### CONFERENCE COMMITTEE

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<th>Name</th>
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<tr>
<td>Marcel Lebrun</td>
<td>Université catholique de Louvain, Belgium</td>
<td>General Chair</td>
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<tr>
<td>Martin Ebner</td>
<td>Graz University of Technology, Austria</td>
<td>Chair for the research track</td>
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<tr>
<td>Inge de Waard</td>
<td>The Open University, UK / Belgium</td>
<td>Chair for the experience track</td>
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<tr>
<td>Michael Gaebel</td>
<td>European University Association, Belgium</td>
<td>Chair for the institutions track</td>
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### EXPERIENCE TRACK’S COMMITTEE

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<tr>
<td>Inge de Waard</td>
<td>The Open University, UK / Belgium</td>
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<td>Nathalie Schiffino</td>
<td>Université catholique de Louvain, Belgium</td>
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<td>UNED, Spain</td>
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<td>The University of North Texas, USA</td>
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<td>Bent Kure</td>
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<td>Jeremy Knox</td>
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<td>Kristin Ingolfsdottir</td>
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<td>Eva Seiler Schiedt</td>
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<td>Rachel Glasser</td>
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<td>Paul Belleflamme</td>
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### RESEARCH TRACK’S COMMITTEE

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<td>Guy Lories</td>
<td>Université catholique de Louvain, Belgium</td>
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<td>Michael Kopp</td>
<td>University of Graz, Austria (MOOC-track CHAIR)</td>
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<td>Patrick Schweighofer</td>
<td>University of Applied Science CAMPUS 02, Austria</td>
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### WORLDWIDE TRACK’S COMMITTEE

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<tr>
<td>Sabine Schumann</td>
<td>P.A.U, Education, Conference Co-organizers</td>
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CONTENTS

EXPERIENCE TRACK

Design Intent and Iteration:
The #HumanMOOC .............................................................. 7
Mentoring at Scale: MOOC Mentor Interventions Towards a Connected Learning Community...... 13
A new participative space for MOOCs; overtaking technological evolution to achieve educational innovation ...................................................... 18
An Unconventional MOOC as a Solution for Short Budgets and Young Researchers in Europe...................................................................................23
Making MOOCs collaboratively: working effectively with stakeholders........................28
Collaborative MOOCs: a challenging experience ...................................................32
MOOCs in Amdocs – Corporate Learning Based on MOOC’s Methodology....................37
Massive Open Online Courses as a Tool for Student Counselling and Study Guidance: The Example of MOOC@TU9 ........................................41
Potentiating the human dimension in Language MOOCs ..........................................................46
Why make MOOCs? Effects on on-campus teaching and learning ....55
Creating MOOCs by UAMx: experiences and expectations........................................... 61
Experiences from 18 DelftX MOOCs..........................................................65
Integrating MOOCs in Traditional Higher Education.................................................. 71
Three-Step Transformation of a Traditional University Course into a MOOC: a LouvainX Experience ...............................................................76
MOOCs from the Instructors’ Perspective ............81
Automatic grading of programming exercises in a MOOC using the INGInious platform ...............86
Learning by doing: Integrating a serious game in a MOOC to promote new skills .................92
Sizing an on premises MOOC Platform: Experiences and tests using Open edX .................97
From MOODLE to MOOIN: Development of a MOOC platform..............................102
UCL’s Extended Learning Landscape......................... 107

RESEARCH TRACK

How Do In-video Interactions Reflect Perceived Video Difficulty? ......................... 112
An Evaluation of Learning Analytics in a Blended MOOC Environment .....................122
Video-Mapper: A Video Annotation Tool to Support Collaborative Learning in MOOCs ....131
Maintaining the heartbeat: Checkpoints and FishBowl s ......................................... 141
Enhancing Content between Iterations of a MOOC – Effects on Key Metrics ..............147
Supporting language diversity of European MOOCs with the EMMA platform............157
Reconsidering Retention in MOOCs: the Relevance of Formal Assessment and Pedagogy....................................................................... 166
Do MOOC students come back for more? Recurring Students in the GdP MOOC ...........174
What do we know about typical MOOC participants? First insights from the field........... 183
A Tale of Two MOOCs: Analyzing Long-Term Course Dynamics.................................191
Can demographic information predict MOOC learner outcomes?..............................199
Are there restrictions on the roll-out of MOOCs in EU universities and high schools on the basis of applicable EU Data Protection law? ........................................... 208
The Same MOOC Delivered in Two Languages: Examining Knowledge Construction and Motivation to Learn.............................................. 217
Does peer grading work? How to implement and improve it? Comparing instructor and peer assessment in MOOC GdP........................................... 224
Self-Directed Learning in Trial FutureLearn courses............................................. 234
EXPERIENCE TRACK
Proceedings of the European MOOC Stakeholder Summit 2015
Design Intent and Iteration: The #HumanMOOC

Whitney Kilgore, The University of North Texas
Robin Bartoletti, The University of North Texas Health Science Center
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ABSTRACT

In the Fall of 2013 “The Human Element: An essential online course component” was facilitated on the Canvas Open Network. Lessons the authors learned upon reflection about design, pedagogy, and research led to the second iteration: “Humanizing Online Instruction: Building a Community of Inquiry (CoI)” a 4-week Micro-MOOC made available Spring 2015. These professional development courses were designed for instructors who teach online and hybrid courses and wish to improve their online teaching practice. The courses introduced participants to the CoI framework. Participants in these networked learning experiences actively explored emerging technologies and developed digital assets that they could employ in their own online teaching practice. In this paper the designers and instructors share experiences and lessons learned and describe efforts taken to design, develop, and evaluate the second offering of this MOOC.

Multi-Institutional Professional Development for Faculty

Increased demand for online learning options coupled with fast evolution of technology and pedagogy necessitates an equal growth in the quality and quantity of online facilitation training for faculty to ensure effective online educational experiences (Ganza, 2012). Many online educators are using technologies that they have yet to explore in the face-to-face classroom. While advanced online and computer technologies are gradually decreasing the barriers of traditional professional development programs, instructional designers are still faced with the challenge of designing online venues for professional development based on sound design principles that take advantage of the strengths of the online medium. Using a MOOC for Professional Development allows for participants from multiple institutions and teaching across many disciplines to participate in a course together. Traditional professional development models that have existed on higher education campuses have not typically been multi-institutional.

Building a Faculty Community of Inquiry

MOOCs utilize a digital ecosystem that allows learners to self-organize around a topic of common interest. In “Humanizing Online Instruction”, a networked community of practice is created that encourages the sharing of teaching practices through blogging, tweeting, status updates, etc. Leveraging an online delivery system (Canvas.net from Instructure) for professional development reduces the participation barrier for online educators, creates a student experience from which they can explore and reflect, and develops a cross-institutional community of practice (Anderson, 2011). It is the transparent sharing and reflecting component of the course that allows the learners to experience the power of social presence, which drives the cognitive element. Ganza (2012) states, “Reflection is the key ingredient of effective professional development” (p. 31). Based upon the model defined by Couros (2009), the facilitators will promote learning experiences that are open, collaborative, reflective, transparent, and social.
Previous experience/ Lessons learned
The authors have developed numerous Micro-MOOCs (4-week format) since 2011. All of these courses were focused on providing professional development to educators. The strengths of these courses, as stated by the learners, have been the connections between the individual participants and between the participants and the facilitators that last beyond the actual course. This sentiment is aligned with the findings from Kop (2011) who said that the closer the ties evidenced between the people, the higher the level of presence and the higher the level of engagement in the course activities.
Each weekly module in the course contains annotated research and activities related to specific elements of the CoI framework (i.e. instructor, social, and cognitive presence). Building the course upon the foundation of the CoI grounded the course’s application-based activities in theory. The course began with an orientation week where learners prepare for the subsequent weeks by creating a blog and a twitter account if they did not yet have one, introduce themselves using video on the discussion board, and attending or watching the recorded session “The Human Element: An Essential Online Course Component” by Michelle P acan sk y-Brock. The second week of the course focused on Instructor presence and the CoI in online education. Week three was centered on social presence, and the final week of the course was related to cognitive presence.
“The Human Element: An Essential Online Course Component” was taught in the Fall of 2013 on the Canvas Open Network (canvas.net). While 697 registered for the course, the course designers define participation as learners who are active in the course between the dates that the course was available online. 137 participants completed the first survey in the course making them active course participants (Kilgore & Lowenthal, 2015). Of the 137 course participants, 50 completed the first assignment, 49 developed individualized communication goals for their own online teaching and 30 completed the course in its entirety. This means this MOOC had a 22% completion rate. When designing “The Human Element”, the designers did not have a good sense of the potential audience for the course or their experiences and were truly designing for the unknown learner. In the course re-design the designers used the demographics from the previous participants to inform their understanding of the potential audience. The demographic information below was collected during the first week of the course (see Table 1).

<table>
<thead>
<tr>
<th>Participants</th>
<th>Educational Background</th>
<th>Age</th>
<th>MOOC Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>91% Master’s degree or higher</td>
<td>21-29 yrs old: 2%</td>
<td>0-1 MOOCs: 59%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30-39 yrs old: 17%</td>
<td>2-3 MOOCs: 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40-49 yrs old: 30%</td>
<td>4-5 MOOCs: 11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50-59 yrs old: 33%</td>
<td>6-8 MOOCs: 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60+ yrs old: 18%</td>
<td></td>
</tr>
</tbody>
</table>

Kilgore & Lowenthal, 2015, p. 379

In follow up interviews six months after the completion of the course, the participants highlight the importance of effective pedagogy, mention attempting new ways to humanize courses they design and teach, and maintain connections to people from the course. Participants shared how effective it was to learn about humanizing instruction while participating as a student. Some participants also shared negative experiences and feedback and this information was utilized in determining the approaches that could make this learning experience richer in another iteration. The comments from participants included: “I’ll admit to being a little anxious about using video in my online classes. I haven’t done it yet, but I might. One of the joys of online teaching is not having to worry about my appearance.” “Tech scares me. I don’t have a camera on my computer.” “At one university I teach for, we record our lectures, the problem is that the field I am in changes and updating recorded lectures is a big pain.” “Sorry, can’t get the VoiceThread to record my voice for some reason – still troubleshooting.” These comments point to technical issues, varying technical proficiencies, a lack of
desire to leverage recording technologies in online teaching, and issues related to content that is continually changing (Kilgore & Lowenthal, 2015). Figure 1 below is a visual representation of the redesign of the course based upon the experience of teaching the course in 2013.

![Diagram of the redesign of the HumanMOOC](image)

**Figure 1: The redesign of the HumanMOOC**

**Pedagogical Competencies for Online Teaching Success**

In an effort to ensure that the redesigned course would be pedagogically beneficial for faculty who teach online, the competencies for online teaching success defined by Penn State were reviewed. The Humanizing Online Instruction MOOC addresses nine of the 27 Penn State competencies. (1) Attending to the unique challenges of distance learning where learners are separated by time and geographic proximity and interactions are primarily asynchronous in nature. (2) Provision of detailed feedback on assignments and exams. (3) Communication with students about course progress and changes. (4) Promotion and encouragement of a learning environment that is safe and inviting and mutually respectful. (5) Monitoring and management of student progress. (6) Communication of course goals and outcomes. (7) Provision of evidence to students of their presence in the course on a regular basis. (8) Effective use of course communication systems. And (9) Communication of expectations of student course behavior (Ragan, Bigatel, Kennan, & Dillon, 2012). The course learning objectives are thoughtfully crafted and aligned with these pedagogical competencies for online teaching (see Table 2).

**Learning, Achievement, and Badges**

Each weekly module contains authentic assessments that allowed for evaluation of learning, includes a variety of engagement opportunities including a few Google Hangouts that participants can watch live or later, and requires task completion to earn the badges for instructor presence, social presence, cognitive presence, and the CoI badge. Each week of the MOOC is designed as a stand-alone module in which participants can earn individual badges for completing specific tasks for that week (example: in week one the activities are focused on instructor presence, so the completion of the required assignments earn the participant the instructor presence badge). Those learners who elect to complete all course assignments will be eligible to earn a course completion badge known as the Community of Inquiry badge. The participants will demonstrate an understanding of the CoI, reflect on their own teaching practices, and develop an action plan to implement methods to increase teaching, social and cognitive presence in their future courses. The design of the authentic assessments ensure that learners have a strong foundation in the community of inquiry as well as ways that they can apply the principles in a very practical manner in their own teaching right away.
Activity Alignment to Learning Outcomes

Using a similar method, the learning outcomes and learning activities were reviewed for alignment. Prior to the awarding of course badges the designers determined through the alignment process the tasks that demonstrate the competencies and that are necessary to receive each of the badges. It was discovered that many of the learning activities align to multiple standards as seen on in Table 3.

Course Design Evaluation

Prior to learners entering the newly revised course for the first time, it will undergo an extensive review. There are three steps to the formative evaluation cycle. First, the instructors who will co-facilitate the course will review and edit one module each. Next, the entire course will undergo a full review using the Continuing and Professional Education (CPE) MOOC rubric designed by Quality Matters in conjunction with EQUFEL and the Gates Foundation. The Humanizing Online Instruction MOOC reviewers are from Australia, the UK, and the US and all are qualified learning designers (master’s degree or higher in instructional design) with a minimum of 10 years of design experience. One reviewer is a certified Master Reviewer for Quality Matters and will oversee the training of the volunteer reviewers and lead the review process. After this review cycle is complete, the course will again be edited based upon the feedback from the review team. These edits will ensure the course contains all of the remaining standards on the Quality Matters rubric that may have been missed in the previous development and editing process. And, finally the Canvas Network Instructional Design team will review the course before it is made available to learners.

Table 2: Mapping Course Objectives to the Penn State Competencies

<table>
<thead>
<tr>
<th>Humanizing Online Instruction MOOC: Alignment of Learning Outcomes to Penn State Competencies for Online Teaching Success</th>
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<tbody>
<tr>
<td><strong>HumanMOOC Learning Outcomes</strong></td>
</tr>
<tr>
<td>Evaluate the use of several asynchronous tools that enhance teaching presence, social presence, and cognitive presence to meet the needs of learners who choose distance learning for the sake of convenience.</td>
</tr>
<tr>
<td>Evaluate and choose the audio/video screen-casting tool that will be used for providing learners feedback via video.</td>
</tr>
<tr>
<td>Develop a sample course announcement using audio and/or video to include in a comprehensive course communication plan.</td>
</tr>
<tr>
<td>Demonstrate good digital citizenship using instructor presence.</td>
</tr>
<tr>
<td>Explores and select a new method of monitoring and managing student progress using voice and video</td>
</tr>
<tr>
<td>Develop course goals and outcomes communications</td>
</tr>
<tr>
<td>Develop a personal action plan explaining the new communication strategies to enhance instructor, cognitive, and social presence that will be included in the learners’ future courses.</td>
</tr>
<tr>
<td>Create engaging events for your own course that build learners problem resolution strategies in order to deepen cognitive presence.</td>
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<table>
<thead>
<tr>
<th>Penn State Pedagogical Competencies for Online Teaching Success</th>
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<tbody>
<tr>
<td>1. P1.1.1: Encourage students to participate and engage in the learning process.</td>
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<tr>
<td>2. P1.1.2: Provide feedback and ongoing support.</td>
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<tr>
<td>3. P1.1.3: Create a safe learning environment.</td>
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<td>4. P1.1.4: Foster critical thinking and reflection.</td>
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<tr>
<td>5. P1.1.5: Foster collaboration and cooperation.</td>
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<tr>
<td>6. P1.1.6: Foster creativity and innovation.</td>
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<tr>
<td>7. P1.1.7: Foster self-direction and motivation.</td>
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<tr>
<td>8. P1.1.8: Foster enthusiasm for learning.</td>
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<tr>
<td>9. P1.1.9: Foster the development of new knowledge and skills.</td>
</tr>
<tr>
<td>10. P1.1.10: Foster the development of new knowledge and skills.</td>
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MOOC reviewers are from Australia, the UK, and the US and all are qualified learning designers (master’s degree or higher in instructional design) with a minimum of 10 years of design experience. One reviewer is a certified Master Reviewer for Quality Matters and will oversee the training of the volunteer reviewers and lead the review process. After this review cycle is complete, the course will again be edited based upon the feedback from the review team. These edits will ensure the course contains all of the remaining standards on the Quality Matters rubric that may have been missed in the previous development and editing process. And, finally the Canvas Network Instructional Design team will review the course before it is made available to learners.
**Table 3: Alignment of Activities to Learning Outcomes**

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Week 1: Setting the Stage</th>
<th>Week 2: Instructor Presence</th>
<th>Week 3: Social Presence</th>
<th>Week 4: Cognitive Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate the use of several asynchronous tools that enhance learning presence, social presence, and cognitive presence to meet the needs of learners who choose distance learning for the sake of convenience.</td>
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<tr>
<td></td>
<td>Evaluate and choose the audio/video screen-casting tool that will be used for providing learners feedback via video.</td>
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<td>Develop a sample course announcement using audio and video to include in a comprehensive course communication plan.</td>
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<td>Develop course goals and outcomes communication.</td>
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<td>Create intriguing events for your own course that build learners’ problem solving strategies in order to deepen cognitive presence.</td>
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**Research Plans for the Humanizing Online Instruction MOOC**

Due to the concerns raised regarding technology proficiency, the Online Learning Readiness Scale (Hung, Chou, Chen, & Own, 2010) and Stages of Adoption of Technology instrument (Christensen & Knezek, 1999) will be administered in week one of the new iteration of the course. The data from these instruments will allow us to identify participants who may require additional resources and support with technology tools during the course. Furthermore, the relatively low retention rate of MOOC participants has been a central criticism in the popular discourse. In these discussions, retention is commonly defined as the fraction of individuals who enroll in a MOOC and successfully finish a course to the standards specified by the instructor (Koller, Ng, Do, & Chen, 2013). However, the varying and shifting learners’ intentions for participating in MOOCs calls for new metrics that go above and beyond the traditional benchmarks of certification, grades, and completion in order to understand what actually happens in a MOOC (Bayne & Ross, 2014; Ho et al., 2014). In our attempt to understand persistence in MOOCs that captures these varying motivations, we will employ different data sources such as microanalytics measures (DiBenedetto & Zimmerman, 2010) and trace log data to examine whether specific self-regulated learning process relates to participants persistence in achieving the individual goals they set for themselves during the first week of the course.
References


- Kop, R. (2011) The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. The International Review Of Research In Open And Distance Learning, 12(3).


Mentoring at Scale: MOOC Mentor Interventions Towards a Connected Learning Community

Manuel León; Steve White; Su White; Kate Dickens
Institute for Learning and Innovation, University of Southampton

ABSTRACT

The “Understanding Language: Learning and Teaching” MOOC produced by the University of Southampton/British Council attracted a large number of enrolments (almost 30,000 active participants) and incorporated a design structure aimed to promote social learning. This combination of high participant numbers and ‘learning as conversation’ approach (Ferguson & Sharples, 2014) posed a significant challenge in terms of course mentoring. This article explores the novel approach to course management and facilitation used on the MOOC, with a particular focus on the training, management, and intervention strategies of course mentors. The paper outlines a cloud based, flexible and collaborative system for managing and connecting mentors which was useful in organizing a geographically distributed group of five mentors. Further, in the context of social learning at scale, a role of ‘mentor as connector’ is proposed to align with the affordances of the MOOC platform and the particular course design.

KEYWORDS
Massive, open, online course (MOOC), scale, learning as conversation, mentoring, mentors as connectors, facilitation

Introduction

In November 2014, the seventh University of Southampton MOOC, entitled “Understanding Language: Learning and Teaching” (UL MOOC) was launched. It was developed and delivered in partnership with the British Council. Nearly 60,000 learners enrolled, of which almost half participated in some way. More than 140,000 comments were posted in discussion fora during the four weeks of the course. Such a large volume of activity and participants presented a significant challenge to the five members of the mentoring team, as this course placed more emphasis on learner support than other MOOCs run by the university. The MOOC was hosted on the FutureLearn platform, which is designed to promote social learning and is inspired by Laurillard’s conversational framework (Laurillard, 1993; Sharples & Ferguson, 2014). However, the platform on its own may not fully engage the learners through the course, and many of them may feel unsupported and isolated. In order to foster a fully social and connected learning experience, mentors have an essential role to play.

This paper will explain how the mentoring team addressed the challenge of such massive numbers, by adopting a novel approach to course management using cloud computing and emphasising the role of mentors as connectors.

The course

The UL MOOC was a course designed to promote reflection on how languages are learned and taught and was aimed at both language teachers and learners. The course was divided into four weeks, each of which reflected on language learning at a different level of analysis: individual, classroom, Web and global levels.

Interaction in the course

Table 1 shows the total number of comments, replies, and mentor interventions made in the course. Approximately one in five comments received a reply from the learning community, and 3.6% of these replies were mentor interventions.
Mentors replied to nearly 1000 comments at an average rate of 7 interventions an hour. Although there were no strict directions on how many interventions should be made in each shift, it was decided to dedicate more time to the quality of the interventions, rather than the quantity. The mentors would then leverage the platform affordances for adding visibility and impact to these interventions. For example, learners were encouraged to follow mentors. Also, taking into account that Futurelearn contains a discussion forum for each "step", predictions were made on which discussion spaces needed more attention and which needed less. For example, there was a step that received nearly 10000 comments but required fewer interventions, as it consisted of an opportunity for learners to say where they were from and they would see their names in a map. However, there were other steps, namely the "reflection" section of each week, where more time from the mentors was devoted (see chart below for number of comments by step).

Table 1. Interaction figures

<table>
<thead>
<tr>
<th>Total comments (within course dates)</th>
<th>145,426</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replies</td>
<td>27,669 (19%)</td>
</tr>
<tr>
<td>Mentor Interventions (reported, only team)</td>
<td>994 (3.59% of the replies)</td>
</tr>
<tr>
<td>Total mentor hours</td>
<td>147.5 (6.7 interventions/hour)</td>
</tr>
</tbody>
</table>

Mentoring towards a connected learning community

Following Anderson (2008), the approach to mentoring on the UL MOOC prioritised communication and interaction as the primary focus. To promote a connected learning community and appropriately address learner comments, the mentoring team also needs to be well connected. The five mentors in the team shared similar backgrounds but were based in different locations and institutions (the University of Southampton and the British Council). Fluid communication was enabled using cloud computing technologies. This meant the course rota and the course map could be collectively accessed and edited. Also, a cloud based reporting system was set up so that mentors could fill a form each time they completed a shift, in which they would highlight interesting discussions made by the learning community. This allowed an agile way to identify key issues arising during the week that would feed in the weekly reviews. It also enhanced communication within the team, as all members would know in real time what interventions had been made in previous shifts. The resulting dataset from this form also became potentially valuable for further research, as it contains a high amount of reflections, gathered in a structured manner, from those who were in close contact with the learning community, namely the mentors.

Mentor training outlined the pedagogical, social, technical and managerial roles which are required of online mentors (Berge, 1995), but a further ‘connector’ role was identified in the UL MOOC to help align with the affordances of the platform, the course design, and the ‘massive’ number of participants. All members of the team were involved in editing and checking course materials (reported on a shared Google Doc), whilst also familiarising mentors with specific course content, and identifying spaces where intervention would be potentially most needed.
affordances of the Web for education (rather than information delivery, for example). The emphasis on “learning as conversation” in the FutureLearn platform (Ferguson & Sharples, 2014) and the specific course design/content also reflected this view of learning. However, Gasevic (2014) notes that an absence of social interaction in online courses can inhibit the effectiveness of online education. To promote social learning and close ties between participants, Kop (2011) highlights the importance of fostering “presence” in MOOCs, defined as the “illusion of non-mediation”. She cites Garrison, Anderson and Archer’s categorisation of teaching presence, cognitive presence and social presence as “three core elements for an educational experience” (2000:103). Mentors on the UL MOOC aimed to foster conditions in which experiences involving these forms of presence occurred. To this end, the mentor interventions in discussion forums were of 5 kinds:

1. Connecting the learning community
2. Providing links to suitable content
3. Fostering learning as a conversation
4. Encouraging development of external networks
5. Producing weekly reviews and suggestions for further study/exploration

1. Connecting the learning community

The first and second intervention types both aimed to use tools available in the discussion forum to increase the density of connections in the course. To develop connections between participants (and between participants and mentors), use of the ‘like’ function was encouraged, while the mentors attempted to ‘like’ useful or interesting comments which they encountered, and also link comments by participants on related or complementary topics. Users were also encouraged to use the ‘follow’ function on the course mentors’ profile pages to make mentor posts more visible to them within the platform forums. These interventions were primarily attempts to foster a sense of social presence, characterised in the literature as those exhibiting emotion, open communication or bonding within the group (Garrison, Anderson and Archer, 2000). Linking of posts on related topics might also, however, trigger the exploration and integration of new ideas which are markers of cognitive presence.

2. Providing links to suitable content

In addition to linking course participants, mentors tried to post links to particular steps, videos or resources as part of replies to participant comments or questions. These were aimed to foster cognitive presence, but also could be seen as attempts by mentors to develop understanding of new ideas or topics among participants, or instruct them on particular points (teaching presence).

3. Fostering learning as conversation

The FutureLearn platform, it is claimed, reflects a social constructivist approach to education, and derives its learning design from Laurillard’s conversational framework (Ferguson and Sharples, 2014). This design allows for multimedia resources, collaborative learning, and importantly “opportunities for tutorial intervention and guidance” (2014:100). Ferguson and Sharples (2014:108) claim that “conversational learning can and does scale” (though their 2014 study does not develop support for this claim in depth). On the UL MOOC, mentors tried to participate in and foster conversational learning by encouraging participants to reply to replies they themselves received, and by contributing to long discussion threads. Mentors often used the platform tools (likes, links) in relation to such discussions, and it was hoped that other participants following the mentors could later locate these discussions.

4. Encourage external networks

The British Council Facebook page was also used for ‘live chat’ sessions - an opportunity to develop teaching presence. During these periods, participants could post questions or comments to which a team of mentors attempted to respond. An unofficial, participant-created Facebook group was also established, showing the wider affordances of the Web for networked learning, collaboration and sharing of information and expertise. The group is still active at time of writing. Prioritisation of social interaction as part of learning is a common theme in much current literature on MOOCs, such as the ‘participatory pedagogy’ explored by Anderson and Ponti (2014), development of new literacies of participation (Stewart, 2014), or the influence of learner positions in social networks on learning outcomes (Gasevic, 2014).

5. Producing weekly reviews

Mentors recorded video reviews of important ideas, activities and participant responses for each week of the course. The key issues were identified from the forms mentors would complete after each shift. In the reviews (posted on YouTube near the end of each week), mentors were able to comment on and build on authentic participant contributions and questions. Ideas and resources for further study
and exploration were suggested, and the comment function in YouTube was also open for participant responses. These reviews allowed connections to be made between participant comments, course content, and external resources, whilst also providing a more visual sense of social contact with mentors.

Mentoring challenges

Maintaining communication between mentors during the course

Because of the volume of participant comments, maintaining effective communication between mentors regarding emergent issues, problems, or common themes was challenging. Future iterations of the course may include some systems to share weekly reviews or updates of such emergent information that summarise the experiences of all mentors in that period.

Identifying key issues for participants

It was difficult to determine the most interesting, engaging or current issues for learners at this scale. There was also little time to determine a consensus on what these issues were among all mentors. Systems for sharing mentor impressions of the key themes (as reflected in participant comments) or identifying such themes through automated keyword analysis might assist mentors in supporting participants during the course.

Choosing which participant comments to address and link

Mentors had to make quick decisions about which participant comments to address. Attempts to link comments on related themes was also a challenge simply in relation to remembering and finding previous comments on similar topics. The platform does, however, record and give access to a list of mentors’ own comments (on their profile page), so perhaps increasing mentor awareness of this affordance might help improve performance in this respect.

Maintaining confidence in mentors’ own content knowledge

Mentors were encouraged to make substantive comments on participant responses to course materials, suggesting related materials to explore or responding directly to the content of participant posts. With the volume and pace of comments generated by participants, mentors found it difficult to post comments rapidly and repeatedly, whilst maintaining confidence in the accuracy and quality of their own contributions. Ideas posted on the Web are both public and have some permanence, and knowing this adds pressure on mentors to some extent.

Conclusion

The UL MOOC attracted a large number of learners and attempted to implement a pedagogy of conversational learning at scale. The affordances of the platform and the course design and content were produced with this form of learning in mind. However, the mentoring team still had an important role to play in helping to foster conditions in which a connected learning community could develop.

The management of the mentoring team included training for mentors which outlined their different roles on the course, and particularly the overarching role of connector which exploited the affordances of the platform and the Web more generally. Cloud computing was also used to help connect the team which was geographically distributed and had other professional commitments. Mentor interventions on the course focused on creating a connected learning community, mainly by encouraging use of and demonstrating the affordances of the platform for learning as conversation at scale.

Platforms such as FutureLearn and courses such as the UL MOOC are designed to address high numbers of learners by making learning scalable. In order to achieve such a goal, a mentoring plan designed towards a networked learning experience can be a highly useful complement to both the course content and the platform.
References

A new participative space for MOOCs: overtaking technological evolution to achieve educational innovation

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ABSTRACT

The prime aim of this paper is to take a critical look at current MOOCs in order to demonstrate that the alleged techno-educational innovation is generally little more than a manifestation of the divergent interests of the stakeholders involved. Any convergence of these interests is actually rarely linked with teaching or learning. In a second step, our objective is to present the approach developed by the Université libre de Bruxelles to minimise this divergence and overcome the technocentricity of MOOCs. This approach is singular in the sense that the whole production of these open online courses is being constantly fuelled by research aimed at designing systems fully meeting – from both an educational and technical angle – the needs and usages of their users, whether teachers or students. The technological, pedagogical and scientific implications of this MOOCs development process will be assessed.

Introduction

1994 was a landmark year for humanity, marking the birth of the World Wide Web. That same year, William Geoghegan, an IBM consultant, caused a stir in the field of educational technologies with the publication of his paper titled “Whatever happened to Instructional Technology?”. With this publication, he highlighted and attempted to explain the persistent failure of ICT to penetrate the world of higher education, despite several decades of effort and massive investment (Geoghegan, 1994). Twenty years later, nothing seems to have changed: each new technology seems full of new promises, only to vanish increasingly quickly. The latest example: Massive Open Online Courses (MOOCs). Though these systems promised - and for many people still do - to revolutionise teaching and learning, to democratise access to knowledge and to provide new research perspectives, even the most fervent "MOOC-aholics" have their doubts. This is for instance the case of Sebastian Thrun, who put out a statement a year ago saying that "MOOCs are a lousy product". The fact that this statement comes from him is even more interesting that he helped pioneer this type of system with his course on artificial intelligence which attracted an audience of 160,000.

This leads us to the following question: why, despite all the material and human resources invested by major academic institutions, do these widespread IT systems not bring generally speaking any great educational value, and fall even shorter from bringing the much expected innovation to learning? With a view to answering this question, the prime aim of our contribution is to take a critical look at the current MOOCs using concepts of participation (Akrich, Callon & Latour, 1988) and participative space (Akrich, Callon & Latour, 1991). The underlying assumption of this article is that the alleged techno-educational innovation is generally little more than a manifestation of the divergent interests of the stakeholders involved, with any convergence rarely linked to teaching or learning. In a second step, our objective is to present the institutional approach developed by the Université libre de Bruxelles in its MOOC initiative, which intends to shift the center of gravity of the participative MOOC production model towards teaching and learning.

Techno-educational innovation as a participative space

The world did not wait for Geoghegan to discover that the majority of higher education teachers remain cautious when it comes to integrating technology into their teaching, despite the
decades-long litany that ICT will revolutionize higher education. Though the percentage cited by Geoghegan with regard to the proportion of teaching staff using ICT is not supported by any serious research, the overall finding has since been backed up by a large number of research projects (Karsenti et al., 2011). There are four reasons explaining this low penetration (Geoghegan, 1994).

Firstly, it was wrongly believed that the potential target of ICT was a single, homogeneous group, with no attention being paid to the fundamental differences separating the few early adopters from the mainstream. The objective alliance between these early adopters, the “support centres” and the software developers is the second reason: these three stakeholders quickly discovered a common language, unfortunately radically different from and not understood by the majority of teaching staff. Thirdly, the successful projects conducted by the early adopters turned out to be unproductive in the sense that the implementations and examples trumpeted by the early adopters seemed out of reach for the mainstream, in fine alienating and discouraging them rather than encouraging emulation. Finally, one crucial element needed for bridging this gap was missing: “a compelling reason to buy”, i.e. an application where the benefits far outweigh the costs - in terms, inter alia, of personal investment.

