises the question: is it possible to build a learning environment in which all levels of previous experience can profitably and creatively interact? It could be a marvellous opportunity for reciprocal support and benefit.

It is important to acknowledge, however, that at this early stage we do not know how typical these patterns of participation are. It may well be that those who come first to an open course turn out to be very different from those who come later.

Issues raised by demographics of participants

The University of Edinburgh's participant survey and exit survey of people who had signed up to its six initial MOOCs brought out a number of important issues, including: educational achievement, employment, age profile, nationality, previous experience of MOOCs. The Coursera MOOCs of course have their "home" in the United States, and it is no surprise that the US was the top country of residence by a long way, at 28 per cent. The UK was second at 11 per cent. However, it was still the case that the majority of participants were non-US: a thought-provoking observation made to some members of the EDCMOOC team during a subsequent review activity. There was also a lot of variation across the MOOCs. An interesting feature is that AI Planning had only 16.7 per cent from the USA and 4.2 per cent from the UK. Although still not large, this course recruited a larger proportion from China (1.3 per cent).

The low recruitment from China is also reflected in online distance courses at the University of Edinburgh. While China is second only to Scotland in recruitment to campus-based Masters programmes at Edinburgh (Scotland 1419, China 1022), when it comes to online Masters the figures are starkly different (Scotland 243, China 4). This does suggest an issue worthy of further exploration.

Care needs to be taken over drawing implications from the demographic statistics as many questions can be asked about what is not there. For instance, very few respondents to the Edinburgh survey said that they had "never logged onto the course once live" (MOOCs@Edinburgh Group, 2013) and yet we know that only 40% of those who enrolled accessed the sites in the first week. Those who never accessed the site then become a very large proportion that we know little about.

While the above also suggests caution in claims about learner satisfaction, it is perhaps reassuring to know that 98 per cent of exit survey respondents indicated that "they felt they got out of the course(s) what they wanted". What they wanted was mainly to learn new subject matter and to find out about MOOCs and online learning. The MOOCs@Edinburgh Group report concludes that: "It is probably reasonable to view these MOOC learners as more akin to lifelong learning students in traditional universities than to students on degree programmes, which is a common comparison being made" (P.32).

What kind of learners (dis)like MOOCs?

While the positive messages about MOOCs were generally reflected in the EDCMOOC, 7 per cent reported finding their overall experience "poor" (see Figure 1), which is possibly slightly higher (though still low) as compared with the other five Edinburgh MOOCs.

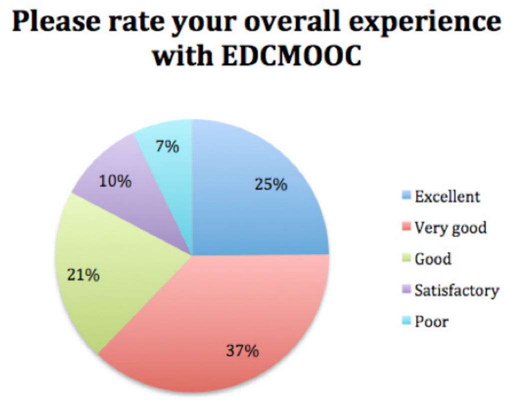

Figure 1. Overall experience.

The hybrid nature of EDCMOOC – (arguably) a connectivist MOOC on an xMOOC platform – brought out both strongly positive and strongly negative feelings, which were vocally expressed in the discussion forums, publicly accessible blogs and in the exit evaluation. It has been important for the team to be able to contextualize the more extreme comments by considering the satisfaction levels represented in Figure 1. Comments that praised EDCMOOC for taking a "connectivist" stance contrast with those that criticized lack of teacher presence and lack of structured content. While some participants loved the creativity and opportunities to follow their own interests, others derided the chaos and complexity that left them not knowing what they "should" be doing. Some welcomed the links with many other people; others immediately recommended ways of making the massive more manageable – "I'd love to be put in a group". The themes of digital utopia and dystopia – part of the object of study in the MOOC – were mirrored in analyses of the MOOC form as the future of education. In short, two broad frames of reference, the social constructivist and the instructionist, seemed to be in tension. Blogs and forum posts began to be populated with guidance for coping at scale, advocating either a more relaxed approach or a more structured one. Some of this advice is feeding into the development of MOOCs in general as the EDCMOOC has spilled out into public discussions, especially with a continuing Twitter presence at #edcMOOC.

The course design team have been reflecting on their experience, aided not only by this continuing stream of commentary but also by dialogues with colleagues who have invited us to speak at conferences. We've pondered the evidence that some students may have had a wonderful experience but did not actually "get" some of the key messages. We have been contemplating ways of supporting "lost" learners and having a greater presence at scale without compromising our view that digital education can be the privileged mode of learning, rather than a deficit-laden one. The MOOC as a structure is an opportunity to explore this precept further: getting to know what our unknown learner (dis)likes is part of this, but will not mean trying to please everyone in the long run. We conclude by suggesting an alternative way of viewing the seemingly insurmountable problem of differing perspectives (which of course are much more nuanced than the cMOOC and xMOOC binary leads us to believe).

The unknown learner as a massive multivoiced entity

If the MOOC is simply a commodity, then strategies to maximize the "likes" over the "dislikes" will be sought. This tendency can be seen in the agonizing over retention figures on MOOCs. However, getting to know who has been on the EDCMOOC is bringing to light an important feature of the unknown learner (and, as so often happens with digital education) one that has always been there: when there are a lot of learners we will be unable to reduce them to one set of characteristics. As Knox (2013) advocates, it is now time to "embrace the massive". A member of the EDCMOOC team himself, Knox proposes that rather than trying to fix the problems caused by having so many unknown learners, we should explore and harness what we can do at scale.

Knox is not alone in seeking an alternative to treating the unknown learner as a single being. By avoiding binaries of the one and the many, or by seeking to resolve them, we are missing the opportunity to recognize the dynamic of the interanimating voices (Bakhtin, 1981) that have long awaited an opportunity to be fully heard. Writers who conceptualize digital engagements as participation in a global dialogue (for example Evans, 2008; Wegerif, 2013) offer frameworks that might support new ways of thinking about designing our MOOCs that do not rely on an individual simply receiving, constructing, connecting and performing – from, with, and to other individuals – but recognize our shared engagement in a new form of educational practice.

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MOOC Experience in the University of Cantabria

Sergio Martinez and Fernando Cañizal

Abstract: *MOOCs have been called 'University killers,' but we don't see them that way. MOOCs are probably the best way to promote universities and to make it easy the transference of knowledge from universities to society. Is it possible to imagine a better way to spread universities' names and works than with Open Educational Resources? Outcomes of using Open Educational Resources: reducing costs; promoting the University; good practices in intellectual property rights; better educational resources.*

Introduction

It has been said that MOOCs are like a tsunami and, in that case, it is better to be surfing the wave than waiting on the beach. But, it is also true that surfing such a big and unpredictable wave is not easy.

The University of Cantabria (UC) has a wide experience in the development of Open Educational Resources. We began in 2007, launching our OpenCourseWare (http://ocw.unican.es) site (160 courses nowadays) and then created the institutional repository UCrea in 2011 (http://repositorio.unican.es/xmlui); and the last step has been the development of our first MOOCs in the MiriadaX platform (https://www.miriadax.net/). In this paper we will first talk about our experience with MOOCs and afterwards analyze more carefully other interesting aspects.

Some data about MOOCs in the University of Cantabria

In November 2012, the launch of a new MOOC platform in Spanish was announced: Miriada X. The technological development was made by Telefónica Learning Services (TLS, a subsidiary company of Telefónica, the biggest communication company in Spain), the marketing and institutional boost was provided by Universia (a nonprofit company, part of Banco Santander, which gathers almost all the universities of the Hispanic world), and the contents were supplied by some Spanish universities. In the first edition (launched in February 2013) there were 18 universities, 58 courses and more than 200.000 students enrolled. The UC participated in 6 courses with more than 36,000 students enrolled. In one of these courses the rate of students that finished all the activities was up to 50%, the highest across the board.

That success was a surprise for everybody, especially because there was no previous marketing campaign. The main setback was the unfinished technological development of the platform MiriadaX.

Besides, the participation model was not the best, considering the short time to launch the first edition.

In the second edition of Miriada X things changed considerably.

For starters, Universia and TLS announced a big improvement in the platform to resolve the common problems and mistakes in the first edition, especially related with peer2peer activities. But, despite those intentions, most of the problems are still there, and users complain frequently.

Second, in the first edition there wasn't knowledge accreditation, only a simple and automatic diploma sent by the platform and without any kind of validity. In the second edition there are three types of certification:

a. An automatic diploma sent by the platform and without validity (like that of the first edition).

b. A certification sent by the university, with the university logo and the professors' signatures, but also without official validity.

Course	Enrolled	Certification	Percentage
Técnicas de Creatividad	4.578	1.318	28,7%
Presentaciones Eficaces	5.217	1.546	29,6%
Instrumentos Económicos Aplicados al Medio Ambiente	1.320	472	35,7%
Habilidades y Competencias a través del Coaching Personal	11.875	7.365	62%
La Seguridad del Paciente	3.945	1.901	48%
Pervivencia de la Mitología Clásica en la Cultura Occidental	1.928	355	18%

Table 1: Students enrolled in the six courses of University of Cantabria. MOOC platform Miríada X (spring 2013).

c. A real certification after an in-class exam (only if the university wants).

After the first edition test signing a real agreement between Universia and the different universities was necessary. The process wasn't easy, but finally we signed the agreement in October 2013. The idea is simple: Universia puts in the institutional development, TLS provides the technological tools, and the universities contribute with the contents. The benefits, if any, will be share out: 40% to the university, 30% to Universia and 30% to TLS. All the accreditations have a fixed price of 40 euros. We were against this decision because we thought that it was better to link price and course length, and moreover because we thought the price was too high.

In the second edition the University of Cantabria has 8 courses (2 more than the first edition), but less students.

How has the university organized internally the production of MOOCs?

3.1 Administration

As we did with OCW, all the MOOCs have to pass through the e-learning Support Unit.

We think it is better to work with a centralized department because:

a. aWe can provide homogeneity to all the courses.

b. We can improve those materials, creating videos, podcasts, interactive activities, etc.

c. We remove those materials that are against the intellectual property rights.

d. We are the representatives between Universia and the university professors, and we manage the whole administrative process.

3.2 Call for participation

In the University of Cantabria we have worked in two different ways to involve professors in MOOCs.

a. First we made a general call for participations to all the professors of our university, but warning them about the effort needed to create a MOOC. If OCW is only a way to publish educational resources, with MOOCs a bigger implication is necessary. In general, professors do not answer massively to these calls, because they usually take part in other e-learning activities and it is difficult to attend them all.

b. Thus, finding a parallel way is a must: asking directly those professors who are usually enthusiastic about New Technologies, e-learning or Open Educational Resources - this has been the best way to enlist professors in MOOCs. In the first edition of Miríada X all of our courses were previously published in our OpenCourseWare site, making it easy to find something if you know where to look.

In the first edition we had six applications and all of them were approved. In the second edition, now in process, we have had 12 applications, but finally only eight courses are in development.

Still, the most difficult aspect is not how to get professors, but how to keep them. In our opinion there are two ways:

a. If MOOCs finally become a commercial product, our aim is that professors participate in the profits. Probably, the best way is not to give them the money directly, but to finance different initiatives in education innovation. But this is a utopia, because we do not know yet if MOOCs will be profitable in the future.

a. The other way to help professors in OER is giving them technical and pedagogical support. Today, what professors like most about OCW and MOOC is:

- Visibility and dissemination of their works.
- Improvement in resource quality.
- Institutional recognition of Learning Innovation.

Advantages and disadvantages of MOOCs

If we assume that MOOCs are a tsunami, we can agree that it is better to be surfing the wave than waiting on the beach. But this is not enough. We are involved with MOOCs because we are willing to, and because we think it is really interesting, considering the costs and benefits.

Advantages:

a. Broadcasting. OCW and MOOCs are fantastic tools to promote universities' names and works. Nowadays you are only important if you have a good standing in the Internet. As Cathy Casserly, CEO of Creative Commons, says: "The creators who thrive today are the ones who use Internet distribution most intelligently. In fact, the ones who are most generous with their work often reap the most reward. People used to think of reuse as stealing; today, not letting others use your work can mean irrelevance." Besides, MOOCs can be a good way to attract students, especially from the expanding market in Spanish. Traffic from South America amounts to approximately 60% of the total. Spanish universities have a clear advantage in this market, and we should use it through the right marketing policies. And here MOOCs can help.

b. Knowledge transference. Open initiatives make works widely accessible, not only for students, but for all of society. Public universities are supported basically with public funds and, for that reason the results of their activities must go back to society. Thus, OER have to be part of the social mission of the universities.

c. Education Innovation and better educational materials. Professors working in these initiatives try to improve their materials because of their global dissemination. In our case they also have the help of two technological departments.

d. New educational methods. Working with 3,000 or 10,000 students is an experience never seen before. Students can give very interesting information and it is also very interesting to study their behaviour (Big Data analysis).

Disadvantages:

a. If a University wants to participate in OCW or MOOCs it must assume some costs. First of all, it is necessary a technological department to develop these initiatives, unless you let professors to participate freely and without help - and this is not the best way to achieve good results. Second, if you want to work with your own platform, you have to assume the cost of its development. In our opinion, Spanish universities usually make big efforts developing things that are already developed. We thought that it is better to collaborate with companies (like Miriada X, Udacity or Coursera) than develop your own software. Moreover, the broadcasting is always better through a common platform than through individual ones, especially if your partners are Banco Santander and Telefonica. And third, it is necessary to think about the work professors should do to create courses.

b. MOOCs, OCW or Open repositories are only a small part of professors' activities, which also include research, classes, virtual classrooms, conferences and meetings. It is thus necessary to reward conveniently these activities if we want to keep these professors engaged in innovation activities.

c. The last disadvantage, if you choose a common platform, is that you have to adapt your expectations to the platform, and you have to accept that not everything you want to do can be done. In our experience, we have had some arguments but finally the collaboration has worked out fine.

Are MOOCs Open Educational Resources?

Hewlett's updated OER definition begins (1): " OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge".

The idea behind OER is really simple: educational materials can be used almost without any conditions and freely. So they should be libres (accessible and reusable) and gratis (available at no-cost). This is clear in OCW, but not so obvious in MOOCs.

The problem between OCW and MOOC is the meaning we choose for the term "Open". In OCW the meaning is crystal clear: free, accessible and reusable. In MOOCs, Open means free (the materials, at least) and accessible (during the course timetable), but we are not sure if they are reusable or not. The wikipedia definition for MOOC says (2):

Although early MOOCs *often emphasized open access features, such as open licenses of content, open structure and learning goals and connectivism, to promote the reuse an remixing of resources, some notable newer* MOOCs *use closed licenses for their course materials, while maintaining free access for students.*

For us, working with open licenses in MOOCs has benefits. In the Creative Commons website we can see some of them (3):

- OER can increase the reach of their materials by making the rights to use and adapt them crystal clear from the start;
- OER will be able to serve even more learners because they will be granting legal permissions to use their course content in other educational settings; and
- You do not have to respond to individual permission requests from users and can instead focus on delivering quality educational content to the largest number of students.

Besides, if we use open licenses we allow others to transform the work. Doing this, it is possible, for example, to translate the courses to other languages, increasing the impact.

And, finally, it is possible to use a Creative Commons licence 'NonCommercial' only for educational purposes and keeping the commercial rights.

In our case, the situation is a bit strange. The agreement with Miriada X says that all the contents have to be licensed with Creative Commons, but there are no tools in the platform to tag contents with CC licenses. So, we decided to include a note in every course saying "© The authors. This work is licensed with CC BY-NC-SA." We furthermore add CC license in all the videos we upload to YouTube.

Now we are working on demanding of Miríada X a better way to include open licenses in our MOOCs, considering that it is fundamental for increasing the usage and impact of OER.

Big data. How can we get useful information?

There is a final question that is really interesting for us: the study of the huge amount of data generated by MOOCs users: age, gender, timetables, most viewed pages, most used resources, etc.

All this information provides usage patterns of the websites (and in this particular case, of the educational materials) that can be very interesting to improve the course offer or better fulfil user expectations. They are also subject to commercial interests because of the possible attention that some companies may have in getting to know such patterns.

In the first edition of Miriada X MOOCs barely any analysis was carried out, and in the second it this was still only being considered as a possibility, regardless of how interesting it would be. Nonetheless, the UC has the intention to set up a line of innovation based on Big Data research in order to involve professors in the study and analysis of this information. This will provide us with a way to improve our offer, adapting it better to the needs of the users.

Conclusion

To sum up, MOOCs are a new step in the development of the huge possibilities of New Technologies in Education. They are really interesting (especially because a lot of users can be enrolled) but it is necessary to consider their advantages and disadvantages. Thus, going back to the simile between MOOCs and Tsunamis it is probably better to be surfing the wave than waiting on the beach, but somebody may think that the best course of action is going up to the top of a hill, and wait until the water goes away. Time will tell.

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Mathematics Courses: Fostering individuality through EMOOCs

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Abstract: When it comes to university-level mathematics in engineering education, it is getting harder and harder to bridge the gap between the requirements of the curriculum and the actual mathematic skills of first-year students. A constantly increasing number of students and the consequent heterogeneity make it even more difficult to fulfil this task. This article discusses the possibility of complementing an introductory course in mathematics with learning environments designed by the international ROLE project in order to use a MOOC to provide an internal differentiation of large learner groups such that it gets easier for students to gain the knowledge needed for the content of the curriculum.interact on the forums and assess peer assignments are more likely to complete the course.