Geoghegan’s analysis is echoed in the participative model, defined by Akrich, Callon & Latour (1991) as a new way of understanding the success of an innovation. Traditionally, a product’s intrinsic qualities are used to explain the speed at which the innovation can spread (Akrich, Callon & Latour, 1991). This is backed up by Rogers (1983), who sees five factors determining the adoption or rejection of an innovative product: relative advantage, complexity, compatibility, testability and observability. The analysis of an innovation thus involves identifying the strengths and weaknesses in each element. By contrast, the participative model is based on putting innovation in its proper context: To understand success or failure, i.e. diffusion and the associated ups and downs, we need to recognise that a product will only be taken up when it manages to gain the interest of a growing number of consumers (Akrich, Callon & Latour, 1991). In this context, the participative model highlights the existence of a whole bundle of factors linking the product to those using it. It highlights the bonds between the product and the more or less organized interests it arouses (Akrich, Callon & Latour, 1991). In other words, the success of an innovative product is not dependent on its intrinsic properties but on its capacity to bring together a large network of stakeholders, whether system builders or system users. The model highlights the collective dimension of innovation, as the fate of any innovative product is dependent on the active participation of all those who have decided to support its development (Akrich, Callon & Latour, 1991). Their participation is thus dependent on their interest in the product, i.e. their expectations or even the problems they are faced with. Nevertheless, participants’ degree of interest will often be different, or even divergent. For an innovative system to be successful, it is therefore necessary to shift the goals and to find the common denominator amidst the different interests in order to reposition these goals around a joint project. Encouraging the convergence of participants’ interests, such a project becomes a ‘participative space’, a space in which compromises, adaptations, participative actions and alliances are necessary; Reflecting the participating groups, their interests, expectations and plans, a reconfiguration takes place. (Rayou, 2004).

MOOCs: a technocentric participative space

From the perspective of such a model, MOOCs form a technocentric participative space linking the interests of a range of stakeholders. Firstly, universities wish to improve their visibility, boost their reputation through the use of such systems (Cisel & Bruillard, 2012; Boullier, 2014) and even attempt to attract new – top-performing – takers for their on-campus courses as well as new learners for their online programmes (Mangenot, 2014). Secondly, teaching staff invests effort, often without financial reward, in the hope of gaining added value for their own research – and sometimes their teaching – activities. Thirdly, on-campus students take up such systems as an innovative way of learning – often in combination with a ‘flipped classroom’ (Mangenot, 2014), while off-campus students can pride themselves on belonging – at least virtually – to the top universities or on continuing their lifelong learning (Boullier, 2014). Fourthly, university techno-pedagogical support departments view it as reinvigorating their work, up to now dominated by providing technical support to teaching staff with regard to online learning platforms. Fifthly, politicians pounce on MOOCs as a way of enhancing what they are doing in the field of higher education, as seen in France where the Ministry of National Education is investing heavily in France Université Numérique, its new university IT platform. Sixthly, hosting platforms as well as e-learning content providers can see signs of the establishment of a new market (Karsenti, 2013). Finally, the media are making it a hot topic, coming up with a plethora of articles and reports on the
subject. At the end of the day, all these divergent interests find themselves prosper comfortably within the current MOOCs.

The participative space created by the MOOCs is mainly technocentric: far from meeting learning needs or promoting new teaching practices, the institutions’ goal remain solely to produce MOOCs and to generate figures – i.e. to have an important number of subscribers (Karsenti, 2013; Boullier, 2014). As a result, the acronym MOOC tends to reflect contrasting realities. Although these courses claim to be massive, often with – tens of – thousands of enrolled students, the facts demonstrate that 50% drop out after the first week, 10% actually end up taking all modules and only 4% actually gain a qualification. The open nature of these courses and the fact that they are free of charge tend to be highlighted in the media and by the system developers. However, these two characteristics sometimes collide with the legal reality of the Internet. Indeed in many cases there is a formal ban on using, modifying or disseminating a MOOC’s educational content, which is to some extent contradictory to the concept of “Open Educational Resources”. Moreover, monetization systems are beginning to appear. These courses – and above all the platforms hosting them – are dependent on a business model to guarantee their continuing existence and, thus, will use a series of different means such as hourly paid tutoring or a fee for a personal certificate attesting the satisfactory achievement of the course objectives, and advertising schemes. Moreover, though these courses are online, enabling anyone to follow them at any time, the requirement to have a stable, high-speed Internet connection may present an obstacle to the plans of the top universities to offer courses worldwide to a diversified audience, in many cases in developing countries. Notwithstanding the features making a MOOC a course, a number of pedagogical principles are regularly forgotten. In many cases, such systems are limited to transmitting audio-visual content – i.e. offering a slideshow narrated by a teacher or a very static “stand-up” shot in a studio –, online activities – i.e. for the most part multiple-choice questions as well as, increasingly, activities with peer assessment –, and discussion tools – mainly taking the form of a forum or a wiki with low student participation (Kop, Fournier et Mak, 2011 and Manning et Sanders, 2013 in Karsenti, 2013). MOOCs thus merely use the set-up and layout from most lectures and memory-oriented tests (Boullier, 2014). Finally, it is only necessary to inspect a few MOOCs to uncover a relative amnesia with regard to recent research on online learning: an absence of pedagogical scenarios, assignments hardly matching content, an absence of tutors, assessments without individualised feedback, etc. As for interactions with the teacher, these are relatively rare: Covering 103 teachers who had designed a MOOC, the survey conducted by Kolowich (Karsenti, 2013) demonstrated that interaction with students was on average limited to a comment posted in the course forum once a week. Within MOOCs, the ultimate incentive seems to be, for all players, the number of enrolled at the beginning of the course. All the focus remains on this figure, although, as mentioned above, it can decrease very quickly. Therefore, it is understandable that under these conditions, there is no need to invest in risky pedagogical innovations as it seems rather better to provide the public with what it knows: lectures marked from the label of major universities (Boullier, 2014).

Shifting the participative space’s center of gravity: the policy of the Université libre de Bruxelles

With a view to examining the potential of Massive Open Online Courses, in October 2014 the Université libre de Bruxelles gave its ULB Podcast unit the task of implementing a project based on action research. At the start, the objective was to develop four courses.

Their production was based on two complementary theoretical methods: design-based research (Design-Based Research Collective, 2003) and AGILE (Beck & al., 2001). The former combines the development of a system – in our case a MOOC – and an analysis of its impact with a view to developing new theories. In contrast to predictive and experimental research, in which experience is used to test theory-based hypotheses and thereby further develop the theory in question and perhaps find applications for practitioners, the aim of design-based research is to analyse a practical problem through having researchers and practitioners work together. These then develop, via iterative cycles and successive improvements, solutions based on existing design principles. The development process is, at the end, thoroughly reflected on with a view to arriving at design principles and enabling improvements for the solution’s implementation (Reeves, 2006). The second theoretical method, AGILE, is an iterative, incremental and collaborative method, with just the right dose of formalism, and generating a high-quality product while taking account of developing needs.

What is more, the work of the ULB Podcast unit, set up in 2010, has developed a user-centric approach (Roland, 2012). In an effort to
strengthen the pedagogical dimension and enhance the learning impact, the design process of the MOOCs took account of the needs, expectations and characteristics of both teaching staff and potential learners right from the start. This user-centric approach is also being used in the scientific assessment of the MOOCs. Looking beyond the data, the aim is to get teaching staff and students interested in the project. This in turn demonstrates the importance of the active role of individuals to interpret the changes brought about by the system. This discussion prior to the introduction of Massive Open Online Courses at the Université libre de Bruxelles was tested, within the ULB Podcast unit, in the context of a similar action research project on podcasting (Roland & Emplit, 2015). The findings have demonstrated the value of the work undertaken, resulting in the development of an innovation project centred on pedagogy and learning and maintained over time.

Three-dimensional implications: technical, pedagogical and scientific

Looking at the technical dimension, the design-based research approach allowed the development of tools perfectly matching how they are being used. Technological development is thus continually influenced by the significance accorded to MOOCs by users, by the way in which they adopt the MOOCs and are able to influence certain functions. This in turn makes MOOCs more responsive to users’ needs in terms of teaching and learning. In this context, ULB Podcast has already developed, through analysing student usage of pedagogical videos, an enhanced audiovisual player including a function allowing users to interact with the video. Both students and teaching staff have the opportunity to include temporal bookmarks (a title, a description and keywords related to a specific time) as a way of annotating, sectioning or summarising their videos. Moreover, with the aim of encouraging collaborative practices with regard to these bookmarks, ULB Podcast has included a simplified bookmark export/import function. As of February 2015, the player also contains a chat system synchronized with a specific timecode in the video.

Looking at the pedagogical support for the MOOC designers, the approach used concentrates on supporting them throughout the production process and in particular before the recording. This support ranges from the initial interview with the teacher to discuss the ins and outs of adapting a course to MOOC format to the production of the educational documents, via the scene-setting in the form of a storyboard, an analysis of student behaviour with a view to improving the product, and possibly even via the in-depth technical aspects. Indeed, these different steps should by no means be overlooked as the pedagogical investment before the actual production of the MOOC can help avoid overloading the cognitive processes involved, and even help improve comprehension, persistence and/or motivation. Through using our design-based research approach, ULB Podcast has now developed in-depth knowledge of how to didactically transpose scientific and/or pedagogical content into an audio-visual support tool using the most suitable media. It now produces audio-visual material – recorded courses or modules – taking into account the properties of an efficient educational video based on its research results.

Turning to the scientific dimension, the aim is to produce a longitudinal axis between the MOOCs production process and their adoption by learners. This allows for feedback and a basis for reflection for researchers, designers and techno-educational teams ultimately leading to improvements for future MOOCs. This research is based on a mixed approach aggregating a quantitative part (learning analytics and surveys) with a qualitative part (interviews, anthropological analysis of behaviours and logbooks). This scientific approach, though of fundamental importance, as yet hardly features in the field of MOOCs. Moreover, given the investment of teaching staff both in the production of their MOOCs and in the recasting of their in-class courses, it is essential to get them interested in Scholarship of Teaching and Learning (SOTL). The aim here is to get teaching staff who produce MOOCs to reflect on university teaching practices through the window of their personal experience.

Action research as a driver of innovation in university teaching

As far as MOOCs are concerned, Cisel (2014) stated recently that the phenomenon is still in its prehistory; technologies employed are still rustic and scientific knowledge is just beginning to take shape. In our view, this is incorrect. We consider the Massive Open Online Courses as a new avatar of distance learning and the product of twenty years of research, which have provided a better understanding of teaching and learning practices. To conclude, the goal of the ULB’s deployment of MOOCs is to systematically enrich these systems with the technical and educational elements that are too often missing, helping them to become real learning tools promoting success and emancipation. It is essential to link the production of such
systems with research work based on a combined – quantitative and qualitative – methodology, using a design-based research approach promoting iterative improvements to the system. Looking beyond current MOOC production – in many cases done without much thought, in haste, without support and technocentric –, other paths are possible.

References

An Unconventional MOOC as a Solution for Short Budgets and Young Researchers in Europe

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ABSTRACT

The MOOC ‘Magic in the Middle Ages’, organized by the Universitat de Barcelona (UB) with the collaboration of the Université catholique de Louvain (UCL), is an unconventional course even for an e-learning platform. It is being created by a group of interdisciplinary and inter-university lecturers and a team of organizers that is intended to be self-sufficient in order to create a brand new MOOC with a non-existent budget. A hotly debated topic is whether European universities are able to compete with the MOOCs offered by North-American institutions, which are often the results of huge investments (Ruth, 2014). Our MOOC faces this problem but it also advantageously benefits from the competences that today’s young researchers generally have (new technologies, social networks, multilingualism) and offers them an opportunity to pursue a teaching and research career and to make new contacts with professors from other European universities in a moment in which their affiliation to a university cannot be taken for granted.

The Singularity of the MOOC Magic in the Middle Ages

This article is based on the experience of creating the MOOC Magic in the Middle Ages, offered by the Universitat de Barcelona with the collaboration of the Université catholique de Louvain. It deals with four distinctive features of this course: a) the interdisciplinary perspective of the MOOC, b) the collaboration between European universities and its benefits, c) on the one hand, the possibilities of a MOOC run by postdoctoral and pre-doctoral researchers and, on the other hand, the MOOC as an opportunity for young researchers to enrich their teaching experience and to strengthen their connections with European universities, and d) the resources and infrastructures available to a MOOC with a short budget. I will address how having young researchers joining the team reduces the need to turn to external resources to obtain services that they might be competent to perform: linguistic advise, using new technologies, managing social networks.

One of the aspects of the MOOC phenomenon that makes them extremely attractive for researchers, instructors and educators is its cooperative format (Plotkin 2010). In fact, the high number of students willing to follow these courses compels the organizers to design an assessment plan that both encourages, and depends on, the interaction and feedback that learners receive from their fellow students, as is the case for peer-to-peer exercises (Balfour, 2013) as well as for the forums of the course. McAuley, Steward and Cormier (2010) address this topic in The MOOC model for digital practice. According to Cormier, ‘networked learning models can support long term connectivity between peers to provide an extended impact on how learning can happen for an individual’ (p. 14). But, although all the focus has been placed on students, MOOCs also offer a valuable framework for strengthening cooperation between academics from different fields and universities, not just once the MOOC has been released and it is available to other scholars, but also during the very process of creating it. In this paper the experience of designing an interdisciplinary and inter-university MOOC will be addressed.

The MOOC Magic in the Middle Ages is organized by ARDIT Medieval Cultures, a graduate students
EMOOCs 2015
EXPERIENCE TRACK
Proceedings of the European MOOC Stakeholder Summit 2015

association, the Institute for Research in Medieval Cultures (IRCVM) and the Master’s degree in Medieval Culture of the Universitat de Barcelona. These three entities have a relevant experience working in interdisciplinary projects regarding the Middle Ages. Therefore, the MOOC was conceived as an introductory course to the study of this period from different disciplines (History, Literature, Art History, History of Science). Each unit focuses on a topic related to magic in order to offer an overview to the different methodologies and techniques applied to deal with the analysis of medieval documentation and literary and artistic manifestations. The program had to be consistent regardless of the variety of approaches to the topic; therefore a strong coordination between all the instructors was needed. Moreover, as professionals with different abilities (an advanced level of English, informatics, organizational skills, editing videos...) were required, it was decided to work in two different teams that would also be coordinated by Gemma Pellissa Prades. On the one hand, the teaching staff: Noemi Álvarez da Silva (Universidad de León), Godefroid de Callataÿ (UCL), Jordi Casals (UB), Pau Castell (UB), Sébastien Moureau (UCL), Delfi-I. Nieto Isabel (UB), Gemma Pellissa Prades (Harvard University), Sergi Sancho Filba (Universitat Pompeu Fabra) and Blanca Villuendas (CSIC). On the other hand, the organizing team: Gemma Pellissa Prades (coordinator), Delfi-I. Nieto Isabel, Joana Palau, Pau Castell and David Carrillo Rangel (although some researchers are in both groups and we have had an important number of collaborators during this process). Surprisingly enough, working in two teams or committees never was a problem, but what are the challenges that the organizers of an interdisciplinary MOOC have to deal with?

Creating an Interdisciplinary Course: From Failure to Success

First of all, preparing an interdisciplinary course meant that, in contrast with MOOCs that all of us might have in mind as valuable models, our MOOC could not be taught by just one professor (and his or her assistants) or by a group of research, because we needed experts in different disciplines. So, we selected a heterogeneous group of lecturers who would teach different topics. The syllabus was designed and the program had the same structure than now, that is, six modules dealing with medieval magic through a wide range of disciplines, but there was a very important difference compared to the current version of it. Instead of assigning one lecturer per module, we thought that due to the quantity of time that should be invested in each unit, it would be better to ask each lecturer to prepare just one script/video. This implied that we had from three to four lecturers approximately for each module (20 in total), something which was certainly out of proportion. We tested it with one module and it was definitively too difficult to coordinate: the results were too heterogeneous, there was no consistency between the different videos and, above all, there was too much content for a unit to which a student was supposed to devote between three and four hours per week. Besides, the videos were too long (they lasted for 15 minutes or more). Consequently, the organizers decided that the program should be adapted and made more consistent, that the videos should be shortened to 6 minutes and that in general there should be only one responsible per each unit who would prepare all the materials and videos. This is the formula that has been finally retained in our MOOC. There are a total of six instructors responsible for a module and three lecturers that offer optional videos and activities. All of them had to be fluent in English in order to avoid translating costs, as we wanted our MOOC to be self-sufficient due to the lack of budget.

Secondly, in any course, conventional or not, quality is a must. So we had to find a way to guarantee it. However, each of the members of our organization is specialized in his own discipline and it was difficult to revise our colleagues’ contributions, although most lecturers are experts in the topics they address in the course. This is the reason why we asked IRCVM for an external scientific committee that evaluates the scripts as if they were articles to be published in a scientific research journal. We could also count with the collaboration of renowned professors from other universities for this purpose. So, the papers underwent two revisions: a pedagogical one made by the coordinator and a blind and scientific one made by the scientific committee.

Finally, looking at other MOOCs, we thought that the best way to articulate the course was having only one lecturer appearing in the videos. Whereas the scripts, the bibliography and the activities of every module were prepared by different lecturers, we wanted to have only one ‘visible face’ of the MOOC; but we finally rejected this idea because we felt that the specialists in each one of the topics of the course were the best qualified to transmit and explain the contents. We currently have a conductor of the course who introduces and closes each unit (videos 1 and 6) except for module 4, which was made by two professors from the Université catholique de Louvain, a collaborating institution of our MOOC. In fact, these two professors will participate in the presentation of this session in the 2015 European MOOCs Stakeholders Summit, together with one
member from the organizing team at the Universitat de Barcelona. Moreover, the coordinator and instructor of module 5 of the MOOC, will prepare a video to promote a rich and provocative reflection and discussion.

**International Collaboration between European Universities: Our Experience**

The collaboration on the MOOC between the UB and the UCL, two large and renowned European universities, was meant to be a win-win experience, and so it has been up to the present time. For the UB creators and organizers of the MOOC, the collaboration represented an efficient possibility to extend the potential interest of the MOOC to the international community, as well as a way to reinforce its content by additional expertise. For the UCL, it meant a rare opportunity to get involved in a brand-new and ambitious project by taking full advantage of the experience already acquired in this field by the partner. Concretely, the original “contract” (no such thing was needed in reality, since the collaboration entirely lays on the mutual confidence of the partners) was that UCL-based Godefroid de Callataÿ and Sébastien Moureau as experts in the history of Arabic science would busy themselves with the six units making up module 4 of the MOOC, devoted to “Magic in Islam”. What was originally agreed was that they would: 1) write the scripts of their units; 2) find at UCL, and free of charge, the material necessary to record the corresponding videos; 3) have these videos recorded on the site of Louvain-la-Neuve; 4) provide indications as to the way the videos should be edited by the Barcelona team; 5) provide indications as to the way the students taking this course would be assessed.

All this was done in the space of a very few weeks in November/December 2014, in permanent online consultation with the coordinator of the MOOC, and benefitting indeed greatly from the advice and experience from the Barcelona team (as module 4 was the last one to be recorded on videos). But curiosity for this new way of communication, and interest in the promising perspectives it opens in terms of education and teaching rapidly grew up for the two UCL collaborators, who both desired to get involved more closely to the following phases of production of their units, and more particularly to the assessment of the students.

In fact, MOOCs provide an ideal framework to enhance collaboration between universities. Epelboin (2013) states that, in order to engage in the MOOC phenomenon, European universities do not need to do it individually, as creating one of these courses is an ambitious project that requires important human, technological and economic investment. He defends the use of European consortums such as the LERU to create MOOCs in a collaborative way. Indeed, there are remarkable experiences of successful MOOCs that have been created thanks to the participation of different universities. In the area of the Humanities, I would outline, for instance, the case of LACE (Literature and Change in Europe), which counts with a network between seven institutions (Verbeken, Truyen and Baetens, 2014).

**MOOCs as an Opportunity for Young Researchers and Universities**

Nowadays, one of the questions that European universities have to ponder is whether they are able to compete with MOOCs offered by prestigious universities from the USA in which an important quantity of money has been invested (Ruth, 2014). Academics such as Enric I. Canela have repeatedly outlined the difficulty of finding the necessary means to obtain similar results in the current economic situation. Scholars legitimately wonder who is paying for these free courses and which price universities and governments are willing to pay for them, since they obviously have a cost. Although it is not the ideal scenario, the MOOC Magic in the Middle Ages has not received any funding until now (December 2014). The only payments that have been made were for the illustrations of one of the modules (150 euros) and for the editing license for the videos (Camtasia). We also count with an assistant assigned by the UB for approximately 20 hours/week. Neither the organizing committee nor the teaching team receive any salary for this purpose.

The members of both the organizing team and the teaching group (except for the professors from the UCL) are either junior postdoctoral researchers or PhD students. Allowing young researchers to participate in the creation of MOOCs provides some remarkable benefits to the universities and to the participants. First of all, it is an opportunity to maintain the contact between the institution and its new doctors, which might find themselves in a vulnerable position (often without a university affiliation after having obtained their doctoral degree). Maintaining a link with their former universities while they are preparing for the next step is mutually beneficial. Secondly, it enables them to develop a teaching and research career, to share
the results of their PhD thesis with others and to make new connections, especially in the case of inter-university and international MOOCs. Thirdly, this is a generation of researchers that have a significant formation in foreign languages, e-learning (both as students and as instructors), communication skills, new technologies and the managing of social networks and social media. It is likely that they have been trained in all these abilities during their PhDs and that they have had the opportunity to teach courses, to organize academic events, to present papers in international conferences, to lead work teams, and so on. In other words, they have the skills to make unnecessary the more expensive hiring of professional translators, linguists, computer engineers, managers, marketing experts by the universities. Young researchers are indeed the key to form a self-sufficient team, although it should be explored how this work should be remunerated or, at least, rewarded.

Working with a Non-Existential Budget

One can find a wide range of tutorials and other materials on the Internet that explain how to record videos for a MOOC using a Smartphone or how to re-utilize the resources created for a conventional class in a new MOOC. Regarding the first statement, we tried it and we rejected it afterwards because we did not obtain the results that we expected. We also had an innovative conception of the course that required building it from scratch, but we were convinced that these new materials should be used as complementary resources to some courses taught at university. In this section I will briefly expound how our MOOC has survived the lack of funding until now.

First of all, all the members of the organizing team volunteered to create the course in their free time. The Coordinator also asked her fellowship program for permission to allow her to devote time to the MOOC. As it has been mentioned before, we are all postdoctoral researchers and PhD students who are affiliated to the association ARDIT for young medievalists. Since its foundation in 2011, ARDIT has provided a supportive environment for its members to develop organizational skills and to undertake different projects related to its research and educational goals (i.e. seminars, conferences, and training sessions). It offers them the opportunity to enlarge their experience and it is the place to look for partners for your next project. Therefore, most of the organizers of the MOOC had worked together before and made the commitment to create the MOOC in the same way they would undertake, for instance, the organization of an international conference. As it has been said, the team was intended to be mostly self-sufficient, but we also applied for a 8.000 grant from the Secretary for Universities and Research of the Ministry of Economy and Knowledge of the Government of Catalonia (the results of the application will be announced by the end of December 2014). Secondly, we applied, to a lesser scale, the concept of cooperation developed by Epelboin (2013) about a consortium between universities that would allow them to share the existent resources. Thus, our MOOC has three organizing institutions. Although none of them had a budget to invest in this project, they all have human resources (i.e. scientific committee) and an infrastructure (an office, a computer, access to institutional spaces or contact with museums) that have proven essential for the course. In addition to it, we have had regular meetings with the Vice-rectors’ Office for Teaching Policy at the UB. Last but not least, we have asked for contributions: a) we have used Twitter in order to look for someone to provide a specific service for us in exchange for acknowledging his/her collaboration to the MOOC (i.e., to obtain the right to use a recording of medieval music) and b) we have constantly asked for the collaboration of ARDIT’s members, who were assigned simple and short tasks (i.e. to prepare a Power Point to be used as a teleprompter or to translate a script in order to obtain subtitles for the course).

Finally, I will give some guidelines to maximize the use of university resources and infrastructures in order to facilitate the organization of a MOOC, as it is a very recent phenomenon for some of the European universities engaged in this process. All these suggestions are open to further discussion. With an effective use of university resources, the amount of time and the cost required by a MOOC can be swiftly reduced.

The Vice-Rectorship for Teaching Policy of the UB selects and approves the MOOCs that receive support from the university. They facilitate the contact with the platform that will hold the course, they assign an assistant to help to edit the videos and they offer advice and information about various aspects of the creation of a MOOC. It is a recent initiative. Furthermore, it should be stressed that the formation that the academics from our university (and it is my impression that it can be applied to the Catalan universities in general) receive about the process of creating a MOOC is excellent, as there are conferences devoted to the topic since some years ago. In 2014 there was a free online course offered by the Institut de Ciències de l’Educació to all the academics of the UB wishing to learn about MOOCs and there was a series of workshops
promoted by the Catalan Government at the Universitat Pompeu Fabra and at the Universitat Rovira i Virgili.

In addition to this, I consider that there should be an established and permanent network within each university that would provide the organizers with the necessary institutional contacts for undertaking this kind of project. Based on our experience, these are some of the actions that it would be very useful to implement: a) the organizers should be able to borrow cameras and microphones from the audiovisual services of the university free of charge without further negotiations; b) there should be a list of spaces that might be booked by the organizers of a MOOC in order to record the videos. It is convenient to make available some of the most emblematic spaces of the university, as it helps to promote the international image of the institution; c) free editing programs should be prioritized; hence, there would not be license expenses; d) the university should facilitate a model of documents regarding the cession of the intellectual rights of the scripts for the videos and authorizing the use of image of the instructors that appear on the videos; e) the language advisory services of the university should revise the documents of the course if it is necessary; f) the possibility to offer assistantships to students from the university to collaborate in the organization of the course should be encouraged; g) having fluency in English (minimum: C1, European framework for language learning) should be a requirement for selecting the assistants that will work in MOOCs taught in this language (the same criteria should apply to other languages); g) the university should facilitate the contact between the different teams that are creating MOOCs (or having done it in the past) and encourage the exchange of experiences; h) pedagogical advice regarding the design of the assessment for MOOCs should be granted.

Conclusion

To sum up, the innovative conception behind the MOOC Magic in the Middle Ages and the process of its creation has offered us an invaluable opportunity to reflect about the way MOOCs offer some answers to the challenges of the European higher education system today. This is a fresh perspective to hotly debated issues such as the price that universities can afford to pay for a Massive Open Online Course or the benefits of working together with other institutions in an international collaboration. At the same time, it was our purpose to consider other aspects of MOOCs which have not frequently been addressed, such as the role of young researchers in the changes produced in education or the importance of universities and institutions as active agents involved in the process of the creation of MOOCs.

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This article has counted with the support of the Secretary for Universities and Research of the Ministry of Economy and Knowledge of the Government of Catalonia.
Making MOOCs collaboratively: working effectively with stakeholders

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ABSTRACT
The University of Leeds is one of the founding partners of the FutureLearn Massive Open Online Course (MOOC) platform. During 2014, the University developed six MOOCs for the FutureLearn platform, from a wide range of academic disciplines and using a variety of instructional design and content approaches. Whilst there are common threads in the development process for every course, each MOOC has its own unique drivers and range of interested parties and stakeholders. This paper focuses on the challenges and rewards of developing MOOCs with individual academics, teams of academics and external stakeholders from the perspectives of the Digital Learning Team at Leeds. It is hoped that our experiences will highlight, through example, some of the challenges we have overcome and will help other MOOC developers who are faced with a growing portfolio and a diverse stakeholder base.

An introduction to the role of the Digital Learning Team
The University of Leeds established a new project team, the Digital Learning Team, in late 2013. This team quickly grew to 9 digital learning professionals within 18 months of conception, including those with a professional understanding of online learning pedagogy, as well as those with a more practical skill base including filming, editing and animation (Morris et al., 2014). The primary remit for the team is to work with academics from around the university drawing upon their subject knowledge and translating their ideas into an online learning journey, through the design, development and delivery of an online course. The team also produces individual learning objects and re-purposes MOOC assets for publication on other internal and external digital learning channels (e.g. Virtual Learning Environment, iTunes U, YouTube), operating in accordance with the University’s position of Open Education Resources wherever possible (University of Leeds, 2012). The University has recently affirmed Digital Learning as a core capability of its Student Education provision, paving the way for further growth and development of blended, hybrid and distance learning across the institution.

During 2014, the Digital Learning Team developed 6 MOOCs working with academics in all 9 of the faculties within the University. As a result of the intensity and time-limited nature of the MOOC development process, processes and systems for project management have been developed, including documents that identify timelines and milestones, as well as visual course maps and detailed step-by-step outlines. The team now uses an Agile project management approach (Cervone, 2011), to ensure all deliverables and outputs are completed to a high standard on time, and within budget.

Using the FutureLearn platform
The FutureLearn platform was conceived on a social constructivist pedagogy, and is defined as a social learning platform. The platform currently has over 800,000 registered users (Press Association, 2014). A core aspect of FutureLearn is the ability for user discussion alongside content, along with opportunities to follow, like and sort user contributions within discussions (Ferguson & Sharples, 2014). Within the FutureLearn platform courses are structured by weeks, with each week being broken down into activities and with each activity comprising a number of steps (Ferguson & Sharples, 2014). The platform is intuitive in layout and navigation, and is easy to use for learners. The Digital Learning Team has taken a specific design approach for all of its online courses in order to provide a clear learning journey through the weeks, ensuring that each week follows a similar pattern to aid navigation and to provide consistency. FutureLearn offers a range of content and activity types within steps, and during course design these are designated by the Digital Learning Team as either ‘passive learning,’ ‘interactive learning’ and ‘learning with peers’ steps. These core learning activities are supplemented by additional information provided as downloads or external links, to accommodate learners
Outcomes from the first year of MOOCs

The MOOCs developed during the first year were diverse in subject, course design approach, academic support and engagement with external stakeholders (see Table 1). This portfolio was developed strategically, to enable the University to gain detailed understanding of the benefits and drawbacks of online courses in different academic disciplines, working with individual academics and teams of academics, and working with external stakeholders to develop courses. The courses were between 2 and 3 weeks long, and attracted between 3,468 and 14,959 participants. As illustrated in Table 1, the number of educators involved with course development has increased over time, ranging from three courses with a single educator to a course with five educators. Two of the courses were developed in partnership with external organisations, Marks & Spencer and the BBC.

In terms of participant satisfaction, the average overall satisfaction for all courses was 92% (rating the course as good/excellent), with all courses achieving satisfaction rates between 87-97%. Participants also valued the engagement of the educators supporting the course; between 92-99% of participants indicated that the educator(s) were engaging/very engaging. Several educators have commented on the addictiveness of responding to learner comments and many have spent considerable time on the platform joining in discussions; over and above that expected. Finally, between 90-100% of participants reported that the course had met or exceeded their expectations. Further more detailed analysis of the participants and their behaviours online is available in a separate paper submitted to the eMOOC conference (Morris et al., submitted).

As might be expected there was a positive correlation between the number of course enrolments and the total number of comments posted (R2 = 0.59). However, there was no correlation between the number of enrolments or learner comments with the number of educator comments. There was a weak positive correlation between the number of educator comments posted and the learners’ overall satisfaction with the course (R2 = 0.21); however, there was no correlation between number of educator comments posted and learners satisfaction in terms of educator engagement.

Working with subject matter experts

During MOOC development, the Digital Learning Team has worked intensively with a wide range of academic colleagues and external stakeholders. For the first three courses the team worked with just one lead academic; in each case the academic was extremely passionate about their subject and keen to be part of this new and exciting opportunity to share their knowledge with an international audience. For two courses the team worked with groups of academics and external stakeholders, providing several layers of passion and commitment but also tinged with the challenges inherent when working simultaneously with a number of experts. The next section critiques the relative benefits and challenges of creating a MOOC with individual academics, teams of academics and external stakeholders from the perspective of the Digital Learning Team.