This article discusses the project ***V****orkurs mit* ***O****pen* ***E****ducational* ***R****esources in* ***M****athematik* (**VOERM**) (Mathematical Introductory Course with ***O****pen* ***E****ducational* ***R****esources* (**OER**)) that has been started at the Bonn-Rhine-Sieg University of Applied Science in the winter term of 2013. The course was conducted in September and October 2013. The course is not part of the curriculum but is taught every year during orientation. The objective of the project is to turn parts of the course into a **MOOC**. Following a short summary of the actual situation, we will present the idea of the project as well as research questions and aims. Furthermore, we reflect on the experience and possible future developments.

Introduction

Problems in mathematics courses

In general, mathematics continues to play a dominant **ROLE** in our everyday life. Technologies, techniques and procedures, like for example the optimization of parameters or chain supply management, are fundamentally mathematical based (Ziegler, 2006). In order to keep pace with modern technology and also to understand existing concepts, future engineers have to have a deeper understanding of mathematics. Thus, mathematics continues to play an important **ROLE** in their education.

When it comes to engineering education, a German survey dealing with sustainable university development in 2011 has shown that nearly half of engineering students cancel their studies and one in four students is still leaving the university without a university degree. Students stated that the most common cause for dropping out of studies in these courses is that academic entry requirements often ask too much of them (Hetze, 2011). During their orientation phase at university and their first semester courses, students decide whether they continue their studies or give it up.

Engineering disciplines are fundamentally based on mathematics and problem solving. As a consequence, the entry requirements of these courses still represent a major obstacle for the students due to their heterogeneous levels of mathematical knowledge. Mathematics education at school level differs from school to school and unfortunately some contents are hardly taught anymore. Thus, students lack formal and important symbolic elements. Due to changes in the school curricula the learning behaviour has also changed so that for example "teaching to the test" does not stimulate the integration of knowledge in the long-term memory.

After finishing school students also often mention that there are inadequate overall conditions at universities when it comes to repetition of school mathematics. As a consequence, the gap between the initial requirements of the mathematical courses at universities and the prior knowledge of the first semester students is steadily enlarging (Knorrenschild, 2009). Students lack the mathematical ability needed for their future courses. A constantly increasing number of students and the consequent heterogeneity make it even more difficult to fulfil the task of bridging the gap. Hence, the problem of giving lectures for large audiences with heterogeneous levels of mathematical knowledge must be resolved.

MOOCs

In order to deal with a large number of students and with the problems of prevalent passivity of students in a large audience, information must be presented in different ways. The lecturer has to support each individual learner and their individual learning processes. One way of doing this is the usage of ***M****assive* ***O****pen* ***O****nline* ***C****ourses* (**MOOCs**). The term was first used as a result of a large online course run by George Siemens and Stephen Downes in 2008 (Cormier/Siemens 2010). The *massive* part of a **MOOC** "comes from the number of participants, which could range from hundreds to thousands to hundreds of thousands" (Bond 2013). Discussions have suggested that a group of 100 participants is a minimum. The word *open* comes from the fact that "anyone is free to register [and that] [t] here are no prerequisites, other than Internet access, and no fees are required" (Bond 2013). Typically, open source software is involved and **OER** are used as material for the course. *Online* refers to the fact that the internet is used for the courses and the word *Course* itself states that **MOOCs** are courses with "schedules and facilitators, readings or other course materials, and sometimes projects, all organized around a central theme or topic" (Bond 2013).

In (Powell/Yuan, 2013) there are different issues and challenges for **MOOCs** mentioned. Three of the main challenges are pedagogy, quality and completion rates. The concept of **MOOCs** raises the question of whether the courses and their organizational approach to online learning will lead to quality outcomes and experiences for students. New pedagogies and strategies are required to deliver a high quality learning experience for the students. On the one hand, **MOOCs** provide great opportunities for non-traditional teaching styles and getting the focus on the individuality of each learner. Each learner can experience his own difficulties and the lecturer is able to provide material so that each student is able to work on his deficits using his own speed. Individual or alternative routes of learning can be taken and online communities can always answer to given problems. On the other hand, the lecturer is not able to deal with each student personally. Social learning experience is not provided by **MOOCs**. Also, as a consequence of the lack of structure of the online courses, the self-directed learning demands from the students that they motivate themselves to participate and structure the online material for themselves. Lectures demand a certain level of digital literacy from their participants.

In order to deal with the heterogeneity of first-year students, the Bonn-Rhein-Sieg University of Applied Science intends to use a **MOOC** as an extension of the traditional mathematical introductory course. The above mentioned gap between output orientation, the minimum mathematical requirements of the course of studies, and the input orientation, the compensation of personal mathematical shortcomings of the first-year students, cannot be sufficiently filled by the introductory courses at universities. In only a few weeks before the semester starts, the lecturer is not able to communicate new subject matters completely (Knorrenschild, 2009). Each student has different mathematical abilities after finishing school and is lacking some topics that will be important for his engineering studies. Since the university is facing approximately 300 students the lecturer is not able to provide an individual learning environment for each student in a traditional lecture. Instead this should be put into practice by an extra **MOOC** that supports the traditional lecture. The next section outlines the idea of the new project.

The VOERM project

The ROLE platform

In order to solve the problems mentioned in the previous section the Bonn-Rhein-Sieg University of Applied Science in cooperation with the Frauenhofer Institute for Applied Information Technique (**FIT**) tries to combine the traditional mathematical introductory course with a MOOC. This course uses the so-called **ROLE** platform of the **FIT**. **ROLE** is an acronym for ***R**esponsive **O**pen **L**earning **E**nvironments* and is a European collaborative project with 16 internationally renowned research groups from 6 EU countries and China. **ROLE** technology is "centred around the concept of self-regulated learning that creates responsible and thinking learners" (**ROLE** 2009). On the **ROLE** platform the lecturer is able to develop the open personal learning environments for his students where they work on material that is provided by the lecturer. There are platforms available for several topics of school or university education.

On the **ROLE** platform the lecturer can choose between many widgets, which are small graphic windows that can be integrated as a small program on the online platform. Each widget can be individually fitted to the learning material of the subject matter and some are even developed especially for certain topics. Examples for widgets are the *Language Resource Browser Widget*, where students can use a web browser, that is adjusted to finding texts matching the actual subject matter, to search the internet for texts and use a translator and a vocabulary trainer for these texts, or the *WolframAlpha Widget*, which can be used by students for example to plot functions or solve logarithmic equations.

Using these widgets, students are able to:

- structure their own learning process individually,
- search for learning material on their own,
- learn and
- reflect their own learning process and progress.

For the collaboration with the Bonn-Rhein-Sieg University the **FIT** will set up a platform that will be accessed by the students via their online account for the eLearning platform of the university. Thus, there are only little administrative difficulties since the students have to create their online accounts anyway. Next, lecturers of the introductory courses in mathematics were able to create their own spaces on the **ROLE** platform by using widgets from the existing compilation of the **ROLE** project. If widgets performing a certain needed function were missing, the **FIT** tried to create these widgets on their own. Before the creation process began, the lecturers got an instruction for the **ROLE** platform and the widgets, and the staff of the **FIT** accompanied each step of the creation of the online space. Assistance and ideas for improvements were given for the choices of the different widgets and for the usage and production of **OER**. Furthermore, lecturers were able to exchange experiences with the eLearning team of the university.

The introductory course

The project started at the university in the winter term of 2013 and the introductory course is divided into three different phases that are presented in Figure 1.

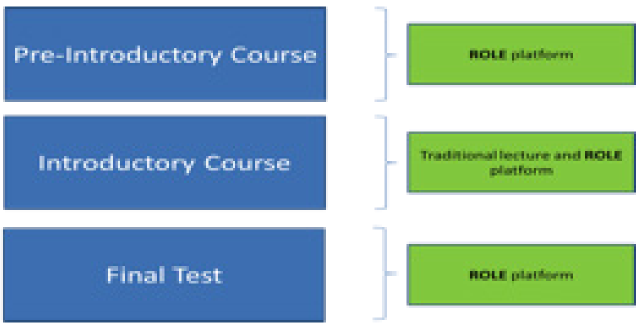


Figure 1. The structure of **VOERM**

The course lasts ten days. The first phase is a pre-introduction and lasts three days. The first-year engineering students of the university will be welcomed and alongside information about their upcoming studies the structure of the new introductory course and the platform of the **ROLE** project will be presented by the lecturer. On the following two days the students will work on the **ROLE** platform. This phase is a **MOOC** and thematically deals with the mathematical fundamentals needed for the rest of the course (equations, algebraic signs, brackets and number range). For this purpose the lecturer has assembled several widgets with **OER** contents:

- Videos
- PDF documents
- Exercises
- Calculator, tools for formulas, function plotter
- Forum
- Bulletin board
- …

An *Activity Recommender* contains instructions on how the **MOOC** works and how the widgets can be used by the students. This recommender also helps to create a *To-learn list*. The students are able to cross off the points on this list to mark the completed tasks. The forum can be used to discuss problems, exchange further material or get in contact with fellow students or the lecturer. The videos can be taken from the pool of **OER** found for example at YouTube or the famous *Khan Academy*, which produces online learning material for mathematics since 2007. For the project at the Bonn-Rhein-Sieg University, the lecturer produced most videos were in advance. Thus, the videos are exactly fitted to the subject matter. Additionally several other tools, like for example the previously mentioned *WolframAlpha Widget* or the *MathBridge Widget*, which is a search engine for mathematical phrases, are integrated. In general, students are free to use each widget when they want to. They can decide on their importance for themselves and on the order in which they are using the widgets. Hints for advisable combinations can be found in the *Activity Recommender*.

After this online experience the second phase of the introductory course is a mixture of a traditional lecture and the online course. During the next six days, several topics of engineering mathematics, such as trigonometry, powers or roots, are discussed in class. After each lecture the students are able to log onto the **ROLE** platform and work on the topics discussed earlier that day. For different topics, there are different spaces on the platform, which can be given to the students one at a time. These spaces were prepared in advance in the same way as the spaces for the first three days of the introductory course. The advantage for the lecturer is that the space can contain the material of the traditional lecture and additional material for each topic so that students who realized that they have deficits in some areas can pick the learning material that is most suitable for them. Additionally, more difficult tasks can be given to students whose mathematical ability is more advanced. In summary, if students decide that they prefer to work online they are not depending on the traditional lecture in order to get the information and material needed.

The third phase of the project involves testing the online platform, which will be conducted on the last day of the project. This test checks whether the students have understood the topics presented during the last nine days. It contains ten questions and each student is supposed to work on the test alone. The results will be used to identify students lacking the mathematical ability for their engineering education so that the lecturer can provide a special mentoring program for them during their first year of studies.

In summary, the project should support individual learning strategies and the acquisition of mathematical skills through an internal differentiation by giving students the possibility to work with their own speed on the topics of the subject matter that are the greatest obstacles for them. Students lacking elementary skills get the chance to fill in gaps in their own time without the pressure of their peer students and also students that show a deeper understanding of the subject matter can be challenged by more difficult tasks on the online platforms. Additionally, students can contact the lecturer in private and not in front of a large audience via personal chats. Thus, students who apprehend that any form of oral communication in huge classrooms would humiliate them in front of their fellow students are encouraged to use these personal chats.

Aims and Research Questions

The research questions of the project **VOERM** are the following:

1. What is the access frequency of the elements on the **MOOC** platform?

2. Has the result of the final test improved in comparison to the last year where there was no **MOOC**?

3. Do students express that the **MOOC** has supported their acquisition of knowledge?

Is the **MOOC** platform more suitable than the traditional lecture to support the students' learning processes? Do some students even prefer the **MOOC** and skip the traditional lecture?

4. Can an improvement of the mathematical ability be experienced during their first-year of studies in comparison to the last years?

The aim of the **VOERM** project is to use an additional MOOC to bridge the gap between the input and output orientation mentioned in the introduction. Students should reach a higher mathematical ability that enables them to perform better during their studies. They should dispose of their mathematical deficits and get ready to understand the subject matter of their later mathematical courses.

Short-term aims are an increase in students' motivation and facilitation of students' academic integration. Through the additional **MOOC** students should experience that their mathematical ability has increased and they should evaluate their own performance in a positive way.

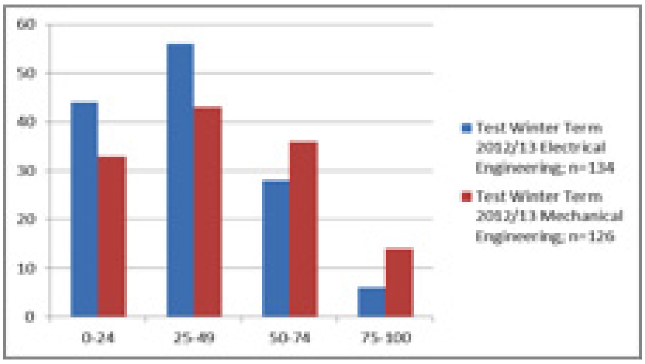
Evaluation and reflections

In this section I will try to give some provisional answers on the research questions raised in the previous section and reflect on these answers. Furthermore, we will share some of our experiences. Not all information is available yet since some data is still being processed and individual student answers are still pending.

On the technical side, the data on access have not been evaluated yet. However, during the course I was able to get an impression of how the widgets were accessed. First, there were some students that complained about not being able to access the entire online space. The online team of the university did its best to help these students and after two days no student complained about this problem anymore. Still, it may be the case that some students just took the traditional course and skipped the additional **MOOC**. Unfortunately, some students had problems accessing specific widgets, such as the videos made by the lecturer. Students that used Internet Explorer as a browser did not have a start button for the video. The university's online team was able to relink the videos through the online platform of the university so that these students were also able to see them on their home computers. In other cases the problem of not being able to see the video was fixed by changing the DivX-setup of the computer. If problems could not be fixed by the online team, students were advised to access the spaces from one of the computers of the university. In theory, each student should have had the opportunity to work on the **MOOC** course.

In class, students stated that the most common widgets used were the online videos and the PDFs with exercises and solutions. Also, Internet links providing further videos or additional reading material were used quite often. The additional helping devices, like for example calculators, functions plotters or the activity recommender were hardly used by the students. When asked why these widgets were hardly used the most common answers were that students had the specific function of one of the widgets on their calculators or that they did not need these functions. For future **MOOCs** on the **ROLE** platform students expressed the wish to have more learning videos and widgets that are explicitly designed for the different topics of the course. Most of the actual widgets are general mathematical applications, which can just be used for the introductory course. However, for future **MOOCs,** it would be better to design widgets with which the students can control and test their results of the exercises instead of auxiliary exercises. It should be mentioned that this would increase the workload for the lecturer and the members of the **ROLE** team significantly, as these new widgets would need to be programmed.

In total, 279 students signed up for the course. 229 participated in the final exam. Even though the final exam was mandatory, a lot of students did not attend it. During their first year of studies these students will have the opportunity to take the final exam. Thus, their results are not included in the diagrams below. In comparison to the previous year the results of the final exam improved tremendously even though the test had the same questions (see Figure 2 for the results; on the horizontal axis there is the result of the test (in percentage), and on the vertical axis there is the number of students).



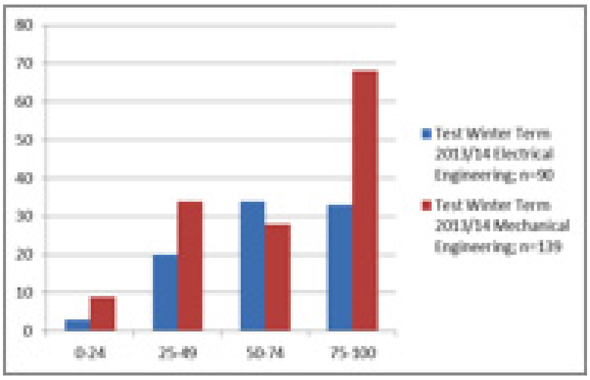


Figure 2: Results of the finals exams in percentages

Unfortunately, this year's test was written online whereas last year's test was written under supervision at the university. Thus, students were able to use books, calculators and the course material during the exam. Additionally, they were able to work in groups. Nonetheless, there were no simple calculation exercises and the students did not have much time for each task of the exam, so that it can at least be said that students performed better in finding approaches that led to the solution. Furthermore, there were no consequences if students did not pass the test. The test served only as a classification of their pre-university knowledge and I explicitly explained that they would just betray themselves if they cheated on the students. While talking to the class after the test, I got the impression that most of the students tried to work on their own. Since we do not have the staff capacity to correct all the finals exams in two days in person, and in order to ensure more significant comparisons, the test will be performed again online next year.

One particular student retook the course and was able to compare the **MOOC** experience to the regular course of the previous year. He stated that the widgets on the online spaces were of great help. This student had deficits because some topics were not taught during his school education. When attending the course in the first year, he had problems following the lecture and solving the tasks provided. With the **MOOC**, he was able to watch individual videos again and test his knowledge on easier exercises. In the event of problems, he thought that the forum, provided on the online space, was of great help. He had a lot of questions that he was afraid to ask in class in front of his fellow students, so he used the individual message function of the online space to ask for help. He stated that not being exposed to the scrutiny of his fellow students made him more comfortable when asking his questions.