The individual academic

Working with an individual academic has both advantages and disadvantages. The positive aspects revolve around the individual control of the lead educator; the ability to define the course objectives, form a consistent approach to the content and importantly to understand the entire learning journey. There is a consistency of approach and a definite improvement in the quality of video material as the relationship between the team and the academic builds and development progresses. However, considering the more challenging aspects, the individual academic has to shoulder all of the work (which can become overwhelming) or encourage other colleagues to provide support. This is true through both the development phase as well as during the development phase.
Table 1. Information about University of Leeds MOOCs

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>Distinctive design features</th>
<th>Duration (weeks)</th>
<th>Number of educators</th>
<th>Enrolments</th>
<th>Total number of comments (average per learner)</th>
<th>Total number of educator comments (average per educator)</th>
<th>External stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>When worlds collide</td>
<td>Use of animated story telling, annotated green screen video, case studies and group discussions</td>
<td>2</td>
<td>1</td>
<td>5,554 (rerun)</td>
<td>9,923 (6)</td>
<td>381 (381)</td>
<td>n/a</td>
</tr>
<tr>
<td>Physical theatre</td>
<td>Theory and practice, reinforced by animated examples, practical exercises and online reflection</td>
<td>3</td>
<td>1</td>
<td>3,468</td>
<td>3,873 (6)</td>
<td>455 (455)</td>
<td>n/a</td>
</tr>
<tr>
<td>Anatomy: the human abdomen</td>
<td>Theory supported by detailed animations of anatomical structures, expert discussions with clinical experts</td>
<td>3</td>
<td>1</td>
<td>8,590</td>
<td>6,045 (5)</td>
<td>1142 (1142)</td>
<td>n/a</td>
</tr>
<tr>
<td>Starting a business: realise your vision</td>
<td>Case studies with advice from business professionals – learner polling and entrepreneurs ‘revealing’ their business decisions, business case planning</td>
<td>2</td>
<td>2</td>
<td>12,903</td>
<td>11,920 (5)</td>
<td>555 (278)</td>
<td>n/a</td>
</tr>
<tr>
<td>Innovation: the key to business success</td>
<td>M&amp;S and University case studies, learner polls and crowd sourcing activities, learner logs for innovation planning/ideas</td>
<td>3</td>
<td>3</td>
<td>14,959</td>
<td>13,749 (6)</td>
<td>495 (165)</td>
<td>Marks &amp; Spencer</td>
</tr>
<tr>
<td>World War 1: changing faces of heroism</td>
<td>Learner ‘pin board’ activity to record course highlights, collating a painting exhibition and documenting a WW1 memorial.</td>
<td>3</td>
<td>5</td>
<td>7,035</td>
<td>12,440 (9)</td>
<td>682 (134)</td>
<td>BBC</td>
</tr>
</tbody>
</table>

Course delivery. There is also the danger of course participants being ‘over-exposed’ to a single academic voice, and only seeing one face throughout the course. These challenges can be mitigated through including contributions from other subject matter experts, in the form of interviews, group discussions or bespoke material. To alleviate the workload on individual academics during course delivery, courses have been successfully supported by undergraduate and postgraduate students, and academic colleagues not involved in the course development.

Academic teams

Having worked with individual academics, or in one case a team of 2, the University’s fifth MOOC involved 4 academics each from a different faculty with no previous experience of working together: ‘a manufactured team’. Also, the last course involved working with a team but this time the academics had worked together on previous projects. Although online learning was new to them all, they had a clear methodology for collaboration and were fully aware of the team dynamic and individual strengths and weaknesses. In many ways the advantages and disadvantages of working with a team of academics are the reverse of working with an individual academic. The major positive aspects revolve around the time commitments of the team members, both during development and delivery, as the work is being spread between a number of individuals. From a learner perspective it can also be more engaging to interact with a number of academics, particularly if the course has been designed to highlight their individual expertise. The challenges of a team of educators are around consistency and the ability to maintain the learning journey through the course. With the team who had previously worked together this was not such an issue, although they did need to define ways of working that enabled them to avoid repetition. This was managed by regular meetings/communications, sharing of scripts and early viewing of rough-cut videos.

Working with the team of academics who were new to online learning, had not worked together before and had no existing digital learning materials, was a
challenge for all involved. It took time for the team to get to know each other, establish the objectives of the course and articulate an agreed narrative and learner journey. From all perspectives this course was the most difficult to manage. However, once the team gelled and there was a general understanding of the individual focus of each academic, this course did come together well and formed a coherent learner journey with some inspiring case studies.

Working with external stakeholders

The ‘Innovation; the key to business success’ course was developed in association with Marks & Spencer. The University of Leeds has a long-standing relationship with M&S and hosts the M&S Company Archive on campus. M&S supported the course through making available learning assets from the M&S Company Archive and involving senior staff in the production of case studies. The ‘World War 1: changing faces of heroism’ course was one of a series of four courses developed in association with the BBC. Along with three other FutureLearn partner universities, Leeds worked with staff from the BBC to define the overall objectives for the course. The BBC provided support with securing third party footage and filmed a number of short videos drawing on their connections within the industry. In both these cases the external stakeholder did not contribute any financial support however they were both instrumental in providing learning content, assisting with marketing initiatives and raising the profile of the course. Their respective logos were prominent on the course sign up page and their support recognised throughout the course.

Whilst the benefits of having access to content and expertise from external sources are indisputable, developing courses that draw upon content from a third party does complicate the process. Several of the case studies in the innovation course included videoed interviews with senior M&S staff. All such content had to be approved by the member of staff and the M&S legal department. Intellectual Property for co-produced assets was shared with the external organisation and as such the University had to request permission to share resources through other external platforms such as iTunes U, which is normally standard practice as part of its commitment to Open Educational Resources.

Conclusion

To conclude, through the development of six very different MOOCs it has become apparent that the team dynamic does impact considerably on the design, development and delivery phases of courses. Whether working with just one academic or a team of academics and external stakeholders there are both advantages and disadvantages. The Digital Learning Team has appreciated the variation in approach and has enjoyed working with all stakeholders. However, each new course requires a different approach, and a period of adaptation, which can be time intensive.

References


Collaborative MOOCs: a challenging experience

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ABSTRACT

RESCIF is a French-speaking network with 14 faculties of technology from the North and from the South. One of their research themes is water and four partner institutions decided to build together a MOOC as tentative tool for disseminating knowledge and contribute to education of southern engineers. This MOOC “Rivers and Men” is thus an example of collaborative work. The paper gives some facts about the building process and the success of the course. Some reflections are proposed about the target and the actual audience and some preliminary conclusions are drawn about advantages and limitations of such collaborative approach.

“Des rivières et des hommes” a collaborative MOOC

The context: a collaborative network

The Network of Excellence in Engineering Sciences of the French-speaking communities (Réseau d’Excellence des Sciences de l’Ingénieur de la Francophonie – RESCIF) was created in 2010 by 14 universities of technology, seven from the North and seven from the South. The basic idea was, following the RESCIF declaration to “prepare a cohort of young engineers in emergent countries and universities through education in advanced technology, in order to initiate useful research for the development of their country”. Three domains crucial for the development of emerging countries were selected to promote common research programs: water, energy and nutrition. Indeed, while they weakly contribute to the climate evolution, developing countries are in the front line regarding the consequences in terms of natural disasters and food safety.

To take full advantage of the South-North network, it seemed more efficient to organize distance training than classical exchanges of teachers and students that are generally expensive and difficult to set up in intensive form, so disrupting the local lecture schedule with poor results due to a too dense supply of information. In that context, a MOOC approach appeared as well adapted to easy diffusion of knowledge at a reasonable rhythm.

Another logical consequence of functioning in network was the idea of collaborative work, in such a way that a collaborative MOOC appeared as evidence. The lead of the present project was taken by Grenoble INP who proposed “Rivers and Men” (“Des rivières et des hommes”), as the theme for this experimental MOOC, a theme in line with the “water” topic and comprehensive enough to concern a wide audience.

However, to the knowledge of the authors, there were at the moment of the first initiative, no other example of such collaborative MOOCs, developed between different institutions, since MOOCs are often considered by universities as a promotional activity, in which the institution may stand out from the other ones. Another challenge was in the network constitution itself, with a part of members liable to offer knowledge and experience and another part more interested in receiving information and technology. It was rapidly decided to turn this apparent dissymmetry into an asset of the system: developing countries are rich in interesting problems. Floods and inundation, as well as pollution, are often huge in developing countries and means to face these disasters are often extremely limited. So, receipts from the North cannot be used as they are, and their adaptation to southern context is an exercise where exchanges between theoretical consideration and local experience are essential.

For timing reasons, it was chosen to build a season 1, where three partners in the North (Grenoble INP, Ecole Nationale Supérieure de Lyon and Université catholique de Louvain) and only one in the South (Vietnam National University –HCMUT) were involved, with the idea to enrich the MOOC for a season 2 with the collaboration of additional partners from the South.
Target audience, content and organisation

The selected theme was rather wide with possible developments in varied directions: Hydrology, hydraulics, land use, urban planning, or even some aspects of sociology and economics. Moreover, the partners, while all involved in science and technology, presented various profiles either in earth and life sciences, or in civil engineering. So, the target audience was not simple to define, neither regarding the required education level, nor their typical field of activity. After many discussions it was decided to focus on engineers outside the river domain but interested in widening their interest, and on technicians daily involved in activities related to river world (for instance measurement devices maintenance or data collection) but interested in upgrading their theoretical knowledge. So it was assumed that the learners would have a basic background in mathematics and physics, which revealed not completely true as some participants, interested in water resources management in general, did not have this assumed background.

According to the availability of the potential teachers, it was also decided to build a rather short course: one introductory week and four effective weeks, each of them with five sequences representing a 30-minute daily workload for the learners.

The four effective weeks were organized around specific themes. The first week presented environmental issues (pollution, eutrophication, reservoir sedimentation) and hydrological characterization of the watershed; the second week was devoted to river flow mechanics (uniform and non-uniform flow, hydraulic modelling, flood propagation); in the third-week sequences, sediment effects were added (initiation of erosion, sediment transport, river morphology, bank stability); and finally the fourth week was dedicated to interactions between rivers and human activities (for instance effects of urbanization) and to practical measurements of river characteristics.

Typically, each 30-minute learning session was organized as follows: a 12 to 15-minute video was supposed to give the information, the rest of time being devoted to quiz questionnaire with the possibility of scoring points. In practice, video duration varied from 9 to 18 minutes, depending on the difficulty of the topic, with an adapted length of the quiz questionnaire to keep the target 30-minute daily workload. At the end of each week, either a forum of discussion was suggested, or a more complete exercise was proposed, this latter allowing accumulating more score points. In the reality, it was observed that many learners needed multiple viewings of the videos to assimilate them, mainly for lessons with mathematical requirements, with the consequence that they spent more time than expected for these lessons.

From project to reality: facts and figures

The MOOC started on 3 November 2014 with an introductory week, called “Week 0”. One week before the start, there were already about 2500 participants registered, and registrations continued until the limit date fixed on December 8, as illustrated in Figure 1, to reach a total number of 3456. During week 0, the participants were asked to give some elements of their profile, such as their geographic origin and their scientific and professional background, among others to check to which point the actual audience fitted the expected one. During this week they could get familiar with MOOC’s rules, platform’s tools and basic vocabulary.

As expected for a French-speaking MOOC, the participants originated mainly from French-speaking countries in the world, but not only. Participants also registered e.g. from Brazil, New-Zealand, Germany, United States. However, among the participants who posted their profile, the very large majority originated from France.

As regards the background of the participants, they were many professionals active in environmental or river training institutions, but not always with an engineering background. Some of those registered to increase their level of knowledge, some others to refresh their scientific knowledge, or simply to exchange with other professionals. Also, a large number of master but also undergraduate learners registered. The third group of participants consisted of persons in charge of environmental associations or active members of NGO. In this third group, not all the participants had the expected scientific level to follow all items of the course, which clearly appeared in the discussions during the MOOC. Nevertheless, the interest for the discussions was well present.

Looking now at the activity of the participants during the MOOC, it can be observed in Figure 1 that the number of participants who responded to the quiz at the end of each learning session decreased significantly during the first week, then remained almost constant, still with a low decrease rate, until the end, with numbers between 250 and 300, i.e. just below 10 % of the registered participants. Among those active participants, the grades obtained are shown in Figure 2: it ranges from 49 % for the end-of-week work of Week 3 which appeared the most difficult exercise to all the participants, to 92 %. Finally, 175 participants scored higher than 66 % on average.
for all the exercises and obtained the final certificate, i.e. about 6% of the registered participants, and about 70% of the participants who remained active until the end. It is interesting to compare this number to the 175 learners who finally completed the final exercise of week 3, exercise that was over weighted in scoring.

Figure 1. Number of responses to the quiz provided at the end of each learning sequence, as an indicator of the number of active participants

Figure 2. Average score of the participants who responded to the quiz provided at the end of each learning sequence
**Nice surprises, nasty surprises**

**Preparation and implementation**

Each teaching team had his own experience in terms of pedagogy. An agreement about pedagogical aspects was sometimes tedious to reach, some teachers favoring description and illustration of river features, other more attracted by design and calculation aspects. It was finally decided to accept some heterogeneity between sequences, though with a uniform layout and style, each of them reflecting the background of its author.

Regarding the platform, as the French-speaking community was targeted and as main supports were in French, FUN was selected as supporting platform. Unfortunately, MOOC platforms do not provide usual Learning Management System functionalities. For instance, it was rather easy to manage multiple-choice quiz and numerical answers but it was impossible to organize a cascade of answers, blocking question 2 until question 1 was replied. Moreover, while drawings and graphs may be included in the question form, no possibility is offered to the learner to post his own figure in his reply, which is a real limitation for engineering themes.

**Progress of the course**

The first pleasant surprise was the number of learners interested by the topic, but their geographical repartition was unexpected. Most of them were issued from France, the other French-speaking countries in the North as well as countries in the South being underrepresented. That clearly means that channels used for advertising were not adapted to the foreign audience, despite efforts made in that sense. This predominance of French learners was still more marked in the participation to the interactive processes: quiz, forum, exercises and final project. This is a little disappointing and will constitute a challenge for season 2, where partners from the South will be involved in the production.

The discussions open to learners after each sequence also revealed some surprises. While the target audience of engineers and technicians were expected to be familiar with mathematics, the first appearance of an equation to be solved at the beginning of week 2 appeared as a real stress for many learners, at least those who participated to the open discussion. The surprise was great to see that some learners were unable to handle a fractional exponent and the surprise was still greater to observe that a nice solidarity network rapidly organized, some learners giving pertinent information to the other ones.

Another nice observation was the fair play of the participants. Most of them were demanding of more solved numerical examples to help them in solving the proposed problems, but, in their mutual interventions, they always defended the point of view to keep a good level of difficulty to maintain the quality of the certificate they could get at the issue of the course.

**Lessons from collaborative work**

One of the most original aspects of this MOOC “Des rivières et des hommes” relies in its collaborative initiation and production. Involved institutions had their own culture and experience and collaboration was not so evident. So, it is not really surprising that this way of working presents some difficulties besides some real advantages.

**Advantages and drawbacks**

More than distinct institutional practices, distinct background of teachers may be a challenge, each of them being accustomed to specific student audience: audiences of geographers, of environmentalists, of physicians or of engineers are completely different in their expectation and approaches. This heterogeneity of teachers and approaches may be a real enrichment for learners as well as for teachers themselves. Being teachers ourselves in the hydraulic part of the course, we have learnt a lot of interesting concepts from colleagues’ lessons. The counterpart of this heterogeneity is the difficulty for the learners to adapt from one sequence to the other one, with a change in point of view and sometimes a sudden jump in difficulty.

In terms of project progress, an invaluable advantage, that is also a severe constraint, may be found in the momentum inspired by the group. For instance, if your sequence is delayed for any good reason, you cannot relax your own effort as you could be responsible of a delay for the whole group, with the risk of missing a window reserved in the platform calendar.

Another added value could also rely in the mutual criticism the group could exert for improving your own production and to ensure a better complementarity between sequences. From the beginning, it appeared that even the basic definitions were not always the same for the various teachers (for instance the concept of ‘uniform flow’ was not defined in a common way). So the idea of a common vocabulary was pitched as well for learners as for teachers themselves. This was unfortunately not realized for lack of time. Another idea was the possibility of a mutual review of all the sequences, in a multiple steps process. In a first step, the layout of each sequence had to be presented by the person...
in charge of the sequence to the whole group. The intention was to provide to the whole group an overview of the whole course, and to identify possible repetitions, or needs for more details. Then, in a second step, a “reviewer” was identified within the group for each sequence, with the task of checking the slides before recording the sequence. Finally, in a third step, all filmed sequences had to be reviewed by the whole group. Once again the tight schedule did not allow this kind of brain storming. Only the first step was achieved, and some parts of the third step, as not everybody could watch and comment in details the existing sequences.

Actually, the potential advantage of a work in team was not really exploited in this particular case, probably as a counterpart of the pushing effect of the group schedule: most of the teachers were very tight in their own timing, so considerably reducing the availability to take an operational interest in the colleague’s sequences. It is expected that the perspective of a season 2 will let more time to interaction between the actors, but this remains to be checked against the hard reality of busy schedules.

Perspective of season 2

Regarding this second season, two main challenges have to be faced: open the teaching staff to southern teachers, and improve the homogeneity of the course, with the special difficulty that the opening of the teaching staff is of course a potential new source of heterogeneity.

As regards the homogeneity of the course, it is foreseen in a debriefing session to try to recover at least partially the reviewing process that could not be achieved in the preparation of the first season. All sequences will be analyzed by the group, in terms of difficulty, length, workload and presentation, also taking into account the comments received by the learners, in order to identify what should be improved for the next season.

The, widening as well the proposed material as the audience to the South is not an easy task. Often, available data that could illustrate southern examples are missing or not compatible with methodology from the North: for example Digital Terrain Models with high resolution are seldom available in developing countries, while they become common in industrialized ones.

Also the teaching culture may be different. Distance learning on an individual basis is unrealistic in some countries where Internet connection, already often limited or intermittent in privileged institutions like technology schools, is seldom available at home. So, the whole learning process has to be adapted to local conditions, maybe by creating local hubs where the MOOC could be deposed with Intranet connections, supervision and evaluation by local teachers, themselves with close assistance by staff from the North.

Acknowledgements and thanks

The authors thank the partner institutions: the Université Lumière Lyon2 and the Institut de Recherche et Développement. They express special thanks to the group leader Florence Michau, to the contributing teachers: Hervé Piegay, Oldrich Navratil, Julien Nemery and Huynh Thanh Son, and to the supporting team: Coraline Bel, Patrick Paris, Estelle Dutto, Sandra Carenini, Catherine Simand, Françoise Docq and Sophie Labrique and university audio-visual teams.

They also acknowledge the financial support od UNIT, Région Rhône Alpes (CEDES, UNRRA, CMIRA), OSUG and EPFL, coordinating collaborative MOOCs in RESCIF network.
MOOCs in Amdocs – Corporate Learning Based on MOOC’s Methodology

Nomi Malca, Amdocs, USA

ABSTRACT

Amdocs is a global company of 23,000 employees worldwide. In order to reach each one of them, we decided to implement MOOCs in our Learning & Development offering. We developed internally 4 MOOCs and integrated external public MOOCs in an additional blended program that combines public courses with internal content. In this lecture I will share our story; starting with why we selected this method, how we developed the courses and the program, how we managed the implementation (including selecting a platform and integrating it), how the organization accepted the new approach, what works and what we plan to improve. We will explore the unique challenges: employee’s engagement & availability, IT security rejections and the costs of internal development. By May 2015 I will be able to share the results of 2 cycles of each of the courses and at least 1 cycle of the blended program.

Our Story

Implementing MOOC learning in an organization like Amdocs highlights challenges related to learners’ engagement and drop-out, in a way that is probably similar to public MOOCs. But the closed, relatively small environment we are working in increases the need to demonstrate success and ROI much faster. We must have more than 50% accomplishment, and high satisfaction feedback, from the very beginning. This lecture, describes the different aspects of our journey towards a new learning experience in the results-driven medium-sized corporate world.

The Need

During 2014, Amdocs introduced a new role architecture to all of its employees worldwide. The main benefit the employees gained from this change, at that point, was a new focus on, and interest in, the employee’s personal development. As part of the company’s corporate, we, the Learning & Development unit, were asked to address the need for personal and in-profession development. Our main focus till that point was offering learning for the immediate need of the job performance. We defined our new objectives as follows: Creating learning that opens up a world of opportunities; that provides the learner with experience and that makes him feel elevated, connected and inspired.

So far, this might be found in many organizations, but, since we wanted to reach each and every employee, no matter where he is located, and how many people in his area are interested in the same learning, we had to embrace a new method of learning. Something that is social, remote, short and engaging. We decided that MOOCs can answer this need.

The Organizational Environment

In order to understand the challenge, I would like to provide some background on the organization. It is believed that Amdocs employees have a constant feeling that they have much more work than the time required to do it. They are very focused on their goals and measurements. Therefore, on one hand claiming to provide personal development is very ambitious, and, on the other hand, finding time to learn is very challenging. As opposed to a public MOOC that people select to learn in their spare time, an organizational course should be learned during work hours, but no one really gives the employees time to learn for personal development, especially in a self-learning mode.

From the technological perspective, the learning systems existing at the entry point could not support this kind of learning. Implementing a new system would have been a challenge as well. We faced information security constraints and only partial integration with the other organizational systems. However, we decided to start with partial manual processes to gain experience and succeed in setting the learning platform.
Our Initial Guidelines
In light of our constraints and the organizational environment, we defined several guidelines for the MOOC’s implementation. We decided to limit ourselves to 12–20 hours of learning per MOOC, to include online synchronous sessions, to help create a sense of social community. We understood that we cannot count on voluntary participation in the courses’ forums. We started with mini as opposed to massive courses: the courses were limited to around 80 learners per cycle. All these guidelines were selected in order to create a positive buzz in the organization around the new learning experience.

The Topics
We started with 4 topics (see table 1). The topics were selected from 24 competencies that were defined as required in Amdocs. For each role, several competencies were selected from this bank of 24 competencies. Most of the competencies were defined as a set of behaviors that are required on top of the professional aspects of the role. We started with those competencies that had a wider target population.

Table 1: MOOC Topics and Target Audiences (The numbers will be updated again before the conference)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Estimated Target Audience</th>
<th>Actual Learners So Far</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Excellence &amp; Operational Efficiency</td>
<td>2–7K</td>
<td>150</td>
</tr>
<tr>
<td>Technological Excellence</td>
<td>10–15K</td>
<td>100</td>
</tr>
<tr>
<td>Continuous Improvement &amp; Integrative View</td>
<td>4–9K</td>
<td>80</td>
</tr>
<tr>
<td>Project Management</td>
<td>3–6K</td>
<td>160</td>
</tr>
<tr>
<td>Creativity &amp; Innovation</td>
<td>10–15K</td>
<td>120</td>
</tr>
</tbody>
</table>

The Main Development Challenges
In order to create MOOC, both the instructional designers and the content owners had to change their mindset and let go of the classically controlled learning design process.

The content is offered but the learners cannot be forced to consume it. More than that: even if all of the content were consumed by the learner, it would not provide him with any new actual profession-related knowledge or skills. (Consuming all the content does not certify the learners to do anything new or different). As explained, the competencies we teach are only an additional layer to the professional work, and not even necessarily a totally new layer.

The instructional designer has to crystalize the content to its most extreme core messages. The learner’s time cannot be wasted on less important aspects. And, most important, the risk of losing the learner is an ongoing threat. We are much more vulnerable to dropouts than the massive courses with tens of thousands of learners: our investments are very high, and the buzz that poor learning experiences can create has a dramatic impact.

Solution Integration
After convincing the main stakeholders that even a Mini Open Online Course can work, we started to face the technical challenges. We tried to run a MOOC using our existing learning management systems, and soon found out it was not doable. The learning experience was so poor and the learner had to be so tolerant and flexible, that it simply could not work.

So, we had to invest additional budget in a dedicated system. We were required to select a system and run all the internal approval processes. Getting Information Security approval for a new and open system was a journey by itself. Eventually we selected Moodle, installed it inside the Amdocs network and lightly customized it to manage MOOC courses. It enabled us to achieve a quick and effective implementation, though we had to compromise on some of the MOOC platform functionality.

Course Facilitation
The Learning & Development department has learning designers and operational experts, but does not hold the content expertise and the trainers who facilitate the courses. In an organization like Amdocs, there are more than 150 roles, divided into more
than 10 different profession areas. Hardly any of the best performers in the areas have time to facilitate learning. But, more than that, in these MOOCs we provide learning across roles and professions. Who then can lead such a course? The fact that we included remote synchronous interactive sessions made it even more crucial, as this kind of facilitation requires more experience and passion to create an interactive learning session. Eventually, the facilitation was divided between various people and functions as can be seen in Table 2:

### Table 2 Course Facilitation

<table>
<thead>
<tr>
<th>Competency</th>
<th>Facilitation of the 1st Cycle (Pilot)</th>
<th>Facilitation of the Next Cycles</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Excellence &amp; Operational Efficiency</td>
<td>An internal content expert who was trained to train others</td>
<td>An internal content expert who was trained to train others</td>
<td>The facilitator was characterized as passionate about remote learning and MOOCs</td>
</tr>
<tr>
<td>Technological Excellence</td>
<td>A co-facilitation by a content expert and the instructional designer</td>
<td>A co-facilitation by a content expert and a soft skills facilitation expert</td>
<td></td>
</tr>
<tr>
<td>Continuous Improvement &amp; Integrative View</td>
<td>A vendor who consulted throughout the development</td>
<td>An internal content expert who was trained to train others</td>
<td></td>
</tr>
<tr>
<td>Project Management</td>
<td>A vendor who was recognized as a partner for the whole development process</td>
<td>The same vendor, with some assistance from internal content experts</td>
<td>The same vendor is facilitating most of the face-to-face courses around this area in Amdocs.</td>
</tr>
</tbody>
</table>

### Learning Results

The first result we can measure is the percentage of course completion. It is directly derived from the course completion criteria; we defined it as completion of 70% of the course assignments and participation in at least 50% of the remote sessions. In terms of performance change, we cannot prove a causal relation to the effectiveness of the learning, a challenge relevant to many other learning solutions in the organizational environment. We are going to measure how Amdocs employees perceive the new learning offering, and the MOOCs as part of it. This will be done within the annual employee engagement survey and through a pulse survey after 3 months of consumption.

During the courses and immediately after them, we collect participants' feedback in various ways: anonymous survey, questioner interview, and in the courses' forums and online sessions. So far, we have found out that, although the courses are perceived as valuable:

a) The learners are having difficulties allocating the required time for learning;

b) They have many complaints about the system and the user experience in it;

c) Social aspects were not well implemented, and the learners do not feel part of a learning community.

In order to continue to provide learning using this method, we are struggling to find additional ways to lower the percentage of learners who drop out. We believe we have to find the right balance between:

a) The time and effort the learner has to invest in a course;

b) The sense of belonging to a learning community (based mainly on participation in the online sessions), and:

c) Active self-learning that provides the new insights. (See Table 3).

### About the Presenter

Nomi Malca is a Learning and Organizational Development partner and a learning designer with 20 years’ experience. Most of the experience was gained in Israeli consulting firms and by leading learning projects in various organizations. For the last 4 years, Nomi has been working in Amdocs, developing and leading major learning programs designated for Amdocs employees’ worldwide. Nomi leads a team of 14 professional experienced instructional designers, as part of the global Learning & Talent Development department.
Table 3: Courses’ Efforts and Results
Please note that this part will be filled and updated according to the data we are going to collect in the coming months.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Required Effort</th>
<th>Participation in Synchronous Sessions</th>
<th>Dropout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Excellence &amp; Operational Efficiency</td>
<td>12 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Excellence</td>
<td>20 hours</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Continuous Improvement &amp; Integrative View</td>
<td>14 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Management</td>
<td>28 hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Massive Open Online Courses as a Tool for Student Counselling and Study Guidance: The Example of MOOC@TU9

Daniela Pscheida, Christian Hoppe, Andrea Lißner, Andreas Sexauer, Maria Müller and Thomas Koehler, alliance of leading Institutes of Technology (TU9), Germany

ABSTRACT

The alliance of leading Institutes of Technology in Germany (TU9) co-produced an English-language Massive Open Online Course (MOOC) on “German Engineering” in the winter term 2014/15 (course website: http://mooc.tu9.de). The aim of this offer was to advise prospective students worldwide of the variety of engineering programs offered by the TU9 universities and to attract international talents for postgraduate studies (master, diploma) in engineering sciences in Germany. The design, production, and implementation of the TU9 MOOC took place as part of a joint collaborative project, in which the TU9 universities contributed to the content and finance in equal parts.

In the article, we focus on the potentials and the possible usage of the MOOC format in the form of a virtual lecture series as a tool for university marketing and study guidance and counselling. The potential didactical value of such an offer of information and education is also critically examined.

The Project MOOC@TU9: Discover Excellence in Engineering and the Natural Sciences Made in Germany

The TU9 is an association of nine leading technical universities in Germany founded in 2006. Its objective is to promote “science and research in engineering and the natural sciences” through the discussion and coordination of higher education policy positioning, strategic and development-related activities and cooperative relations with participants from industry, economics and politics (see http://www.tu9.de/en). The TU9 member universities are all interested in further strengthening the quality of engineering courses and the improvement of their good international reputation. In addition, there is a common interest to recruit appropriate and especially promising international applicants (high potentials) for an engineering degree in Germany.

In order to support these objectives the project “MOOC@TU9” has been set up: It is an English-language, web-based course in which the participants are given an in-depth overview of various advanced engineering studies and the special features of “German Engineering” at TU9 universities. The nine-week course was open to all people interested and was provided via the course website: http://mooc.tu9.de. The design and the production of the all in all 19 course units (2-3 per week) were realized by an editorial team of at least one representative of each TU9 member university. This team was supported by people from the local media and e-learning centers. Moreover, the vice-rectors and the vice-presidents responsible for the university’s academic program and teaching at the TU9 universities had an advisory role.

The main element of the course was a weekly, 90-minutes, interactive, live session in which at least two professors from different TU9 universities introduced their subject, their research focus as well as their university in a mixture of moderated live interviews, lectures and short pre-recorded videos (video clips). The live sessions were enhanced by weekly assignments, accompanying texts on the website and external e-learning platforms, as well as different ways of interactive exchange.
Student Counselling and Study-Related Self-Assessment by means of MOOC - Challenges and Solutions from MOOC@TU9

Student Counselling

As already indicated the MOOC@TU9 did not have a close technical focus like the MOOC concept generally suggests and as similar offers on Coursera, edX or the equivalent German universities are designed. Instead the course was intended to be a lecture series with the widest possible overview of “German Engineering” and thereby allowed a basic orientation in the field of engineering. Thus exemplary “first hand” insights on contents and organization as well as useful background information regarding continuing study opportunities and the prerequisites associated with them were given. This way MOOC@TU9 could be used by the participants specifically as an exclusive offer of academic counselling: In addition to information and links on the course website, the weekly live sessions in particular formed the central element of the course. Every Monday, two or three professors and their faculties from different TU9 universities presented professionally moderated interviews and lectures using video clips. In addition, it was possible for the participants to incorporate questions in the live interview via text-chat. Discussion forums were also available as a convenient exchange and consultation option.

In order to meet the objective of student counselling, the live sessions had primarily an informational character. In addition to the information about the respective university location, the lectures were about presenting exemplary contents of an engineering course in a didactically compacted way. Moreover, the possibilities of modern media production could be used in the live session: The professors were able to convey the contents in a highly enhanced manner by the visualization of processes and experiments, the use of examples from practical everyday life as well as insights into laboratories and seminar rooms. Nevertheless, at the didactic compacting stage and in view of this study guidance and counselling the involved university teachers were confronted with the not always easy to be solved challenge of preparing the content so that it is (1) sufficiently intelligible for a group of participants which in several respects was very heterogeneous, (2) sufficiently interesting and entertaining for the format of an accessible online live session or recording and (3) sufficiently representative of the level of expertise of each featured discipline.

Study-related Self-assessment

As with the presentation of live sessions, didactic reduction was needed also in relation to the design of the weekly assignments. Through this element of the course participants should be given the opportunity to test their existing knowledge and understanding and activate those if appropriate. The aim was to present content at a Master’s level. At the same time it should be understandable and resolvable for participants who come also from adjacent fields of study. To obtain a Statement of Accomplishment it was necessary to complete and submit five tasks out of the various fields. In addition to the possibility of self-examination the tasks should give an idea of the importance of the particular fields of study for global interdependencies and individual action. The tasks were partly analytical ones (e.g. to analyze and document the sustainability of its own hometown by certain criteria), partly experiments (e.g. to build a simple motor and measure material properties while moving), and partly the participants were asked to develop own ideas and concepts (e.g. program a virtual mobile robot or design a mobile application prototype). In some cases also ‘classic’ online tests with multiple-choice questions etc. were used. Accordingly, the offered task solutions also differed. For example some were presented in a short video, some were text-based. An organizational challenge was the diversity of the participating professors/faculties, and thus the at times widely differing disciplinary cultures. The required time to solve the assignments also varied in parts enormously. At the same time, for exactly this reason, the diversity and characteristics of each discipline became clear for the participants in a direct and authentic way.

Course Experiences and Initial Evaluation Results

Since it was a pilot project both at the level of the initiative itself (cooperation project of all TU9 universities) and in terms of orientation/objective of the course (MOOC for the purpose of the student counselling and study guidance), the implementation was comprehensively evaluated in both formative and summative ways. Some data on participants’ activities could be extracted directly from the course website and the registration tool. For more detailed information about the motives, backgrounds, and interests of the participants and their course assessment and satisfaction, we performed a
comprehensive online survey before and after the course, and inquired ‘impressions’ at the end of each week of the course.