134 students completed the online evaluation of the course. In total, 113 students stated that the MOOC explicitly supported their understanding, and that the self-regulated learning on the spaces helped them gain the knowledge needed for their studies. 18 students said that the **MOOC** was only partially helpful and one person considered the **MOOC** to be useless. Students in class stated their appreciation for the opportunity to repeat exercises, watch the videos and get additional information. One of the main reasons they considered the MOOC to be useful is that during orientation, students do not go to the library of the university and pick a book that might help them. Some of them did not even have a library card at that point of their orientation. In the online spaces, additional information and course material selected and structured by the lecturer is made available. The positive effect of this is that students who skip searching for books after a short period of time when they are not able to find the material needed, and students who do not have access to the library are now able to work directly with the texts and exercises provided. This way these students work at home for the class instead of skipping this process. On the other hand, there is the negative effect that the lecturer takes more and more responsibility into his or her own hands. Thus, the experience of searching for literature is curtailed and students lose some of their learning autonomy.

Despite this fact, more than 80 percent of the students mentioned that the **MOOC** fostered their learning autonomy. They stated that the search engines and the possibility of selected their own level of difficulty on the online spaces made challenging experiences possible. Individual learners, mostly those with deficits resulting from incomplete school mathematics, told me that they needed the opportunity to take a closer look at the material. Hence, students' motivation definitely increased (more than 87 percent) and the reception of the MOOC course is very positive. The students think that they gained the knowledge, but one has to keep in mind that students often misjudge their own mathematical understanding. Even though they think that they have gained the knowledge, they are not always able to solve the tasks provided.

Their positive feeling after the course was supported by my experience during the first weeks of the current winter term. Despite the fact that a lot of elementary problems are still caused by a lack of knowledge, deficient accuracy or inattention, the overall impression of this year's course is much better than that of the last winter term. This may also depend on the individual learners of the course, but especially when it comes to the topics of the introductory course, the students of the current class perform a lot better than last year's students. During the repetition course, which is held during the winter term, we discuss current problems rather than spending a lot of time repeating the fundamentals.

Finally, when students were asked if the **MOOC** could replace the traditional course, they stated that they feel there is still a need for in-class elements. They appreciated the existing structure with a basic course and lots of presence elements. Among other reasons they mentioned that they like the direct contact with the lecturer, that questions can be discussed in the plenum and that there is a direct student-student interaction, which is important for forming peer groups during orientation. Despite the fact that some students had technical problems with the online spaces and could barely participate, nearly all students stated that the **MOOC** played an important **ROLE** in deepening their knowledge and bridging existing gaps. In class, they could get a glimpse of the necessary topics and an idea of their personal deficits. At home they were able to work on these deficits with their own speed. Exercises that they did not understand in class because the speed of the lecture and the tutorial was too fast could easily be repeated at home. They could watch the videos that explained the topics discussed in the morning if they had not fully comprehended each step. If the exercises of the traditional course were too simple, students could pick more advanced tasks or search for continuative literature.

In the survey, ten students stated that just a **MOOC** would be enough to gain the mathematical knowledge during orientation. 14 students stated that there was no need at all for an additional **MOOC**. The remaining 113 participants in the survey stated that they would keep the subdivision into a traditional course and a **MOOC**, as was the case in this year's orientation.

In summary, both the students and I were satisfied with the way the additional **MOOC** worked. Despite technical problems, and the necessity for selection of the widgets to be better adjusted to the topics of the introductory course, a further **MOOC** will be held during orientation at the Bonn-Rhein-Sieg University of Applied Science.

For the structure of this year's **MOOC**, a university would need access to the **ROLE** platform. Once this is set up, the online spaces can be linked to the universities' own online platform. **ROLE** spaces are available for many different subject matters. For additional information, please contact the Frauenhofer Institute **FIT**. Examples of different spaces and a widget search engine can be found on the web page: www.ROLE-project.eu

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First time MOOC provider: reflections from a research-intensive university in the UK

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Abstract: *Massive Open Online Courses (MOOCs) have attracted global attention in the Higher Education sector over the past two years, with 2012 named the Year of the MOOC. Apart from front-running universities in the US, most Higher Education Institutions have only recently begun to fully digest the potential implications of MOOCs on their existing provision, staff and students. This paper provides insight from the University of Leeds in the UK, a Russell Group research-intensive university, about our experiences of developing and delivering MOOCs for the FutureLearn platform, from a position of limited experience with fully online course delivery. The paper will focus on the University's strategic approach, key governance and quality assurance issues, MOOC selection criteria, creation and sourcing of digital content for the online courses and organization of learner support materials. It is hoped that this paper will encourage and support other higher education institutions considering developing freely available online courses.*

An introduction to student education at the University of Leeds

The University of Leeds is a large red brick university with over 100 years of history. The university was formed from a collection of Yorkshire colleges in 1904 and now has over 30,000 campus-based undergraduate, postgraduate taught and postgraduate research students, studying a very wide range of subjects. The university is a member of the prestigious Russell group in the UK, whose mission is to deliver world-class education alongside globally important research, in order that students are taught by world leading research active academics and are fully engaged in research from the outset of their studies. The university also places a very high value in the quality of the student experience and the holistic nature of a higher education, exemplified by its commitment to support students in their academic achievements, co-curricular activities and professional development.

Interaction between teachers and students at the University of Leeds is conducted through a wide variety of mechanisms, ranging from the traditional large group lecture, small-group tutorials, practical classes workshops etc. and makes use of a variety of technologies and online resources to enhance the student learning experience. The university has an aspirational digital strategy for student education and a blended learning strategy both of which encourage academic teachers to make full use of digital tools and resources to enrich contact time between students and teachers, and increase learning opportunities during private study. Teachers and students make extensive use of the University's Blackboard virtual learning environment (VLE), and are increasingly realizing the opportunities within such tools to enhance learning, beyond use of the VLE as a repository for learning resources. However, with around 4000 academic staff at the University, within around 30 academic schools in nine faculties, there are inevitably peaks of excellence and areas for improvement in respect of the blended learning strategy.

The University is currently investing in a wide range of IT related infrastructures (e.g. lecture capture, desk-based capture and multimedia management capabilities) to ensure that staff and students have access to the tools necessary to realize the Blended Learning strategy. It is hoped that staff will adopt these digital tools across programmes and curricula to produce interactive multimedia resources to enhance the student experience for campus-based and online learners.

The University has a small number of very successful fully online courses but these are fee-paying and limited to relatively small numbers of students. In addition, the university (and many of its staff) is very protective of the learning materials provided for students on fee-paying courses, not having a presence on any major externally facing digital learning channels. However in 2012, the University agreed a policy on Open Educational Resources (University of Leeds, 2012), encouraging staff to make use of appropriate openly available resources within student education and to publish high-quality learning materials externally. Whilst this policy has been broadly welcomed across the university, there remain a number of concerns from academic staff, particularly in the area of rights, permissions and intellectual property. The university is currently engaged in an institution-wide programme of staff development to support a culture change towards fully embracing digital learning within student education.

The journey to becoming a MOOC provider

The University of Leeds signed up as a launch partner of the Open University-led FutureLearn MOOC platform in December 2012. The decision followed Senior Management Team discussions about the desire to engage with free openly accessible online courses, the need to keep pace with competitive universities, the opportunities to showcase the excellence and breadth of the University's student education and research to a global audience, and the opportunities to enrich the learning of campus-based students and further embed the blended learning strategy across the institution. The decision to engage with delivery of MOOCs on the FutureLearn platform was made fully cognizant of the fact that the University is relatively inexperienced with delivering fully online courses and did not have a dedicated central e-learning team to develop and deliver the courses. However, one of the major contributing factors for the university's decision to partner with FutureLearn was the commitment of the Open University to the venture, with its long-standing and world regarded reputation for delivery of excellent online learning courses. The University also benefits from a world class School of Education with academic staff experienced in technology enhanced learning and distance education, as well as colleagues in a variety of academic schools with experience of delivering fully online courses.

The University's first action upon joining FutureLearn was to secure the time of the lead author to provide academic leadership for the FutureLearn project. Early in 2013, a vision and strategy for the University's development of a MOOC portfolio was presented to, and endorsed by, the Vice Chancellor's executive group. The university committed in partnership with FutureLearn to deliver a minimum of two courses in the first six months of launch of the platform, in recognition of the university's relative inexperience of online delivery. Quickly following the agreement of this strategy was the initiation of two projects: firstly, a project to establish the governance for developing and delivering MOOCs, and secondly identification and development of the University's first courses. These two projects are described separately in the following sections.

Establishing a governance structure for MOOC delivery

From the outset of the project, it was obvious that delivery of MOOCs by a University requires agility, innovative thinking, understanding of market demands and impact on existing provision and a clear business strategy. It was also quickly realized that working with FutureLearn, a start-up company, would require trust, shared responsibility, responsiveness and belief in their vision. However, universities such as Leeds, with very high academic standards and established processes for specifying and quality assuring courses will inevitably recognize, and feel conflicted by, the need for agility, responsiveness and placing trust in evolving processes. In recognition of this, the University established a slightly modified governance process for overseeing the FutureLearn project and the development of MOOCs.

As the FutureLearn project is in part a business related project involving the potential for revenue, a steering group was established, reporting to the Faculty Management Group (composed of the Faculty Deans) and the Vice Chancellor's Executive Group. The steering group, chaired by the pro-Vice Chancellor for Student Education includes academic representatives, heads of service such as IT and library and the University's finance director. The remit of the steering group is to oversee the University's relationship with FutureLearn, define and steer the strategy and vision for development and delivery of MOOCs and oversee business models, commercialization opportunities and partnerships arising as a result of MOOCs. The steering group also oversees the University's marketing and communications strategy for MOOCs.

A parallel and complimentary governance structure has been established to manage the design, development and delivery of MOOCs, modeled on the University's existing processes for specifying and quality assuring courses. A cross-institutional FutureLearn Education Committee was established, with responsibility for scrutinizing and approving the MOOCs to be published on the FutureLearn platform. This committee was established at university level instead of within Faculties and Schools, to ensure a consistent approach to the scrutiny of quality assurance for MOOCs and in order to have oversight of all potential courses academic staff wished to develop. There are, however, processes in place to ensure that MOOC proposals are discussed and agreed within Schools and Faculties before being proposed to the FutureLearn Education Committee and this local approval process involves line managers and the Faculty Dean.

As the University is relatively inexperienced in developing and delivering online courses, an additional tier of support has been put in place before the FutureLearn Education Committee receives MOOC proposals for consideration. Two advisory groups have been established: firstly, a pedagogic advisory group, consisting of academic staff specializing in technology enhanced learning and distance education from the School of Education, representatives from existing fully online programmes across the institution and members of the team responsible for developing MOOCs; this group scrutinizes the underpinning pedagogical approach for the course, the learning journey, the plans for learner interaction and collaboration, the course elements, accessibility and the assessment strategy. The second advisory group is a creative group, whose remit is to support the development of visually appealing, engaging and interactive multimedia learning resources, which will be educationally appropriate for the intended learning outcomes of the course. This group contains learning technologists, academics from the Institute of Communication Studies and colleagues with experience of broadcasting and relaying messages to large public audiences.

The final group that was established is a University wide MOOC Forum, open to all staff interested in the development and delivery of online courses. This group is facilitated by the Staff and Departmental Development Unit, and provides a forum for communicating updates, receiving suggestions for development of courses and learning from discussions about best practice from experienced academic practitioners, learning technologists and online learners. This forum meets every six weeks and has been very well attended on every occasion, signalling the level of interest and engagement with the project across the University.

Identification of MOOCs for development

At the outset of the project the University defined very clear selection criteria to guide development of courses aligned to the university's ethos and vision. At the current time, the selection criteria include: showcasing on-going research excellence, showcasing exceptional quality research-based student education, evidence of broad market demand and appeal to large audiences, link to existing University, Faculty and School strategy and alignment with current on-campus provision in order to extend learning opportunities for current students.

The university is currently developing courses aimed at learners in the transition between high school and university education: the rationale for this is partially pedagogic and partially business orientated. It is widely accepted that high achieving A-level students appreciate the opportunity for extension studies particularly in the run-up to examinations or for the purposes of coursework assignments. Our first suite of MOOCs have been designed to offer this extension study approach by linking to the high school curriculum but extending the depth and breadth of learning to an undergraduate level. Our courses will also offer opportunities for current undergraduates or professional learners to extend their knowledge and understanding through engagement with additional learning materials pitched at their level. Designing online courses for learners at different levels requires very clear signposting within the course materials to indicate which resources are appropriate for which type of learner. The rationale for pitching online courses at this level from a business perspective relates to the competitive nature of undergraduate admissions in the U.K.'s marketised environment and the desire to showcase the breadth and quality of our courses to potential high quality fee paying students across the globe. However, there is as yet little evidence from existing MOOC providers that this approach actually drives undergraduate recruitment in any significant way. Of course, any participant in a MOOC may at some point in the future provide tangible benefit to the University through increased awareness of the quality of our provision or the breadth of our activities, but this will be hard to measure or validate.

The approach taken to identifying potentially suitable courses has initially been bottom-up, with staff from across the institution expressing interest in developing a course through a course enquiry form developed to help individuals describe how their course would meet the selection criteria. This process has resulted in a large number of expressions of interests and initial meetings with individuals to explain the development process, the likely time commitment and the potential outcomes from developing a MOOC. Whilst the time investment necessary to conduct these initial meetings has been costly, it has helped in the process of selecting the most appropriate courses and individuals to work with in order to develop more complete proposals and course templates to feed into the governance process. In fact, in a number of these initial meetings it quickly emerged that the individual did not necessarily want to develop a MOOC but wanted to publicise and promote their learning materials on an external digital learning platform, enabling us to guide them towards more appropriate channels such as a presence on iTunesU, a channel which the University has recently launched.

Making decisions on which courses to develop for the FutureLearn platform has been difficult. Many of the proposals received from across the University meet the selection criteria, generating a robust future pipeline of courses for development. Experience from successful courses on other MOOC providers (e.g. Coursera, Edx) and advice from FutureLearn about market demand have also influenced decision-making, but have not constrained the University from being innovative and disruptive with its MOOC portfolio. Final decisions about which courses to develop have included discussion with FutureLearn, taking into account courses offered by other partners and scheduling.

The University has taken a decision in the short term to develop short courses in the region of 2 to 4 weeks. This decision has been taken for pedagogic reasons in an attempt to maintain learner engagement for the duration of the course, by offering limited but achievable learning outcomes from engaging with the course for a reasonable amount of time.

As the project evolves, it is likely that the University will wish to commission specific courses from across the University particularly in response to demand from external partners. This approach will not be without difficulty as it is already our experience that ideas generated by individuals and teams within Schools and Faculties have more potential to deliver than proposals that are suggested to academic staff from external individuals. This is due in part to a lack of understanding about the potential benefits of MOOCs for an individual academic or their School, a lack of time to envisage or develop a course or a lack of leadership to reorganize existing priorities in order to react quickly to potential opportunities.

Finally, it is worth noting the general level of interest in MOOCs from the academic community at the University of Leeds. An institution-wide survey was delivered during the summer of 2013 to gauge academic staff's views about the potential of MOOCs to disrupt higher education. The survey received 256 responses and 55 academics across all of the University's Faculties expressed interest in developing a MOOC now. A further 73 academics expressed interest in developing a MOOC in the next one to two years (Morris et al., unpublished data).

Development of MOOCs for delivery

The university has established a new team responsible for the development of MOOCs across the University. This digital learning team also has responsibility for the University's other external digital learning channels (e.g. iTunesU) and for supporting the embedding of the blended learning strategy within Schools and Faculties. The digital learning team consists of a director, digital learning manager, learning technologist, digital content officer, project officer and student interns. The director, reporting directly to the Pro-Vice Chancellor for student education, is responsible for the digital learning and blended learning strategies, interaction with other service directors and has responsibility as the university's FutureLearn representative. The digital learning manager is the manages the external digital learning channels and is responsible for overseeing the development of MOOCs from initial conception, through development, delivery and reporting of outcomes. The learning technologist works very closely with the academic lead responsible for the MOOC translating their vision, ideas and learning materials into an educationally appropriate online course. The digital content officer is responsible for production of all digital assets (e.g. video and audio etc.) for use in the MOOC and works closely with the learning technologist throughout the process. The digital learning team is currently making use of the valuable skills within the student community at the University through employment of student interns, working in partnership with students to develop materials for the MOOC (e.g. animations) and including students in the delivery of the MOOC under the direction of the academic lead, and will continue to do so.

The digital learning team is producing bespoke content for use within the University's MOOCs. This means that the first step in production of the MOOC is for the academics involved to produce written scripts for the whole course, based on the agreed course structure. The next step is for these scripts to form the basis of green screen video recordings capturing the academic's spoken word and face for use within digital learning materials. Building on established principles of high quality e-learning materials (Alonso et al, 2005), these recordings are then overlaid with relevant video footage, slide presentations, animations and other interactive activities to maintain learner engagement, deepen learning and support multiple learning styles. As video presentation forms the main basis of the FutureLearn platform functionality at present, a lot of focus has gone into ensuring that these resources are maximally useful to learners. However, additional resources are also being provided to learners in the form of transcripts, audio files and additional material such as links to research papers and web resources. Significant emphasis is also placed on the opportunities for social interaction between learners and with teachers within the platform, and for these interactions to be directly related to learning resources being presented at the time. The sophistication of the social learning aspects of the FutureLearn platform in the future will offer opportunities for group based collaborative learning, an invaluable feature of any learning environment (Dawson, 2009).

The University's first MOOC was delivered in October 2013, lead by Professor Jon Lovett from the School of Geography. The MOOC explored the challenges associated with making difficulty decisions about natural resource management, and encouraged participants to use basic principles to help them make decisions with fairness and integrity.

Feedback from the first MOOC

The focus of this paper is on the University's experience of developing its first MOOC, but it is insightful to offer some feedback from participants as a measure of the success of the approach taken. The two-week course was delivered on the FutureLearn platform under a beta launch and attracted over 5000 participants from over 100 countries around the world. The participants generated over 10,000 comments in discussion forums, facilitated by the academic lead, his research staff and a number of final year undergraduate students studying a similar campus-based course. The level of interaction from educators was strongly praised by course participants.