**Numbers of Participants and Groups**

The course was held in the period from 20.10.2014 to 21.12.2014. Previously, it was advertised for about two months via mailing lists and websites of multiple institutions in Germany and abroad (TU9 office, DAAD - The German Academic Exchange Service, Goethe Institute, partner institutions, selected universities world wide, etc.) and social media channels (especially Facebook and Twitter) of the TU9 universities. As a key marketing tool an approximately 2-minute teaser video was used in addition to digital flyers and leaflets, which among other things are accessible via YouTube¹ and Vimeo². For countries in which those channels are not supported, e.g. China, access via ftp was given.

By the start of the course, 990 people had registered. By the end of the course, this number had risen to 1.328 registrations. The focused target group of international students indeed constituted the majority of the registered participants (65% students, also about 20% employees and a small group of school children about 7%). The participants came from more than 80 different countries around the world (see Figure 1).

**Participants’ Activity**

As customary for MOOCs and open, online-based teaching-learning formats (see among others Grainger 2013, p. 28), not all registered participants were constantly active. A total of 318 weekly assignments were submitted by the participants corresponding to an average of about 35 tasks submitted for each course week. Of the 220 participants who indicated their intention of obtaining a Statement of Accomplishment in the initial survey, at the end of the course a total of 30 people achieved the required number of at least five completed weekly assignments. The completion rate is thus also in the normal range for MOOCs (cf. Jordan 2013,

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¹ http://youtu.be/BcBLXnqZDjw
² http://mooc.tu9.de/?p=55
³ Clustering accordingly to http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm. Largest groups of participants: Germany (21%), India (14%), Colombia (8%), China (7%), Spain (5%), Indonesia (4%), Egypt (4%), Brazil (3%), Turkey (2%), Chile (2%), France (2%), United States (1%) and Malaysia (1%).
Parr 2013) and depending on the reference point it even can be considered as comparatively high. 86 participants, however, worked on at least one of the weekly tasks. The participants’ activity in the discussion forums was relatively low. There were a total of only 62 posts written over the course of nine weeks (including those of the organizers). With just a few questions on the relevant weekly assignments, this means virtually no exchange between participants took place (other than planned by the organizers). This may be because of the general course design, which was not mainly focused on discussions. On the other hand a critical mass of participants for an exchange was simply not achieved, taking into account the drop-out rate which was normal for MOOCs (see Onah et al. 2014).

Due to the limited number of viewers of the live sessions (on average 20-25 people, only two times more than 50) the accompanying ‘chat’ for questions was also used only sporadically. The recordings of the live sessions, however, were significantly more common being viewed a total of about 9,000 times. This suggests a significantly higher number of passive participation. A certain decrease in attention from week to week over the course can be observed here as well.

Participants’ Interests and Satisfaction

The results of the final survey show an overall satisfaction with the course with regards to meeting the expectations that the participants put on it. 94% of respondents would recommend the course. In addition, it became clear that participating in MOOC@TU9 was helpful for the personal study guidance/decision for about 48% of the respondents (another 32% of respondents confirmed this was at least partially true for them). In addition to the lectures as part of the live sessions (73%), the weekly assignments were especially highlighted as useful elements by 58% of the respondents.

The results of the initial survey show that the majority (72%) of respondents wanted to use the offer to obtain an overview of the courses offered in engineering in Germany. An equally large proportion of respondents (60%) also wanted to get specific information about the TU9 universities. These interests were fulfilled according to the final survey.

Establishing contacts with other prospective students or the professor was, however, relevant to only a quarter of the respondents before the course started, although at this time at least 48% were planning to participate in the forum discussions. The final survey also reveals that the offer to provide practical and somewhat exclusive course guidance by the Head of Faculty and their employees as well as the possibility of establishing contacts and exchanges with other prospective students on the course website during this course played virtually no role.

“This is not a MOOC, it’s an advertisement.” – A Conclusion

Based on the evaluation results it can be stated that the offer of (passive) study information was apparently taken on quite well, while the personal study orientation in the sense of an active self-assessment via the offered tasks was only of interest for a small group. This may be due to the fact that the level required to process at least five tasks from different engineering disciplines was very high. On the other hand, the extrinsic incentive with the acquisition of a Statement of Accomplishment without a specific context of use was very low. At the same time an interpretation also suggests that the didactic orientation of the course towards student counselling and study orientation not only allows, but also explicitly encourages a selective use of the service according to the participants’ interests and concerns. As stated in the final survey, only 1/5 of respondents participated in all nine weeks of the course.

Based on the experience, we can say that the MOOC format is quite suitable as a tool for student counselling, orientation and self-assessment – not only in engineering or the STEM subjects. It has to be mentioned that in particular the xMOOCs usually inherent character of a professionally oriented course (similar to a lecture) is necessarily reduced which presumably also has an inhibitory effect on the participants’ activity. Using the MOOC format as a tool for student counselling and study guidance, shifts the focus from teaching and learning to information and orientation. This should be clearly emphasized – even if through an alternative designation. As one participant in one of the weekly evaluations noted quite applicable: “This is not a MOOC, it’s an advertisement.” Nevertheless, the enhancement of informational and organizational oriented contents regarding studies with exemplary professional communication processes taking place and for the self-assessment intended tasks can be regarded as a clear benefit in MOOC@TU9. Both sides can thus potentially be united in one offer and complement and supplement each other.
Acknowledgements

We kindly thank the management of the TU9 member universities, particularly the vice-rectors and the vice-presidents responsible for the university's academic program and teaching, for financial and advisory support enabling the project. Our sincere thanks also go to all the participating professors as well as the staff of the participating departments, without whose dedication and creativity it would not have been possible to realize the course.

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Potentiating the human dimension in Language MOOCs

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ABSTRACT

This article presents a reflection on what is referred to as ‘the human dimension’ of MOOCs for language learning (LMOOCs). To begin with, the defining features, typology and general characterization of these courses are considered. Then, the article focuses on certain intrinsic problems present in LMOOCs, whose nature is more humanistic than technological and lead to some student and teacher dissatisfaction with these courses. The students’ problems are worsened due to the heterogeneous nature of the group, giving rise to mutually exclusive motivations and perspectives. Even though this course modality is heralded as something radically new within the field of education, given the limitations and circumstances of participating teachers and institutions, materials and activities are often taken from passive unidirectional traditional courses, all of which may have negative consequences. The impersonal nature of these courses is also discussed and its relation to the confusion and anxiety often reported by students. A potential alleviation to these problems is proposed, based upon the authors’ LMOOC research, which involves the new concept of ‘e-leading student’, and how this figure may be empowered by course designers and teachers to improve the overall LMOOC learning experience.

Introduction

There seems to be no limit to the possible disciplines or topics that are being taught in MOOCs, from Astrophysics to How to succeed in interviews, or even MOOC design. However, MOOCs in the field of Humanities and, more specifically, those concerning foreign language learning seem to be extremely scarce when compared to other disciplines (Bárceña & Martín-Monje, 2014). The number of MOOCs available in 2014 reached almost 4,000 (www.moocs.co), but only 30 of those were Language MOOCs (LMOOCs henceforth). Furthermore, it must also be noted that many of the online courses that claim to be LMOOCs do not qualify as such, because they fail to fulfill one or more of the premises Sokolić (2014) outlines: Massive (large enrollment, in the thousands), Open (free and not dependent on location, age, etc.), Online (entirely digital), Courses (not just a repository of materials, but structured syllabi with a schedule and the guidance of an instructor).

Foreign language learning has some specificities that need to be taken into account before considering the theoretical suitability of MOOCs for learning second languages: 1) Language learning is mainly skill-based, “it involves putting into practice an intricate array of receptive, productive and interactive verbal (and non-verbal) functional capabilities” (Bárceña & Martín-Monje, 2014, p. 2); 2) it entails considerable practice, just like any other skill; 3) the cognitive process involved in learning a foreign language favors the engagement with higher-order thinking skills (relating, contrasting, criticizing, inquiring, justifying, deducing, etc.); and 4) after infancy one is assumed to gradually lose some of the innate acquisition abilities and acquire a more rule-based cognitive profile (see, for instance, Meltzoff & Prinz, 2002), which results in the need for an explicit type of learning model, with explanations, illustrative examples and lots of practice, both individually and collectively.

This is partly why authors such as Romeo (2012) or Stevens (2013a) have expressed concerns about the suitability of the MOOC format for language learning. The former claims that there are two crucial requirements for foreign language learning which LMOOCs cannot fulfill: pro-activeness and live communicative interaction with ‘native’ speakers. The latter states that MOOCs are not a
good means of teaching grammatical structures, unless students are set to learn them inferentially and from one another. Other LMOOC creators and researchers have evidenced some potential difficulties that should be addressed: the change of role of teachers in such challenging courses, how to provide effective feedback with such an unbalanced teacher-student ratio, the sheer heterogeneity of the group, and the intrinsic difficulties of the evaluation of language communicative competences under such conditions (Martín-Monje et al. 2013a). Beaven et al. (2014) also delve into these issues and note “that a high level of interaction is difficult to achieve, that it is difficult to engage in social learning of language skills, that there is a substantial time cost for educators, and that LMOOCs, like other MOOCs, have big drop-out rates” (p. 50).

The most common categorization of MOOCs, including LMOOCs, is the cMOOC/xMOOC dichotomy. Connectivist MOOCs, or cMOOCs, offer networked content, participants are encouraged to organize themselves and make progress in a collective, constructivist fashion. In contrast, xMOOCs have a centralized core of content offered on a single platform and seem to be preferred by universities offering these courses. Evidence shows that the connectivist paradigm proposed by Downes (2012) does not fit well when used as the unique model for online language instruction. As Sokolik (2014) and Godwin-Jones (2014) point out, an effective LMOOC design should combine both. CMOOCs share some characteristics with the most widely used methodology in foreign language, which is Communicative Language Teaching, since both of them put an emphasis on interaction and community building. On the other hand, xMOOCs provide a familiar structure to any participant that has followed undergraduate studies, since they have the same structure as a standard university course: a syllabus and a sequence of activities, together with some sort of assessment to verify that learning progress has been made. In this sense, Godwin-Jones (2014, p. 8) insightfully affirms:

[T]he optimal approach to structuring a language learning MOOC is to provide an adaptive learning system within an extensive social and personalizable learning environment, in effect combining an xMOOC style format with a cMOOC. The mix between machine learning and social learning will depend on proficiency levels and on the skills being learned or assessed, with the social dimension gaining in importance as proficiency develops. This raises another added complexity, as stated by Sokolik (2014): in truly communicative LMOOCs students make use of the target language only, which means that they are using the medium of instruction as the medium of communication. LMOOC designers should take this into consideration and keep away from the assumption that cMOOCs are better than xMOOCs, since probably what LMOOCs require is a platform that is flexible enough so that it caters for the peculiarities of this subject matter, taking ‘the best from both worlds’. In this sense, Sokolik (2014) has put forward some recommendations in order to achieve a successful LMOOC: 1) maximize engagement and interaction, considering ways in which students can participate more actively on the MOOC platform; 2) facilitate, but do not manage, self-organized learning, e.g. through social media; 3) create an instructor presence, so that students realize that there is a human teacher actively engaged in the course; 4) use video for engagement and as a source of authentic materials –it is an excellent way of getting students involved in the target culture; 5) define success, encouraging students to think of their own goals and how to use the course to their own individual benefit; and 6) match the goals of assessment with its form, so that it is coherent, valid, meaningful and purposeful.

As previously noted, there has been very little scholarly work published about LMOOCs (Bárcena & Martín-Monje, 2014), with just a few papers published in scientific journals (Godwin-Jones, 2012, 2014; Schulze & Smith, 2013; Stevens, 2013a, 2013b) and Winkler, 2013) and only one monographic volume devoted to the topic (Martín-Monje & Bárcena, 2014). However, there are already solid attempts to map out the LMOOC scenario, providing a picture of the teacher profile (Castrillo, 2014) and the course participants (Beaven et al. 2014). As for the teacher profile, Castrillo states it clearly (2014, p. 68): ‘The new roles, competences and tasks of the teacher arising from this new open-course format have been insufficiently researched to date’. In her detailed analysis of the role of the LMOOC instructor, the author proposes a new classification of teacher roles that comply with the needs of the different stages of the MOOC: 1) beforehand, there is a need for a MOOC developer and structure organizer, a content expert/creator/facilitator, an assessment designer, and someone who gives shape to the communication tools (e-mail, forums, Q&A, etc.); 2) once the MOOC has been started, the roles of curators –providing guidance and help on the course content– and facilitators –focusing on technical issues– are vital for the smooth running of the course; and 3) finally, after the LMOOC, the instructor becomes a researcher who analyzes the data and looks into possible updates and improvements for subsequent editions of the LMOOC.
As for the profile of the LMOOC participant, it seems that the initial altruistic objectives of MOOCs, aiming at democratizing education and making it accessible to vulnerable social groups who would not normally have access to higher education, is still somewhat of a fallacy, since the majority of MOOC participants seem to be young, well educated, employed individuals from developed countries (Selingo, 2014). The same can be applied to those of LMOOCs (Bárcena et al., 2014; Rubio, 2014): they are intrinsically motivated and self-determined, especially those who manage to complete a course, but there are tensions that must be taken into consideration, such as confusion and time pressure, which may account for some of the reasons for high dropout rates in MOOCs.

Despite the constraints and limitations of this new model of online instruction, it is a fact that MOOCs are here to stay and will have to evolve and become consolidated within the field of online language learning. Authors, such as Colpaert (2014) or Godwin-Jones (2014), have ventured to suggest possible paths for future development. For the former, “an LMOOC should look like it has been well designed in a methodological and justifiable way, with its eventual features depending on local context and learning goal” (2014, p. 169) and he proposes four issues in the future development of LMOOCs: 1) modularity, 2) specialization, 3) adaptation, and 4) co-construction. The latter expands the question further and enumerates seven possible directions: 1) more options for credentialing from completion of MOOCs; 2) growth in learning analytics applied to MOOCs; 3) more involvement in planning and teaching by information specialists, especially librarians; 4) more openness in MOOC content; 5) greater modularity in MOOC structure; 6) increased adaptation of MOOCs to mobile environments; and 7) more LMOOCs in targeted areas: English as a foreign language, less commonly taught languages and for specific purposes.

Over the years, MOOCs have generated a comparable amount of adepts and detractors. A considerable part of the literature praises these courses as opportunities for lifelong learning and social and professional inclusion, for the democratization of knowledge and so on (Gibaldi, 2013), while the other criticizes their many limitations and unsolved challenges (Holton, 2012; Littlefield, 2015). Apart from peripheral policy and economic issues concerning MOOCs, frequently highlighted problems refer to the different intrinsic pedagogical aspects of any type of course: approach, design structure and methodology, the types of contents and materials, and the didactic mechanisms that deal with the pillars of the learning experience: student (and teacher) motivation and engagement, feedback, scaffolding, and assessment. Most of this debate applies to MOOCs in general, although some is even intensified in the field of languages.

The ‘human dimension’ in Language MOOCs

Completion rates

Probably the first criticism of MOOCs was the fact that of the very many students enrolled in the courses, very few reached the end and even fewer demanded paid certification (Read & Rodrigo, 2014). This has had major consequences on the institutions’ attitude and policies towards MOOCs after the initial editions, and the turn that these courses are steadily taking towards formal education and various ingenious attempts to become economically sustainable, if not profitable (Aparicio et al., 2014; Read & Bárcena, in press). Furthermore, it soon became apparent that student dropout rate had to be sharply redefined as a criterion in MOOC quality evaluation (Read & Rodrigo, 2014). However, the circumstance remains that a lot of students sign up for the courses with little effort and thought about the implications for the work entailed, and never even get to see the first didactic video. People enroll for free, almost instantaneously, with a few mouse clicks, after finding out about a given course through social media, blog posts, or by surfing the Internet. The initial abandonment peak is perhaps the most noticeable in MOOCs. It is ironic that the same feature that attracts people to these courses acts against their potential willpower to maintain interest as the course progresses. If the student remembers to login at all, as the course goes on, for various reasons (e.g., lack of interest, difficulties in keeping up with the work) s/he might end up quitting the course and, although other students may join in later, the population curve will point increasingly downwards. However, the ease with which students can hop in and off should not be held as an excuse for disrupting the motivation level of other students.

In some cases, the interpretation of the diminishing student numbers in a given MOOC is not negative. The openness of MOOCs gives students the rare chance to think about and explore their learning/training needs and to try out unlikely topics of study. However, the problem lies with the students who did want to do the course because they need to acquire certain knowledge/develop certain skills. In most cases, a low completion rate means that students were unhappy or just unable to stay on top of the work. The self-motivated, work-as-you-please atmosphere of MOOCs (especially cMOOCs) is not
appropriate for everyone. Some students only thrive in a structured environment with close supervision, obligatory tasks and materials, and set deadlines. There is a considerable challenge here for the LMOOC teacher to keep the students’ motivation sufficiently high to complete their course against all odds. Learning Analytics researchers attempt to identify and interpret abandonment peaks in given courses so that the developers can reinforce them strategically (Daniel, 2012; Clow, 2013).

**Course work**

A constant exodus also takes place throughout MOOCs that has been identified to be partly related to their design, structure and methodology. It is paradoxical that such a revolutionary learning modality has so many traces of traditional instruction, such as the lack of interactivity and adaptive mechanisms (Mackness et al., 2010). Course design typically focuses on content coverage, the completeness of the materials and the accuracy of task performance, over meaningful learning and understanding. Part of the problem can be traced back to the topic and goals of the course, which might be unsuitable, unrealistic or imprecise. Regarding the materials, sometimes they appear to lack a specific purpose or address specific key/difficult topics within the context of the course. They are non-interactive traditional ‘lectures’ or monologues with obscure relevance and insufficiently active learning, and may even have been imported and more or less adapted from previous courses. Some lack strategy in their integration with the learning experience and others lack integration with the rest of multimodal materials (e.g., some videos are typically placed before [not after] students have both explored the topic on their own and developed a fundamental ‘need to know’ and involve no ‘follow up’ (Littlefield, 2015). The first part of this criticism is particularly present in most LMOOCs.

Another issue with these courses is related to excessive demand of time and effort on the part of the students. As a strategy to cope with the very heterogeneous student groups, MOOC teachers include lots of additional material from different sources (their own, web links, printed texts, etc.), not sequenced, integrated or even defined in terms of who should work with what and under which circumstances. LMOOC students have complained of unreasonably time-consuming tasks that involve far too many hours of reading (on screen/ expensive printing) and working (Ventura et al., 2014). Furthermore, the attempt to put order to chaos relies heavily on timely structuring (weekly and fortnightly assignments). Although this works for some, it creates anxiety in others with less structured lives and regular learning time slots. What might be accepted by ‘visually cognitive profiled’ students, may not be by text consumers/web surfers/project participants, etc. If LMOOCs lose students due to either excessive laxity or overly strict control, given the virtually infinite number of learning styles, then the question can be asked about whether MOOCs are a non win-win situation.

**Teacher support**

We have seen how MOOCs may not end up being successful learning experiences due to student demotivation, confusion, strain, or anxiety. Underlying these emotions is a recurrently alluded sense of solitude due to the particularly impersonal nature of MOOCs in comparison to other online courses (Kilgore & Lowenthal, 2014). In the different courses and editions, the students either have access to/interact with the director of the MOOC, the coordinator, the course designer, the materials creator, the facilitator, or the curator. Too often the student has the feeling that all of these are absent altogether. Academics have their reasons for their diminishing enthusiasm too. Many of them jumped into this modality for their own research purposes, academic kudos, etc. and, once the course is launched (especially after the first edition), without any particular compensation or exemption from their principal teaching commitments, the mere prospect of attending thousands of students voluntarily and freely becomes too heavy a burden. In many cases, teachers are developing and teaching MOOCs (as well as providing online materials) for free. While teachers’ pay has never been particularly high, they used to be able to count on making supplemental income from textbook writing and additional teaching assignments. Furthermore, those teachers that embraced MOOCs for their research purposes have encountered that they do not have support for technical development, as most platform institutions are terribly cautious about undertaking such investment, given their still somewhat unclear future. The lack of incentives when developing and running MOOCs is obvious in teachers’ modest efforts (lack of revision and updating and infrequent access to the course). This directly affects students, as there is great solitude in being surrounded, uncertain and confused, by thousands of people. This is all food for thought for teaching authorities and policy makers and beyond the scope of this article. Technological development (e.g., a tool for error correction or even for the automatic creation of small working groups for enabling personalized debates in the language of study; Bárcena et al., 2013; Read, 2014) is largely out of question for
the time being. Until the business model enigma of MOOCs is solved, educational authorities are not likely to authorize the necessary investment in technological innovation and human support, and MOOC teachers will have to make do with their current resources and their vast and heterogeneous student population. The authors claim that, given this complex and challenging scenario, teachers need to intensify the initial design course phase by delving into the nature of their course (Why is this MOOC really needed? Who is it exactly useful for?) and the optimum way to transmit this to potential students. Subsequently, teachers need to empower students to personalize the course themselves. There is no doubt that research findings on Personalized Learning (Martínez, 2001) will provide techniques and strategies worth exploring by MOOC teachers.

Given all the above disparities and limitations, what is there in abundance in all MOOCs that could assist the teacher in his/her quest to run a successful course? Hundreds or thousands of students. This is a common factor in LMOOCs. For some (scientific, technical) subjects, social contact is exclusively a psychological/emotional issue. Language courses, however, rely on in-depth discussion and debate, and learners often feel that they are missing something when they study in isolation (Steels, 2003).

Turning a problem into an opportunity

Massive social language learning

Peer interaction is arguably the most important element in a MOOC (Draper 2013). After all, why do we select a course instead of other learning objects such as books, video or software that allow great expertise, asynchronous, self-paced learning? The authors believe it is because we are social beings and we learn by using learning resources other than conceptual information, such as significance and emotions. We do that best with other human beings. If the subject of study is language, this is even more so. As Bárcena & Martin-Monje (2014) explain, firstly, language learning requires the passive assimilation of vocabulary items and combinatorial rules, but they are subservient to an intricate array of receptive, productive and interactive functional capabilities (Halliday, 1993; Whong, 2011). Secondly, the path to proficient language use should entail practice, practice and more practice (Bárcena & Martin-Monje, 2014). Thirdly, the mind that learns a language best must be in a proactive and engaged disposition to activate its high order skills (relating, contrasting, criticising, enquiring, justifying, deducing, etc.). Fourthly and finally, the (adult) language learner is likely to benefit from the well-known explicit type of learning model, with explanations and illustrative examples followed by some creative form of practice. Part of this process will be more effective if undertaken individually, particularly for the improvement of certain areas of language, such as pronunciation or punctuation, since it provides the necessary flexibility and adaptation to personal learning styles, rhythms and circumstances, and enhances metacognitive processes. However, given the intrinsically social nature of verbal communication, there is no doubt about the strong affordances of negotiating meaning, engaging in group work, providing mutual assistance, and constructing and sharing new knowledge and skills collaboratively with others (Nunan, 1992; Warschauer & Kern, 2000).

Social interaction with ‘mootiquette’

Students in a MOOC fulfil multiple goals of an emotional and academic nature. Peers provide each other much-needed social support, and become sources of comfort and recreation. Despite the occasional forum conflicts (especially observed in intercultural debates, but also due to the constraints of written communication), their empathy, small talk and sense of humour are crucial to make the course a pleasant experience, and definitely have motivational value. Furthermore, forum communication is a valuable arena for training digital interpersonal skills. Major interpersonal skills include the following: verbal communication (what we say and how we say it), non-verbal communication (what we communicate without words), listening skills (how we interpret both the verbal and non-verbal messages sent by others), negotiation (working with others to find a mutually agreeable outcome), problem solving (working with others to identify, define and solve problems), decision making (exploring and analysing options to make sound decisions), and assertiveness (communicating our values, ideas, beliefs, opinions, needs and wants freely) (cf. Spitzberg & Cupach, 2011). Digital interpersonal skills are worthy given the predominance of, firstly, computer-mediated communication in professional, social and even personal spheres of reality nowadays and, secondly, the importance of interpersonal skills as an employability criterion (European Commission, 2015). The following ‘mootiquette’ was developed by the authors for the Professional English MOOC in UNED’s platform in 2012, and contains advice on general online messaging, language use and emotional communication (including Shea [2004] reference to the use of emotional language):
Feedback and error correction

Peers have an invaluable academic role in language in providing an opportunity for practice through forum messaging and debate, and also linguistic feedback. "The term feedback is often used to describe all kinds of comments made after the fact, including advice, praise, and evaluation. It is information about how we are doing in our efforts to reach a goal" (Wiggins, 2012). Feedback is crucial in learning. Both common sense and research make it clear: "formative assessment, consisting of lots of feedback and opportunities to use that feedback, enhances performance and achievement." (Wiggins, 2012). Unfortunately, teacher in-depth feedback simply is not realistic in most MOOCs. Apart from the fact that many instructors may not be remunerated, as mentioned above, even the most generous simply are not capable of correcting hundreds or thousands of oral or written language interventions a week. Some disciplines of a scientific/technical nature allow for individual study and automatic feedback. Open language production needs feedback on demand since it depends upon what has been written. Without a mentor, some students find themselves repeating the same mistakes over and over again. Feedback in LMOOCs takes place in the form of spontaneous and voluntary language error corrections in the forums or may be embedded in the course methodological strategy. In the MOOC platform MiriadaX, for example, a student’s text is sent anonymously to three peers and the student receives, in turn, any other three for error correction. Given their lack of expertise in this complex task, it is preferable to provide the group with a rubric. There are many freely available on Internet1.

Peer feedback in LMOOCs is not void of problems, the main ones being dubious identity and authority. Experts have noted that peer feedback is bound to contain errors and the validity of their feedback, therefore, may not always be reliable. True, although language learning is no longer restricted to the idea of the continuous imitation of the ‘flawless’ performance of a single teacher (and/or set of materials). Nowadays, the ultimate objective of language learning is generally accepted to be functional/proficient engagement in intelligible, empathic, and effective verbal performance, in a varied set of contexts and situations, with different types of interlocutors (Council of Europe, 2001; The National Capital Language Resource Center, 2003; Bárcena & Martín-Monje, 2014). Furthermore,

1 http://www.fcps.edu/is/worldlanguages/pals and the students), which arguably need further study.
students should be encouraged to undertake their error correction as a learning activity for themselves, consulting more authorized sources in the process. Understandably, in such an impersonal learning environment, low-level language students tend to be more receptive towards peer feedback, while advanced students are more reluctant to accept criticism.

The e-leading student figure
In order to 'humanize' MOOCs, alleviate social conflicts, lighten up dying debates, search for supporting resources, resolve academic disputes, etc., the authors have identified in previous LMOOC editions (such as Aprendo and MiriadaX’s professional English and German courses; Martin-Monje, 2013b), the existence of a type of student that outstands in the group for the social and academic influence they exert in it, which they use to aid and support others in the accomplishment of the common learning goal. For this reason, the authors have defined this figure to be an e-leading student (e-LS), claiming that e-LSs can be encouraged by the MOOC teacher to expand their presence and guidance within the course, and particularly the forum, for the benefit of all parties involved. Independently of his/her level of the target language, an e-LS does most or all of the following:

- Connects on a very regular basis and keeps more or less on task with his/her work;
- Spends a considerable amount of time participating in collective tasks;
- Answers lots of messages and peer queries showing concern and attention to detail;
- Contributes to the resolution of academic disputes satisfactorily, seeking consensus where possible;
- Searches for supporting evidence to help throw light on debates;
- Undertakes tasks for the benefit of the group, such as building up an errata list of the course materials;
- Acts as a pacifier when there is social conflict in the forum;
- Defends teachers when attacked;
- Corrects others’ mistakes with grace;
- Serves as a ‘coach’, praising good work and encouraging demotivated students;
- Serves as a voluntary intermediate with the teachers when there are problems with the methodology, contents or materials of the course;
- Shows an attractive positive and extrovert attitude and, thus, becomes popular with the group.

With time in the course, e-LSs gain the attention and respect of the group. Evidence of this may come in the form of a noticeably high number of responses to their messages and the threads they open in the forum, and an associated high karma value. There is typically a very reduced number of e-LSs per course edition but their presence and effect is clearly perceived to be useful, and as such, it is (explicitly) appreciated by both teacher and peers. The authors, who have been working with LMOOCs since 2012 (Read & Bárcena, 2014), argue that LMOOC teachers have a unique opportunity to gain in control and improve the dynamics of their courses by identifying potential e-LSs in the group, empowering them, and prioritizing their own course interventions to attend their needs, so that they, in turn, do voluntarily the same with their peers, leading to a sort of a positive cascade effect.

Conclusion
This article has analysed some of the main underlying principles of MOOCs for learning languages. The analysis covered linguistic, pedagogical, technological, psychological and sociological considerations. Despite the fact that open online courses can be designed to facilitate the development of communicative language capabilities by students within potentially massive and highly heterogeneous groups, the reality is that there is great scope for improvement in most fronts. This article has dealt with the ‘human dimension’ of LMOOCs, that is to say, some of the aspects of the methodological design of these courses relative to their agents (the teacher).

The outcome of this analysis has been four proposals for LMOOC teachers. Firstly, student dissatisfaction,
demotivation, and dropout may find a valuable tool in Learning Analytics, that can be used for the identification of significant variables, cause-effect relationships, and academic patterns that can help teachers predict and avoid course failure. Secondly, the replacement of old language teaching methods and passive unidirectional content consumption with better learning experiences that can be accepted by different student cognitive profiles is necessary. This new approach will benefit from deeper and more accurate reflections in the initial stages of the course design (Why? What for? For whom?). It goes without saying that potential students must be presented with such information expeditiously, so that they can undertake the course in an informed way right from the beginning. Thirdly, the impersonal nature of MOOCs and the unlikely reconciliation between excessively controlled and laxly structured designs call for a proactive involvement on the part of the students, incorporating techniques and strategies from the field of Personalised Learning (Perianou, 2014). Fourthly and finally, peers are arguably destined to fulfill crucial social and academic roles in online courses with massive student numbers. However, in practice, results would be far less rigorous and effective without the presence of a certain type of student that has been identified and defined by the authors as ‘e-leading student’. The question raised here is whether the performance of these highly motivated, proactive, and socially skilful students is the asset teachers were waiting for to turn their LMOOCs into successful and pleasant learning experiences, and how they must go about empowering their performance.

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Why make MOOCs?
Effects on on-campus teaching and learning
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ABSTRACT

Why make MOOCs? It is expensive and nobody can foresee if this tendency will last. Is it a reasonable investment for a university? What is the meaning of engaging in MOOCs? We address those questions from the point of view of an pedagogical advisor, discussing the added values of MOOCs for Higher Education, in particular through their effects on on-campus teaching and learning. Following the previous works of Docq, Lebrun & Smidts (2010), we analyze MOOCs effects through three categories and 13 criteria. While managing MOOCs as an on-campus innovative project, we show first evidences that they have a pedagogical worth.

Context and question

What are the pedagogical added values of MOOCs for a university such as UCLouvain? This paper discusses this question and ends up with some added values after about two years experimenting with MOOCs.

In March 2013, the Université catholique de Louvain (UCLouvain) had the opportunity to join the edX consortium as a charter member. This was the start of the Louvain moocXperience. The close output was to create and run four MOOCs on the edX platform. The Institut de Pédagogie et des Multimédias (IPM) – a teaching and learning center aiming to support faculties in quality teaching and pedagogical innovation – had been asked to support the project, helping the course teams in developing effective and reliable online courses. Quickly the question of why doing MOOCs appeared to the IPM pedagogical advisors. The purpose announced by the university board was to seize the opportunity of MOOCs to
1. rethink the forms of Higher Education, not only online but also on-campus, and
2. address this challenge within an international team of prestigious universities.

Those were the goals of the edX company (1) and they seduced the university board. The idea of seizing an opportunity was prevalent: MOOCs were new at this time but had started to make the buzz; nobody really knew what it was about and what were the stakes; the field needed to be explored...

From the beginning, the intention was to experiment widely, without any specific target in mind.

There were however other points of view. Making MOOCs is expensive and some university members would have preferred to see those resources allocated to more urgent and local learning needs.

Why wasting money and time for a wide audience of learners who will never come to our campuses while our credential students need more support, more teaching assistants, better infrastructure, innovative learning methods etc.?

The managerial point of view (inviting to explore without explicit target) confronts the pragmatic point of view (wishing to answer immediate learning needs). Can MOOCs meet both? This article aims at discussing, the meaning of making MOOCs from the point of view of a pedagogical advisor. What are the pedagogical added values of MOOCs for a university such as UCLouvain? There is a state of uncertainty about the future of MOOCs: will they still exist in five years from now? Will they find a sustainable business model? Will they appear to offer more opportunities than threats to education? Will UCLouvain still have resources to make MOOCs in five years?... In this state of uncertainty, what will allow us to declare, at the end of the Louvain moocXperience (no matter when the project ends up); this was worthwhile; the moocXperience has been a success?

Louvain moocXperience organization

The project started with the opportunity to join the edX consortium. The university board decided to build and run four MOOCs on its own financial resources. A call for projects was launched and four courses were selected out of twenty proposals. MOOCs seemed to raise the interest of UCLouvain stakeholders as a few months later, the university...
got a donation allowing the extension of the project to three years with the goal to build about 14 new courses by 2016. A second call for projects was launched nine months after the first one and four new courses were selected (out of fourteen). Five other courses were added, chosen intentionally within the Louvain School of Management courses in order to offer two edX XSeries – series of coordinated courses offering a deep approach of a topic. The Louvain moocXperience is thus, at the time of writing this paper, made up of 13 MOOCs on edX out of which six have already run (once, twice or three times) and seven are in preparation for a run in 2015 (2).

Professors involved in MOOCs get a financial support allowing them to hire a teaching assistant half time during one year in order to help them prepare and run the MOOC first edition. The IPM team has been reinforced to support all the dimensions of the Louvain moocXperience: a MOOC cell of three people is dedicated to make the learning videos, train and support course teams in the instructional design of the MOOC and in the instructional design of the on-campus courses integrating the MOOCs, etc. All that allowed for three years by the donation.

Added values of educational technology to quality of Higher Education

IPM was founded in 1995 with the aim of supporting faculties in quality teaching and pedagogical innovation, technological amongst others. UCLouvain has a tradition of fostering pedagogical innovation through a call for project each year, allocating extra resources for innovative projects. Following the technological and societal evolution and the faculties’ projects, IPM pedagogical advisors have sought to experiment with professors, to analyze, to understand, to create meaning about new uses and new tools (Lebrun & Vigano, 1995; Bousmar, Docq, Gilson et al., 1999; Docq & Daële, 2001; Lebrun, 2007; Lebrun, Docq & Smidts, 2009 etc.).

In 2010, Docq, Lebrun & Smidts determined a model of added values of “hybrid learning” for a quality Higher Education. They defined hybrid learning as a “pedagogical setup involving technology and reconfiguring the spaces and times as well as the methods of teaching and learning”. This model was based on three added values categories and 13 criteria. Table 1 shows a translation into English of those. Can the added values of MOOCs be analyzed through the same criteria?

---

**Table 1**

<table>
<thead>
<tr>
<th>Years 90</th>
<th>Years 2000</th>
<th>Years 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational cd-rom</td>
<td>LMS (discussion forum, learning path)</td>
<td>Distance / hybrid learning</td>
</tr>
<tr>
<td>Active &amp; interactive learning methods</td>
<td>Adaptation 21st century</td>
<td>Podcasts</td>
</tr>
<tr>
<td>Professional development of teachers</td>
<td>QUALITY HIGHER EDUCATION</td>
<td>MOOCs</td>
</tr>
</tbody>
</table>

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Figure 1. Three constant added values of technology for Higher Education through technological evolution
Table 1: Added values categories and criteria

<table>
<thead>
<tr>
<th>Categories</th>
<th>Criteria: An hybrid course adds values if it...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focuses on learning (rather than on teaching)</td>
<td>1 offers the students resources allowing deep learning</td>
</tr>
<tr>
<td></td>
<td>2 makes use of the Internet to offer a worldwide opening</td>
</tr>
<tr>
<td></td>
<td>3 helps students get familiar with technological tools (which are those of their future life as citizens and professionals)</td>
</tr>
<tr>
<td></td>
<td>4 promote personal involvement of students into their learning</td>
</tr>
<tr>
<td></td>
<td>5 boosts learning through a variety of activities</td>
</tr>
<tr>
<td></td>
<td>6 fosters critical judgment by students</td>
</tr>
<tr>
<td></td>
<td>7 promotes autonomous learning</td>
</tr>
<tr>
<td></td>
<td>8 leads to interactive knowledge building through students</td>
</tr>
<tr>
<td></td>
<td>9 maximizes interactions between professor and students to support learning</td>
</tr>
<tr>
<td></td>
<td>10 allows students to produce visible signs of their learning (personal productions)</td>
</tr>
<tr>
<td>Contributions to the adaptation of university to the evolution of Higher Education context and new learning needs</td>
<td>11 makes use of the flexibility of online learning to answer specific learning needs (distance learning)</td>
</tr>
<tr>
<td>Fosters teachers professional development</td>
<td>12 makes the teacher evolve from a focus on the content to be taught to a focus on the learning process of every student</td>
</tr>
<tr>
<td></td>
<td>13 contributes to build a SoTL identity by the teacher (3)</td>
</tr>
</tbody>
</table>

Added values of Louvain moocXperience

Can MOOCs enter our hybrid learning added values framework and be analyzed with the same criteria? At first sight, MOOCs are not hybrid learning but real distance learning targeting learners who are not UCLouvain students. However, at Louvain, we want to consider MOOCs as one amongst others educational innovation: the main goal we defined for the whole project is that it must lead to “reconfiguring the spaces and times as well as the methods of teaching and learning” (see our definition of hybrid learning above). We want to grasp MOOCs as we grasped hybrid learning and previous educational technology before it; with the same criteria.

Impact on on-campus teaching and learning

For the very beginning, two out of five selection criteria in the calls for MOOC projects have been linked to on-campus students:

- the MOOC should be articulated to one or several on-campus courses so that it answers specific learning needs;
- the MOOC should spread inside the UCLouvain community so that it gives pedagogical ideas to others.

Candidates had to argue how those two criteria would apply to their MOOC in the submission form. The intention of positioning MOOCs as a way of rethinking on-campus teaching and learning was explicit from the start.

Here are some examples of how the first MOOCs have been integrated with on-campus courses, linked to the added value criteria above:

1. A MOOC integrated in a first year bachelor course helps the inexperienced students (1500 of them) to organize their learning time: the weeks of the MOOC, including learning quizzes and tests, invite them to learn progressively, instead of the (wrong) habit of Belgian students of putting memorization off to the end of the semester. In addition, the quizzes allow them to train themselves several times before the exam, which is also organized with multiple-choice questions. Those students benefit also from the endlessly opportunity of re-listening to the professors’ explanations on the videos (criteria 1, 4, 5, 7).

2. Three MOOCs cover topics that benefit from international points of view: political science (comparing different state organizations), international human rights (discussing the
application of those rights in different countries) and the study of natural resources management linked to development (in emerging countries). Thanks to the MOOCs, UCLouvain students can share and compare opinions and examples from different parts of the world (criteria 1, 2, 6, 8).

3. Several professors have flipped their classroom during the MOOC period (6 to 8 weeks during the semester): students would discover the topics to be learnt through the MOOC and then apply their new knowledge during the classroom meeting. Professors organize debates, case analysis through small groups, deepening exercises… One of them organizes a serious game after the end of the MOOC: students have to play a board game created by the professor and then discuss the links with the theories learned in the MOOC (criteria 1, 2, 5, 8, 9, 13). Furthermore, four professors who taught individually the same introductory course to four different on-campus groups who are responsible collectively for a MOOC decided to design together learning scenarios to be run during the flipped classrooms sessions. Each of them decided to develop specific weekly topics, preparing dedicated flipped scenarios and leading those activities whether with their own group of students or in their colleagues’ classes. For consequences, during the semester students would have 4 different professors, instead of one ordinarily, depending on each professor’s scope of expertise. Besides, a peer-assessment process on teaching began between the four faculty members (criteria 12, 13).

4. One professor completely transformed his course following the first run of his MOOC. Satisfied with the results of the credential test that followed the MOOC for his residential students, he was convinced that students can validly learn the theory from the MOOC. He now delegates the theory part of the course to the MOOC and asks students to draw up clinical cases studies during the class hours, helping them developing the case by moving along work groups in the classroom (criteria 4, 7, 8, 9, 10). He claims that he has eventually found a way to offer students the possibility of learning by doing and that time is now better used inside the classroom (criterion 12).

Impact on teachers’ professional development

Those examples of learning design transformations illustrate a move that has started by some faculties, becoming concerned about the learning process in addition to the content to be learnt. Once the videos are made, their mind becomes open to start thinking about how students will get to master the content (criterion 12).

This concern switch is enhanced by collective training sessions offered to faculties by IPM pedagogical advisors. Professors and teaching assistants are invited to meetings:

1. to learn together a specific topic (how to create learning videos, how to assess online learning, how to flip the classroom using the MOOC or build an online community of learners…);
2. to share with their peers their MOOC design working progress.

Those workshops take place four or five times during the period of MOOCs preparation (about six months). Specific media training is also offered for those who are not comfortable with video teaching. Therefore the Louvain moocXperience is presented as an opportunity for professional development. The goal is not only to make a successful MOOC but also to develop teaching skills and to get used to facing and solving teaching issues as a UC Louvain educational team (criterion 13).

Not only course teams involved in MOOCs benefit from training sessions on MOOCs but also the UC Louvain community. Thus, in 2013-2014, the IPM organized five workshops about several stakes of MOOCs: pedagogical, economical, strategic, impact on on-campus teaching and learning etc. 97 participants attended those workshops. Those workshops were advertised through the same promotion channels as other teaching training workshops on topic such as “how to flip your classroom”. Those different events has supported the same goal: give space and inform the discussion on the future of Higher Education. One of those workshops was led by some MOOCs course teams, presenting their new experience to the UC Louvain community.

The SoTL model of professional development proposes to consider teaching as a research object and invites professors to communicate about their teaching as they communicate about their research. In addition of a local communication (through the workshop mentioned above), two course teams (out of four running the first MOOCs) had papers about their MOOC presented in scientific conferences (Combefis, Bibal & Van Roy, 2014; Hamonic, Reuchamps, Schiffino et al. 2015) (criterion 13).

Impact on adaptation of Higher Education in the 21st century

How to evaluate the impact of the Louvain moocXperience on the capacity of UC Louvain to adapt its structure, organization and curricula according to the evolution of Higher Education?
Do MOOCs help us to try to think on a prospective basis over the future of education? The single criterion proposed by Docq, Lebrun & Smidts (2010) [criterion 11] seems poor to analyze this category of added value. An update would be necessary to identify more precisely what would mean, today, “adapting to the evolution of Higher Education context”. As a draft of updated criteria for this category, we propose:

An hybrid course adds value if it...

a) Allows distance learning for people in need for flexibility (NB: distance learning hasn’t been offered by Belgian universities so far)

b) Contributes internationalizing education (students and professors’ mobility, international exchanges and collaborations in teaching)

c) Provides answers to the growing need for lifelong education (students of 18-25 are no longer the only target in need for Higher Education)

MOOCs seem to fit the lifelong education needs as most of the MOOC learners is an adult population already involved in professional life (Cusack, 2014). MOOCs can play a role of teaser to appeal those adult learners to online executive education certificates, as edX has started to offer [criterion c]. Besides, MOOCs allow professors to get familiar with online teaching. Gaining new skills in distance teaching was indeed one professor’s personal goal while getting involved in MOOCs: she aimed to be able to reach new students in Africa (she teaches development studies) [criterion a].

Louvain moocXperience starts now to provide evidence that criterion [b] may become encountered as well, as four collaborative MOOCs involving UCLouvain are now planned (one of them has already run). Those MOOCs are built by several universities in partnership (see for example the MOOCs of the Rescif network (4)).

Conclusion and discussion

Our starting question was whether it is significant for a university to engage in MOOCs, knowing that it is expensive and that nobody can foresee if it’s a profitable investment. From the point of view of a pedagogical advisor who seeks to improve the quality of Higher Education, this investment is worthwhile provided that it has effects on

1. teaching and learning methods in favor of more active and interactive ones [criteria 1 to 10],

2. the adaptation of Higher Education to the 21st century [criterion 11],

3. faculty members’ professional development [criteria 12 and 13].

After almost two years of Louvain moocXperience, we’ve started to see evidences of added values from this project on those three domains. We identify as a condition of those effects the need of considering MOOCs as one, amongst past and current others, opportunity of rethinking on-campus Higher Education in addition to provide a way of spreading knowledge worldwide.

Those first evidences have been gathered through frequent discussions, debriefing meetings with course teams and students and direct observations in classrooms. The next step is to deeper analyze MOOCs impacts by means of an organized evaluation research project.

Could those effects be reached by other means than MOOCs? Could other pedagogical projects, cheaper than MOOCs, allow us to reach the same effects? Probably yes but short terms elements have to be considered:

- The university got a donation specifically for MOOCs (and not for other innovation).

- Thanks to the MOOCs buzz and to the high visibility of the output (an open worldwide course), faculties are, today, more like to engage in MOOCs than in any other pedagogical innovation.

- A specific advantage of the Louvain moocXperience compared to our annual call for innovative projects (see beginning of page 2), is that 13 course teams are involved in the same kind on innovation at the same time. That allows a real learning community between them: training together, sharing processes and outputs, evaluating effects together and comparing. This means a specific added value for faculties’ professional development.

MOOCs appear to be a pedagogical development opportunity UCLouvain has the chance to seize. Would we need more reasons to engage?

Notes

(1) https://www.edx.org/about-us

(2) NB: Some other MOOCs have emerged from some professors’ personal network, involved in collaborative MOOCs with other universities. The Louvain moocXperience is thus actually larger than the LouvainX MOOCs on edX.

(3) SoTL – Scholarship of Teaching and Learning – is a model of teacher professional development. It proposes to consider teaching as a research object and invites professors to 1° question, analyze, make hypothesis and experiment learning methods and 2° communicate their findings publicly as they do for research.

(4) The Rescif network: http://www.rescif.net/en/content/moocs
References


Creating MOOCs by UAMx: experiences and expectations

Iván Claros, Ruth Cobos, Gabriela Sandoval and Mónica Villanueva, Universidad Autónoma de Madrid, Spain

ABSTRACT

This article presents the experiences and best practices collected through the creation of four MOOCs supported on edX platform by the team of Universidad Autónoma de Madrid, called UAMx. These courses are the first cohort offered in the current year about topics as Chemistry, History, Law and Medicine, and Computer Engineering. The description of these experiences is gathered in aspects such learning design, creation and promotion strategies. The lessons learned from these experiences will allow us to improve the strategies and technologies for online education. In this address, some expectations about MOOCs are proposed in order to tackle research lines based on data.

I. Introduction

The MOOCs allow the improvement of online education through the innovation on technologies and teaching strategies (Breslow et al 2013). Its relevance is reflected on the contribution of knowledge to society under an inclusive, universal and continuous training model. Therefore, it demands new strategies to foster motivation and engagement of students in learning activities. In order to deal with this challenge, it is necessary to bring together an interdisciplinary team to support, encourage and lead the creation of MOOCs. As a result, the Universidad Autónoma de Madrid (UAM, http://www.uam.es) has assembled UAMx.

Following edX’s recommendations, UAMx team is composed by several roles, namely: a program director, to manage the course; legal advice, marketing, multimedia and information technology staff, to support the creation of the courseware; data czar, to define and lead the overall research strategy around course data; and the faculty and teacher assistants, to devise the courseware. These roles are described in guidelines which deal with tasks and responsibilities shared with the institutional team. Besides, there are recommendation about topics such as accessibility, integration with third party content and promotion of courses (http://docs.edx.org).

Several researchers have exposed their experiences and ideas about the design, implementation and release of a MOOC. For instance, Kellogg (2013) features some recommendations for the development of MOOCs (Kellogg, 2013), e.g., using reduced class groups for recording teachers barely familiar with technology. Moreover, Seaton et al. (2014) propose four categories to characterize the consumption of videos and identify patterns by geographic areas or based on the course structure (Seaton et al 2014). Sharma et al. (2014) use Eye-tracking techniques to analyze the behavior, performance and probability of a student giving up a course (Sharma et al 2014). Other authors propose new tools to improve the effectiveness of learning through questionnaires embedded within videos (Woll et al. 2014). Gutiérrez-Rojas et al. (2014) present a mobile app focused on growing study habits among unqualified staff (Gutiérrez-Rojas et al. 2014). Finally, a growing number of publications related to data analysis are found in the literature (Yu et al. 2014; Ruipérez-Valiente et al. 2014).

Some Spanish Universities have their own experiences in the creation of MOOCs (Bárcena et al. 2014; Ruipérez-Valiente et al. 2014; Claros et al. 2014). In this context, UAM has offered their first four MOOCs at edX platform in late February (https://www.edx.org/school/uamx). UAM is a leading university in Spain composed of eight schools: Philosophy and Arts, Psychology, Law, Sciences, Business and Economics, Education, Engineering and Medicine; and all of them have shown their interest in MOOCs, proposing wide range courses likewise its graduate and postgraduate study programs.

In the current year, UAM is offering eight courses divided into two cohorts (http://www.uam.es/uamx). The first cohort includes the following entitled MOOCs: i) “The Spain of Don Quixote” (Quijote501x) is a trip to the Spanish Golden Age, which raised the Hispanic arts and literature to
global excellence; ii) “Organ Transplantation: Ethical and Legal Challenges” (TxEtj201x), which covers Law and Medicine fields, assesses the ethical and legal challenges posed by organ transplantation; iii) “Playing with Android, Learn to program your first App” (Android301x) is a course about programming with Android technology based on the implementation of an interactive game step by step; and, finally, iv) “The Organic Chemistry, a world at your fingertips” (QuiOrg101x) is an introduction about the foundations of Organic Chemistry and the structure of its molecules. All these courses will be taught in Spanish.

At the start date of all of these courses, there were more than 12,000 students enrolled in Android301x. In all these courses, a quarter of the students are from Spain, more than a quarter of student are from USA and Mexico, and the rest of the students are from 80-90 other countries all over the world. In all the courses, most of the students are from 20 to 35 years old and they have a High School Diploma, a College Degree or an Advanced Degree.

The design process begins with an open call to every instructor in the University in which a variety of courses are proposed. A commission evaluates and chooses those that are found to be more appropriate for a MOOC. The proposal’s documents are the first input for the design and the establishment of its learning strategy. Taking this into account, a set of potential students and their expectations about the given topic are specify. Teaming up with multimedia professional and instructors, the quantity of interactive and multimedia resources necessary to ensure the dynamism of the course is estimated.

The design process is lead mainly by the instructor which propose the course, with a close cooperation of the support team on technical and methodological aspects. In order to maintain a high level of motivation in the staff, the course follows the style of the instructor; also, all activities are coordinated with his/her agent, taking into account the additional workload that it entails. During the design process, UAMx provides: first, a demonstration of capabilities and recommendations contained in articles, forums and guidelines about platform; second, a possibility to create interaction components in order to introduce a dynamic and innovative character to the course content.

Creation
The creation process involves tasks such as developing or adapting various interactive components that enhance the learning experience. For instance, QuiOrg101x provides a periodic table of chemical elements which allows exploring properties such as physical appearance on nature, electronegativity and ionization energy. In this course, a molecular gallery has also been created, supported by a JavaScript framework called JSMOL (http://sourceforge.net/projects/jsmol/); it provides an interactive 3D model which represents the atomic structure (see left of Figure 1). In Quijote501x, the default PDF document reader is replaced by the turnjs viewfinder (http://www.turnjs.com/), which offers a closer experience to a paper book reading. Additionally, a loupe component is used to improve accessibility of old documents by combining original and modern versions (see right of Figure 1).

Legal aspects become particularly important when creating open content. Some of the laws that govern and make more flexible the use for academic purpose do not recognize MOOCs as part of an educational program, adding restrictions. In order to lessen this fact, the legal advice staff oversees the third party content, like papers or book chapters, and manage relevant authorizations. In case of need, they seek for alternative content in open repositories, for instance, https://www.oercommons.org/oer, http://pixabay.com/, http://search.creativecommons.org/.

Promotion strategies
The main strategy implemented for promoting MOOCs are based on the official communication channels available by the University. As a result, people in charge from other institutions are notified about the course offerings through an official statement, keeping an inter-institutional courtesy which provides the message with credibility. These channels are considered as the proper previous step towards unofficial media campaigns, e.g., personal blogs. Related to this, edX provides a section in its platform in which UAMx offered courses are advertised and it also deals with comments about the courses through its accounts in Facebook, Twitter and other social media platforms. In these spaces, the potential students can share links to the

II. Experiences
The experience gathered during the courses building processes are divided in three aspects: design, creation and promotion strategies, which are presented as following.

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courses and ask questions about the requisites or the syllabus. Finally, UAMx also uses press and radio channels to disclose massively the offer to general audience.

Figure 1. Interactive components: left, molecular gallery; right, loupe and book effect applied to old text.

III. Expectations
Every experience offers a great volume of data related with the interaction between students and courses. This information allows us to determine the success or failure of the experiences based on the implemented strategies and the consumed resources; thereby improving future reruns of courses. Nevertheless, owing to the massiveness and diversity of events, sceneries are complex to analyze and hardened the access to information useful for decision making.

In this line, Learning Analytics gathers processes related to the capture, analysis and display useful information that derives from an educational setting (Siemens & Long, 2011; Munoz-Merino et al. 2014). This approach is a data-based research which requires questions in order to aim the analysis process. In this context, some of such questions are: what is the profile of students enrolled in courses and their expectations?, how effective are the promotion strategies?, who are the students which require more attention or motivation for continuing in the course?, how many students finished with success the courses?, what are the most attractive and useful resources for the courses goals?

To address these questions, edX platform offers two kinds of data interface: the first one consist in real time reports that summarize the course status, whilst the second is a detailed dump of events. In the first case, this reports are available as a web interface; however it is insufficient and scarcely contextualized, even though new extensions and improvements are being development. In the second case, edX offers the access to different types of files with events by means of AWS (Amazon Web Services). The management of these files is the “Data Czar” responsibility, who download, distribute and advice about the data analysis.

The study of the data offered by the four courses in their first three weeks shows that an average of 59% of the students are looking for social interaction in contrast with students who interacts with videos. However, the rate decrease over time (see Figure 2). Throughout social interaction, students share

Figure 2. Ratio between social and video students according to UAMx experience.
their struggle with content, as well as personal experiences or ideas related with the course subject. UAMx believes in the importance of this data connected to two aspects: first, social interaction is a relevant mechanism even for MOOCs; second, collaborative approaches are required in the instructional design of MOOCs in order to lead such social intercourse toward better experiences lest they go down (Claros et al. 2015). Part of the interest of the UAM in MOOCs platforms is on the potential usage of this technology for supporting its on-campus courses. In this regard, it is expected to master techniques, models and strategies of training that are attractive and efficient. Finally, the success in MOOCs experiences is given by the institutional recognition of the learning methods and the innovativeness in its practices, as well as a global aperture of knowledge and the acknowledgment of the audience of these new offers.

IV. Conclusion

This article has presented some of the experiences collected during the creation of four MOOC courses by UAM: first, introducing the role models and responsibilities of the support team, UAMx; second, explaining some guidelines used during the design, creation and promotion of the courses; and, last of all, sharing the main motivation that caused UAM to engage this proposal. Currently, the first four courses have been launched; and the design, creation and promotion of next ones are in progress. The first data packets are available from edX. Those contain information related with students’ profiles and the subscription process, allowing us to begin researching processes guided by the questions exposed in this article.

Acknowledgment

This work was partially supported by the Universidad Autónoma de Madrid (Spain), by the Spanish National Plan of R+D, project number TIN2011-24139 and by the Autonomous Community of Madrid, e-Madrid project, number project S2013/ICE-2715.

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Experiences from 18 DelftX MOOCs

Janine Kiers and Nelson Jorge, Delft University of Technology, Netherlands

ABSTRACT

This paper describes experiences and lessons learned from developing, building and running 18 MOOCs (including 4 reruns) at the Delft University of Technology, namely the selection of courses, the design, development and delivery of courses, innovative educational elements for use in online and in residential teaching, and the generation of data. Overall the development and offering of MOOCs has augmented the awareness, expertise, and innovation regarding online and residential learning, and has contributed to an active and positive spirit of educational innovation. In addition, we saw indications of a positive effect on quality and quantity of enrolment for on-campus programs, gathered data for research and were able to share the university’s knowledge with the world.

MOOCs at the Delft University of Technology (TU Delft)

Starting by September 2013, the TU Delft has developed and offered 18 MOOCs, of which 4 can be considered reruns, on the edX platform. Currently 5 more courses are announced and under development. Apart from contributing to the democratization of education (Lewin, 2012; Siemens, 2013), the TU Delft offers MOOCs for the following objectives: share knowledge with the world, branding and attracting better students, improvement of residential teaching and educational innovation, and to gather data for Learning Analytics and research. This paper describes and evaluates the identification of courses to be developed, course design and production, innovative elements to promote engagement and learning, the use of online material in blended learning, and further experiences.

Course Identification

To identify the MOOCs to be developed, a tender is issued each semester, or recently: quarter, where faculty are asked to submit proposals that address course content and production, the marketing and educational innovation. The proposals are evaluated by a committee that includes a.o. the e-Dean, the Director of online education, and the MOOCs Product Manager. The evaluation criteria include feasibility of the planning, organisation, budget, the attractiveness of the introductory movie and the way in which the proposal meets the Criteria for a DelftX MOOC, which are listed here. The MOOC should be:

1. Reliable: the content of the MOOC is correct and reliable.
2. Understandable: the content of the MOOC is conveyed in a clear, efficient and understandable manner, implementing online learning theory.
3. Inspiring: students experience the MOOC as inspiring and challenging, and are activated during their learning.
4. Recognizable: the identity of the TU Delft is well-expressed in the MOOC.
5. Innovative: the MOOC is innovative and may be used for research to improve both online and residential education.

This has resulted in the approval of proposals that presented a sound project plan, and in addition e.g. addressed a large audience to brand the university, focused on a smaller audience but had the capacity to establish the university’s groups or staffs name in the field, or aimed to disseminate the results of a high-impact research programme. We have seen that a feasible project plan is not a guarantee for a smooth, structured and timely implementation of the production process. We did notice that the preparation of the tender proposal forced the course teams to think their plans through and made them realize which elements needed to be addressed. Furthermore, they identified the audience for their course.

Course Production

Course production is team work that requires a variety of expertise and novel collaborations, and ideally all involved realize what their role and contribution is in the course creation process (see figure 1).
Training
Every semester, the new Course Teams participate in an ‘On-boarding day’, a whole day workshop where the different aspects of MOOCs are addressed: the roles of MOOCs at TU Delft, the e-Learning pedagogy aspects, video and multimedia production, the variety of options for assignments and activities to enhance interaction, marketing, creative commons license, etc. The Course Teams present their approach to the Course Development and get to meet and interact. We have seen that the course teams found it valuable to receive this introductory overview of MOOC activities, and to get to know the other Course Team and the support team.

Support
The support team consists of, or receives input from, e-Learning developers, Instructional Designer, AV-support/New Media Centre, Product Manager, Graphic Designer, Marketing, Copyrights expert, etc.

Roles in Course Teams
We have seen very different set-ups of course teams, ranging from a three-person team consisting of one teacher with two students for a low-cost MOOC, to an extensive team with a variety of members – several teachers, a designated project manager, and student assistants focusing on presentations, assistance during video-recordings, exercises and forum moderators.

Overall, the production of a MOOC forced teachers to rethink their teaching and course design, and developed teaching into a team-effort instead of an individual activity.

Course Design
When thinking about developing a MOOC, teachers often start structuring their course based on the video lectures to be produced. We believe this happens naturally since: 1) the xMOOC eruption in the past years is structured around more conventional lecture formats, setting this format as the most common example of what a MOOC is; and 2) transferring the traditional method of teaching to an online setting is more comfortable and easy to develop.

However, the video lecture broadcast model represents a simplistic pedagogical approach that doesn’t take in account the learning context, that is, "on making learning happen within activity-rich, interaction-rich, and culturally rich social environments (…), that the intelligent use of technology is making possible, and where different paradigms apply" (Figueiredo & Afonso, 2006:4).

It is important to consider that the video lectures and quiz model are valid instructional resources that can deliver high quality learning experiences, at students’ own pace. As reported by the Higher Education’s Digital Moment (UUK report 2013), "while the [video lecture and automated quiz] model is basic and may not be suitable for all courses or represent leading pedagogical practice, it is accessible, flexible and scalable to large volumes of diverse students."

Reaching a high number of students is something very positive that makes us reflect about the different type of students with different learning styles we take into account when planning and developing a course.

"Ten people are ten will powers, ten ways of understanding the world. A hundred people are an explosion of complexity. A thousand people are a multidimensional enigma, impossible to decipher completely" (Peixoto, 2014). Although in a more poetical approach, this impression helps us reflect and recognize the complexity of a massive number of students enrolled in the same course.

Therefore, we believe in an integrated approach where videos and quizzes are important educational resources, along with challenging, interactive, cultural and social activities in order to promote higher levels of engagement, motivation and learning. Incorporating various types of activities and content, accessible in multi formats, contributes to meet different learning styles and to promote an inclusive educational setting.

As described in the previous section, TU Delft stimulates team work when planning, developing and implementing a MOOC. After defining the global learning objectives and outlining the structure of the course content, teams enter the phase of further
defining the course plan. During this process, course teams get involved to add innovative elements to their course, like for example challenges, awards, informal “sofa sessions” and presentations on a world map. This innovative spirit is something course teams share with each other, bringing a healthy competition between MOOC teams to come up with new good ideas. The next section describes these innovative elements.

Innovation
MOOCs often include innovation and new pedagogies (Kop, Fournier, & Mak, 2011; Milligan, Littlejohn, & Margaryan, 2013), forming an excellent lab to develop, implement and evaluate novel course elements, that can be (re-)used in MOOCs, and in blended and online teaching. We stimulate this innovation by including it in the tender criteria, and disseminate it by sharing the outcomes with the community. Presented below is a selection of novel course elements and their results.

Awards
ET3034x Solar Energy, student awards were available that included a visit to the Delft campus and a Solar Energy lab course. To enhance collaboration and not cause competition among the students, the selection criteria to win an award included both the students grade and their contribution to the course. Based on those criteria, a limited number of students were selected to submit a letter of motivation, of which four students were invited to come to Delft, and awarded the travel, board & lodging and the visit & lab.

NGI101x Next Generation Infrastructures, offered a conference visit (travel, board & lodging and conference fee) to the two students that submitted the best paper.

CTB3365x Introduction to Water Treatment offered a free online course to the best 10 students based on their grade only, thus being able to test run the newly developed online (not massive, not open) course.

TBP101x, Technology for Biobased Products, issued a pre-course challenge: students submitted movies on creative use of biowaste several weeks before course start. Selected submissions were presented in a webinar that formed part of EuropaBio, a consortium of industries in the field. This resulted in a limited number of submissions, students understandably don’t expect to submit material before course start. A positive effect was the attention for the course among the players in the field.

We haven’t been able to measure the effect of the awards on engagement. Overall, the awards were received positively by the student community, the awarded students were very appreciative and excited to receive their awards. Their positive stories were shared with the TU Delft community and with edX, and published to communicate about the effect of MOOCs.

Course elements
TBP101x Technology for Biobased Products included a clickable infographic of a bioprocess, enabling the students to connect the overview of the process with the details of the different units in the process by zooming in on the details of those units (see figure 2).
TW3421x Credit Risk Management included sofa sessions: videos where the teacher recapitulates each week of content while drinking an espresso on his sofa at home, thus providing a summary and an alternative way to interact with the material. AE1110x Introduction to Aeronautical Engineering, challenged the students weekly in short hand-shot videos on location. Students were challenged to e.g. lift a payload to the greatest height using a balloon, measuring the attained height and retrieving the payload with the recorded height after the experiment, thus activating the students, and motivating them to share their submissions. ET3034x Solar Energy made the draft text of the book to be used in the course available. Students were asked and enabled to comment and improve on it, thus having the students actively work on the text and crowdsourcing the book. DDA691x Delft Design Approach presented “mock students” that completed weekly assignments in a video, that was subsequently evaluated by an expert in the field. After reviewing this, the MOOC students were asked to complete the assignment. This presented the students extra information and a feedback-loop on the assignment. Several DelftX courses include a world map, where students can introduce themselves and pin their (approximate) location, upload essays and assignments, and find fellow students for online or offline collaboration. This resulted in a visual overview of the distribution of students and their submissions over the world and in more insight in who the students are. This helped create a sense of community, by information of the students location and by adding more characteristics to the individuals. The presented course elements were positively received and resulted in an abundance of submissions, demonstrating an active attitude of the students, and contributing to the creation of a course community. Furthermore, the course teams appreciated to see the massive classroom come alive and more personal by seeing faces, contributions and creativity among the students. Several of these and other novel course elements have been implemented in residential teaching.

Use in residential teaching

Course material developed for MOOCs has been integrated in residential courses in a number of ways. ET3034x Solar Energy: students on campus are required to watch videos and make weekly assignments before class and come to campus to interact with the teacher, using the flipped classroom approach (Mazur, 2009; Berrett, 2012; Fitzpatrick, 2012; Fredericks et al, 2013). They then ask questions, receive further explanation, work with the material, and discuss recent developments. FP101x Functional Programming: students are expected to have completed the MOOC before they take the on campus part of the course. AE1110x Aeronautical Engineering: the MOOC material is additional to the residential course and offers the students another way to interact with the material. Overall both students and teachers value this blended approach. The first results are positive: a higher completion rate, a higher average grade, more flexibility for students to interact with the course material, and more flexibility for teachers in choosing which elements to include in the interactive classroom sessions (Van Valkenburg, 2015).