Over 50% of the participants had no experience of the subject matter in the online course, but the majority visited the course at least a few times a week, spending an average of 24 minutes and visiting an average of 15 pages. The course did not have an end of course examination, so completion rate cannot easily be measured, but participant engagement was over 50% during the second week of the course. Over 90% of the participants rated the course as excellent or very good, and 97% indicated that they would recommend it to a friend or colleague. Participants were particularly complimentary about the additional course support materials: in particular, 86% liked the course orientation materials,

72% liked the study skills advice, 87% liked the accompanying written transcripts and 74% liked the subtitles on video content. Post-course survey data indicated that the majority of participants enjoyed viewing learning resources in video format (79%) and taking interactive quizzes (82%).

However, the participants were not as social in their learning habits as may be expected from online learners: only 51% liked discussing things online with other learners. This may be due in part to the functionality available on the platform at the time of the course delivery; there was only a basic discussion tool which didn't not support searching, filtering or tagging features, meaning that discussion threads quickly became excessively long and unwieldy. This has been addressed in recent upgrades to the platform.

Conclusions

The time elapsed from agreeing a University strategy for MOOCs to delivering our first MOOC on the FutureLearn platform was nine months, which is very rapid for the Higher Education sector. For many academics, the pace of change in respect of digital technologies and their impact on higher education is too fast. However, universities have no alternative but to remain at the forefront in the use of new technologies to support learning, particularly given the intense competition from private providers and other institutions. Many undergraduate students are already supplementing their on-campus experience by enrolling on MOOCs offered by other universities (Bartholet, 2013), and this trend is likely to increase further, and may soon be seen by students as a lack of provision in universities where MOOCs are not offered. Although it is not yet clear whether there is a sustainable business model for direct income from individual learners in the emergent MOOC market (Mehaffy, 2012), there are tantalizing examples of how businesses may be looking to commission higher education institutions to provide MOOCs for professional development and training for employees, which is likely to generate a very clear revenue stream. This paper has described a journey to develop and deliver openly accessible online courses to learners around the globe, for the benefit of individuals with the potential to learn and improve their individual situation.

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An Academic Online Resource at Técnico Lisboa

Ana Moura Santos and Rui Costa

Abstract: *This project started to take shape in January 2012 as IEEE-IST Academic, and as of September 2013 is part of an international project named IEEE Academic, with contents that have the signature of both college students and professors. In this paper we describe how it began at Técnico Lisboa as a student initiative of IEEE Student Branch and how it has developed since then. The student technical team is responsible for the capture, processing and edition of the video contents, and is also in charge of the design and back office of the Academic portal. The online educational contents are in video format and organized by course topics. Mostly they consist of complementary contents to an important part of the Mathematics undergraduate curricula, Computer Sciences Introductory Course, Chemistry and Electronics curricula at Técnico Lisboa. The responsibility for the contents lies with highly motivated faculty members, who work closely together with the student team in editing the videos. Moreover, the videos are designed to be accessed from several platforms, such as laptops, tablets and smartphones, and extensively make use of visualization and 3D graphics in order to help the learning experience.*

Key words: web-based education, online contents, video modules, teacher-student collaboration, educational web portal.

General Comment

Our focus will be on the description of the process of creating contents, the format of the contents and the first statistics on the usage of the web portal of this e-learning initiative. It shares some common features with a Massive Open Online Course (MOOC), but differs from it in many ways. More technical details can be explained in a full paper, but in what follows, we will try to explain why we feel the need to focus on contents that are in Portuguese and close to the curricula of undergraduate courses at Técnico Lisboa, a Technical Institute in Lisbon with circa 11,000 students and more than 900 faculty members. We will try also to give some empirical evidence on the validity of this project but, since it started only recently, this is done based on the initial statistics.

Short Description

In October 2011, the IEEE-IST Academic project started being drafted by one of the authors, Rui Costa, at the time a Master's degree student at Instituto Superior Técnico (here designated as IST or Técnico Lisboa) and Educational Activities Chair at the IEEE Portugal Section. Rui Costa then contacted the Students Support Office at IST-Taguspark (Nape-TP at Técnico Lisboa) seeking support from the student team and for promotion of the project among faculty members. Ana Moura Santos, the other author, as head of the Nape-TP and a professor in the Department of Mathematics, facilitated the contacts with fellow professors at this institution, and the Nape-TP provided student grants. At this time, a decision was taken that the first priority should be the topics for first year undergraduate students at Técnico Lisboa. In May 2012, the IEEE-IST Academic portal was first made available to the public, featuring 69 videos whose contents were signed by five professors from different departments of Técnico Lisboa.

The original project evolved in a year to a global initiative called IEEE Academic, supported by IEEE, under guidance of the original Portuguese team, and complemented with student volunteers from other countries. Each local technical student team follows the same model used at Técnico Lisboa, and makes use of the experience accumulated in producing the IEEE-IST Academic. The original project was then replicated in other countries and the IEEE Academic is now being developed in eight different countries (Brazil, India, Pakistan, Palestine, Poland, South Africa, Tunisia, Turkey and the USA), apart from Portugal, with the collaboration of 18 universities. The original Portuguese IEEE-IST Academic was renamed and reorganized to follow the global structure of the project; it is now called IEEE Academic Portugal and has more than 195 video modules.

In this paper we focus mainly on the organizational and pedagogical features of the original project, which we designate hereafter as Academic project. Since it began as an initiative conceived by students of IEEE Student Branch at IST, it was aimed from the beginning to closely meet the needs of students at Técnico Lisboa. As a result, many contents are worked out and planned for the needs of undergraduate students in Computer Sciences, Civil, Electrical and Mechanical engineering (Jinwen, 2010), and also degrees in Applied Mathematics and Physics, just to mention a few that are part of the Técnico Lisboa undergraduate degrees.

Despite the fact that several widespread initiatives offer web accessible academic contents, see for example, MIT-OpenCourseWare, Khan Academy, and the more recent MOOCs of Coursera and edX, some of the students at Técnico Lisboa find it hard to make use of these contents, mainly when preparing for their quizzes, tests and exams. Most of the contents are in English, and therefore it is hard to adapt the technical jargon in answers to questions in exams. In addition, very often there is no direct correlation to the depth or approach of local courses syllabus to the contents of the online materials. Because of this, the first decision was made to use the native language: Portuguese.

The second decision concerns the granular format of the video contents, and is inspired on the videos of Khan Academy and other MOOCs available (Mcauley et al., 2010, De Boer, 2013), with modules from 7 to 15 minutes long. But, even when collected and organized by topics, the Academic videos are not specialized one-off courses offered by professors at Técnico. At least for the moment, they are not intended to substitute any course classes, in contrast with the purpose of the generality of MOOCs. Instead they constitute complementary topics, sometimes with basic concepts and applications, sometimes with carefully chosen proofs and sophisticated algorithms; they are mostly planned taking into account difficult or crucial moments in the learning process (XianPing, 2009).

Both student practices of networking, common to university students all over the world (Goodyear & Ellis, 2010, Rennie & Morrison, 2012, Schaffert & Hilzensauer, 2008), and students' learning needs at Técnico were taken in account. The result was a choice of video formats that maximize the video effectiveness of the different available technologies. This includes traditional video modules, which are recorded in front of a board with a teacher presenting a given topic, and tablet contents that contain explanations by means of a tablet with the possibility of writing notes on top of pictures, schemes or diagrams. Then there are in-the-field video modules, which are recorded on specific locations, e.g. demonstrating a chemical reaction in a lab. Finally there are screencasts, designed for demonstrations made with the help of a computer, where the full screen is captured while the teacher explains the topic out loud, focusing on the relevant parts.

The Academic Web Portal

From the very beginning we were aware of the relevance, besides the importance of having clear explanations about a given topic in video modules, of having a clear and neat interface to access the contents. The project student team designed a website that takes into account principles and requirements such as a clean and simple interface, quick access to information from a specific course, and the ability to search and find connections between contents. Besides those requirements, it was taken into account that the website needed to be accessed from several different devices. Therefore an adaptive design was created, one that takes into consideration the device with which the user is accessing the website.

In addition to the overall functionality and navigation of the website, some features were developed in order to help professors create more interesting and challenging support materials for the videos. We think that it is important that each video be enhanced with exercises, either interactive or static, which can aid students in their self-assessment on the contents of each video module. Static exercises cope in analogy to the traditional worksheets delivered and used within many standard curriculum courses, while interactive exercises can offer students quick feedback on their degree of understanding of the topic they have just consulted.

One of the main concepts behind the development of the whole portal was the requirement to deliver quick access to the contents. Based on that, a simple principle of accessing the desired contents with only one page-jump was worked out. Students can search and browse contents by country, language, topic, professor, academic area and many other filters.

Due to the present global scope of the project, the project is organized with different points of access. The main one, henceforth described as Global Website (see IEEE Academic), serves as a search engine for finding contents from all universities participating in the IEEE Academic that can be browsed in general or refined with the above-mentioned filters. Besides the Global Website, there are several local initiative websites available (e.g. IEEE Academic Portugal) that correspond to initiatives headed by either given countries or universities. The main reason to use these local initiatives' websites is to facilitate the customization of such portals with local languages and relevant information, e.g. soon there will be contents in Urdu, Turkish and Slovenian, which are adjusted to the course curricula of the local universities.

By being based on the collaboration of several local initiatives, the IEEE Academic portal is able to scale up the amount of contents available by those sparse contributions.

The Academic Contents

The basic pedagogical strategy adopted was to transfer the contents of a specific curriculum course taught in large university lectures into video modules, splitting the topics of the syllabus into several small parts. Video modules are intentionally very granular in structure and very focused on one specific concept or procedure. This is a common feature for a large number of MOOCs, but what is different in this project is the way in which contents are produced. Due to the close cooperation between students and teachers in producing the contents, the students' feedback is a main source for new video modules. There is no such thing as a full course planned in advance. A good example of the dynamics that are going on is the way in which professors, while answering students' questions during office hours, detect which are the contents that are more difficult for students to understand, and then propose to the student technical team that they record in the following week an explanatory video on the subject. With this quick feedback from the students, the project is quick to adapt to students' needs. This is something that is hard to accomplish in general MOOCs, which are designed to serve the vast majority of students worldwide. Apart from this, the organization of the contents follows the general structure of a technical book, which is divided into several chapters that contain several separate topics, called in this project video modules. In this context, the expertise of the professors is used in order to guarantee that the contents are divided in the most accurate and correct manner, while students once more can give their input to highlight the topics in which they experienced the most difficulties. The feedback from students who have already passed a course whose videos are being developed is another determining factor in deciding where to focus efforts: it is better to reinforce topics that the majority of students have more problems dealing with.

Another positive fact of having videos constructed in the form of granular modules is that, in the case of course curriculum changes, it is easier to replace or add a new video module to the project web platform. In addition, the project technical team, together with professors, found that there are some video modules that can be easily integrated within the curricula of different courses. For instance, matrix transformations, that are one of the basic concepts in Linear Algebra, are very useful in a Computer Graphics course, and in some other contexts. The separate video modules can, and should, be inserted in the topics of more than one course, therefore reducing the development cost of the project. This last feature also helps students to establish relations between basic concepts taught in the first years of their undergraduate studies and applications in several specific areas of their engineering degree.

Therefore, having the contents developed within the institution, with faculty members from different departments involved, and delivered in the native language, the Academic project can solve the problems related with understanding and establishing connections between the technical jargon of the online contents and the ones actually taught in classes, while having videos directly correlated with learning needs.

Since the project is at its very beginning, it is still hard to analyze all the benefits from the learning point of view. There are many clear advantages sensed by students such as any time/any place explanations and the possibility for a student to return to something only half understood in a class. To what extent a teacher at Técnico Lisboa can use these materials in a course also depends on his/her "beliefs" in this kind of content. To our knowledge, there are some faculty members already planning to use the video modules in a flipped classroom model in future semesters.

First Statistics

In order to assess the usefulness of this project, as well as to understand students' needs regarding the proliferation of online-based educational (eLearning) content, different surveys and usage data analysis were performed. In this section we analyze first a survey carried out with the entire student community of Técnico Lisboa and then usage statistics of both the IEEE-IST Academic web portal and YouTube channel.

During the first two weeks of March 2013, an online survey for undergraduates and master-degree students at Técnico Lisboa (circa ten thousand students) asked questions about their practices in the context of online academic resources. From the three thousand students who fully answered the questions of the survey, 59.54% said that they use online resources as a complement to standard classes, 82.58% of the students use online resources for clarifying not well-understood concepts and 69.68% answered that they use the contents in order to prepare for assessment, tests and exams.

Taking into account the period between September 2012 and February 2013, equivalent to one full semester of classes in Portugal, an analysis of the IEEE-IST Academic website traffic has been performed, based on several metrics. The website had a total of 16,959 visits from 5,871 unique visitors, with a total of 58,041 page views, meaning a rate of 3.42 page views per visit. The average visit duration was of 5 minutes and 48 seconds. During this period, from all the visits registered, 65.53% were returning visitors, while 34.47% were new visitors.

The above-mentioned results show that a good percentage of users felt the need to come back and use the IEEE-IST Academic portal again, spending a reasonable time browsing the site. It is important to note that YouTube video viewers are higher than the viewers of the website, due to the direct browsing of the IEEE-IST Academic videos through the YouTube website and search engine.

From the total number of visitors, 93.39% were from Portugal, while 4.9% (830 visits) were from Brazil. This number shows that, by creating video modules in Portuguese, other countries with the same native language can share the same produced materials. It is important to note that no advertising was done in Brazil regarding this initiative, meaning that all visitors ended up browsing the website as a result of search engine results.

Regarding traffic sources, 34.81% were a result of search engine queries, 28.59% from references from other websites and social media and 36.60% came from direct traffic.

A total of 41,916 views were registered on the YouTube channel with an estimate of 138,682 minutes of video being watched. The video with the most views was the Linear Algebra module, Eigenvalues I, with a total of 2,973 views and an estimate of 11,187 minutes being watched. That means an average of 3:45 minutes of video being watched per visitor. Based on this statistic, it is possible to conclude that videos are not being watched in their full extent but mostly browsed to the more important parts.

Regarding the visitors' source country, 74.72% views originated in Portugal, while 17.8% were from Brazil. By comparing these results with the Web portal results, one may conclude that a significant part of the visitors from Brazil accessed the contents produced by IEEE-IST Academic through search engines, either directly from YouTube or other providers, such as Google or Bing.

Moreover, 50.7% of the videos were watched in the YouTube page, against 45% seen on the IEEE-IST Academic web portal embedded player. This shows a balanced distribution between users who browse and watch the videos on the web portal, and users who browse the videos directly in the YouTube website (either by direct search queries or by choosing the YouTube interface).

This last result reinforces our belief that it is important, in order to keep users on the website rather than have them randomly browse the videos on the YouTube channel, to add information that enhances the learning experience of the content presented in the video modules.

Final considerations

With regards to the contents of the Academic project, we expect that they will remain up-to-date and valid for several years as long as the author-professor feels that they are adjusted to the main goal. Due to the videos' division in atomic concepts and topics, in case of minor changes in the course curriculum, videos can be rearranged in the web portal and YouTube channel, without the need for new recordings. Other topics can always be added.

Based on the Técnico Lisboa experience, the authors conclude that this sort of initiative constitutes one of the best ways to cope with students' needs. The innovative approach of professors and students of local institutions and countries creating locally-based video contents helps substantially to enhance the learning experience of students with academic contents. What we try to always keep in mind within the Academic project is that, in the end, students are at the heart of the learning process and should be its main beneficiaries.

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Opening up higher education through a low-cost MOOC model

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Abstract: *Many believe that MOOCs may not survive because they are both expensive to produce or do not represent high quality learning experiences. However, there is evidence that low-cost content on the Internet can generate high user satisfaction and more specifically, in the case of educational content, actually facilitate effective learning. The success of a relatively simple and low-cost form of online distance learning from Institute of Technology Sligo also suggests that it is possible to enable effective learning without excessive expenditure. In this paper the author is proposing that by applying this model of online distance learning to MOOCs it will be possible to deliver effective open learning at reasonable cost levels. In addition, by reusing the content of such MOOCs for various purposes these costs can be justified and MOOCs may sustainably emerge in almost all domains of learning. Combining this with the increased availability of challenge examinations based on a competency based education model could result in the significant reductions in the cost of higher education, truly opening it up to many who previously could not afford it.*

Cost as an Access Issue

The problem of access to higher education has been effectively solved from a technological point of view. It is now possible to put virtually any course of study, either completely online or into a blended format with much reduced attendance requirements. All that remains to be done is for higher education institutions to widely adopt online educational practices that have been shown to achieve similar, if not better, outcomes than traditional methods. It could be argued that it will not be long before almost all programmes of study will be available online from some institution in the world. However, that will not solve the problem for many who will be unable to afford the fees for these online courses. Unless accredited online courses are available at low enough prices, they will continue to be beyond the reach of many.

Massive Open Online Courses (MOOCs) may, at first sight, seem to hold great potential to reduce the cost of access to higher education. After the first wave of publicity for MOOCs, it was correctly observed that these courses do not generally carry credits from the institutions delivering them and were thus of limited value to many. This, in fact, is being addressed very quickly with several universities and other institutions offering to assess students on their learning from MOOCs (Fain, 2012), and the American Council for Education's research into the possibilities for granting credits for MOOCs (American Council for Education, 2012). This separation of the delivery of courses from assessment and accreditation, a phenomenon known as disaggregation (Wiley and Hilton, 2009) holds significant potential for reducing unit costs in higher education.