MOOCs enrolment patterns & reruns

Without specific marketing activities, enrolment is mostly linear with time. Marketing activities such as the course being featured on the edX homepage, in the edX newsletter (to the 3+ million students), a twitter or Facebook campaign were followed by higher enrolment numbers. It is difficult do attribute the increase in enrolment to one of the activities, as they may be implemented at the same time, and we do not have insight in all factors that influence enrolment. Courses with a more general topic and without entry requirements generally have higher enrolment. After a course has ended, enrolment may continue to steadily increase, or may fall – we see both types of graphs. The four courses that were offered as a rerun all showed a lower number of registrations compared to the first edition. We need to take into account that at the time of the reruns, the total number of courses on the edX platform had increased fourfold. Reruns allow us to improve our courses based on the experience in the first run. In addition, Course Teams have more time to evaluate and improve the educational elements: they don’t need to produce all course elements at the same time. Adaptations range from corrections and minor improvements only, to re-creating the course schedule, replacing course elements by better ones, and adding new elements. We have seen students from the first course run act as Community TAs in the second run.

Data for “research”

This paper does not discuss the big data on student behaviour that the MOOCs yield. We show results of data that students actively submitted in the course, as a response to a question or assignment.
NGI101x Next Generation Infrastructures asked the students to enter data on the infrastructures in their location, which resulted in an overview of the location and type of infrastructure that were problematic in a region and thus may be interesting to further investigate.

ET3034x Solar Energy asked the students to enter data on the number of hours of sunlight and frequency of interruptions of electricity, thus giving an indication on the feasibility of Solar Energy (see fig. 3).

(1) Light green is high potential (best markets), dark is less interesting, gray is no reliable data.

(2) Light color is low probability of black-outs, black is a high probability.

Figure 3. (1) The potential of solar energy (given in kWh electricity cost x amount of sunshine hours) and (2) the probability of blackouts of the electricity network.

These data indicated the challenges in infrastructures or the potential of the use of solar energy in different location, which were used by the faculty. At the same time, the students were able to contribute to the course and thus form part of the community.

Concise evaluation of 18 DelftX MOOCs

No course team is the same – with the same preparation from our side, the MOOC development may go from smooth and with ample time to review and improve the course material, to needing lots of input from the support team and extremely last minute. Expectation management is important: many teams underestimate the time and effort involved in making and running the course, and some teachers overestimate the effect by thinking the online course can be a 100% replacement for their on campus course.

MOOCs do result in creating awareness for, and promoting innovation in, learning. The use of MOOC material in on-campus teaching leads to positive results: students and teachers have a better experience and study results seem better. In the evaluation of MOOC development and offering, all aspects that are relevant to the university should be included, ranging from social responsibility and attracting more or better students, to improving education and gathering data for research. These can then be assessed against the allocated resources and costs.
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Integrating MOOCs in Traditional Higher Education

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ABSTRACT

With mooin, the Lübeck University of Applied Sciences builds its own MOOC platform upon the open source learning management system (LMS) Moodle. To gather the needed features, experiences with MOOC platforms, known challenges and further objectives were analysed. Consequences for the platform development were derived in the fields of media design and mobile access, social media integration, sustainability and gamification – among them a number of interesting features for further experiments.

Introduction

Many voiced concerns about MOOCs disrupting the higher education. However, 3 years have passed since the start of the MOOC “frenzy” and major changes in education due to MOOC are yet to be observed. If anything, MOOCs have opened the eyes of a lot of tutors and policy makers determining them to start rethinking the way courses are being delivered to the students.

There are some who started using MOOCs in a successful symbiosis with their traditional course, embracing blended learning or the flipped classroom concept. Blended learning refers to a formal education program where the student learns at least some parts of the course via the online and digital medium, taking part as well, at some face-to-face classroom sessions in a “brick-and-mortar” school institution. Flipped classroom is a form of blended learning in which the students usually learn the content from someplace else then the school and in the face-to-face meetings they pose questions and solve homework and practical activities.

Introducing MOOCs in traditional education

There’s nothing particularly new about MOOCs, as many universities have offered online courses for many years and the basic technologies involved – video lectures, discussion forums, tests, and the like – are the same as used with on-campus and distance students. The only difference is the scale. The most obvious use for a free open course is promoting the university itself, giving the public an idea of the current state of inquiry and research in a particular field (Riddle, 2012).

MOOCs are not as disruptive as expected, especially because, not having a lot of e-learning specialist in their developing crews, the majority of MOOC platforms use videos of talking heads of tutors giving the same lectures they have been giving for most of their career. And this does not equal with an educational paradigm shift (Davidson, 2012).

As Christensen pointed out, brick-and-mortar institutions have advantages that are not easily duplicated online: they provide an on-campus experience that offers students (who can afford it) myriad socialization and networking opportunities. (Mazoue, 2013)

When integrating MOOCs into blended learning, the students are exposed to high quality material from top tutors all over the world, educational technologies and the opportunity to participate in a collaborative global environment. Studies done by others have shown that new skills and tasks are required for teachers facilitating blended courses integrating MOOCs: complex course design and management, OERs and MOOCs curation, evaluation of distributed and collaborative activities of students, facilitation of the local learning community and nurture of its integration in the global communities of MOOCs and many more (Holotescu et al, 2014).

Integrating MOOCs into curricula, one should be aware of the three major components of the curriculum: learning outcomes, learning activities and assessments. For example, when developing learning activities, the instructor may find that some components in a MOOC such as video clips or quizzes are relevant and helpful, and want to refer students to those pieces (Zhang, 2013).

Other examples of integrating MOOCs into traditional education can be found at Vanderbilt, where computer science professor Doug Fisher...
experienced in the fall of 2012 with "wrapping" a course around a MOOC. He had students in his graduate-level machine learning course complete a MOOC on machine learning offered by Stanford University. The students watched the lecture videos and completed the online assignments, while also working through additional readings provided by Doug and meeting once a week as a class for discussion. At the end, he found that using a MOOC as a "super-textbook" of sorts was more challenging than using a more traditional textbook. However, he considers the experiment a real success and himself several steps ahead his fellow educators (Bruff, 2013) (Fisher, 2012).

Why should we try and resist using MOOCs to help our traditional classroom? The marginal cost of production and distribution of course materials for millions of non-matriculated learners had sunk to close to zero, while adopters, at least the early ones, accrued significant institutional and reputational benefits (Cooperman, 2013).

After cMOOCs and xMOOCs divided users into two separate groups, the first offering a highly distributed peer learning and the second more content-oriented and unidirectional in approach, a new type of MOOC emerges, respectfully, the one that is integrated into traditional institutions, called by some MOOC 3.0 or hybrid MOOC (hMOOC) (Sandeen, 2014).

One of the biggest setbacks into getting the full benefit out of MOOCs is the lack of credentialing policies regarding the online badges and achievements that students get after finishing an online course. Therefore, this is one of the most researched field in what online education is concerned. Sandeen (2014) states that the Universities UK report (2013) outlines four major credentialing models: recognition of prior learning, articulation and credit recognition, content licensing, and reciprocal arrangements.

Specific concepts of higher education in Romania

MOOCs are becoming a way of responding to the actual trends in education and learning: increase of the use of online learning, delivery of shorter courses, creation of new awarding schemes and increase of partnership in building new curricula. One of the problems with all those trends is to integrate them into the national and international legislation regarding quality of education, assessment of knowledge and award of educational degrees.

The Romanian legislation for education is quite a contradictory one. On one hand, it declares the teaching programs as being student centred, but on the other hand it allows relatively small possibilities to the students to create their own curricula by selecting between optional courses (that are many times less than expected due to under-financing of the higher education). But at the same time it states that master degrees cannot be obtained through distance learning, and any other education at university level cannot be done online. If we recognize that learning today happens everywhere, we also have to recognize that it is very difficult to get recognition for skills that are obtained online or out of the university. Some countries are more flexible in recognizing different skills, independently on how those skills have been obtained, based on prior learning assessment through competence testing. Some other countries (including Romania) are declarative open recognizing those skills, but in practice make it almost impossible to be implemented, under the very inflexible quality assurance rules.

Our conclusion is that it is still a very long way and a lot of work to be done until implementing a real open educational system throughout Europe and this is very much depending on political willingness in adapting legislation to the today practical needs and on the decision makers’ mentality regarding open and flexible education.

MOOCs in traditional education: study cases in Romania

Originally conceived as ICT interactive “events”, in 2013 MOOCs started to be used also as a teaching activity (Cooperman, 2013).

A blended learning model can be achieved by mixing the MOOC technology with traditional class, by taking the MOOCs from the large scale and applying them to small scale courses. Integrating MOOCs in blended learning can be used on different ways, depending on the type and structure of the course. One of the most common is the flipped classroom model (Koller, 2012) which integrates either video and multimedia materials from MOOCs, or uses MOOCs as large textbooks. A more complex one will be based on a cMOOC (connectivist) concept. The cMOOCs are based on the connectivism theory of learning with networks developed informally. They provide a platform to explore new pedagogies beyond the traditional classroom setting. cMOOCs provide great opportunities for non-traditional forms of teaching approaches and learner-centred pedagogy where students learn from one another (Dron, 2014).
There are several ways in which MOOCs can be blended in higher education courses mainly based on: the topic complementarity with the course, the synchronicity between the MOOCs and course, and the numbers of MOOC to be integrated. In Politehnica University of Timisoara (UPT) there were several pilots on integrating MOOCs in traditional courses and in the assessment and evaluation of student coursework based on this. One UPT case study was based on the participation of students from the undergraduate course of Web Programming in different MOOCs, and integrating this experience in a blended course run on Cirip.eu, in a dedicated private group in Autumn 2014 (Holotescu, 2014). Reporting and analysing this study, two thirds of the students (66%) have realized more than half of the assignments, while a quarter (24%) completed the whole massive course; almost half of the students participated in MOOCs hosted by Coursera (44%), nearly a quarter on Udemy (23%), the rest have chosen Udacity, edX, Khan Academy, Codecademy, FutureLearn, but also European MOOCs found on the Open Education Europa portal; most of the MOOCs were in English and a small number in French, however, several students have participated in the collaborative translation of materials in Romanian, where possible; some of the students reported that they have followed a few MOOCs in parallel for supporting other disciplines of the Fall term (for a few courses, their activities in MOOCs were formally recognized by other teachers) or just for self/individual study. Another UPT study case involved Master of Science students’ in the Instructional Technologies course where MOOCs were used as external resources to the course in the Autumn 2014. The 27 students involved took 16 courses (45% edX, 34% Coursera, Udacity), on subjects related to educational technologies. During the evaluation of this piloting study 19 students finalised the MOOCs to which they subscribed, the rest using the materials only as references. An interesting aspect during this pilot was the continuous critical discussion between the students and the teacher regarding the quality of the video materials, the instructional methods used in different courses, the course interaction between peers and the evaluation and assessment methods. Some of this discussion was held online in the dedicated blog on CVUPT (the university Virtual Campus) and some was during the face-face classes. Some stirring comments in the blog were related to students reported the need for a direct communication and feedback from MOOC facilitators, not only from peers as a more valuable and qualitative feedback and as a personalization of learning. Some students reported that in a MOOCs the students should have the possibility to choose which of the learning pedagogies they want to follow. A wiki tool, in CVUPT, was used by students to create or contribute with course content, which they assessed as relevant to the specific topics indicated by the teacher. The topic with the most comments and references was related to course structure, students concluding that “In order to have quality content, the teachers and course material creators should have access to a number of powerful and intuitive tools for content editing and structuring”. At the end all students wrote a report on their experience on this study, on integrating and recognizing the activity from a MOOCs in the traditional setting of the Master course. Students reported a high interest in MOOCs and in the educational model it provides, declaring their willingness to take part in future MOOCs activities, a change from the fact that just 3 students knew about MOOCs, and only about Coursera, previous to this pilot.

Table 1 summarizes the activities realized by students and for each activity the pedagogical benefits are underlined (Agarwal, 2013; Conole, 2013).

These case studies propose a new method for open educational practices, bringing new perspectives for integrating MOOCs in blended courses/flipped classrooms. Students have had a high autonomy in assessing their own learning needs for choosing the MOOCs in which to participate in order to deepen the course topics, but also to find useful information for group project development. New skills and tasks are required for teachers facilitating blended courses integrating MOOCs: complex course design and management, OERs and MOOCs. All of these could be accomplished only if teachers adopt a new and open attitude towards the teaching-learning process, have the will to test and to learn new things together with their students, wanting to oppose uniformity and self-sufficiency.

Conclusions

The main reason for supporting MOOCs by academic community lies precisely in this possibility - to provide access to a high class education at which only a limited number of individuals have had access until now. Even though the courses are not equivalent with those offered by universities, they are similarly taught by experienced teachers from the best universities in the world and the exams are in front of the computer.

From our experience we conclude with some advantages to be considered for setting up an
academic use of MOOCs template (it is a simple overview, not an exhaustive list):

- fading away the traditional educational barrier, eliminating not only the compulsory presence in the classroom, but also unsustainable costs
- developing/improving digital skills
- always connected to real-life situations
- experiencing a more fundamental form of self-education and open-education
- access to latest technology: social media platforms, connection with OERs, mobile learning facilities, etc.
- learning in activities such as homeworks, completing online surveys, writing mini-essays, give and receive feedback to and from other course participants
- it is not boring (in most cases)
- learning from the stream: there are thousands of colleagues/practitioners/experts from all over the world to interact with
- duration: definite start and end date with the same activities proposed to all participants, “carousel” MOOCs (users can “get on, get off” at any point) or “Mini-MOOCs” (2-week intensive courses).

There are possible limits which should be considered:

- eliminating the confusion with distance education: universities that already have implemented this model, use information technology as a support for education, and not as an alternative
- for MOOC facilitators, prior experience in designing and running online courses is needed
- a strategy for assessment to be implemented as also teh online MOOCs assesment to be atken into consideration

However MOOC is not „an educational panacea” (Creed-Dikeogu and Clark, 2013), it is a supplement for traditional courses / a recipe for educational reform which “has the potential to become a global higher education game changer” (Dennis, 2012).

The universities’ reasons to get involved in the MOOC development are very different and they range form marketing to innovation and community support or, in some access, CSR Corporate Social Responsibility. But it is also true that they try to position themselves as global leaders of innovation, and as educational institutions capable of delivering high-quality education on a global scale.

Table 1. Integrating MOOCs in HE course activities and pedagogical benefits

<table>
<thead>
<tr>
<th>Activities in the HE course (in CVUPT)</th>
<th>Pedagogical benefits</th>
</tr>
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<tbody>
<tr>
<td>Face-to- face activities</td>
<td></td>
</tr>
<tr>
<td>Discussions for deeper understanding of the course topics/requirements</td>
<td>Learner-centric teaching</td>
</tr>
<tr>
<td>Feedback on assignments</td>
<td></td>
</tr>
<tr>
<td>Online activities on CVUPT</td>
<td></td>
</tr>
<tr>
<td>Follow course materials</td>
<td>Self-paced study for different learning styles, enhanced focus and attention</td>
</tr>
<tr>
<td>Discussions of OER, MOOCs and CC licenses</td>
<td>Openness to/culture of knowledge-sharing and re-use, exploitation of the OER movement benefits, critical thinking</td>
</tr>
<tr>
<td>Project work: online course/ training / ICT help development</td>
<td>Collaboration in local community, peer assistance PLE building</td>
</tr>
<tr>
<td>Group work</td>
<td></td>
</tr>
<tr>
<td>Online course project</td>
<td>Skills for collaborative work: challenge assumptions, delegate roles and responsibilities, share diverse perspectives, find effective peers to emulate, collaborative tools usage</td>
</tr>
<tr>
<td>MOOC</td>
<td></td>
</tr>
<tr>
<td>Study MOOC materials podcasts, presentations) corresponding quizzes</td>
<td>Self-paced/active learning</td>
</tr>
<tr>
<td>Solve assessments</td>
<td>Retrieval learning, gamification</td>
</tr>
<tr>
<td>Evaluation of peer assignments</td>
<td>Peer-assessment, assuming objectivity and responsibility</td>
</tr>
<tr>
<td>Discussions / feedback in MOOC forums</td>
<td>Participation in global communities, instant feedback learning</td>
</tr>
<tr>
<td>MOOC selection</td>
<td>Skills for continuing and for learning autonomy, self-assessment of learning objectives</td>
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</tbody>
</table>
We consider that in today’s world, it can be beneficial for every University to at least try the MOOC experience, from a user experience, and for any higher education academic it can be a different experience. For Romanian universities, which are public funded and where online learning is not encouraged or recognised, the involvement on integrating MOOCs in a higher education environment is mainly backed by their belief that valuable knowledge and information need to be made available to the students, new methods of teaching and instruction need to be used and students need to be fully encouraged to discover and develop skills for online and lifelong learning.

References


Three-Step Transformation of a Traditional University Course into a MOOC: a LouvainX Experience

Sébastien Combéfis and Peter Van Roy, Université catholique de Louvain, Belgium

ABSTRACT

This paper presents a practical approach to transform a traditional mature university course into a MOOC. The approach has been applied to LFSAB1402 Informatics 2, a second-year bachelor university level course about programming paradigms of 5 credits (ECTS), taught at Université catholique de Louvain (UCL) to about 300 students in engineering. The transformation was done in three steps spread over two years. A SPOC limited to our students was first created, covering part of the material of the traditional course. It was then opened worldwide as a MOOC. Finally, two MOOCs followed at the same time by our students and worldwide learners and covering all the material of the traditional course have been created. In addition to our 300 students, we had about 7000 (resp. 4000) external students for the first (resp. second) MOOC. About 90% of on-site students and about 4% of registered external students got a certificate at the end of the course. This gradual transformation of the traditional course has three main advantages. First, it makes it possible to reach two different publics given roughly the same efforts and human resources. Second, it opens the possibility for both publics to interact through the discussion forums. Third, it offers to our students a new learning experience supporting them in their regular work and allowing them to study the course autonomously.

Introduction

MOOCs (Massive Open Online Courses) are emerging all over the world, created by universities, associations or even by private companies. This new mean of education got the attention of the Université catholique de Louvain (UCL) as it joined the edX consortium in 2013 under the name LouvainX. Some professors took the challenge to create a MOOC from an existing course, after a selection that took place inside the institution. This paper reports on one particular experience where a traditional course on programming paradigms was transformed into a MOOC, which is now followed at the same time by our students and by other learners all around the world.

The MOOC was created from a mature traditional course that has been taught for nine years (Van Roy, 2011). The traditional course is a 5 ECTS course and its transformation into a MOOC was done over three academic semesters. In a first step, a SPOC (Small Private Online Course) was created and run on-site, to make it possible to test the course before opening it worldwide as a MOOC in a second step (Combéfis, Bibal & Van Roy, 2014). The third step was the creation of a new version of the MOOC, which is used for our students on-site and for all the other learners worldwide, at the same time. Similar approaches have also been followed by other authors (Fox et al., 2014; Delgado et al., 2014; Yu, 2015).

There are three main motivations for having one unique MOOC for both publics: it makes it possible to reach the two publics with the same effort and resources, it opens the possibility for the two publics to interact and it offers a new modern mean of education for our students. The reasons for having spread the migration over two years was to have a smooth transition allowing the limited human resource available to learn how to produce a MOOC and to have enough time to build it.

The remainder of the paper is organised as follows. The first section is about the three-step transformation of the traditional course into a MOOC. The second section discusses about the changes that have been made for the Fall 2014 MOOCs. Finally, the last section presents a first evaluation of those two MOOCs analysing the experience of our on-site students.
From the Traditional Course to the MOOC

The transformation of the traditional course into a MOOC was done in three steps, which are spread over three academic semesters from Fall 2013 to Spring 2014:

- During Fall 2013, a SPOC covering a part of the traditional course was created and used for the on-site students in a two-track structure (Combéfis, Bibal & Van Roy, 2014). Students learned part of the material of the course through the SPOC (3 ECTS) and the other part in a traditional way (2 ECTS). This first step offered the possibility for the teaching staff to learn how to build a MOOC and how to create the videos and exercises, since it was a first experience in the MOOCs world for the teaching staff. It was also an opportunity for our students to be faced to a new mode of teaching.

- During Spring 2014, the SPOC was turned into the “Louv1.01x: Paradigms of Computer Programming” MOOC, proposed on the edX platform along with three other LouvainX courses. During that transformation, coding exercises that were proposed on a local separate server with the SPOC were directly integrated into the edX platform thanks to the Pythia platform (Combéfis & le Clément de Saint-Marcq, 2012). It was an opportunity for the teaching staff to learn how to animate a worldwide MOOC and to teach to distant learners. Corrections were also done thanks to the feedback collected after the run of the SPOC, and integrated in this first MOOC.

- The last step of the transformation took place in Fall 2014 when the whole course (5 ECTS) was turned into two MOOCs: “Louv1.1x Paradigms of Computer Programming – Fundamentals” and “Louv1.2x Paradigms of Computer Programming – Abstraction and Concurrency”. Both on-site students and worldwide learners are now following exactly the same course. The grader used for the coding exercises was replaced by INGInious (Derval, & Gego, 2014), which is an evolution of the Pythia platform. Moreover, the MOOC has been split in two MOOCs because a 10-week MOOC is too long which reduces the probability for a student to complete it.

| Table 1: Evolution of the LFSAB1402 course before and after the introduction of the MOOCs. |
|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Fall 2012                                | Fall 2013                                | Fall 2014                                |
| **On-site activities**                   | **On-site activities**                   | **On-site activities**                   |
| Lecture: 2h/week                         | Lecture: 2h/week                         | Lecture: 1h/week                         |
| Lab session: 2h/week                     | Lab session: 2h/week                     | Lab session: 2h/week                     |
| Project                                  | Project                                  | Project                                  |
| Midterm and final exam                   | Midterm and final exam                   | Midterm and final exam                   |
| **On-line activities**                   | **On-line activities**                   | **On-line activities**                   |
| None                                     | 13 lessons/10 weeks                     | 6 lessons/7 weeks + 6(+1) lessons/6 weeks |
|                                         | 8h37 videos                              | 5h20 + 5h01(+1h33) videos                |
|                                         | Midterm and final exam                   | Two final exams                          |
| **Resources**                            | **Resources**                            | **Resources**                            |
| 1 professor                              | 1 professor                              | 1 professor                              |
| 4 teaching assistants                    | 4 teaching assistants                    | 4 teaching assistants                    |
| 11 student monitors                      | 11 student monitors                      | 11 student monitors                      |
| 1 MOOC assistant                         | 1/2 MOOC assistant                       | 1/2 MOOC assistant                       |

Table 1 summarises the whole transformation process for the LFSAB1402 course, from the last traditional version during Fall 2012 to the current MOOCs-based version first taught in Fall 2014. The table focuses on the different activities that our on-site students have to follow. The main changes are the decrease of the lecture hours and the addition of on-line material (3 ECTS for the SPOC to 5 ECTS with the two MOOCs). In the Fall 2014 version, one of the lessons of the second MOOC is optional (it represents 1h33 of videos). At a first sight, it may seem that the workload of the students increased. In fact, the 10 hours of videos correspond roughly to the 1h/week lecture that has been removed and the time spent on exercises structures the individual work they have to do in addition to the supervised activities. A second observation is that at the end of the transformation process, only a half-time MOOC assistant is necessary during one semester to handle and animate the MOOC. The additional human
resource was higher for the SPOC since material had to be created and the automatic code grader had to be implemented and tested. The number of persons dedicated to the traditional activities (lab sessions) has not changed, but the workload of the professor increased (1 day/week for the SPOC and half day/week for the MOOCs).

**Changes, Evolutions and Discussion**

Building a MOOC to replace an on-site traditional course by a MOOC, which is opened worldwide at the same time, is not an easy task. One first reason is the differences amongst the learners. They have different motivations, available time, education levels and requirements. We identified two categories: on-site students, and worldwide students, the latter category being further split into two groups (students and professionals):

- **On-site students** are following the MOOC as part of their university program. Their participation to the MOOC leads to a bonus or penalty for their final grade for the course. Consequently, they have to watch the videos because there are no more traditional lectures and they have to make the exercises to get the bonus. A consequence is that the MOOC has to be a university-level course.

- **Worldwide students** are following the MOOC because they are interested to learn the material of the course. Approximately two thirds have at least a bachelor’s degree and about one third have at most a high school diploma. There is therefore a mix between real students and people with a professional activity. A part of those worldwide students are working on the MOOC during their free time and, consequently, do not complete the course.

Due to this difference in requirements, some traditional activities have been kept for our students. In particular, every week, the professor provides a restructuration of the new material during a one-hour lecture and students attend a two-hour lab session during which they work on the exercises of the MOOC and can ask questions about them, and they also work on additional advanced exercises.

Another concern is the evaluation of our students. Evaluating the students based on their results on the MOOC is not legal. Therefore, our students still have a proctored exam at the end of the course. In order to incentivise students participating to the MOOC, a +2 bonus/-2 penalty has been put in place. Whereas external students only have the opportunity to earn a certificate if they reach 50% for the MOOC, our students also get a bonus/penalty depending on their participation. Having a 100% mean participation for both MOOCs results in a +2 bonus, a 50% mean participation is neutral and a 0% mean participation leads to a -2 penalty. A last difficult part of the evaluation is the automatic grading of the submitted code. The system currently in place using the INGInious grader is doing a great job for the grading part, but has still to improve the feedback messages sent back to the learners in case of a wrong answer.

**Evaluation of the MOOCs for UCL students**

Two different evaluations of the MOOC have been launched. The first evaluation was conducted directly on the edX platform for all the learners. The second evaluation was only dedicated to our on-site students and this section presents the main results from that second evaluation. A total of 78 students participated to the survey. One of the questions is about the perceived average workload for the exercises on the MOOCs. There are two kinds of exercises: classical exercises are multiple choices or fill in the blank questions and coding exercises require the students to write a (portion of a) program. Table 2 shows the percentage of students for different mean workload duration, comparing the figures of the Fall 2013 edition with those of the Spring 2014 edition. The first observation is the same as described in (Combés, Bibal & Van Roy, 2014), namely that coding exercises take more

<table>
<thead>
<tr>
<th>Table 1: Evolution of the LFSAB1402 course before and after the introduction of the MOOCs.</th>
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</thead>
<tbody>
<tr>
<td><strong>Classical exercise</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Less than 5 minutes</td>
</tr>
<tr>
<td>5 minutes</td>
</tr>
<tr>
<td>10 minutes</td>
</tr>
<tr>
<td>15 minutes</td>
</tr>
<tr>
<td>More than 15 minutes</td>
</tr>
</tbody>
</table>

EOOOCs 2015
time than classical exercises. But we can observe a difference for the coding exercises, for which the students perceive a larger workload.

Another set of questions from the survey asks students to give their agreement level for a set of statements. The possible answers are either yes/no or a degree of agreement on a five-level scale from totally disagree to totally agree. Hereunder are eight selected questions related to the discussion of this paper, where ‘the course’ refers to LFSAB1402, the programming course that is in the students’ program, and ‘MOOCs’ refers to the MOOCs they have to follow for the course. Those questions and the results are shown on Figure 2.

Looking at the answers for those different questions confirms intuitions of the teaching staff and informal feedbacks received from our students. First of all, students are globally satisfied with the MOOCs. Moreover, the deadlines constrained the students to work regularly, which maybe explains that roughly half of the students felt ready for the proctored exam of the course, after having completed the MOOCs. The third question highlights the fact that students do not perceive well the difference between the requirements of the MOOCs and those for the course. This observation is reinforced by optional comments that the students were allowed to add in the survey; a certain number of them indicated that the proctored exam did not correspond to the level of the MOOC. Question 5 reveals that the workload of the MOOCs is not too high for the majority, but we have to take care because nearly a third of the students felt overloaded. Questions 6 and 7 confirm our intuition that the main motivation of our students is to get the +2 bonus, they are not interested in certificates. Finally, the interaction between the two publics is limited since only few of our students used the edX discussion forums.

**Conclusion**

It is not an easy task to build a MOOC from an existing and mature traditional course. It requires one full-time teaching assistant for the first edition (SPOC) and one half-time teaching assistant for each of the following editions, in addition to the time needed to set up the automatic grader. But as explained in this paper, following an approach by steps and using the MOOC for our on-site students makes the investment worthwhile. However, using the same course for two different publics (on-site and worldwide students) with different requirements involves some constraints. While the MOOC must remain a university-level course...
with coding exercises needing creativity and rigour, it must also be accessible to worldwide learners who have less time to do all the exercises but are interested by the material of the course.

We discovered that there are two distinct groups in the worldwide students: those who put in the effort to obtain a certificate, and those who stay active until the end but do not target a certificate. We conclude that the exercises are too time-consuming for many of these students, as the survey reveals for our on-site students, even though they are clearly interested in the material. Perhaps there should be a way to reward these students, to encourage even more participation of this type.

The first edition of the completely remastered course as two MOOCs is now finished. The course has been significantly improved from the SPOC version, through the feedback of the learners, of our students and of the teaching staff. Future work includes a detailed analysis of those feedbacks in order to improve the MOOC to better satisfy both publics. Another improvement that we will work on is to bring a better feedback for the exercises when the learners provide a wrong answer, with a particular attention for the coding exercises.

The INGInious grader will include more advanced analyses of submitted codes to provided intelligent feedbacks to support their learning.

In conclusion, our experience in transforming LFSAB1402 has been a satisfactory one. We will continue to teach the LFSAB1402 course as a MOOC from now on, with both on-site and external students. For almost the same teaching effort, the same course reaches two audiences, which is a significant increase in the number of students. As educators, this aspect of the transformation is a definite win. We will likely add further pedagogical innovations to the course in the future.

References


MOOCs from the Instructors’ Perspective
Klaus Wannemacher and Imke Jungermann, *Institut für Hochschulentwicklung (HIS), Germany*

**ABSTRACT**

This paper presents the results of an exploratory online survey carried out in 2014 among MOOC practitioners from German universities. Through a preceding inquiry among all German university administrations and a research in major MOOC portals and catalogues and among MOOC providers, a group of 100 instructors could be determined that were member of a German university and (had) taught one or more MOOCs. The online survey focused on the conceptional considerations and practical experiences of MOOC practitioners from German universities. Additionally, the MOOC practitioners were asked for information on their universities’ strategic positioning on MOOCs. The survey revealed distinct tendencies with regard to aspects such as motives of instructors, MOOC forms, course language, course size or the interest in providing further MOOCs. While most aspects of MOOC practice at German universities resembled tendencies reported for MOOCs at American and other international universities, a few proved different.

**Introduction**

MOOCs (*Massive Open Online Courses*) are emerging all over the world, created by universities, associations or even by private companies. This new mean of education got the attention of the Université catholique de Louvain (UCL) as it joined the edX consortium in 2013 under the name *LouvainX*. Some professors took the challenge to create a MOOC from an existing course, after a selection that took place inside the institution. This paper reports on one particular experience where a traditional course on programming paradigms was transformed into a MOOC, which is now followed at the same time by our students and by other learners all around the world.

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There are three main motivations for having one unique MOOC for both publics: it makes it possible to reach the two publics with the same effort and resources, it opens the possibility for the two publics to interact and it offers a new modern mean of education for our students. The reasons for having spread the migration over two years was to have a smooth transition allowing the limited human resource available to learn how to produce a MOOC and to have enough time to build it.

The remainder of the paper is organised as follows. The first section is about the three-step transformation of the traditional course into a MOOC. The second section discusses about the changes that have been made for the Fall 2014 MOOCs. Finally, the last section presents a first evaluation of those two MOOCs analysing the experience of our on-site students.

**A Survey among German MOOC Practitioners: Purpose and Approach**

The HIS Institute for Higher Education Development (HIS-HE) conducted an exploratory study in 2014 addressing instructors who were member of a German university and who were preparing to carry out or carried out one or more MOOCs. The survey objective was to discover current tendencies of MOOC design, facilitation and participation from the perspective of German university lecturers who actively taught MOOCs. Additionally, the survey was supposed to answer the question if the respective German universities...
had played an encouraging and conducive role in enabling their lecturers to offer MOOCs. Due to the small amount of MOOCs offered so far at German universities and subsequent difficulties in collecting data, an exploratory survey design was chosen. The research questions were developed on the basis of a review of available literature on international MOOCs and on MOOCs at German universities and were validated through a peer review process among e-learning specialists and MOOC designers. Since the exact size of the population of all instructors at German universities who employ MOOCs is not known, but appears to be comparatively small of size, a split sampling method was chosen. Within a preceding full population survey among German universities, the vice-presidents and pro-rectors for teaching of all German universities had been asked to name MOOC instructors at their universities. Within this preceding survey, the German vice-presidents and pro-rectors for teaching had specified 63 university instructors who offered or prepared MOOCs in 2014.