The disaggregation, or unbundling, of delivery and assessment is being enabled to a large degree by a competency-based approach to learning, where there is a move away from measuring inputs such as "seat-time" to defining competences and using well designed summative assessments, to verify the achievement of the defined competences or learning outcomes (Herzog, 2013). This is now being described by many university presidents in the US as having greater significance for disruptive change in higher education than the much hyped MOOCs (Lederman, 2013). If MOOCs become quite commonplace and many institutions offer to assess and offer credit to students who have taken MOOCs, some course fees could drop almost to the cost of assessment alone.

However, the cost of delivering MOOCs is currently quite substantial, and there are many who question the financial sustainability of MOOCs. Coursera have estimated that it costs around $40,000 to prepare and deliver a MOOC (Parr, 2013). Institutions developing MOOCs currently justify it on the basis of improving their brand recognition and recruitment of fee-paying students into both full-time and online programmes. However, at this level of cost many institutions may not be able to justify the development of MOOCs and the promise of free online courses covering all disciplines may not materialise.

The author would like to propose that it is possible to reduce the cost of development and delivery of MOOCs and by doing so and by using MOOCs to reduce teaching costs and generate income, the problem of sustainability can be addressed.

Reduction of Development and Delivery Costs

Institute of Technology Sligo (IT Sligo) has been delivering a form of online distance learning since 2003 that is primarily based on streamed live online classes. Rather than invest a significant effort into alternative instructional designs, lecturers have used a low-cost conferencing system to deliver live online classes, without technical support, in an approach that has more in common with the classroom teaching they were used to than the heavily asynchronous approaches that had been common in online learning previously (Mulligan, 2009). The provision of a modest level of technical and pedagogical support to lecturers has allowed them to respond to learner feedback and continuously improve their online teaching over time, resulting in high levels of student satisfaction in these courses. During that time, improvements in screen capture systems has also allowed lecturers to develop reusable learning objects with very little effort and easily replace live learning with asynchronous approaches where most appropriate.

The resulting courses have much in common with the transmission MOOCs (xMOOCs) that have been developed recently by Coursera and Udacity. Even though IT Sligo courses contain significant opportunities for learners to discuss issues with their lecturers and peers, as well as to submit assignments and receive useful feedback, they are based around a core of learning materials that are relatively easily produced by a lecturer without assistance, in a manner that is not all that different to the way they have always taught. The most significant extra effort by lecturers has been for those who have chosen to add online objective tests (multiple choice quizzes) to their courses. However, many have chosen to do this because of the improved progress monitoring it enables and the actual continuous assessment workload reduction it delivers with larger class sizes or over a number of years.

Quality

An important way in which these courses do differ from the offerings of the commercial MOOC providers is in production quality. However, as has been demonstrated by the popularity of home-made videos on YouTube, consumers seem to be well able to distinguish between the entertainment quality of content and the quality of production, and appreciate such content, even when it is not necessarily produced to a high level of quality. However, YouTube contains much popular educational content as well as entertainment. The most well-known educational content from the Khan Academy illustrates the point. These original videos were in the very simple format of audio and screen capture most of which was quite amateurish drawing on a simulated blackboard. However, these low production quality videos proved to be pedagogically effective for very large numbers of people.

In online courses from IT Sligo, the live sessions and short screen capture objects are rarely edited before publishing. The knowledge of the lecturers and their experience in presenting to learners is easily transferred online and their first efforts are almost always considered to be of good enough quality for release to classes that range in size from 10 to 100 students. These live sessions and recordings along with additional learning materials, either created by lecturers or sourced as free materials from the web, and with forums available to enable peer-support, have resulted in courses with high levels of student satisfaction and requiring relatively modest levels of support from the lecturer. This leads on to the question: If a course is delivered to a group of 30 learners who are happy with the quality of content contained in the course, would that content not also be useful to thousands of others?

A low-cost Development Model for MOOCs

If higher educational institutions are confident that their regular online teaching is of a standard that they are prepared to allow anyone to see, then they can effectively reduce the cost of production of a MOOC to the cost of production of their regular online courses. This can vary between institutions but the model described above is one where there are very little development costs above those of normal teaching of fee-paying students.

So if we accept that a regular online course could be delivered as a MOOC by allowing anyone to enrol, the author would like to suggest the following approach:

- MOOCs can be developed and delivered as regular online courses using an xMOOC mode approach, where full classes can be delivered live and recorded, or short learning objects can be recorded and published easily using screen capture techniques.
- A certain amount of assessment can be built in to such courses with minimal incremental costs, using online objective tests and/or peer assessment.
- Certificates of satisfactory completion can be automatically generated based on automated and peer assessments.

Sustainability through income generation and reuse.

Even if MOOC production costs can be lowered significantly, the costs will still have to be justified or recovered in some way. The following are proposed as justifying these costs.

Free Online Learners

If an automated method of enrolment is then used, this can be delivered free to large numbers of learners with modest delivery costs. Although this does not generate income, it can have a significant marketing impact and departments may be able to fund this activity from marketing budgets or justify the activity on the basis that it will improve brand awareness for the institution and increase enrolment in other fee-paying courses. This justification is predicated on the assumption that the quality of such low-cost MOOCs does reach a minimum standard that would not reflect badly on an institution. Give the unexpected success of content of low production quality on the Internet it may be reasonable to say that it is too early to say what an acceptable level of production quality is.

Fee-paying online learners

Institutional MOOCs can be reused for other groups, either to reduce teaching costs for existing students or to generate extra income. Existing fee-paying distance learners can enrol on these courses and be separately provided with tutor support, feedback on assignments and more rigorous summative assessment. The resulting reduction in delivery costs can be used to reduce fees in such online courses.

Campus based learners

Such courses can also be simultaneously used for campus based students, on one or multiple campuses, using a blended flipped-classroom model, where the students are expected to cover materials from the MOOCs in their own time and attend tutorial sessions separately, thus reducing contact time and teaching costs for such campus based courses.

Competency based learners

Students who attend as free learners and do not avail themselves of tutor support or assessment feedback may still wish to receive full credit for their learning. The MOOC provider may generate income by providing competency based challenge examinations (or other competency based assessment) on a fee paying basis. Although it is well known that MOOCs can be taken from anywhere, it is less well known that there are now excellent examination proctoring services that can supervise examination candidates anywhere in the world. This increases the potential for income generation significantly.

Summary

It is plausible that it may emerge that MOOCs can be made to be sustainable by reducing the cost of production and delivery to that of regular online courses that institutions may already be delivering, and by saving tuition costs elsewhere through simultaneously using these MOOCs for their fee-paying online and campus students, and by generating extra revenue from free online learners who may be interested in having their learning assessed and accredited. If such a model proves to be educationally effective and does no damage to institutional reputations, it may be widely adopted, particularly for niche courses resulting in a huge increase in the availability and variety of free learning on the Internet. In addition, if the concept of competency based education becomes widely accepted and practiced, particularly in the availability of challenge examinations, accredited higher education will become truly open to millions who would otherwise be unable to access it.

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SPOCs for Remedial Education: Experiences at the Universidad Carlos III de Madrid

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Abstract: *The Universidad Carlos III de Madrid has been offering several face-to-face remedial courses for freshmen to review or learn concepts and practical skills that they should know before starting their degree programme. During the last two years, our University has adopted MOOC-like technologies to support some of these courses so that a "flipping the classroom" methodology can be applied to a particular small educational context. This paper gathers a list of issues and challenges encountered when using Khan Academy technologies for small private online courses (SPOCs). These issues and challenges include the absence of a single platform that supports all the requirements, the need for integration of different learning platforms, the complexity of the authoring process, the need for an adaptation of gamification during the learning process and the adjustment of the learning analytics functionality. In addition, some lessons learned are presented, as well as specific actions taken in response, where MOOCs do not replace teachers and classrooms for these remedial courses, but improve their effectiveness.*

Key words: MOOCs, SPOCs, learning platforms, learning experiences, remedial education

Introduction

After the New York Times declared 2012 "the year of the MOOC", we found our new favorite acronym, standing for Massive Open Online Courses, in every pedagogical higher education endeavor. MOOC is one of the new words describing all the actions and technologies that educators implement in different e-Learning environments and approaches. It seems that MOOCs are here to stay, looking for academic opportunities to implement the challenging pedagogical model that they encompass, but also to enrich traditional education. Now, we MOOCify teaching and learning practices, academic courses are getting MOOCed and some new pedagogies are called MOOCification. MOOCs have gained in popularity in less than two years, encouraging new and creative learning spaces. Online education and eLearning has been around for decades at many universities. The Universidad Carlos III de Madrid implemented its first Learning Management System (LMS) ten years ago, and since then it has been steadily building a blended learning educational model, where face-to-face classes and online educational resources and activities have merged.

Remedial courses (so-called zero-level courses – "cursos 0" in Spanish) are basic courses that several universities teach on a regular basis before a degree starts, to ensure that all students are able to cope with a common baseline in disciplines such as Mathematics, Physics, Chemistry or Biology. Those courses are not strictu sensu degree courses but "extra" university short courses. They are often considered expensive in time and resources for the academic organization. The Universidad Carlos III de Madrid (UC3M) wanted to experiment with MOOC-like technologies but in a small and controlled group of students (between 100 and 300 for each course) and in a private environment (our educational intranet), so these remedial courses were the perfect context to implement so-called SPOCs, Small Private Online Courses (Goral, 2013).

These SPOCs implemented at Universidad Carlos III de Madrid aimed at solving a problem with zero-level courses at our university. These zero-level courses are usually offered during only one week at the beginning of September. Many students need more time to review the different concepts covered. The SPOCs offer students the possibility of working for more time with the topics of the course and provides additional resources. Moreover, the SPOCs enable the possibility of making the face-to-face class sessions more productive as students can watch different videos and solve several exercises in advance.

The efficacy of online learning has been discussed before the MOOC phenomenon. Glance, Forsey and Riley (2013) showed that online learning pedagogy may even be superior in the overall effect on student performance. We are going to describe here how the Universidad Carlos III de Madrid improved traditional on-campus remedial courses through MOOC-like technology, using our own adapted instance of the Khan Academy (KA) platform (Khan Academy, 2012, 2013). We will describe our experience with SPOCs in years 2012 and 2013, the different phases and the main issues: the selection of the supporting platform, the authoring of videos, the authoring of exercises, the gamification environment, and the evaluation. Decisions taken for the presented challenges are explained based on the proposed context of experiences.

Context of the KA-UC3M Experience

The first selected zero-level courses for the experiences were Physics in Summer 2012 with Mathematics, Physics, and Chemistry following in Summer 2013. Table I gives an overview of the number of videos, exercises, students enrolled, and teachers participating for each of the SPOCs and years.

The total number of videos in each course was quite similar, ranging from 22 to 30. There was a specific video for each atomic topic, so the difference depends on the different number of topics to explain for each course. Teachers had to create at least one exercise related to each video. There were some topics that required more than one exercise, especially in Chemistry, so the number of exercises was more for this course.

Traditionally, freshmen who enrolled in the remedial courses received lessons on campus. These lessons ran for one week and took place at the beginning of September. The main problems of this model were the limited amount of time to study all the concepts, and a very compressed schedule.

With the introduction of Khan Academy (KA) technology, a "flipping the classroom" methodology (Bergmann & Sams, 2012; Tucker, 2013) was planned. Students can access the different resources prepared by teachers during the month of August anytime and anywhere. Students can watch videos, solve exercises or interact with other classmates before the face-to-face lessons. These lessons take place during the first week of September, and students can take more advantage of these class sessions as they already know the concepts that they studied in August within our particular KA implementation (KA-UC3M). Therefore, students can focus and ask the teachers about more advanced topics. In addition, students can devote more time to studying the different topics as the educational resources are available on the platform during the time they are enrolled.

	Course	# Students	# Teachers	# Exercises	# Videos
Summer2012	Physics	102	6	35	27
Summer 2013	Physics	181	10	30	30
	Mathematics	278	16	30	25
	Chemistry	91	7	49	22

Table 1: Number of exercises, videos, enrolled students and teachers participating in the SPOC experience, by course and year

Implementation

In the process of the creation, deployment and evaluation of MOOC-like technologies to improve our remedial courses, different issues and challenges emerged. This section describes a list of issues, decisions taken and lessons learned through the implementation of our private Khan Academy (KA-UC3M) installation, first in 2012 and in an improved implementation in 2013.

Based on the experience in 2012, the Educational Technology and Teaching Innovation Unit was created in our university (UTEID, 2013). Its purpose is to help in the development of MOOC technology and in the creation of educational resources. The existence of this UTEID technical unit made the process easier and more scalable in 2013.

The main educational requirements considered to MOOCify zero-level courses were: the possibilities of watching videos; solving automatic exercises; provision of useful analytics of the learning process to evaluate the course; making a clear structure of contents; automatic help for students when solving exercises if they get stuck, and improving communication among students. The requirements for automatic help when solving exercises and the communication among students was stronger than in other typical MOOCs because these SPOCs run in August, the vacation month in Spain. Therefore, it was not planned that teachers would give any support during students' interaction, but instead the platform had to provide mechanisms to overcome this.

Selection of the Supporting Platform

There are quite a few different platforms for supporting MOOCs. Each platform has a specific set of features. The platform should be selected depending on the educational context requirements and the learning outcomes to be achieved.

At that moment (Spring 2012), a platform that fulfilled all the previously described main requirements was not found. We decided to use a combination of two platforms: Khan Academy and Moodle. The KA platform was used for watching videos, solving exercises, generating hints related to exercises, and providing useful analytics data about the learning process. The Moodle LMS was used mainly for communication between students.

Although watching videos and solving exercises can also be done in Moodle, the KA system provides a more powerful learning analytics module. The exercises and videos have to be related to the KA platform to enable this learning analytics support. In addition, the KA exercise framework adapted better to our purposes.

Although the KA platform provides some communication features (e.g. the possibility of inserting comments for each video), other features which are present in Moodle but not in the KA platform were required. These were the possibility of creating common forums where all the participants can contribute, and direct private messages among participants.

The content structure was provided by Moodle but also by the KA platform. In Moodle, the contents were divided by sections, subsections, and chapters. Each chapter usually had a related video and an exercise. In the KA platform the contents were presented using an index, and a knowledge map was enabled so that students could go through the different exercises and see their different connections. The combination of both platforms enables different navigational paths. Users know Moodle better and it is also the default Learning Management System for all degrees at UC3M. Therefore, students may be more familiar with the Moodle content and navigational structure, and its interface can be better for usability purposes.

There were also some features of the KA platform that were used in the SPOCs, but that were not key requirements. Among these features are the possibility of configuring an avatar, the possibility of setting and tracking goals, and the use of a recommender for subsequent exercises. On the other hand, many different features of Moodle which were not used could be enabled in the future for enhanced experiences. Some examples are the assignment, the wiki or the glossary.

The KA platform was connected with Moodle. Some aspects integrated with this solution were single sign-on and the Moodle gradebook connection with the KA user interactions. Moodle enables administrators to set the teachers and students for each course, while the KA platform needs students to select their coaches, which is a similar role to a teacher. The single sign-on should not only enable a user logged into one platform to enter the other, but also convert teachers in Moodle to coaches of all their students in the KA platform.

An important difference between Moodle and the KA platform is that Moodle is designed for private courses in which only a predefined number of enrolled students are allowed to enter and interact with the course materials (so a registered student can only access some courses), while the KA platform enables access to all videos and exercises for any students who are registered for any course. This was an issue in 2013 as there were 3 different courses with different students enrolled in each one (students might belong to one, two or all of the courses). The solution adopted was to have one Moodle instance but 3 instances of the KA platform (one for each course).

In addition, Moodle was the initial platform to enter into the course, and Moodle had external links to the KA resources.

Although an initial concern was that students might get confused with 2 different interfaces from 2 different platforms, this did not present a problem for students. In any case, some links were adapted in 2013 to simplify going from one platform to another.

Authoring Videos

The creation of videos posed two main challenges: 1) Finding the proper methodologies and good practices to maximize students' learning; and 2) Giving homogeneous videos to students so that they perceive the same general rules, such as, for example, the inclusion of university logos in the same way. To achieve this, a rule document for the creation of videos must be available to teachers.

In 2012, teachers only received a few general rules about the process of video creation (e.g. about the recommended duration). People from the UTEID technical unit reviewed all videos from 2012 and some general conclusions were obtained. Based on these conclusions, teachers received more specific rules in the 2013 edition. Some rules were related to, for instance, the combination of colors, or the applications to use for generating videos. Nevertheless, teachers had enough freedom to adapt their videos to their personal teaching style.

Another issue was how to provide resources to create the videos. Teachers were able to create videos on their own, but a place for creating videos was enabled in the library with all the necessary resources and with the support of the UTEID experts.

A final issue was how to deal with the process of receiving the videos, publishing them in the YouTube platform, and annotating them with meaningful tags. The UTEID created a tool to manage this process of uploading videos and annotating them. The tool could also receive videos selected by courses.

Authoring Exercises

One of the main problems with generating exercises was that teachers were not able to create them directly using the KA format, which is an HTML one with specific tags. Average teachers feel it is quite difficult to create the exercises directly in this format. During the first year (Physics course, Summer 2012), this issue was tackled by creating a set of word file patterns for the different types of exercises considered: fill in the blank, multiple choices and multiple response. Teachers had to fill in the corresponding patterns and send these files to 2 experts who did the final conversion to the KA framework.

In summer 2013, as the number of courses and teachers was considerable, it was not feasible to follow the previous strategy: the experts would have had to format too many exercises. A scalable solution was required. Moreover, with the previous solution, teachers were not able to see directly in the platform how the exercises ran: they only had access to the word files. An authoring tool was designed and implemented to mitigate these issues. This tool enabled teachers to create exercises through a simple Web interface. The type of exercises that the authoring tool enabled was "fill in the blank" with the possibility of establishing parametric variables. Each time that a student accessed an exercise, the parametric variables had a different random value within a range until the student answered correctly. Furthermore, the tool enabled text formatting with an HTML editor, to calculate formulae for the solution or add hints. In addition, teachers could view the exercise being done on the KA platform during their exercise design. With this solution, experts did not have to format all the exercises because the authoring tool translated them automatically into the corresponding format. Nevertheless, there were some specific exercises that the authoring tool was not able to create (e.g. restrictions among variables). Experts had to do the formatting for these exercises.

Based on the first SPOC for Physics, during Summer 2012, other lessons were learned: for example, we realized that multiple choice exercises with long texts as options presented problems with visualization, because long texts as options had to be in a narrow column on the right. For this reason, in 2013, the preferred types of exercises were fill-in-the-blank. Multiple choice exercises were only used in cases where fill-in-the-blank exercises did not make sense, with limits on the length of the possible options.

The authoring tool works without any registration and anyone with Web access can log into it to create exercises. This tool was integrated to the video authoring tool created by the UTEID. In this way, the creation of exercises is restricted to the teachers of the course, and exercises are grouped by the different courses.

An important aspect to note is that teachers create videos and exercises and upload the created resources to the servers using the authoring tools, but the educational resources are not automatically uploaded to the platforms. Instead, experts needed to do this task. To do this final step, experts needed to know the knowledge structure of the course and which exercises were related to which videos. This was given by the teachers to the experts.

Gamification

Although gamification was not one of the initial main requirements, the KA platform brought this important feature. Gamification might motivate and encourage students to learn more and better by earning points and badges during the learning process (Li, Don, Untch, & Chasten, 2013). The KA platform provides a set of five different types of badges by default (meteorites, moon, earth, black hole and challenge patches). Each type of badge is identified by a different image. These badges were adapted to the context of the Universidad Carlos III de Madrid. The initial images were replaced by five different names and images of Madrid monuments from the times of king Carlos III. The highest achievement badges (previously the challenge badges) represented one of the buildings in our own university.

The KA platform can give badges for mastering a set of different topics. A student must achieve proficiency in a topic in order to master it. As the contents of the KA platform were personalized, the conditions for achieving badges related to topics had to be redefined. Three different levels of content hierarchy were defined: section, sub-section and chapter. Students who achieved proficiency in all chapters of a sub-section received one type of badge, while students who achieved proficiency in all sub-sections of a section received another type of badge. Teachers of each course had to fill in a form with the structure in the three levels of hierarchy so the badges could be awarded in this way. The number of badges for each course was different as there were a different number of sections and sub-sections in each one.

Moreover, some of the KA badges not related to achieving proficiency in exercises had to be removed, because they did not make sense in our context. Others had to be adapted (e.g. badges for watching videos for some amount of time because the total number of minutes for watching videos was quite different from the original KA educational materials). These adaptations were made in the 2013 KA-UC3M remedial courses, based on observations from the 2012 experience.

Learning Analytics

One important functionality provided by KA is its learning analytics support. The platform generates many reports about students' interactions, students' performance, results divided by topics, etc. For example, teachers can easily see the number of students that struggle in an exercise or obtain proficiency, and students can see the time spent on different topics, divided by videos and exercises. This type of information helps students and teachers to understand the learning process, evaluate it and try to improve it. This is particularly important when there are many students in the platform, which is the case even for a small course.

The learning analytics process has a set of phases (Clow, 2012). Collecting the data from students' interactions is done in a very detailed way in the KA platform. This data is stored in different tables within the Data Store of the Google App Engine. The KA platform processes this data to obtain useful information and provides some nice visualizations about the learning process.

Although the learning analytics support of KA is useful, we needed to extend it to include other parameters and to personalize some specific information such as the criteria for a student to progress on the platform. Some examples of proposed parameters and how to use them to evaluate the learning process are shown in (Muñoz-Merino, Ruipérez Valiente, Delgado Kloos, 2013). Some of these parameters are related to learning effectiveness, learning efficiency, students' time distribution, gamification habits and exercise solving habits. A new learning analytics module for the KA platform was developed for this purpose which is named ALAS-KA (Add on for the Learning Analytics Support in the Khan Academy platform). This module generates individual but also class information about the learning process. This information is available for teachers and experts evaluating the learning process and trying to improve it. The information is helpful for improving the face-to-face sessions but also for improving future editions of the courses. Technical details about this extension can be seen in (Ruipérez-Valiente, Muñoz-Merino, Delgado Kloos, 2013).

Conclusions and Future Work

This article presents a list of different challenges encountered while MOOCifying zero-level courses at the Universidad Carlos III de Madrid during the last 2 years. Some solutions adopted and lessons learned from the experiences are explained.

Among the challenges for the creation of educational resources (videos and exercises) are providing teachers with best practices, homogeneity of materials, enabling teachers with authoring tools which they find easy to understand, providing teachers with continuous support during the process, and centralizing all generated materials so that experts can do the final upload. These challenges require a structured methodology for the creation of educational contents. Authoring tools had to be implemented to enable this process.

As a single platform did not cover all the requirements, two platforms were combined. The combination of both platforms was a success, as they were effectively complementary. Although the use of the Moodle platform communication tools was not high during the first year, it was high during the second year, which is important as it enabled social learning.

The specific setup of the experiment implied adaptations to the gamification features of the original platform, and specific evaluation needs required specific learning analytics for which new development had to be done.

Apart from teachers, resources were required: for helping teachers to create videos and exercises, for formatting some types of exercises, to set up the platforms, or for making software adaptations to the KA platform. Based on these experiences, an educational technology unit, UTEID, was created to help in these tasks.

Some of the lessons learned can be applied to other educational contexts, but others are very specific to this educational setting. The Universidad Carlos III de Madrid plans to continue developing these experiences and improving contents, methodologies and platforms for remedial courses. Furthermore the experience gained with these courses might be extended to other learning environments within the UC3M.

Acknowledgements

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Experiments with connectivism from a moderator's point of view

Jutta Pauschenwein, Erika Pernold and Eva Goldgruber

Abstract: *The learning model of connectivism implies a great challenge to European universities and further education. Over the last few years many teachers and trainers have integrated e-learning into their classes, mostly combining face-to-face workshops with online sections. E-learning gives learners and teachers more flexibility concerning learning location and time-frame. Now connectivism is changing this approach of e-learning and the role of moderators significantly. In the following paper the authors describe the transition from a closed learning environment to an open one and its further development to a hybrid concept, combining protected and open learning processes. The experiences with these different concepts are discussed. The moderators' reflections and the results of online evaluation will also be presented.*

Introduction

In 2005 George Siemens published the concept of connectivism in which he postulates principles of learning in online networks (Siemens, 2005). These principles were used for the first Massive Open Online Course (MOOC) about connectivism and connective knowledge in 2008. Based on materials and questions, the learners aggregated content in the setting of MOOCs and both adapted and remixed it for their own purposes. As a next step the results were shared with others (Downes, 2012). But what is the role of teachers and trainers (so called facilitators) in MOOCs? In the talk "Designing, developing, and running (massive) open online courses" Siemens speaks about the "continued" presence of the facilitator (Siemens, 2012), which leaves room for interpretation.

Free education with open content, open data, and open resources is gaining more and more importance. Many universities, particularly those in the USA, have adapted the concept of MOOCs and new MOOCs are developed and offered year-on-year. According to the Horizon Report 2013 MOOCs and their concepts of openness ("free, copyable, remixable, and without any barriers to access or interaction") will be the key trends from 2013 to 2018 (NMC Horizon Report for Higher Education, 2013).

Different types of MOOCs have been offered In Germany over recent years (1) and 2013 saw MOOC production fellowships fund 10 groups to develop MOOCs in different subjects. Switzerland is investigating the concept of MOOCs in a rather skeptical way because of unresolved issues around personal resources and funding (2). MOOCs are also getting a lot of attention in Austria. In a newspaper article Martin Polaschek, head of the forum 'Teaching' at the 'uniko' Austrian University Conference (3) declares that universities are open to the concept of MOOCs. Polaschek reports that problems arise with MOOC funding and supervision. Another issue is the credibility of MOOCs, which could become a legal problem in Europe (4). At FH Joanneum, University of Applied Sciences in Graz, Austria, the research institute for e-learning 'ZML-Innovative Learning Scenarios' appreciates the openness of connectivism as an important trend. The ZML team members have attended several MOOCs as learners. Based on their experiences they have experimented with the concept of MOOCs. The team wanted to understand the potential of MOOCs, and how MOOCs could be integrated, if possible, into university classes and training courses.

Concepts for closed, open and hybrid courses

A social constructivist approach and the support of the five phases of development for virtual groups - access, online socialization, information exchange, knowledge building and development - were the base of many ZML online courses (Vygotsky 1978, Salmon 2002, Salmon 2004). The courses were in general purely online and participants paid for their training. The virtual environment for the online courses were password-protected and the number of participants limited to small groups (around 15).

The connectivist approach brought different challenges to this course design. It was essential to accept a larger number of learners and to leave closed and protected learning environments behind. The ZML team developed two training courses for learners from companies as main target group within the framework of the project Web Literacy Web (WLL) (5). The first open course was designed in 2012, with the objective to build an online-network of project stakeholders. In 2013 the ZML team started work on a hybrid concept in order to find out how the combination of protected and open group processes would work for both moderators and participants. The concept of these different training courses, with a focus on the most recent training in 2013, is presented in the following paragraphs.

Classic online courses

For more than 10 years the ZML team has designed and moderated online courses in closed learning environments for a maximum of 15 learners. The participants were university teachers, schoolteachers and trainers who had to pay for these courses, which usually lasted for 3 to 4 weeks. Course topics (42 to date) were arranged around e-learning pedagogy, the use of technology in learning and social competences such as moderating or reflecting online group dynamics.

The approach of Salmon's five-stage model for virtual groups - access, online socialization, information exchange, knowledge construction, and development - was adapted to the learners' needs. Members of the ZML team were trained to become e-moderators. As moderators they developed 'e-tivities,' structured online tasks with a purpose, a task and the invitation to interact with other learners. Course participants were invited to fulfill these tasks in an e-learning platform and to discuss and reflect upon them in a forum (sometimes in the form of a wiki or blog). This concept fostered collaboration and learners wrote between 500 to 1900 contributions during these courses.

The moderator plays an important role, as it is her or his responsibility to help learners to become active (especially during the first week), build an online group, and act in a self-responsible way. The moderator did not always assume the role of an expert; the larger part of moderating activities consisted of monitoring participants' individual learning processes. In this way the moderator got to know the participants rather well.

Open course based on connectivism (miniMOOC12)

In February 2012 approximately 60 participants began the first open course, 'Formation of the WLL+ network,' giving the ZML its first experience of how such an online training course could function.

The concept was based on connectivism and MOOCs but included the approach of Salmon as well. The moderators formulated online tasks according to the concept of e-tivities. The participants should remix, re-purpose and feed forward their learning results and reflections, fulfilling online-tasks over a period of three weeks, which were formulated by the moderators. The online-tasks should help the participants to use Google+ as an online environment and explain how to build a network. All content was accessible at the WLL project blog (6), and participants communicated via Google+.

The hybrid course (miniMOOC13)

The concept of MOOCs was used again with some changes in the next open course, 'Content Strategy in the WLL+ network' (January and February 2013). One major course objective was to use the concept of MOOCs again but without losing the knowledge, experience and core of 'classic' online courses. The moderators aimed to combine the benefits of a protected learning process in a closed virtual environment and the challenges of open training. In this advanced concept learners could opt to collaborate in a closed setting first and afterwards progress to an open course.

1. Preparation phase – Online Socialization in a safe environment. The first 10 days of the course were carried out in a closed facebook group. In this period the learners socialized with each other, shared materials and acquired technical knowledge for the open phase (see Figure 1). The moderators supported and encouraged the participants to be active and visible in the virtual environment.

Figure 1. Facebook group.

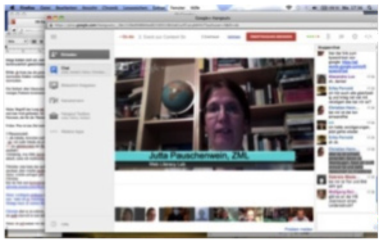

Figure 2. Google+ Hangouts.

2. Open phase – training around 'Content Strategy.' At the end of the preparation phase the participants of the closed facebook group had to leave the protected environment and mix with other learners who had not participated in the preparation phase. During the open phase the learners could actively attend an online video chat in Google+ where experts gave a small amount of input and discussed participants' questions (see Figure 2). These video chats were recorded and streamed via YouTube. The learners were able to watch the videos afterwards as well. The learners had to solve online tasks and share their findings with others. Again links, contents and tasks were collated on the Web Literacy Lab (7) site. By using the material and the videos, learners were prepared to deal with the tasks and contribute to video chats.

Framework of the miniMOOCs

The miniMOOC12 lasted for three weeks and the miniMOOC13 nearly five weeks (both preparation and open phases). In both courses the amount of time participants had to spend was approximately five to seven hours per week. They were free to decide how and when to allocate their learning time. Training was free of charge and all material was available without login. Discussion via the closed facebook group was hidden from anybody who was not a member of the group. Moderators, experts and participants had to log in to Google+. They could decide if they wanted to post their contributions openly or within a restricted group. The moderators and experts shared their contributions in public so that these posts and the videos were available without login.

The miniMOOCs more or less fulfilled the affordance of openness, although they were not massive. The moderators reported about 60 persons in the miniMOOC12 and about 50 in 2013. However it is impossible to determine the number of learners in the miniMOOC design. In the case of the miniMOOC13 between 61 and 148 people watched the expert interview videos. In the preparation phase 33 learners participated in the facebook group.

Reflection and evaluation of the miniMOOCs

In the closed training courses moderators were continuously monitoring participants' learning processes. They observed that online courses need self-determination and a good time management. About 20% of the participants struggled to find enough time for online participation and around 0-20% dropped out during the first week. The participants who finished the course were satisfied with their own learning process and their online network as documented in the final reflection (Pauschenwein et al., 2009).

Such continuous monitoring of the miniMOOCs was not possible, and so an evaluation survey was conducted at the end of the each course. The questionnaire of the first course consisted of 45 questions; the next one contained 30 questions. 17 miniMOOC12 participants returned the evaluation questionnaire, compared to 16 of the miniMOOC13 participants. The questionnaire dealt primarily with pedagogic design, the framework of the training including content, duration and speed, the learning process and network activities. The questionnaires of the two courses were not identical but parts of them were comparable.

Results of the open course – miniMOOC12

The moderators reflected that the first open course was a strange experience after more than 10 years of closed courses with about 15 participants. The concept of the miniMOOCs provided learning in an open way for a much larger number of learners. It was therefore not possible for the moderators to connect with all of them. Without the support and encouragement of moderators, the learners were reluctant to make their learning processes visible. Only a few learners openly shared their results of the online tasks or their learning process. Therefore the network the moderators had aimed for could only partly be established.

The survey showed that about half of the learners who returned the questionnaire were satisfied with their training and the achievement of their learning goals (see Figures 3 and 4). Some of them commented that they were satisfied with the training but had also learned other skills that they had no expected to learn. More than 70% found the learning materials useful. Although most of them did not face technical problems, IT issues such as data security were important discussion topics during training.

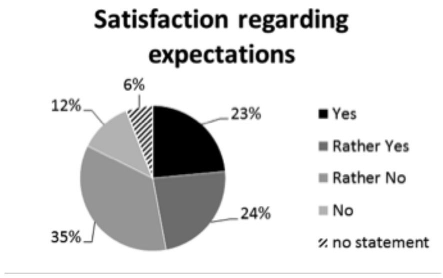

Figure 3. Satisfaction in the miniMOOC12.

Figure 4. Satisfaction with achieved learning goals.

The questionnaire showed that online tasks the tasks were carried out by the majority of participants. Nearly 2/3 managed to complete half of the tasks (see Figure 5). Participants appreciated the support of the moderators and input from experts. 14 people (53% yes, 29% rather yes) found the moderation helpful, while 16 people (65% yes, 29% rather yes) found expert posts useful (see Figure 6).

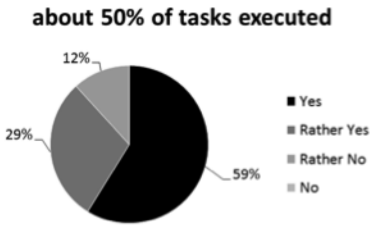

Figure 5. Executed tasks.

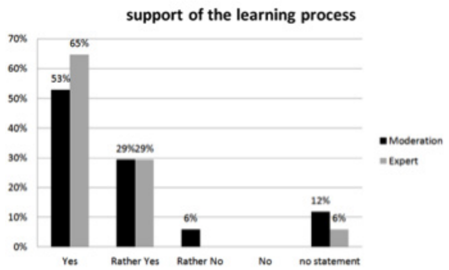

Figure 6. Support Moderation and Expert.

Results of the hybrid concept – miniMOOC13

From a moderator's point of view the hybrid course was quite successful. The closed group on facebook helped the participants to socialize and the moderator to accompany them, because participants' activities were visible in contrast to the purely online course format. The facebook group collaborated well and learning processes were documented.

The transfer from facebook to the open environment on Google+ was not easy. Not all participants changed the medium; three of them commented in the final survey that they did not want to participate in the open learning environment of Google+. The easy exchange in facebook did not continue in Google+, and according to members of the facebook group the discussions on Google+ were tedious. The participants contributed to the discussions around the video chats but they were not as active as in the facebook group and additional participants remained rather invisible.