In a second step, these MOOC practitioner data were contrasted to the extensive data contained in the MOOC databases of the portal “Deutscher Bildungsserver”, of the comprehensive “Open MOOC-Maker Course” and of the major MOOC portals, catalogues and provider websites (e.g. the European Commission’s “European MOOCs Scoreboard”, the “European Multiple MOOC Aggregator”, and MOOC tracker or aggregator websites such as Class Central, CourseBuffet, CourseTalk, Knollop, and Open Culture, for German-speaking universities additionally the websites of the corresponding MOOC providers iVersity, OpenCourseWorld, open-HPI and oncampus).

The group of MOOC practitioners from German universities listed on these portals and websites mostly coincided with the information provided by the vice-presidents and pro-rectors for teaching of German universities, but partly exceeded the university managements’ references. Adding the supplementary information provided by the above mentioned MOOC portals, catalogues and providers to the information received from the university managements finally led to a group of 100 lecturers from German universities who carried out or prepared to carry out MOOCs. This group of 100 MOOC practitioners was invited to participate in the survey in July 2014. While overall 46 MOOC practitioners took part in the survey, 36 fully answered the survey questions.

Survey Results: The Perspective of Early MOOC Adopters

The survey among instructors at German universities who have made or make use of MOOCs displayed that the particular MOOC teaching experience was of different depths: while many of the „early adopters“ (Everett M. Rogers) still gathered their first experiences with MOOCs, others had already taught clearly more than two or three MOOCs. The survey revealed distinct tendencies among the instructors with regard to aspects such as the motives for offering MOOCs, course types, language, size or the interest in providing further MOOCs. The survey results on MOOCs by lecturers from German universities resembled tendencies reported for MOOCs at American and other international universities (cf. Hollands & Tirthali 2014) in many, but not in all cases. While course types, components and duration, participation patterns, degree forms and the motivation to offer MOOCs resembled that at international universities, distinct deviations could mainly be observed with regard to the specific date of initially launching MOOC activities, the course language and achieved course sizes.

MOOC Offerings

Initially, the instructors were asked if they were teaching MOOCs or not (table 1). Some two-thirds indicated that they had already taught MOOCs, slightly less than a half was currently teaching a MOOC, and another half was currently preparing one. That a respondent denied to offer MOOCs resulted from an erroneous reference on MOOC practitioners through the university administrations. Overall, these results prove that the survey essentially reached the intended group of MOOC practitioners. The survey moreover displayed that a large majority of practitioners have started offering MOOCs only in 2013. MOOCs were developed and carried out by one half of the instructors each with and without co-operation partners. In addition, about one third of the respondents specified that they offered a series of related MOOCs.

Instructors’ Motives and MOOC Forms

Dominating motives of instructors for providing MOOCs were the intention to reach new target audiences, a general interest in the development within the MOOC sector, the desire to participate
in this development, the desire to advance and refine the range of one’s courses or to increase the reach of one’s teaching (table 2).

Table 1: MOOC offerings (multiple answers possible) (in per cent, n=39)

<table>
<thead>
<tr>
<th>Offerings</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>I have taught a MOOC/ several MOOCs</td>
<td>64%</td>
</tr>
<tr>
<td>I am currently teaching a MOOC.</td>
<td>44%</td>
</tr>
<tr>
<td>I am currently preparing a MOOC.</td>
<td>49%</td>
</tr>
<tr>
<td>I intend to teach a MOOC in the future.</td>
<td>44%</td>
</tr>
<tr>
<td>I am undecided whether to teach a MOOC or not.</td>
<td>8%</td>
</tr>
<tr>
<td>No, I will not teach a MOOC.</td>
<td>3%</td>
</tr>
</tbody>
</table>

Table 2: Motives for carrying out MOOCs (multiple answers possible) (in per cent, n=33)

<table>
<thead>
<tr>
<th>Motives</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>interest in the course format</td>
<td>78%</td>
</tr>
<tr>
<td>to refine my course offerings</td>
<td>37%</td>
</tr>
<tr>
<td>to expand the effectiveness of my teaching</td>
<td>37%</td>
</tr>
<tr>
<td>to use an existing courseware structure</td>
<td>13%</td>
</tr>
<tr>
<td>to increase the ability to study</td>
<td>21%</td>
</tr>
<tr>
<td>to increase the students’ motivation to learn</td>
<td>24%</td>
</tr>
<tr>
<td>to establish target groups and contribute to opening university education</td>
<td>15%</td>
</tr>
<tr>
<td>Have positive experiences with online teaching</td>
<td>45%</td>
</tr>
<tr>
<td>to participate in the development of new courses</td>
<td>18%</td>
</tr>
<tr>
<td>to expand the study programme/course supply in the further education area</td>
<td>22%</td>
</tr>
<tr>
<td>to offer participation/reimbursement options to interested companies</td>
<td>14%</td>
</tr>
<tr>
<td>to contribute potential compensation at my university</td>
<td>19%</td>
</tr>
<tr>
<td>It corresponds to my university’s strategy</td>
<td>4%</td>
</tr>
</tbody>
</table>

The MOOC forms applied did not notably differ from the widespread, internationally prevalent forms. The instructors more commonly offer xMOOCs (65 per cent) than cMOOCs (44 per cent). Other MOOC forms were mentioned less frequently. In line with the widespread xMOOC model, the MOOC elements most frequently applied were exercises, quizzes or tests, lecture podcasts and instructional videos, discussion forums and additional course readings. Quite often the instructors indicated that a support option through mentors or tutors was offered as well, even though a lack of support through mentors or tutors has been criticised in the MOOC debate as a common shortcoming of many (x)MOOCs (Schulmeister 2013, p. 30).
Tendencies of MOOC Participation

The large numbers of participants that some MOOCs received in the anglophone world are rather atypical for MOOCs being offered by instructors from German universities. Most frequently a MOOC size of up to 499 participants was reported (25 per cent). For more than three quarters of the MOOCs offered at German universities, a maximum size of 9,999 participants was conveyed. Nevertheless, these participation rates exceed the course size of regular university courses by far (HRK 2014, p. 57). About half of the MOOCs were taught in English and in German. On average, MOOCs offered in English received larger numbers of participants.

With regard to the share of participants who finished MOOCs with a performance record, it was ascertained that in more than half of the cases a maximum of 20 per cent of the participants completed the MOOC with a performance record or a certificate of attendance. Less distinct were the tendencies with regard to other MOOC-related aspects. The differentiation of the MOOC spectrum in terms of target audiences still remains at an early development stage. In spite of the large amount of MOOC participants with a university degree which can usually be observed at an international level (Hollands & Tirthali 2014, p. 167), the educational context of the aspired MOOC participants was equally often specified as university education, adult education and advanced vocational training. The aspired target audiences were equally often characterised as regular students, prospective students, employed persons and other persons with a professional interest.

Range of Disciplines, Course Degrees and Platforms Used

The interest or possibility to carry out MOOCs is not evenly spread over the subject groups. To date, MOOCs from the subject groups engineering sciences (20 per cent), law, economic sciences and social sciences (20 per cent), mathematics, natural sciences (15 per cent) as well as propaedeutic and general-education MOOCs (15 per cent) clearly dominate (table 3), and thus courses in subject groups for which mostly a strong interest of employed persons and persons with an interest in further education could be assumed.

Table 3: Subject groups of the MOOCs offered (in per cent, n=34)

<table>
<thead>
<tr>
<th>Subject Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural forestry, animal science</td>
<td>20%</td>
</tr>
<tr>
<td>Human medicine/health science</td>
<td>20%</td>
</tr>
<tr>
<td>Engineering</td>
<td>15%</td>
</tr>
<tr>
<td>Fine arts</td>
<td>15%</td>
</tr>
<tr>
<td>Mathematics, natural science</td>
<td>9%</td>
</tr>
<tr>
<td>Law, economic and social science</td>
<td>0%</td>
</tr>
<tr>
<td>Sports science</td>
<td>0%</td>
</tr>
<tr>
<td>Linguistic and cultural studies</td>
<td>0%</td>
</tr>
<tr>
<td>Veterinary medicine</td>
<td>0%</td>
</tr>
<tr>
<td>Other subjects</td>
<td>15%</td>
</tr>
<tr>
<td>Propaedeutic and general-education courses</td>
<td>15%</td>
</tr>
</tbody>
</table>

With regard to course certificates a broad spectrum of alternatives has evolved, from certificates of attendance free of charge, and online badges free of charge through credit points to a graded certificate for a fee. The development of business models for MOOCs, however, still appears to remain at an early stage.

The instructors use for-profit MOOC platforms, which were developed with aid money and large
amounts of venture-capital, and their universities’ learning management systems much more frequently than non-profit and open-source MOOC platforms. Encouragements that it could be reasonable (in view of the dominance of for-profit platforms which could damage a university’s visibility in the long run) to contemplate on “platforms of university networks” (HRK 2014, p. 60), seem to have generated no apparent echo so far.

Positive Aspects and Obstacles
With regard to reassuring aspects of MOOCs that have already been carried out, in a free text field some instructors referred to experience values such as

- frictionless processes of internal coordination within the universities and within individual MOOC projects, as well as the helpful support given by experienced colleagues,
- a good cooperation within a highly motivated team,
- the felicitous didactical, graphical and technical preparation and refinement of content,
- a well-balanced combination of knowledge transfer and entertainment value,
- and a strong motivation of (a large core group of) MOOC participants, irregardless of the course size. Only rarely did instructors report on unexpected difficulties during the development of MOOCs. Difficulties most likely concerned
- the intricate production of initial contributions for MOOCs,
- uncontrollable costs,
- a lack of support within the university,
- as well as a lack of adequate business models.

In terms of the realisation of MOOCs, repeatedly an exceptionally high mentoring effort was reported. None-the-less, instructors predominantly declared to be willing to continue to offer MOOCs in the future.

Aspects Related to Higher Education Policy
A majority of instructors indicated that they benefited from active support through the university administration with regard to the development and provision of MOOCs (58 per cent). A comparison of the results of this survey with that of the preceding MOOC-related survey among all German university administrations indicates that an active support of MOOCs through a university administration regularly contributes to the occurrence of an actual activity of instructors in the field of MOOCs. The strategy of individual U.S. universities to develop complete curricula on the basis of MOOCs has not led to similar attempts at German universities so far. No instructor reported from corresponding intentions at his university. On the other hand, the MOOC start-up companyiversity has expressed the intention to offer study programmes fully consisting of MOOCs in the future (Franken, Fischer & Köhler 2014, p. 286).

Support programmes for the development and operation of MOOCs have been available only to a limited extent in Germany so far. Thus, the respondents gave rather diverse particulars on the significance of incentive mechanisms such as support programmes: 45 per cent of the instructors attached strong importance to incentive mechanisms while about a third regarded them as not essential. More importantly, instructors expressed the expectation that the perception that MOOCs cause unusually high production costs, may still become more accepted among educational politicians and university administrations alike. The considerable underestimation of the financial means required for MOOCs impeded a stronger dissemination of these courses.

References
Automatic grading of programming exercises in a MOOC using the INGInious platform

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ABSTRACT

This paper represents a return of experience about the use and design of an external grader for a computer science MOOC. We introduce INGInious, an automatic grader for both on-site students and students from the edX platform. Then, we explore both the practical and technical approach of its use. We see that providing good feedback is a key element to learning, and that it must be as detailed as possible, but also, because of theoretical limits, transparent. Then we see how a good external grader must be designed, that is, generic, safe and reliable.

Introduction

When learning computer science, it is important to give actual programming exercises, where students are required to write fully working algorithms. It has been long since the idea of automating corrections of such exercises has been suggested, but faced different limits, theoretical or technical, resulting in full or partial involvement of a human in the correction.

In the case of MOOCs, the automation of these corrections is no longer a desire, but also a requirement. The number of students is usually too great to permit handmade corrections. Even with automation, the slightest involvement required from a physical person can become huge and induce great costs. Apart from alternative forms of feedback [Nicol, 2010], the process therefore needs to be fully automated. This paper presents methods and tools that allow automatic grading of code made by students.

INGInious [Derval et al., 2014] developed at the Université Catholique de Louvain by Guillaume Derval, Anthony Gégo and Pierre Reinbold, is a tool designed for this goal. INGInious is made to be generic, capable of running virtually any programming language; safe, running students’ algorithms in specific virtual environments confined from the base system; and scalable, capable of dealing with large numbers of submissions. In addition to grading algorithms autonomously, INGInious also provides an interface with the edX platform. INGInious is a free and open-source software (FOSS) distributed under the AGPL license. Its sources are available on GitHub.

In this paper, we first discuss the use of INGInious in the Programming Paradigms course given on edX by Peter Van Roy (Louv1.1x [Van Roy, 2014a] and Louv1.2x [Van Roy, 2014b]), and then we present key elements of its architecture, its safety, and its scalability.

Creating exercises with INGInious

To prepare INGInious for correcting student exercises, two preliminary steps are needed. First, it must be installed, which requires some configuration. More information about this important step is available in the documentation of INGInious.

Second, courses and exercises can be added. INGInious classifies exercises in terms of courses and tasks. A course contains multiple tasks, and a task contains one or more exercises. Each exercise has the form of a directory, containing at least two files. One of them contains various information about the exercise, like its name, a description, and various constraints to be applied when tested (time or memory limits). The second file is the actual script to be run. This script can in turn call various components or subscripts present in the virtual machine (we discuss these virtual machines in the section Secure code execution and environments).

This script is intended to check the student’s answer and provide some feedback. The feedback must provide at least two elements, as edX course designers will know, that is, a binary value to state if the exercise is passed or not, and an arbitrary text to provide the user some feedback. This feedback is discussed in the next section. At this point, INGInious is ready to accept student input. When adding an exercise to an edX course, a (small)
additional step is required, that is, setting up the exercise in edX (see edX documentation about external graders [edX, 2014]).

Providing the user with good feedback

Introduction

In the context of MOOCs, one must keep in mind that, historically, automated feedback was the only one the students were going to get, at least in large-scale courses. Nowadays, other forms of reviewing have emerged (peer reviewing for instance), but automated feedback can still be wished for, especially in hard science, due to the factual nature of most exercises. If we choose to use it, it is important to help students to find, understand and correct their mistakes themselves, in order to maximize their learning [Nicol, 2010]. A good feedback is therefore a requirement of a good grading process. Giving a result as 'passed' or 'failed' is insufficient.

Cause of errors

When writing programs, there are three different kinds of errors.

(1) The program is not correct with respect to the programming language, that is, there is a compilation error.

(2) The program is syntactically correct but the execution encounters an unexpected operation, that is, there is a runtime error.

(3) Finally, it is correct regarding to the programming language, but does not provide the correct answers.

One should note that each of these errors does not necessarily mean that the student has a comprehension issue. In our case, a student could very well understand a concept, but fail to apply it to a concrete example because of the particular syntax of the programming language used (in our case, Oz). However, it is quite useless in computer science to understand a concept and not being able to use it, so helping the student to correct the mistake is important.

How feedback is provided

Computer scientists know that automatic correction is not an easy task, because of theoretical limits: it is actually impossible to check whether the student’s code does the same as a correct one (consequence of Rice's Theorem, see [Beckman, 1980]). There are different approaches to check for algorithm correctness. Some mathematical theories provide actual tools to prove a program’s correctness (for example, see [Vander Meulen, 2014]). However, these can be quite complicated, and represent much trouble to implement. Moreover, in the context of a Programming Paradigms course, the goal is not for students to ensure program correctness, which is a theoretical field in itself, but rather to understand the concepts exposed. We therefore take the approach of unitary testing. In other words, we run the student’s code with some inputs and check the output. For each test, we then handle the errors.

Classification of feedback

We can reduce all three kinds of errors to one behavior in the grading process. First of all, before even thinking of interpreting the error, we must accept that it is probably not possible to predict all the possible answers a student could give, and the reasons he gave them. In this regard, it is good practice to be as transparent as possible in the errors detected. It is important to tell the student how his algorithm has been tested, that is, with what input, so that he can test it himself, and reflect about the error.

Nevertheless, we would like to provide more precise feedback, at least for the most common errors. Concerning compilation and runtime error messages, they are often generic and sometimes quite meaningless, even though they often happen for the same reasons. It is usually beyond the scope of a compiler to provide advice to correct errors, but a grader can suggest different leads to the students when a particular error is encountered. Also, it is possible to do some static checks to detect most common syntactic and conceptual errors. These errors are often similar in all possible exercises, and will most likely not be reproduced once understood. Other errors can be specific to a particular exercise. Here, static checks can also be performed. But with a bit of practice, it is possible to recognize frequent mistakes made by students, resulting in the same wrong output, or an error. When this error is detected, it is a good idea then to give more information to the student and probable cause of mistakes.

Practical experience

There are some additional thoughts one should keep mind when designing exercises. First, it is very easy to see the limits of unitary testing: if an algorithm is supposed to compute, say, ‘4+2’, one can design an algorithm that will compute ‘1+5’, ‘3+3’ or simply return 6 directly. Each of these algorithms provides the good answer, but the
computation is not correct. Combined with the transparency principle, it is easier for a student to cheat.

This is an issue for on-site students of a MOOC. The idea is thus to make it more difficult for the student to cheat rather than giving the good answer. There are different possibilities to achieve that. A good start is to make many different tests. Other ways can be to test subsets of the algorithm (for instance, each function individually), force students to use some pre-defined functions, or pre-defined lines of code, and finally, perform some static check to prevent some specific calls or patterns.

More optimistically, though, a student could also write an algorithm that works in some cases but not in others, for instance, he might not even know why his algorithm works or doesn’t work. Our goal here is to provide feedback that will help him understand. Among these test cases, we will therefore test limit cases of the algorithm, that is, cases that can be somewhat singular and require additional steps from the algorithm (for example, trying to sort an empty list). Students often forget about these limit cases, and they often are the reason the algorithm is incorrect: a forgotten limit case can often cause the algorithm to crash. Also can be tested some cases that are to be considered typical regarding the goal of the exercise, to make sure the student really understands its purpose. Once all these tests pass, we can consider that goal achieved, and it will often be enough to consider the exercise correct.

Finally, to avoid too many different causes of mistakes, which complicate the design of the grading process, and most likely the understanding of students, it is a good idea to keep exercises small, and focused on one particular aspect. The automation of corrections being as it is, correcting big algorithms gives more opportunity to encounter an unexpected situation, and thus provide wrong feedback, which often irritates students. Small exercises will allow them to test their knowledge in a straightforward manner, and identify their errors quickly. More elaborate exercises can be done at different intervals, and are an opportunity to cross their knowledge and challenge them more, but it is a better practice to do that only when we are sure each concept has been understood individually.

Architecture of INGInious

INGInious is composed of two parts, called the frontend and the backend. The frontend provides a simple web interface for the students that do not follow the MOOC (at UCL, INGInious is used for other courses that are not on edX), an administration that allows writing tasks directly in the web browser. The frontend also manages the database (using MongoDB) containing submissions and statistics.

The plugin system is also managed by the frontend. It can be configured to run the edX plug-in, communicating with the edX platform and allowing to grade code using the simplicity and power of INGInious on edX. The edX plugin is in fact, from the point of view of the edX platform, a passive grader. The configuration of this plugin is very simple and is described in the documentation of INGInious. Other plugins are available, allowing calling the grader externally via JavaScript for example, or providing additional statistics on the submissions.

Made as an independent library, easily reusable, the backend creates, manages and deletes containers, running the code made by the students. The backend does not store anything in a database or on the disk. Figure 1 shows a simplified diagram of the INGInious architecture.

Once the environments (container images, described in the next section) and the tasks’ scripts have been written by the teacher or its assistants, everything is automatized: the students’ code will
Students have two ways to interact with INGInious: the first being the frontend web interface, that needs the creation of an account (at UCL, accounts are provided via an LDAP server); the second is the edX plug-in, which receives anonymous requests from the edX platform. The use of this plug-in is completely invisible for edX students. The course can be followed simultaneously by on-site students, each with its own INGInious account; and by edX students, each with its edX account, whom will post their answer directly at edX.

**Secure code execution and environments**

INGInious must execute its code in a safe environment that allows both resource control and safety. Code submitted by students should not be trusted in any way. The separation between the host machine and the safe environment is traditionally handled by the usage of virtual machines (Pythia [Le Clément de Saint-Marcq & Combéfis, 2012], the predecessor of INGInious, used User Mode Linux, a kind of virtual machine), that in fact separate the untrusted processes via a hypervisor. This hypervisor manages the resources available to the virtual machines.

This approach certainly has advantages (nearly complete separation of the processes), but also has some drawbacks, in particular creating new environments is hard and there is a huge overhead due to the presence of a second operating system. INGInious uses another approach, based on Docker [Docker, Inc., n.d.-b], a relatively recent technology that provides containers. Containers are safe and closed environments, but run inside the host kernel. This resource separation is in fact provided by two features of Linux, kernel namespaces and cgroups. Containers are therefore very lightweight: they do not start and manage another operating system, as, for the host OS, containers are simply constrained processes. Like virtual machines, containers can be run with a specified amount of memory, be associated with specific CPUs, and mount shared folder from the host.

Moreover, Docker provides a simple way, called Dockerfiles [Docker, Inc., n.d.-b], to create new container images (or environments). With a very simple syntax, anyone that uses a Linux command line tool can quickly create a new environment. Code listing 1 below is the complete content of the Dockerfile used to generate the container for the Programming Paradigms course. It is somewhat simple: it inherits from the default INGInious container image, and installs Mozart 2 (which provides the Oz language, used for the course).

```
# Inherits from the default container FROM
# INGInious-c-default
ingi/INGInious-c-default
# Add the Mozart 2 rpm to the container
ADD mozart2-2.0.0-alpha.0+build.4105.5c-06ced-x86_64-linux.rpm /mozart.rpm
# Install dependencies of Mozart 2 and Mozart 2
RUN yum -y install emacs tcl tk
RUN rpm -ivh /mozart.rpm RUN rm /mozart.rpm
```

**Code listing 1. Dockerfile for ingi/inginious-c-oz**

Docker uses a union file system to store the container images. The container images are viewed as layers, and each command in a Dockerfile (from inheritance to RUN commands) creates a new layer. This allows to drastically reduce space used to store the different environments, as only the difference between the custom container images and the default one is stored.

INGInious launches a container each time a submission is made, from the appropriate container image. Containers are then very short-lived (they live the duration of the grading). Container images are most of the time shared between multiple tasks or even between multiple courses. For the purpose of the MOOC, only two container images were used, ingi/inginious-c-oz (that provides Mozart 2), and ingi/inginious-c-pythia1compat (that provides a compatibility layer for Pythia). Other container images are available, allowing using different languages: C++, Java 7/8, Scala, Python 2/3 are also provided with the sources of INGInious. Creating new containers to add new languages is very simple as shown earlier.

This way to use containers means that there are as many running containers as running tasks. With the union file system, the disk is not used by more
than a few kilobytes at each container start. There is also a very low memory footprint. The kernel scheduler then handles the repartition of the CPU resources between the different running processes. INGInious adds some constraints, such as timeouts, to the container to ensure that they correctly end. Processes that exceed the time allowed to them or that use too much memory are killed, sending an appropriate message to the student.

Scaling of the machine
At INGI, we use a single machine running all the components of INGInious. We have currently four courses that use INGInious: the Programming Paradigms MOOC, Computer Science I, Artificial Intelligence and Advanced algorithms for optimization [Deville, 2014].

Programming Paradigms has a broad audience compared to the other courses: in the Fall 2014 edition more than four thousand students enrolled in the second part of the course. The other courses count between thirty and four hundred students. Exercises of the courses Programming Paradigms and Computer Science I asks students to write very small algorithms that are never long to complete, and do not involve a lot of computing. The two other courses run exercises that may take more than five minutes of computation to complete. The machine hosting INGInious was scaled to handle these two types of loads: a large audience running lightweight exercises and a small audience running computation-intensive exercises. We used a virtual machine with 6 (virtual) CPUs and 12 GB of memory. The figure 2 represents the load averages between December 28th, 2014 and January 12th, 2015, which are the days when the final exam of the MOOC occurred. All the other courses were already finished. During this period, around 600 students made 5976 requests to INGInious, with an average running time of 5.17 seconds. The maximum number of concurrent requests was three.

From the point of view of the MOOC, the machine is clearly over-scaled, with the load averages often below one (less than six times the maximum sustainable load), and with memory usage always under 30%. A small dual-core virtual machine with 6 GB of memory is sufficient to handle the MOOC load. INGInious thus does not need to run on a costly cloud.

The machine we use is well scaled for the usage of INGInious made at UCL, as the two more computationally intensive courses sometimes put it at its limit. Usage peaked twice during the Fall 2014 semester, at the deadlines of the course advanced algorithms for optimization, with a load average of 6 for some hours. The management of the peaks is still a work in progress in INGInious, as heuristics for queue management have to be developed.

Conclusion
Automation of correction is still a great challenge nowadays, and the stakes are high in the context of MOOCs. In the future, with the increase of use of ICTs, more and more students are likely to follow courses online, both in a formal, legal, or informal manner. Followed by actual students seeking for a certificate with a legal value, automatic correction is a key element of checking their competences. But more than just a corrector, an automatic grader has
also to be seen as a feedback provider, which can analyze student’s understanding and guide them in their learning.

Different tools make it easier today to design such grader, with different functional requirements in mind (genericity, safety, reliability). INGInious is one of these graders, and provides both easy-to-use features (for students and instructors) and these requirements. The use of INGInious is very easy, whether for automation of correction, but also by executing about any task based on a student input. More than its use in the context of MOOCs, many prospects therefore rise, that might change the vision of online learning itself.

The use of such tools will indeed change the way instructors are able to design their courses, and provide a very personalized learning despite the distance and virtualization, and the prospects in this regard are most likely to be as great and exciting as the future.

References

Learning by doing: Integrating a serious game in a MOOC to promote new skills

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ABSTRACT

Playing is associated with pleasure and fun whereas academic learning is associated to effort and hard work. Much research has shown the benefits of introducing games in academic teaching as a way to improve learning. Curiosity is also important when learning. Indeed, when curiosity is awakened, people learn without resistance. In order to improve the learning experience, a serious game was integrated in a MOOC. The use of a serious game as a form of evaluation in a MOOC is a true innovation in education: students played a video game where different situations were presented and they had to solve problems related to the courses.

Innovating in education is certainly a challenge. Although integrating a serious game in the MOOC platform needed a considerable amount of technical effort, it was an absolute success: the completion rate was high (31%) with a great percentage of young students (49%) following the courses.

Context

The past few years have seen the exponential growth of the number of MOOCs. Many universities made the move mostly to address institutional visibility and to keep the leadership in education and new learning techniques. Additionally, MOOCs are used in flipped classes, some programs attribute credits to students who complete the courses. Nonetheless, the components used in a MOOC are still pretty much the traditional ones: lectures with videos, and evaluations with quizzes. This system has the well-known advantages and disadvantages of traditional teaching methods: a large amount of subjects can be addressed in a reduced amount of time to a large public but there is no application of the acquired knowledge. Besides, motivation can quickly fade even for students that are highly motivated at the beginning of the courses. Evidence of this fact can be found in the average completion rate of current MOOCs: only around 10% of the students enrolled obtain the certificate of completion.

Faced with this situation, it seems important to develop, propose and try out new developments within the context of MOOCs to help the students maintain their motivation from the beginning to the end of the courses, because “motivation is the most important factor that drives learning...”. In this context, IFP School proposed to insert a Serious Game as a learning and evaluation device within its first MOOC.

Considerable research has shown how Game-Based Learning (educational games) can be a more practical and effective approach to motivate and promote learning (1, 2, 3). Compared to both traditional environments and other computer-based learning environments, learners’ intrinsic motivation toward a Game-Based Learning environment is higher, and learners using the game tend to be more involved and intrinsically motivated when actively solving problems. Games provide a more proactive environment for learners to interact with, as compared to books, audio or video. In particular, video games provide a meaningful context and an interactive visual representation that makes learning material not only useful and relevant but also fun. Video games are especially efficient to get students involved, promote an interest in and a positive behavior toward the topic, and consequently increase their knowledge. In terms of learning outcomes, it has been proven that video games are effective to develop a wide range of cognitive skills, including procedural knowledge, declarative knowledge, and higher thinking skills (4,5). This is particularly true for video games featuring open-ended environments where users can experiment, learn from their mistakes, and update
their knowledge accordingly. Such environments are especially conducive to higher thinking skills required in third-level education. However, the development of such video games in education generally involves high development costs. Unless the games have already been developed commercially, the cost factor usually dissuades educators and developers to develop or use them. Taking into account this research, and as an applied engineering school for the energy and transport sectors, in November 2014, IFP School launched its first MOOC called “Sustainable Mobility: Technical and environmental challenges for the automotive sector”. When building this MOOC the challenge was to implement current pedagogical practices to improve interaction and to develop an environment where the students can experiment and practice the skills learnt from the lessons. A Serious Game was designed and implemented over a three week period of the online course. This pedagogical innovation facilitated knowledge transfer through situational learning (6,7). The Serious Game allowed students to put knowledge into practice: students were faced with situations to solve industrial problems as a real engineer would do in a working environment.

This paper explains IFP School’s experience regarding the production of the Sustainable Mobility MOOC, including the development of the Serious Game as a part of the evaluation process within the MOOC. The subject of the technical challenge that represented the development and the integration of a Serious Game in a MOOC environment will also be addressed. Finally, a brief feedback will be presented regarding the students profile and the satisfaction and completion rates.

**IFP School and The Sustainable Mobility MOOC**

IFP School is an engineering school that offers applied graduate programs, providing students and young professionals with education in the fields of energy which meets the needs of industry and the demands of society with particular emphasis on sustainable development and innovation. The energy industry is facing unprecedented challenges in the 21st century. This is especially true in the transportation field, where global demand is growing exponentially and shows no sign of letting up. Oil and gas are non-renewable resources that will not meet this demand indefinitely. However, no alternative energy solution is currently available to serve as a rapid and comprehensive substitute. At the same time, finding a solution to the issue of global warming is becoming increasingly urgent. To address these various challenges and achieve sustainability, our societies need to develop clean and renewable energies. This means creating the conditions necessary for a progressive and balanced transition. Diversifying our energy sources will enable us to limit the impact on the environment while we search for new alternative energies.

These subjects were the core of the courses developed in the MOOC. The learning goals included the acquisition of technical skills in economics, fuels, refining, engines (internal combustion, hybrids, electrical) and pollution. As an applied engineering school, it was important to create a course where this knowledge could be put into practice. From the School’s standpoint two main goals where pursued: first, to enhance the School’s reputation and visibility in order to attract highly motivated students from all around the world; and second, to innovate and experiment with new technologies through the implementation of a Serious Game in a MOOC platform with a view to improving the students’ motivation, guarantee the acquisition of the required skills, and finally put these skills into practice. The Serious Game allowed us to combine a fun and dynamic environment to improve the learning experience. Since the target population was very narrow (young students wishing to develop a career in the energy engineering sector) the Serious Game was also a way to attract younger people. The Serious Game was entirely integrated in the MOOC platform. It was used to evaluate the students during the MOOC but will also be used during the lectures of the graduate programs of the school. The Serious Game was designed by a group of 5 lecturers, technically assisted by the educational engineering team, developed by a Pi-Learning, and introduced in the MOOC platform by Unow. To limit the costs of the Serious Game, the complete Story board was designed directly by IFP School. This immersive learning is part of an effort to improve the players’ awareness of energy issues, trying to give meaningful practice to the theoretical concepts seen during the MOOC videos.

The story of this video game starts with... Once upon a time, John, a new employee of the company “MOOCenergy”... After a brief introduction of the work environment, the first task that John needs to do is to prepare the specifications for the production of a barrel of gasoline and a barrel of diesel. Both barrels are needed for a European car manufacturer who is a client of ‘MOOCenergy’. This happens in a refinery control room as shown in Figure 1.

Once the first task is achieved, the player is promoted to production manager. He is now in charge of optimizing the operational parameters of the blends units so he can produce the products by using processes that are “ECO-efficient”. After this
task is performed, in the third week, the player is taken to the engine test facility so that he can test the fuels that he has just produced. In the engine test bench, he is asked to measure the fuel consumption, the noise level and the particulate emissions produced by the diesel fuel. Finally, in week 4, this amazing journey ends. John is going back home but he needs to limit his environmental footprint. So he is asked to choose the car, the fuel and primary energy source to limit the global CO₂ emissions (Figure 2). Even though this is a video game, the game is based on real tasks that students at IFP school might have to solve in a future job.