All in all the online survey demonstrated that most of the participants were, as Figure 7 shows, quite satisfied with the training (25% yes, 63% rather yes).

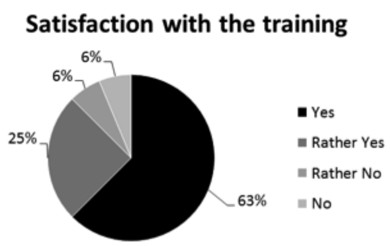

Figure 7. Satisfaction with the miniMOOC13.

The concept of e-tivities was also perceived as positive. It was surprising that all of the participants were aware of the online tasks (69% yes, 31% rather yes). The e-tivities supported the participants in their learning process (44% yes, 31% rather yes). The number of online tasks carried out by the participants was surprisingly high (see Figure 8). Concerning the issue of moderation learners stated that they were well-supported by e-moderators and experts in their learning process, as Figure 9 shows. The documentation of the moderators was helpful for the group (69% yes, 19% rather yes) and moderators' written contributions supported them as well (56% yes, 31% rather yes).

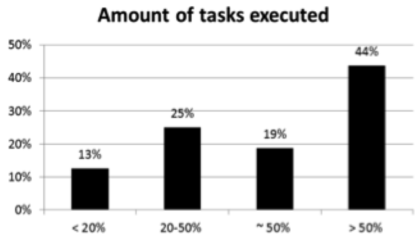

Figure 8. Amount of executed tasks.

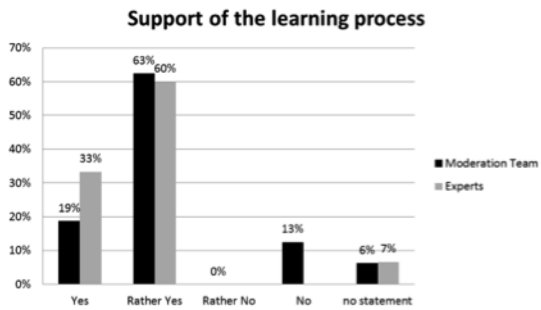

Figure 9. General support Moderation Team and Experts.

Concerning the hybrid concept 71% of the learners answered that the online socialization in facebook supported them in the open learning process in Google+ (57% yes, 14% rather yes).

Discussion and outlook

The results of the questionnaire of the two miniMOOCs were surprising. As the moderators didn't observe learning processes as they were used to, they were unsure if any learning happened at all. At least the learners, who returned the questionnaire and probably had a higher level of engagement in the course than others, reported their (successful) learning progress. From this point of view the miniMOOCs were a success.

The assumption that experts who share their knowledge are far more important in an open learning environment than moderators proved to be false. In both courses the learners appreciated the moderators nearly as much as the experts.

The hybrid concept worked better than the open concept in the first course. Nevertheless, the learning process in the open phase of the miniMOOC13 was not as visible as in the miniMOOC12. Again the moderators did not perceive the efforts of the learners to work on the tasks.

The outcome of the miniMOOCs did not satisfy the moderators who wish to switch to a MOOC with more participants as a next step. Based on the assumption that funding is not a problem the moderators would like to develop a MOOC which has value not only for learners worldwide but also students of some of the study degree-programs at FH Joanneum. As in case of the miniMOOCs they will merge Salmon's five-stage model for virtual groups and the e-tivity approach with elements of connectivism. They will have to decide if they want to start with a closed facebook group.

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Towards a quality model for UNED MOOCs

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Abstract: *This article discusses a prototype quality model developed for courses in the first edition of the UNED MOOC initiative (where over 170,000 students undertook 20 MOOCs between October 2012 and May 2013). It is argued that since it is not easy to differentiate between a MOOC and other types of online courses, it is therefore, difficult to specify a quality model for the former. At the time of starting this project there were no other quality models that could be applied directly. Hence, a practical two part solution was assumed that firstly, considers the overall structure and function of each course in terms of a variable set of characteristics that can be used to evaluate the initial design of the course, and secondly, uses a flexible student certification model, argued to demonstrate that a course has achieved its objectives given the results intended by the teaching team.*

Introduction

Vince Cerf, one of the inventors of the TCP/IP protocol, often referred to as one of the fathers of Internet, stated that certain things get invented when it actually becomes possible to do so, referring to the need for related technology, infrastructure and context to be ready for such developments to become feasible (Cerf, 2012). The first massive open online course (henceforth, MOOC) was run in 2008 (Downes, 2012; Daniel, 2012; Watters, 2012), when arguably the technological, pedagogical and sociological conditions were right for such a course to appear. MOOCs were subsequently hailed as an "educational phenomena" in 2012 (Pappano, 2012), and in June of that year, Spain's national distance-education university, UNED, took the strategic decision to start its Open UNED Web portal (as a way to bring together work on Open Educational Resources and Practices undertaken in different parts of the university), and as part of this project, it was decided to include a MOOC initiative. In order to prepare courses for this initiative it was necessary to define a quality model that could be used to ensure that all courses that were developed would give the students the "course experience" associated with the UNED brand, which in turn, required an understanding of what a MOOC actually is and how it differs from other online courses.

It was Dave Cormier who coined the term MOOC, for this type of online course, in 2008 (Downes, 2012). It has been argued by Downes (2013a) that MOOCs combine the advantages of open content and open learning in a way that is compatible with large-scale participation thanks to the connectivist pedagogic philosophy, where knowledge is developed and distributed across a network. As well as the possibilities for learning and personal development that MOOCs offer, there are also pragmatic reasons for their wide-scale adoption by educational establishments around the globe. Higher education is competitive, not just for the students who finish their studies with a new qualification, when they try to find a job, but also for the institutions themselves as they try to attract new students. Even though hosting MOOCs, which are essentially free to their students (if no paid certification is required), has associated costs for the institution, it is popular with the universities since these courses offer a way to provide potential students with "a taste of what is come", if they enroll on related formal educational programmes at the institution.

However, while offering MOOCs has advantages for the institutions they must also do so with care since any course or educational initiative started by them must reflect the same quality control present in their standard formal educational programmes. Any other alternative would be counter productive and lead to a loss of potential students. When UNED started its MOOC initiative in 2012 there was a strong commitment to quality in the sense of both how a given course would be structured and run together with the control of the certification process of students that have actually finished a course. Specifically, an internal policy was developed in December 2012 to assign ECTS credits to MOOCs, along with other course-specific accreditation, in order to facilitate their integration into the regular academic course programme. In this article, the question of what quality actually means for a MOOC is considered together with the practical implications of how the quality of these courses undertaken at UNED has been achieved.

When is an online course a MOOC?

UNED has over forty years of experience in distance education, and since 2000, has been using an eLearning platform as the main teaching vehicle for its online courses; the majority of which can be defined as using a blended learning methodology (combining online e-Learning with face-to-face sessions in regional study centres). Since then, the university has invested considerable effort in developing quality control mechanisms for its online courses with a special milestone in 2007, when the Spanish Ministry of Education gave instructions that all universities must have systems of internal quality assurance. UNED rapidly completed the design of its internal system of quality assurance as part of the ANECA's (Spain's National Agency for Quality Assessment and Accreditation) AUDIT Programme for all the university's degree programmes. This was verified by the ANECA, with very positive feedback, in 2009 in the First Round of the AUDIT program. Based on this quality system, an a priori control of how courses are actually conceived, structured and what resources are included together with the previsions for supporting students and their difficulties is undertaken by the university's institute for distance education (Instituto Universitario de Educación a Distancia, IUED) Secondly, post-course questionnaires are used so that the students can give feedback on their experience of a given course. Hence, at the end of each edition of a course, the feedback from the student questionnaires is sent to the teaching teams and they are given the opportunity of answering any criticisms received and addressing any weaknesses identified.

When the university took the decision to start the MOOC initiative it was evident that there were a number of courses that could be prepared and started in the first edition. The objective was to have 20 MOOCs developed and running by January 2013. Given the heterogeneous nature of the subjects being covered in the courses and the way in which each teaching team wanted to undertake a course, it was evident that any kind of systematic quality control was going to be difficult to undertake, based upon previous experience. In order to develop a suitable quality model it was necessary to understand what actually constitutes a MOOC. As has been noted in the literature (Hill, 2012), the vary nature of MOOCs, their structure and associated pedagogy differ so much that it is even questionable referring to them by the same term. Downes (2013b) (see also Morrison, 2013a) differentiates between two types of MOOC: connectivist MOOC (or cMOOC, based upon principles of learning communities with active users contributing content and constructing knowledge) and extended MOOC (xMOOC, similar to standard online courses but with larger student numbers). Siemans (2012) notes that the former emphasizes creativity, autonomy and social networked learning whereas the latter focuses on knowledge creation and generation.

Other authors have gone further to highlight different aspects of courses that enable them to be called MOOCs, and even specify what type they are. An example is the taxonomy of 8 types of MOOC developed by Clark (2013): TransferMOOCs represent a copy of an existing eLearning course onto a MOOC platform, where the pedagogic framework follows the standard process of teachers transferring knowledge to students. An example would be the courses offered by Coursera. MadeMOOCs make a more innovative use of video where materials are carefully crafted and assignments pose more difficulty for the students. An example would be the courses offered by Udacity. SynchMOOCs are MOOCs that follow fixed calendars for start, end, assessments, etc. This has been argued to help students plan their time and undertake the course more effectively. Both Coursera and Udacity offer these courses. AsynchMOOCs are asynchronous MOOCs that are the opposite of synchMOOCs in that they have no or frequent start dates, together with flexible deadlines for assignments and assessments. AdaptiveMOOCs try to present personalised learning experiences to the students by adapting the content they see to their progress in the course. The Gates Foundation has highlighted this approach as key for future online courses. Group MOOCs actually restrict student numbers to ensure effective collaborative groups of students. This is argued to improve student retention. As a course progresses, sometimes the groups will be dissolved and reformed again. ConnectivistMOOCS or cMOOCs, are as defined above. MiniMOOCSs are shorter MOOCs that focus on content and skills that can be learned in a small timescale. They are argued to be more suitable for specific tasks with clear objectives.

Conole (2013), instead of actually trying to fit the MOOCs into specific locations within a taxonomy, classified them in terms of a set of dimensions that can be used to define them:

"the degree of openness, the scale of participation (massive), the amount of use of multimedia, the amount of communication, the extent to which collaboration is included, the type of learner pathway (from learner centred to teacher-centred and highly structured), the level of quality assurance, the extent to which reflection is encouraged, the level of assessment, how informal or formal it is, autonomy, and diversity".

Morrison (2013b) prefers a simplified classification, which focuses upon the nature of the instructional methods used, the depth and breadth of the course materials, the degree of interaction possible, the activities and assessments provided, and the interface of the course site. What is evident is that there are difficulties in specifying what a MOOC actually is and defining when an online course actually can be called a MOOC. Even a fairly clear indication of this type of course, namely the large number of participants, is hard to actually specify. What does massive really mean? The authors of this article have online courses on the Computer Science degree programme at UNED with over 3,500 students that are not defined by the university as being MOOCs. Hence, trying to apply the same criteria used for specifying standard online degree courses to the development of MOOCs at UNED would have been difficult to undertake given the wide range of possible courses being developed and the way in which each teaching team wanted to run them (e.g., more or less content, activities, interaction). Even though the strategic decision was taken early on to follow a standard approach to structuring the UNED MOOCs, using design templates to give each course a similar look and feel, differences between the courses would have made it impossible to just apply simple criteria for them all, as if each course were one specific type of MOOC as indicated by Clark (2013) above.

A hybrid approach to MOOC quality at UNED

While research on the issue of MOOC quality is appearing in the literature, as can be seen, there is not currently a consensus on how quality assessment of these courses should be undertaken (Haggard, 2013, p.6) if indeed it makes any sense to try to measure it (Weller, 2013).

The MOOC Quality Project (Ehlers, et al., 2013), undertaken by the European Foundation for Quality, has involved many well-known researchers, to treat different aspects of the question of what quality actually means when MOOCs are concerned. The result of which, including the generation of blog entries and networked discussion, read and contributed to by more than 12,000 people, is that it is very difficult to define what quality means for these courses since their very nature is constantly changing, with new types and variants of courses appearing all the time. They highlight some factors that are related to the perception of MOOC quality: the notion of choice, what pre-course information is provided, the pedagogical approaches supported in a course, the level of student commitment required, is a course scheduled or not, technical requirements, the role of the teaching team, availability and level of interaction, whether certification is availability. A key issue is whether a course actually lives up to its promise.

Downes (2013c), as part of his contribution to The MOOC Quality Project, differentiates between the quality of a MOOC in terms of its platform and related tools (functionality, stability, etc.) and whether the outcome of a given instance of a MOOC is successful or not, in a given context with a given student body. He goes on to note that “measuring drop-out rates, counting test scores, and adding up student satisfaction scores will not tell us whether a MOOC was successful, only whether this particular application of this particular MOOC was successful in this particular instance”.

Another quality initiative that appeared in 2013 is that of the OpenupEd label (Roswell 2012; Roswell 2013), which is based around the E-xcellence approach of using benchmarks for quality assessment (Ubachs et al., 2007; Williams et al., 2012), but here it is applied to MOOCs. The idea is that a MOOC that has been evaluated using benchmarks can put the label on the course Web. The 32 benchmarks represent a good first step toward MOOC quality control but will inevitably need to be refined as more experience of applying them has been obtained.

Even though, as noted previously, a lot of the literature that has appeared on MOOC quality was not available in June 2012 when UNED started its MOOC program, some decisions had to be taken at the time, about how the courses would have their quality controlled, thereby protecting the university’s brand, and ensuring that the first edition of these courses was successful. The initial quality model was based upon the one used for the online degree programmes, which had been developed and refined for more than 15 years. It should be noted that, in principle, preparing a MOOC represents much less of a problem for distance university lecturing staff than for their face-to-face equivalents, since typically the former have been using e-Learning platforms for several years already as part of their daily activities and are very familiar with using the tools available therein. In the case of UNED, the first platform was strategically introduced for a large part of the official courses in 2000 (although many courses had been run “unofficially” previously). Initially a part of the lecturing staff, not familiar with such platforms, had to be taught how to use the platform and its tools, but over the years its use of subsequent platforms has become second nature.

Hence, producing MOOC content and activities, which being somewhat different from those found in other standard university online courses, does not require the development of a new skill set, as might be the case in other areas. Several specific guidelines were established to guide course creators, such as:

- The division of the course syllabus into n modules (with an overall student workload of 1-2 ECTS).
- The inclusion of a short introductory video in each module.
- The use of a self –paced methodology.
- The establishment of interactive user forums to help the students, professors, and teaching assistants develop a community.
- The application of peer-review and group collaboration.
- The presence of automated feedback through objectives and online assessments, e.g. quizzes and exams.

Obviously, the videos used would be shorter than regular video tutorials used in other courses in the e-Learning platform. Instructions for the teaching assistants needed to be prepared, but this activity wasn’t completely unfamiliar to the course authors. It’s worth noting that in UNED MOOCs, the teaching roles were restricted to course facilitators and content curators. The latter acted as "critical knowledge brokers" to maintain the relevance of the information that flows freely between the students in the forums.

Hence, based upon the quality process used in UNED for the blended learning and e-Learning courses, a model was defined in terms of two types of control: firstly, the structural and functional coherence of a given course, based upon the objectives defined by the teaching team which would be matched to a set of characteristics that could be used to evaluate the initial design of the course, similar to those highlighted by Conole (2013), Ehlers, et al. (2013) and Morrison (2013). Secondly, the establishment of a flexible certification model (a freemium model), that would enable the students who had undertaken the course to demonstrate, in a standard test-like evaluation, that the course had achieved its objectives and that they had achieved the results intended by the teaching team.

Regarding the former, the establishment of a variable metric for each MOOC made it possible to control how each course was structured, what kind of resources were included and how activities, interaction and assessment was included. Specifically, the metric contemplated five aspects:

1. Topic: Each course should be as specific as possible, such that there could be an agglomeration of courses into a larger "knowledge puzzle" subsequently. Proposals for MOOCs that tried to cover too wide an area were reviewed and simplified, and where necessary, were split into proposals for more than one course.

2. Contents: In many cases materials previously prepared by the course author(s) could be reused, although they may have had to be adapted to the MOOC format (i.e., videos with an approximate duration of 5 minutes, guidelines that would be understandable without the support of teaching staff, activities that either finished with self-evaluation or involved some kind of forum-based collaboration or interaction, etc.). However, in some cases certain recordings had to be re-scripted and recorded again; it was not possible to take a twenty minute recording and split it into four five- minute ones, due to the logical flow of the recording.

3. Duration: Due to the wide variety of MOOCs considered, it was necessary to accept course durations of between 25 and 125 hours. The majority of courses were nearer the former than the latter, although some were longer if they dealt with experimental simulations, remote laboratory control or the coordination of students undertaking real-world practical activities.

4. Structure: Courses were typically divided into 4 to 8 modules, depending upon duration and objectives. Each module would typically have between 4 to 8 videos with associated activities and evaluations. The latter were used to consolidate acquired knowledge and foster interaction between the students. When the structure of a given course was being reviewed in terms of its overall quality, given the differences in objectives and philosophy, more of a qualitative assessment was made than a quantitative one. A consideration was made of how the combination of videos and other materials facilitated the learning proposed by the course team in the objectives established for the course.

5. Specific instructional design guidelines: courses were designed to challenge the students who took part, and not as a series of lectures to be "passively consumed". The data generated in the assessments could be evaluated 'massively' using automated systems. Also, self-assessment methodology was applied, which requires students to reflect upon their own work and judge how well they performed.

6. Social channels: Forums were the main interaction tool provided, although other associated Web 2.0 tools could also be included if the teaching team so desired. The forum tool present in the OpenMOOC platform enabled members to vote on any post. Posts with more votes appeared higher up in the relevant thread in the forum, so were encountered earlier when searches were made. The methodological approach used for UNED MOOCs, similar to most of these courses, didn't take into account the participation of the course designers in the forums (although quite often they did, in fact, take part). Hence, the forum, and its ordered message system, provided valuable feedback to students undertaking the courses, not only on specific course-related content but also on general platform-related and MOOC-associated topics.

7. Student dropout has been identified as a key problem for MOOCs (e.g., Gee, 2012; Yang et al., 2013). This is too big and complicated a problem to solve with one simple measure. One online survey ["MOOC Interrupted: Top 10 Reasons Our Readers Didn't Finish a Massive Open Online Course". Open Culture] published a "top ten" list of reasons for drop out. The reasons included: the course required too much time, or was too difficult or too basic, the course design included "lecture fatigue" (due to too many lecture videos), a lack of a proper introduction to course technology and format, clunky technology and trolling on discussion boards. Furthermore, hidden costs were cited, including the need to complement course content with expensive textbooks written by the instructor. Other non-completers were identified as "just shopping around" when they registered, or as partic-

ipating only for knowledge rather than because they wanted to obtain some form of credential. However, what has been noted in UNED MOOCs is that the mutual support possible thanks to the forum tool, together with the participation of the facilitator and curator there, have helped students keep in the courses and stay focussed on the tasks relevant to learning.

This was useful both for controlling the development process and also deciding when a course was finished and ready to be put into production. Regarding the latter, the freemium certification model used for this purpose had three types of awards. Firstly, badges that were gained automatically as the course progresses, for having achieved specific results, such as finishing an activity in a course, participating a certain number of times in the community, etc. Secondly, a type of certificate, defined by UNED as a Credential, that is awarded as a result of a student having finished the majority (80% or more) of a given course and subsequently taking an online test. Thirdly and finally are full certificates, which require a student to undertake a test similar to the online one but on a computer in one of UNED's regional study centres, where proof of identity is required and the test is taken in authentic exam conditions. The third type of certification process was established to counter one of the criticisms of MOOCs and the assessments used therein, namely plagiarism and cheating (Oliver, 2012; McEachern, 2013).

Conclusions

The first edition of the UNED MOOC initiative finished in May 2013 with over 170,000 registered users and more than 2800 paid certificates being awarded. Of the 20 courses started, the most popular ones were those on second language learning, as can be seen in Table 1. It was evident when this initiative was started that some control was needed to ensure that the courses developed would be both sufficiently flexible in nature to meet the teaching team's conception of what they wanted in their MOOC, and at the same time, guarantee that the user experience would meet what was expected from a UNED course.

Course	Enrolment
Starting with English: learn the first thousand words	45,102
Professional English	33,588
German for Spanish speakers	22,438
Practical course on e-Commerce	12,763
Accountancy: the language of business	9,799
ICTs for teaching and learning	7,448

Table 1. Top six MOOC enrolment figures at UNED

However, as has been argued in this article, it is not easy to specify what exactly defines a MOOC and differentiates it from other types of online courses. Even basic characteristics of a MOOC, such as the number of students, or the degree of involvement of the teaching team once a course has started, can blur between courses, some of which are called MOOC and some are not. Hence, it is difficult to specify a quality model, given the wide range of parameters for different online courses, which may or may not be conceived as being MOOC. Since a practical solution to the question of course quality was needed for the UNED MOOC initiative, a quality model was used that considered the overall structure and function of each course in terms of a variable set of characteristics that could be used to evaluate the initial design of the course, and the use of a flexible student certification model, to demonstrate, as far as is possible, that a course had achieved its objectives and had achieved the results intended by the teaching team.

The results of the first edition of these courses were very positive because as well as the quantitative data on participation, course completion, etc., the qualitative feedback from the students in the respective forums reflected their overall level of satisfaction both with the courses and the UNED MOOC platform. The two part quality model had served its purpose and in general the courses were well received and undertaken with few problems. One area for improvement that will be addressed in future editions of these courses was the differing expectations of students starting the MOOCs based upon their previous experience of other UNED courses. Some students who are also undertaking other studies at the university (like degree programs) are used to how these courses work and had some difficulties initially with the MOOCs because the course dynamics were different.

In terms of recommendations for course quality that could be made for other institutions wanting to start a MOOC program, leaving aside the technological decisions about which platform to use (if an in house solution is desired) or MOOC hosting (if an external service is preferred), a lot of what has been learned here can be applied. Firstly, if the institution does not have a track record of putting together e-Learning courses, then the teaching staff will initially need to learn how to use the tools required for/in such courses. Secondly, regardless of whether the first point is true, then some experience of how MOOC content and activities differ from other low student-number online courses should be obtained before starting to develop courses. There should also be some control of course structure and educational coherence so that students undertaking different courses at the institution will have a familiar experience in the different courses. Thirdly, an important factor of the dynamics of MOOC that has to be anticipated and dealt with is that of the large scale interaction that occurs in the social me-

[1] http://www.openculture.com/2013/04/10_reasons_you_didnt_complete_a_mooc.html

dia, typically the forums, given that the academic(s) who has(ve) developed the course typically won't participate. Facilitators and curators have had a key role in many different areas in UNED MOOC, ranging from maintaining course engagement through to steering students toward solutions to their problems. Fourthly and finally, if quality is understood, at least in part, as the overall satisfaction of the students who have undertaken the MOOC, then it is important that analytical mechanisms for learning analytics are present and combined with questionnaires. Experience shows that there is a far wider range of expectations present in potential MOOC students then in other e-Learning courses run on degree or masters programmes. Regardless of how well a given course has been prepared there are inevitably problems that arise as the students undertake it. Given the controls presented here a lot can be done to resolve them as the course progresses or for future editions of the course.

Given the wide range of educational scenarios and experiences that are included under the MOOC umbrella it may prove difficult to arrive at a clearly definable definition of what constitutes quality here. However, as the nature of such courses becomes more clearly identified, together with what "works and doesn't work" for each type, then it will become easier to establish course structure, content and interactional dynamics a priori, thereby making the task of quality assessment easier to undertake.

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Project-based MOOCs. A Field Report on Open Learning in Media Education

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***Abstract:** Interest in designing online courses, projects and activities that focus on the learner and the learning community tends to place lower priority on instructional aspects, and instead promote pedagogical approaches to using digital opportunities for problem-oriented and interest-driven learning, and collaboration. The pMOOC format introduced in this article puts collaborative online projects at the centre of learning. (1) Courses offered are open to everyone interested. Digital resources and practices are incorporated not over a single platform as the infrastructure is open and mostly open-license technologies are used. Content provided and collaboratively produced is released under a CC BY license (2) Evaluation results of the pMOOC Good Apps for Children with more than 250 participants show that there is a demand for the format by academics and practitioners, drop-out rate is fairly low, and participants are by majority positive with course outcomes.*

A constructivist approach to MOOC

The dualism between xMOOCs and cMOOCs has been discussed at large (see e.g. DBIS 2013). So far the question of which model of higher education pedagogy MOOCs will apply and advance in the long run remains open. Large MOOCs and MOOC platforms have been criticized for not picking up and giving only little recognition to constructivist approaches to learning. Peer-to-peer learning, collaboration and interest-driven learning might be jeopardized while being subordinated under the massiveness of the courses. The pedagogical view on learning within the digital scope seems in many instances to lack treatment. The big MOOCs replicate renowned instructional teaching methods, according to perceptible criticism (see Reclaim Open Initiative 2013).

There have already been thoughts about introducing a third format (see e.g. Lane 2013). The authors approach MOOCs in a way that it is not primarily about instruction, but about working together on real-world tasks. Rather than instructional teaching methods via for instance, video-based delivery of facts to a high number of course participants, a didactic model is applied that places the focus on the learner. By offering project-based MOOCs, participants collaboratively work on real-world problems while developing connecting practices. The learning theory behind this is constructivism as the digital options for peer-to-peer learning, interest-driven learning, collaboration, and problem-oriented learning are applied. Since Seymour Papert's Mindstorms in the 1980s, a broad range of different approaches (e.g. learning by design, communities of practice, case-based and problem-based learning) tied to constructivism and offering multiple suggestions and encouragement to implement technology in education are on hand. The application of these concepts to the MOOC format could add an important, if not constitutive pedagogical value. This is especially applicable for community-driven MOOCs. MOOCs have great potential to change and improve higher education pedagogy substantially.

An alternative format: pMOOC

We explore the MOOC format by offering open online courses at the Media Literacy Lab (1), based at the Department of Media Education at the University of Mainz, Germany. Project-based learning is the key to our work. Primarily, the p stands for project-based as the design allows for short (ca. four-week length), tightly arranged courses in which participants work together on a project from beginning to end. Phases of individual work alternate with collaborative performed tasks in small groups as well as cooperation with other participants. Instructional scaffolding and technical support are offered to complete the tasks. At the end of the course, participants submit their accomplished work and project outcomes.

P also stands for Problem. Following the principle of problem-based learning, students benefit from being challenged to complete an authentic task - a real-world problem. Courses aim at solving a problem that is not only important for the individual learner but also for the entire field of media education and digital media in education.

P stands for Production and Publishing. Courses offer the opportunity to create a digital artefact or product (e.g. text, video, podcast, mind map, database) for course participants, but also for everyone interested from outside the course. So the course culminates with the public presentation of a product or a digital artefact.

P stands for Participant-Driven. Participants are encouraged to follow their own way of learning, set their own focus and put their own ideas into reality. The course can be used as a platform to find collaborators and supporters, to work together and discuss issues connected to the topic of the course. Participants thereby are at the wheel for their own learning activities. They can choose between different levels of involvement and different types of activities. They can even leave the structure proposed by the host of the course and develop own ways of working and learning.

P stands for Participation. The Media Literacy Lab is open for everyone. We are inviting learners not only to join an academic group of students, but also to participate in the courses and debates on media literacy in the 21st century. Students at higher education are just as welcome as teachers and parents, teenagers and programmers, academics and practitioners.

P stands for Public. Our work and our discussions within the courses are public by default. They even stay public after the end of the course. Observers are not only tolerated, but also invited to follow the activities within the courses.

P stands for Partners from inside and outside of Academia

As the topics and the projects of our courses are aimed at the real world, the Media Literacy Lab strives to work together with partners from the field in which we are working. Partners can bring their own expertise, questions and participants. And of course they can and should use the results of the courses for their further work.

Opening up MOOCs

Openness seems to be fundamental to MOOCs: this is what the first O in MOOC stands for. Advocates for open education are claiming that open means much more than open for everyone to enrol (see Reclaim Open Initiative 2013). In our courses, we refer to open on multiple levels:

- Enrolment. This is underlying to all MOOCs meaning that everyone can take the courses without restrictions regarding formal or non-formal qualifications.
- No Costs. No expenses (at least in 2013) also constitute a criterion attached to almost all MOOCs. No one has to pay for taking the courses.
- Platform. Digital resources and practices are incorporated not via a single platform. The infrastructure is open as we are (mostly) using open-license technologies like WordPress, Mediawiki, Etherpad plus e.g. Google+ Community.
- Licensing. The authors think of open as in Open Educational Resources as meaning that our resources are not only available for free but also are licenced under a Creative Commons Attribution (CC BY) Licence. Everyone can reuse, revise, remix and redistribute the material that is made available for our courses. The open licence does not only refer to resources offered by the presenters but also to the results. Everyone who wants to register has to agree that the results of the collaborative work are published under the CC BY License.
- Pedagogics. We understand the offered course structure as a scaffold that must be open to allow different styles in participating and contributing for every participant. In doing so open course organization reflects the pedagogical perspective of an inner openness for learning allowing a high degree of freedom for the learner.
- Public. Every component of our courses is visible to the public. No registration is needed to see all resources and results. Even the discussions within a Google+ Community or a Wiki are open and public. This does not mean an obligation for public exposure. The way participants work individually and within their teams can be chosen by themselves. Furthermore it is possible to take part using a pseudonym.
- Transparency. The MLAB Team is trying to work in a more transparent manner than most educational institutions do. We aim to publishing our ideas and plans at an early stage so that people can inform, criticise and contribute.

pMOOC "Good Apps for Children"

In summer 2013, more than 250 participants collaborated in the pilot course Good Apps for Children (2). Within three weeks, participants had developed a set of criteria to review apps for children and set up a database with 100 app-reviews. In addition, some participants produced podcasts interviewing children about their favourite apps.

In order to accomplish this, approximately 50 teams of around four group members formed worked to match and merge their work with the results of the other groups. This demanding process was supported by scaffolding via peer-to-peer feedback, peer leading, peer reviewing, coach mentoring and videoconferences with the organizing team. The course community on Google + (3) also played a vital role. Here, participants shared experiences and information, gave each other support and organized peer-to-peer structures. It was interesting to observe that many groups started to leave offered course structures and organized themselves online and offline in places they felt comfortable (ranging from Facebook and WhatsApp to email, phone and cafeteria). An overview of the phases, tasks and tools is provided in Table 1.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Task	Introduction Come Together Grouping	Input Materials Input Tools Criteria Discussion	Set of Criteria Feedback Coaches Merging Group Results	Pick an App App Test App Review Publish in Wiki Peer Review	Transfer Campaign
Tools	G+/G+-Community/ G+-Hangout Doodle Email	Prezi G+/G+-Community/ G+-Hangout Email	Etherpad Google Docs G+/G+-Community/ G+-Hangout Email	Wiki Podcast G+/G+ Community/ G+-Hangout Email	Social Media (Facebook, Twitter) Websites Print Media Offline Meetings

Table 1: Phases, Tasks and Tools of the MOOC Good Apps for Children

Evaluation

Sample. Evaluation results (n= 182) show that a high proportion of females participated in the course (female n=121, male n=46, see Table 2). Among the participants, there were 42 % university students, 21 % practitioners from the field of media education and a further 19 % that categorized themselves as Interested / Third Party. Nearly 8 % schoolteachers and 7 % university teachers participated.

Participants	***N=182***
Gender	
Female	121 (66,5 %)
Male	46 (25,3 %)
No Answer	15 (8,2 %)
Professional Background	
University Student	77 (42,3 %)
Practitioner	39 (21,4 %)
Interested / Third Parties	35 (19,2 %)
School Teacher	14 (7,7 %)
University Teacher	11 (7 %)
No Answer	6 (3,3 %)

Table 2: Sample (Gender, Professional Background, n=182)

Dropout. Nearly 7 out of 10 course members stated that they participated on a regular basis (69 %). Among these, 50% participated in course activities on a daily basis, 33 % when a new task was assigned, 13 % on a weekly basis and 4 % less than on a weekly basis. Dropout rate was at 31 %. Reasons given for not finishing the course included workload (45 %), publicity of the course (6 %); course was no fun (2 %), lack of time (22 %), private reasons (12 %) and course structure (12 %) (See Table 3).

Participation	**N=158**
1 - Active Participation	**109 (69 %)**
2 - Daily	55 (50 %)
3 - Task-Assignment	36 (33 %)
4 - Weekly	14 (13 %)
5 - Rarely	4 (4 %)
6 - Drop out	**49 (31 %)**
7 - Workload	22 (45 %)
8 - Publicity	3 (6 %)
9 - No fun	1 (2 %)
10 - Lack of time	11 (22 %)
11 - Private reasons	6 (12 %)
12 - Course structure	6 (12 %)

Table 3: Active Participation and Dropout Rate (n=158)

Outcome and learning results. Most participants indicated that their expectations were fulfilled (74 %). Also, most were content with course input (86 %) and stated that they gained knowledge of the course topic (76 %). With respect to the diversity of course participants, 80 % reported that they looked upon heterogeneities of the group favorably, only 17 % neglected that. Results indicate that course members were in the majority content with the collaborative work with respect to a) set of criteria (60 % very satisfied/satisfied) b) app database (64 % very satisfied/satisfied) (see Table 4).

Outcome / Learning Results	**N=182**	**Outcome / Learning Results**	**N=182**
Expectations		***Quality of criteria catalogue***	
Have been fulfilled	134 (74 %)	Very satisfied	48 (26 %)
Have not been fulfilled	40 (22 %)	Satisfied	61 (34 %)
No Answer	8 (4 %)	Rather dissatisfied	17 (9 %)
Satisfaction with course input		Dissatisfied	5 (3 %)
Yes	157 (86 %)	I don't know	31 (17 %)
No	16 (9 %)	No Answer	20 (11 %)
No Answer	9 (5 %)		

Table 4: Outcome and Learning Results (n=182)

Gain in knowledge of the topic		***Quality of app database (wiki)***	
Yes	139 (76 %)	Very satisfied	43 (24 %)
No	32 (18 %)	Satisfied	73 (40 %)
No Answer	11 (6 %)	Rather dissatisfied	12 (7 %)
Satisfaction with course input		Dissatisfied	1 (1 %)
Positive	146 (80 %)	I don't know / no answer	53 (29 %)
Negative	31 (17 %)		
No Answer	5 (3 %)		

Summary

Based on the assessment and evaluation of the described pMOOC format, the authors want to contribute to the MOOC debate by shaping and bringing forward the theoretical, empirical and practical groundwork on connecting constructivist learning to MOOCs. Implications for the further development of pMOOCs will be discussed.

- URL: http://medialiteracylab.de/english/ (English)
- URL: http://en.gute-apps-fuer-kinder.de/ (English)
- URL: https://plus.google.com/u/0/communities/115786261725158439238 (German)

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