The advantages of this Serious Game are multiple:
- Each proposed step enables students to acquire knowledge. Students need to do a synthesis and practice in a realistic environment, in a refinery or in an engine test bench. The students are put into action, or in other words it is “Learning by doing”.
- The educational approach is student-centered and not subject-centered. This helps associate the “action” and “emotion” dimensions of education by making the learning attractive through a fun environment. Students are in the core of the game, it is they who are the masters of the environment.
- The video game produces a challenge. The students need to progress, earn points, keep up the motivation. The playful side also relieves the learning effort from the lectures.
- “To play is to experience”. This Serious Game allows a progressive learning by “trial and error”. The more the students play, the more the skills are developed.
- The problems to solve are complex. The student successfully learns the subjects of the courses in a particular context. Recent research conducted by Harvard shows that reflection on learning improves understanding, or in other words, it is “Learning by Thinking” (8). The game helps learners to develop their self-awareness of their learning process and the corresponding effectiveness (metacognition).

The Serious Game was considered a positive asset of the MOOC by 96% of the students. Moreover, it was a good complementary tool for practical work in a massive learning structure.

Figure 1. The Serious Game: during the second week of the MOOC.

Figure 2. The Serious Game during third and fourth weeks of the MOOC.
The Technological Challenges

The implementation of the Serious Game in the MOOC environment implied further technical development (9). Indeed, the game, developed by aPi-learning, based on web technology HTML5 was integrated in the open source CANVAS LMS platform, hosted by Unow. The choice of HTML5 allowed a greater compatibility across devices and operating systems. As a result, the game runs on PC and tablets, whether Android or iOS systems, with no need for any plugin installation. Doing so made it possible to cover a large population of users for access anytime and anywhere.

Besides, integrating the game in the LMS (Learning Management System) allowed us to send scores to student’s grade books. On top of that, the users accessed the game directly from the LMS, making no difference with any other course activity. The whole experience is user friendly.

In order to achieve these results, a new integration standard used for tier applications was followed in the field of educational software. This standard is called LTI or Learning Tools Interoperability (10). The principle is to be able to run a tier application and to identify a user from the LMS: the LMS sends the information regarding the users’ identity, their role and the context to the tier application. Then, the tier application sends a result or a grade back to the LMS. Consequently, the online courses are no longer restricted to quiz activities to assess learners. The use of more dynamic exercises is now possible, with greater interaction such as drag&drop, simulations and direct manipulations. This innovation challenges the current MOOC practices.

Outcomes and Perspectives

The results obtained within this first MOOC are interesting compared to the average numbers observed in other MOOCs in France:

- 49% of the students enrolled were under 25 year olds (the average for other MOOCs is between 15 and 19%). As explained previously, the target population was students in third level education interested in the energy sector.
- 3099 participants enrolled. The completion rate was 31% compared to the total enrollment. This is already a very high value considering that the average completion rate for MOOCs is around 10%. The completion rate was 59% if only the active participants are considered (an active participant is a participant that completed at least one of the assignments).

Even though the numbers that are presented are a result of multiple factors, it is impossible to deny the strong impact the Serious Game had on this MOOC. Some learners have really pinpointed the interest of the Serious Game to learn and put their knowledge into practice, as in the following examples extracted from the final evaluation form:

- "The serious games enable us to put what we just learned into practice. Therefore, we get a better understanding of the course. The fact that we can re-play them as much as we want removes the stress. It is both a pleasure and a great way to learn."

- "The serious games were the most enjoyable part of this MOOC because it is an alternative way of testing. That way a participant does not feel the subconscious anxiety and pressure that a normal test provokes but it is a more relaxed and comfortable way of testing that ensures better performance."

- "The serious game could be far more developed and replace the quiz’s that are very academic and not really interesting."

- "The serious games was great because you work like on a real job"

- "The serious games were very enjoyable ! Learning while having fun !"

With such a good results, IFP School has already planned to propose this MOOC again in November this year. Some improvements in the serious game are already under discussion to make it more real and to include different types of exercises. Additionally, another MOOC focused on Oil&Gas is under development. This second MOOC will be launched in May 2015. In this MOOC all the traditional assessment quizzes will be replaced by small interactive games based on the technology developed with the Serious Game.
Conclusion

Multiple studies have shown the benefits of using games in education. In particular, video games can trigger learners’ motivation for learning. They can also provide authentic learning experiences for learners. The Serious Game in IFP School’s first MOOC was designed to attract a young public. The drawings were done from real life environments. The exercises reflect the real work of a process engineer in a refinery or an engine engineer in a test bench facility. Even if the students are solving real life problems, the playful side helps create a favorable environment that motivates the learners. All these positive aspects are key factors for the success of the first edition of this MOOC: half of the participants enrolled were under 25 years old and 59% of the active participants completed the courses.

The introduction of a Serious Game in a MOOC emphasizes the new possibilities offered by technologies using a MOOC within an applied school environment such as IFP School whose aim is to develop skills by putting knowledge into practice.

Acknowledgements

The authors would like to thank all the faculty team, Unow and aPi-learning for their technical support. We would also like to thank all those who helped and supported us in making this MOOC a success.

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Sizing an on premises MOOC Platform: Experiences and tests using Open edX

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ABSTRACT

Proper sizing of server computer resources is a common concern for those that are thinking on deploying MOOCs in an on-premises platform. At Universitat Politecnica de Valencia we planned to deploy an infrastructure to support a minimum of 17 simultaneous MOOCs and 50000 students. As there were little resources available, we carried out a series of benchmarks both with real students and simulations to size an Open edX platform system. In this paper we describe the process followed to select a hardware configuration for UPV on premises Open edX MOOC platform (upvx.es). We started analyzing access logs from previous editions, decided a base virtual server configuration, designed a stress test using Apache Jmeter, applied it and extracted conclusions for the configuration of our production servers.

Introduction

Choosing the right MOOC platform can be a critical point in an educational strategy (Smith, 2012). There are quite a number of options available (Swope, 2014) and the answer depends on the number of MOOCs that have to be offered and the number of students enrolled on each of them. This is especially true in the case of deploying MOOCs into an on-premises platform, where the systems administrator may find more difficulties in scaling up the solution if a surge in enrollments happens.

Sizing correctly the platform is a common concern when deploying MOOCs on-premises, and there aren’t clear guidelines on how to do that task. So, when in February 2014 Universitat Politecnica de Valencia decided to go on-premises with no less than 17 MOOCs and 50,000 enrolled students, we decided that we needed a plan on how to size that platform.

In February 2014 we had been using the first version of Google Course Builder for our MOOC platform (http://www.upvx.es) for more than one year and were getting good results in students feedback and course completion (Despujol, Turro, Busquets and Botti, 2014) but a lot of things had changed in the MOOC panorama. EdX had open sourced its platform in June 2013, creating Open edX, that offered more features, a much better teacher interface and was being adopted by a growing community, so, after testing it for several months, we decided that we were going to make a gradual switch from GCB to Open edX.

In that moment most of Open edX installations were done in Amazon servers, so an increase in enrollment or student activity could be easily accommodated by increasing Amazon cloud resources, but this solution can be expensive and we had a very good server and internet infrastructure, so we wanted to have the platform running on them.

To make the platform change assuming the minimum risk, we designed a step by step change, based in making a pilot phase with 3 courses in Open edX, studying the results of this pilot courses and the server access pattern for all the courses on the edition, designing a stress test for the servers to decide the actual configuration and, if everything went ok, migrate the rest of the courses gradually from one platform into the other.

This paper describes the pilot phase, the design and conclusions of the stress test and the configuration decided for the servers of the upvx.es on premises Open edX platform, drawing some conclusions at the end.

Real world pilot phase

We had been testing the platform during several months but we needed to know how it worked in production, so we installed an Open edX production suite with a web server and a database server and ran on it 3 courses of the February 2014 edition. We chose an Excel 2010 introductory course, a regular XMOOC that had been quite popular in a former edition and 2 courses on management (Gestión participativa and Cómo implantar grupos de mejora)
de procesos) that required peer grading, a feature that wasn’t available in Google Course Builder.

The Open edX full production stack includes a web server, a SQL database server and a MONGO database server. We decided to separate the app and database server functionalities, installing them in different virtual machines. In the Open edX documentation there is a section on edX Ubuntu 12.04 64 bit installation (OpenedX 2014) where a minimum hardware recommendation for servers is included: 2 GHz CPU, 4 GB of RAM and 50 GB of free hard disk. We used an VMWare ESXi 5.1 cluster with 216 processors (519 GHz in CPU resources), 1.75 TB of RAM and 55 TB of storage, where we configured 2 servers with Ubuntu 12.04, an app server with 4 virtual CPUs, 8 GB of RAM and 38 GB of hard disk storage and a database server with 4 virtual CPUs, 4 GB of RAM and 64 GB of hard disk storage. We included scripts to make a backup everyday and to get daily data from student progression in csv files in a network drive for the teachers.

We had 3250 students enrolled in the Excel 2010 course of which 520 passed the course, 570 enrolled for the Gestión participativa course, of which 31 passed the course and 962 enrolled for the Implantar grupos de mejora course, of which 626 passed the course.

As the installation outside Amazon servers was very poorly documented and there were no scripts at that moment, we had to modify manually several configuration files and templates and we had some initial problems with the ORA (Open Response Assessment) module needed for the Peer Grading, what we think that influenced the completion rate and survey results of the 2 courses that used it. After finishing the courses we sent a satisfaction survey to the students asking them about platform speed (figure 2), platform problems, platform usability, and expectations fulfillment (figure 3). We got 6896 responses in total. The results we got for the Excel 2010 course (649 answers) were quite good and very similar to the ones of the courses that had run using Course Builder. For the two courses that used the ORA module the results were a little worse in platform speed and platform usability and significantly worse in platform problems, what we think that reflects the problems we had with the ORA module configuration at first. The results can be seen below for different courses, the columns shown inside red boxes are the courses made using Open edX.

When we look at the question about expectations fulfillment with the courses, we see again that for the Excel 2010 course the values obtained were very good and similar to the other courses, and for the other 2 courses they were slightly worse. We can see a chart with the results from different courses below.

All the above made us conclude that the 1 app server + 1 database server configuration we had used was right for the number of users we had (taking into account that the Google Course Builder courses ran in Google Appengine and had access on demand to all the resources than they needed).

Figure 1. Platform speed (top of the chart very good, bottom of the chart very slow). Open edX courses boxed.
Stress test design

So our goal was to design a significant test that allowed us to deploy confidently all courses in an on-premises platform. In order to do that we first gathered the statistics for the February 2014 edition and took them as base reference for the needs of the platform.

In figure 3 we have the Google Analytics data from the February 2014 edition, with 14 courses using Google Course Builder (45,639 students enrolled) and 3 courses using Open edX (4,790 students), what made a total of 17 courses and 50,429 students. The shortest period that you can configure to see number of concurrent sessions is 1 hour, so we got the number of 1 hour concurrent sessions during all the edition, seeing that it topped in 1,500 when the bigger courses started and declined fast after that.

Then we designed our test using Apache Jmeter (Nevedrov, 2006) as testing tool. Jmeter is a well-known Apache project that can be used as a load testing tool for analyzing and measuring the performance of a variety of services, with a focus on web applications. By using JMeter you can simulate access from a lot of users and measure the response of the system to those accesses.

Based on the 1-hour concurrent sessions we made two testing sessions: one in which we launched up to 200 concurrent sessions in 300 seconds (fast-paced scenario) and another with up to 500 sessions in 1200 seconds (slow-paced scenario). Both of them go for a number of sessions big enough to accommodate for the planned services as well as for future upgrades.

Each JMeter session was composed of a login into the platform, an access to the course progress and several randomized accesses to different courseware items, to simulate a standard student’s behaviour.

The results have been plotted in in figure 4 and using the Matplotlib library in figure 5. Due to space restrictions and for reasons of clarity we have displayed only the results of the fast-paced scenario, but the results of both tests have been quite similar and we will comment them along.

In the result of both tests we see that in the App Server the CPU usage went to 100% and in the Database Server stayed between 10 and 25%. When we look at memory usage we see that in the...
App Server it never reached 4 GB and in Database Server it stayed under 2 GB. In the other test the results were similar except that memory usage in the Database Server went up to 2.7 GB at the end of the test.

In these graphs the blue line represents the server throughput in request attended per second (right scale) and the whiskers diagrams represent the time taken by a response in milliseconds (log left scale). We can see that a server starts to saturate when the slope of the server throughput line changes and that it is saturated when it decreases when the number of requests increases. We can consider that the requests are being attended properly when the upper line of the boxes of the whiskers diagrams sits around 1 or 2 seconds. Taken this into account we can consider that a server can cope perfectly with 50 concurrent requests in 300 seconds and is a little slow with 100 requests (specially in the progress page), so we can conclude that in 300 seconds a server can attend properly a number between 50 and 100 requests (between 600 and 1200 in one hour).

**Final Deployment. Conclusions**

Considering the student access pattern from previous edition analytics (max 1,500 sessions in 1 hour) and the stress test results, we have installed 3 application servers and 3 database servers in 6 virtual machines. At first we will use DNS round robin load balancing and we will switch to a load balancer when necessary.

In the three database servers we have a Mongo database server, configuring a Mongo replica set (where one of the servers is the master that receives all the writes and the other servers are replicas that serve some of the reads). In two of the database servers we have a MySQL server installed, one attending all the read and write demands as master and the other synchronized as slave and ready to take over if the master fails.
So we have now a hardware configuration in our Open edX on premises platform that we are quite sure that will be able to cope with the expected demand of our next MOOC editions, and we know what the possible weak points are and will be monitoring them during operation. We have extracted several conclusions that can be useful to anyone thinking about installing an Open edX platform on their premises:

- 1 server for apps+1 server for databases works well for 5000 enrolled students
- For 15 to 20 courses with 50,000 enrolled users you can expect a maximum of 1,500 sessions per hour
- 1 server can handle well 50 sessions in 5 minutes (600 sessions per hour)
- Open edX Servers work well in Vmware virtual machines
- App servers didn’t use more than 4 GB of RAM and database servers never used more than 3 GB
- Apache Jmeter is a good tool for load testing
- App server is more critical than Database server in CPU resources usage
- The MySQL server is most stressed when the instructors are extracting statistics from the courses
- Careful synchronization of servers is require to avoid inconsistencies in user experience
- ORA module configuration and use needs careful attention of platform administrators and instructors

References

From MOODLE to MOOIN: 
Development of a MOOC platform

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ABSTRACT

With mooin, the Lübeck University of Applied Sciences builds its own MOOC platform upon the open source learning management system (LMS) Moodle. To gather the needed features, experiences with MOOC platforms, known challenges and further objectives were analysed. Consequences for the platform development were derived in the fields of media design and mobile access, social media integration, sustainability and gamification – among them a number of interesting features for further experiments.

Introduction

Since 2013, Lübeck University of Applied Sciences (Fachhochschule Lübeck: FHL) hosted two MOOCs: Grundlagen des Marketings (German for Fundamentals of Marketing) and the HanseMOOC (History of the Hanseatic League). Each MOOC had been held twice so far. After running the first HanseMOOC on the Learning Management System (LMS) Moodle – already with a number of extensions – the following MOOCs had been enrolled on iversity, a German MOOC platform. Especially regarding control and sustainability of future MOOCs (FHL is to run more than 40 MOOCs until 2020) we decided to develop our own MOOC platform mooin (Massive Open Online International Network, https://mooin.oncampus.de/) and to run the first MOOCs there in March 2015.

The paper describes the identification of basic and extended features for mooin. We refer to three common sources of inspiration in the second section: own and literature-based experiences and thus known challenges for MOOC platforms as well as further objectives that are pursued at FHL. Consequences of this analysis are described in section 3, closing with an outlook on the mooin roadmap in section 4.

Experiences with MOOC Platforms: State of the Art and MOOCs by Lübeck

The well-known US MOOC platforms Udacity (https://www.udacity.com/), Coursera (https://www.coursera.org/) and edX (https://www.edx.org/) were founded in 2012 (cf. Schulmeister, 2014). But also in German-speaking countries a number of platforms have emerged, like iiversity (https://iversity.org/), OpenHPI (https://openhpi.de/), Leuphana Digital School (http://digital.leuphana.com/), or iMOOX (http://imoox.at/). Out of these flagships, a number of features required for developing a MOOC platform can be identified. Schulmeister (2014), a German researcher who empirically analysed several MOOC platforms and courses, names three key and thus minimum requirements:

1. Providing learning content, predominantly video formats,
2. Functionality for integrating short tests between learning units, and
3. Offering communication channels to the participants.

Kay et al. (2013) provide a comparison of according sub-features, e.g. embedding of external videos or task types for quizzes, for main US platform providers. They also discuss the role of native Learning Management Systems (LMS) as a MOOC platform: While native LMS provide a wide variety of functionalities, specific MOOC platforms are highly specialised in key features like video embedding.
Thus, the approach of enhancing native LMS by extra support for video content is not new. E.g. CourseSites by Blackboard (https://www.coursesites.com/) or openHPI by Hasso Plattner Institute are based on LMS software. Meinel et al. (2013) describe requirements they pose to eligible open source LMS as a basis for their MOOC platform openHPI (they finally chose Canvas LMS, https://github.com/instructure/canvas-lms/wiki). These features include:

- Landing page with descriptions of offered courses,
- Sequencing of learning units,
- Representing learning progress and efforts,
- Publishing news, as well as
- Common non-functional requirements as system maturity, scalability, extensibility or usability.

Overall, the approach to use native learning management systems for the implementation of MOOCs has been proven in some examples. With a view to institutions of (higher) education as (potential) organizers of MOOCs, the guest role is another requirement regarding the use of current systems. Users assigned as guests normally have reading access to the system, interactions with course material and participants is limited with few interactive features. Often, guests do not need to reveal their identity and appear as "Guest" only. Until now, LMS had been mainly used internally for closed courses. Whereas Schulmeister (2005, p. 78) yet denies guest roles as a needed feature for higher education, the open character of MOOCs demands an open access to courses also for learners beyond institutional borders.

### Table 1: MOOCs by Lübeck

<table>
<thead>
<tr>
<th>URL</th>
<th>HanseMOOC</th>
<th>Fundamentals of Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st run</td>
<td>2nd run</td>
</tr>
<tr>
<td><strong>Platform</strong></td>
<td>Moodle (extended)</td>
<td>iversity</td>
</tr>
<tr>
<td><strong>Course</strong></td>
<td>04.04.-06.06.2014</td>
<td>06.10.-20.11.2014</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>1252 + unknown number of guests</td>
<td>830</td>
</tr>
<tr>
<td><strong>Assessment Options</strong></td>
<td>Badges after finishing chapter 4 (Citizens), 6 (Merchants), 8 (Hanseats) and 10 (Senators)</td>
<td>certificate</td>
</tr>
<tr>
<td><strong>Completion Rates</strong></td>
<td>12% Citizens (146), 11% Merchants (142), 10% Hanseats (125), 9% Senators (107)</td>
<td>18% cert. (149)</td>
</tr>
<tr>
<td><strong>Facebook</strong></td>
<td>415 likes</td>
<td>903 Likes (668 after first run)</td>
</tr>
<tr>
<td><strong>YouTube</strong></td>
<td>ca. 26.000 clicks</td>
<td>ca. 70.000 clicks</td>
</tr>
</tbody>
</table>

In Lübeck, we gained experience with four MOOCs (see table 1) on two MOOC platforms and thus different infrastructure and features. Additionally, we used further tools like Zeemaps (https://www.zeemaps.com/) to create a map of participants’ location, or several social media tools like Facebook, Twitter, or YouTube for promotion and sharing. Videos had been produced in various ways, like using green screen or outdoor shots. Due to platform functionality, these video contents were put in sequences with quizzes or tasks for individual work. By the evaluation of our MOOCs and regular online courses, we could gather more requirements for our future courses, e.g.:

- Clear descriptions of courses and contents,
- Greater involvement of Facebook, more information on social networks,
- Access for mobile devices (our internal analytics reveal that 10% of online course material, 13% of Moodle logins, 15% of HanseMOOC participants and even 23% of YouTube clicks are done by smartphones or tablet PCs), and
- Privacy and provision of cheating (especially for qualifying exams).
Known Challenges: Sustainability and Dropout Rate

Next to common challenges of regular online courses, like production, keeping up to date or technical barriers, there are two main points that are often discussed for MOOCs: sustainability and dropout rate.

After the first Hype (Johnson et al., 2013; Lowendahl, 2013) and following MOOC experiments, questions of sustainability have become more and more important. Funding campaigns like by the German Stifterverband (https://moocfellowship.org/) as well as the increasing number of MOOC platforms might have lead to a rapid growing of courses and awareness of MOOCs within the education community, but discussions on business models are not finished yet (cf. Mazoue, 2013; Schulmeister, 2014). Whereas the understanding of “open” has several dimensions, like open access to contents without institutional boarders or use of open educational resources, for the most part of the MOOCs, it means that the courses are out of participation fees.

Obvious approaches for refinancing MOOCs by charging examination fees failed because of high dropout rates (Chafkin, 2013; Jordan, 2015; Schulmeister, 2014). Reasons for not completing a MOOC are diverse (Khalil & Ebner, 2014):

• Lack of time,
• Learners’ motivation,
• Feelings of isolation and the lack of interactivity in MOOCs,
• Insufficient background knowledge and skills, or
• Hidden costs may prevent that participants would not even reach the possibility to take part in a final course exam and thus pay fees for it.

Further Objectives: Openness, Fame and Marketing

Some decisions that may shape the range of functions of our MOOC platform result from further objectives we follow by the integration of MOOCs into our overall study program.

The platform should be open. That means for us, that it is easily accessible: No need for affiliation or institutional membership should be necessary, it should have a clear and highly usable design and there should be few data needed for registration.

But at an early stage, we had to give up providing an anonymous access without any registration or pseudonymous fake accounts. Our experiences from the first HanseMOOC, as well as from other German MOOC projects (Lorenz, Müller, Stritzke, & Morgner, 2014) revealed problems for analytics and evaluation: there were no reliable data on participant numbers or completion of courses as well as problems to reach participants for surveys. Furthermore, we would not have any chance for integrating personalised (learning) features like gamification by high score lists.

Not least, FHL wants to win fame and raise marketing success with its MOOCs by strengthen its own brand. After the HanseMOOC ran on iversity, FHL preferred the flexibility, control and uniqueness of an own MOOC platform than being “just a user number” and therefore dependent on their development agenda. Although the hype on the learning format seems to calm down, there are only few institutional MOOC programs in German speaking countries driven by academic institutes (e.g. iMOOX, OpenHPI). Thus, the early adaption and gaining of competences in this field could be a competitive advantage. Strengthen FHL as a brand for high-quality MOOCs will hopefully also attract students for its further education programs.

Consequences for MOOIN

Based on the discussed issues above, we conducted a list of features for mooin in addition to the basic functionality of Moodle. FHL can build on more than 8 years of experiences with this open source platform: as partner of the Virtuelle Fachhochschule (virtual university of applied science, VFH) responsible for the technological infrastructure and a team of more than 50 people including an own department for system development. Most of the following points can be seen as principles for platform and course design that had been regarded and implemented from the start. Some of the points, like gamification or payment models, are also already planned and implemented in terms of functionality, but to provide rather an environment to test several application scenarios with our MOOCs and identify sustainable configurations. Due to the open source license and our common sense of developments for open education, all (modified) source code will be published at GitHub for reuse after successful testing.

Media and Mobile Access

“Fat media” and “mobile first” are our interface design mantras. The MOOCs running on mooin will mainly consist of video content, large photographs and illustrations. To get interaction as close as possible to the media, we integrated Capira (https://capira.de/), a tool to put quizzes directly into the video: the video is loaded from our YouTube channel, stops to display a question and gives direct feedback if the answer was correct. In this way, we keep pages with learning content as simple and clear as possible.
Next to usability aspects, it also supports the development with responsive web design and thus the access to our platform with mobile devices.

**Social Media**

Next to discussion forums directly on the platform, we further encourage learners to discuss and build networks. We also kept the option to appear in the list of participants as well as to be shown in a map of learners’ locations. Facebook, Twitter and Google+ buttons are prominently located at the mooin start page and link to our profile pages. Each course has an own Twitter hash tag, users can leave links to their Social Network accounts on their profile page. Due to users’ privacy, all of these features can be used on a voluntary basis.

With that support of learners’ communication, we also pursue a second target: marketing. Sharing our courses on Social Networks may not only win further participants for our MOOCs, but also awake interest for the regular (online) study program at FHL. For the same reason, we will upload all videos to YouTube.

**Sustainability**

We take a series of measures to pave the way for a long life of the mooin platform and courses. Each course is planned to be offered at least three times, further runs are also welcome (this often depends on available course instructors). All courses will be evaluated for continuous improvements. Furthermore, achievements within some MOOCs can be acknowledged by our regular study program. Therefore, MOOCs in the disciplines of entrepreneurship, media computer sciences and industrial engineering are provided within the project “professional MOOC (pMOOC)” (cf. Granow, Dörich, & Steinert, 2014). We are experimenting with several configurations for business models enabled by the integration of LaterPay (https://laterpay.net/) and thus micro payment for selected course elements. Although we prefer the provision of our courses as open educational resources (OER) under a free license like creative commons, we also want to keep the platform “open” for a wide variety of course concepts and revenue models.

**Gamification**

As mentioned above, dropouts are one of the most discussed problems of MOOCs and their acceptance for institutions of higher education. Thus, we want to motivate and support those learners that want to finish a MOOC. Of course, course instructors and the course community are first persons in charge to get help. With the integration of digital badges in the first HanseMOOC, we also have made first experiences with the concept of gamification. Our mooin platform also supports digital badges and we will experiment with further gamification features, as progress bars, rankings and high score lists.

But on a side note, we do not primarily follow the target to present high completion rates. We surely want to acquire a high number of learners, but we are also pleased it they just select some units of individual interest. We see MOOCs as a chance for higher education to open up for a wider audience and thus more people should get easy access to higher education.

**40 MOOCs until 2020**

Until 2020, FHL will provide more than 40 MOOCs for several target groups. In spring 2015, we start with our tried and tested MOOCs (“Grundlagen des Marketing” and HanseMOOC) as well as with three new ones on the subjects video editing, project management and digital identity, whereas the last one is provided in cooperation with the Volkshochschulen (adult education centers) of Hamburg and Bremen. In autumn 2015, the next five MOOCs will start including first English-speaking courses.

We received very positive feedback from the Moodle community at the German MoodleMOOT 2015 in Lübeck (http://moodlemoot.moodle.de/). On the other hand and despite to our very competent development team, rising an own MOOC platform is hard work. Without experience and competence in system development, we would always suggest hosting your MOOCs on third-party platforms, as it was a suitable solution for our first MOOCs. Due to our long-term plans and intended experiments to develop this educational format, relying on a third-party platform might have been the more risky way for our MOOC development plans.
References


UCL’s Extended Learning Landscape

Matt Jenner and Fiona Strawbridge (University College London, UK).

ABSTRACT

UCL did not directly get on board with a major MOOC platform; instead we ran a meta-analysis to follow from afar. Using the outcomes from others, we collated a broad selection of what we saw as the benefits of MOOCs and, in particular, the capabilities being developed by other practitioners. With this we developed our own online learning environment which offers a range of courses which do distinctive things in their own niche areas. This activity has given us a set of capabilities, discovery of our shortcomings and a new range of courses which have elements of scale, open, online and course – but not necessarily all four simultaneously.

Benefits of MOOCs

As the MOOC marketplace continues to become more crowded any early benefits may have diminished, but in their place is emerging an appreciation of other ‘collateral’ benefits. With MOOCs forming part of a strategic approach towards opening up institutional education; capacity-building in areas such as educational media production; and integrated, evidence-based development of non-traditional delivery formats, primarily blended learning are becoming a priority. As the very large numbers of learners reported by early US MOOCs are less likely to be repeated there also seems to be a trend towards more targeting of courses to specific professional or demographic audiences. This requires market research and target-specific marketing, but potentially will reach more committed participants. At UCL we’re looking towards the future of MOOCS being a component of what we call the ‘extended learning landscape’ – a platform and ideological perspective in which to support and promote new initiatives for enhanced learning experiences.

We collected a summary of collateral benefits from being an active MOOC institution (see Table 1). Data was obtained from top-tier US and European HEIs (Jenner, 2014).

Table 1 - Some benefits of MOOCs

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<tbody>
<tr>
<td>1.1 Encourage engagement</td>
<td>2.1 Inform diversification strategies</td>
<td>3.1 International collaboration</td>
<td>4.1 Encouraging open education</td>
<td>5.1 Digital literacies</td>
</tr>
<tr>
<td>1.2 Targeting alumni</td>
<td>2.2 Create new capabilities</td>
<td>3.2 Widening participation</td>
<td>4.2 Effective service disaggregation</td>
<td>5.2 International experience/globalisation</td>
</tr>
<tr>
<td>1.3 Outreach</td>
<td>2.3 Educational research</td>
<td>3.3 Beyond traditional markets</td>
<td>4.3 Creating meaning from analytics</td>
<td>5.3 International communities</td>
</tr>
<tr>
<td>1.4 Marketing gains</td>
<td>2.4 Enriched online resources</td>
<td>3.4 Pioneering platforms</td>
<td>4.4 Pedagogical experimentation</td>
<td>5.4 Mixing internal &amp; external cohorts</td>
</tr>
<tr>
<td>1.5 Media coverage</td>
<td>2.5 Interdisciplinary courses</td>
<td>3.5 New sources of revenue</td>
<td>4.5 Expanded media capacity</td>
<td>5.5 Accreditation and (micro) credentialing</td>
</tr>
<tr>
<td>1.6 Modern approach</td>
<td>2.6 Student recruitment</td>
<td>3.6 Translation of resources</td>
<td>4.6 Copyright skills/knowledge</td>
<td>5.6 Cross/co-curricular opportunities</td>
</tr>
</tbody>
</table>
Creating our own public-facing online learning environment

UCL has had an institutional virtual learning environment for around 10 years. Since 2008 it has grown in usage from supporting around 5% of courses to now >95% of all taught courses having a VLE presence. It is internally facing and closed to the world.

Measurable growth

To provide some measurable analysis of the VLE we adopted a Baseline model (UCL E-Learning Guidance, 2015) by which all courses were able to self-certify against. The basic idea was the Baseline was ‘just enough’ to support studies, and if consistent, would help provide a consistent minimal experience for all students. Anyone above this minimum standard could further align to either Baseline+, Enhanced or Enhanced+ - these meant the course met or exceeded the set minimum standard. No courses were put through rigorous evaluation but equally, aligning to the baseline was not too demanding, which encouraged acceptance. Since then the baseline has been raised, or enhanced, which raises the overall profile of e-learning for the university if courses still align towards it.

Access

The VLE growth was exceptional, but in conjunction came questions of access and how people external to UCL could get into a course. Often the examples were partnerships with other organisations or groups and the default Guest / read-only access was not enough. Opening up the VLE to anyone meant exposing potentially sensitive content (such as Child Health) and the balance between the walled garden of the VLE and open access was jostled.

Open registration

The VLE requires a computer account & providing anyone these are cost prohibitive, so we sought alternative solutions. We opted for a new VLE: designed to be open for registration and contain courses designed for a wider target audience. Despite being evaluated against other competitive online learning environments, including MOOC providers, we opted for a new instance of Moodle to be the basis of our public-facing, open registration, online learning environment.

Open the VLE

This new platform is branded UCLeXtend and is designed to provide courses where potentially anyone can register and take part. The original scenario presumed supporting short courses and Continuous Professional Development (CPD) but we left the remit open for interpretation by the university community. The technical platform is quite simple; there is a front-end course listing/catalogue and then a back-end Moodle-based learning environment. To take care of payments we have a third-party payment provider which can process credit or debit cards. From the outset we knew opening the VLE would provide us with a few teething issues, we pinned these as financial, legal and quality. We were mostly right.

Financial

Around half the courses currently on UCLeXtend are charging for access, these typically tend to be for CPD purposes. The site offers a range of free courses which shows that making money is not the primary driver for our academics or teaching departments. Being sustainable generally means achieving some income: and we’ve seen this maturing within major MOOC platforms with charging models for certification etc. Currently 100% of the income from UCLeXtend courses are directed to the teaching department, there’s no operational charges.

Legal - not a student

A critical component of this new environment was that anyone who registered would not instantly become a registered student at UCL. This means they do not have the same rights or privileges as a matriculated student. Instead they were simply registering to be active in an environment. We had to be very clear to all registered users they were not registering to become students of UCL and UCLeXtend forces all users to agree to Terms and Conditions which cover this area.

Legal – ownership of content

The legal issues that arose were mostly around the ownership of content and the license or permission to use it for a public-facing course. Having such relative freedom within the private VLE suddenly showed how much one might take advantage of using unlicensed intellectual property. UK copyright law is somewhat friendly towards the use of licensing of materials for educational purposes, UCLeXtend is technically a commercial venture (even for free courses) which means all content must be appropriately licensed. This remains a challenge, especially when courses contain subscription-based content from journals or expensive books which were previously copied
Quality
The ownership of content is not the only quality issue, courses would be open to a potentially high-level of public scrutiny. This provided a challenge, as courses needed to undergo some form of review. A group were initiated who oversee all courses going live. Membership comprises of academics, business owners, library and e-learning staff.

Their approach, originally ‘like a viva’ was stressful and received negative response. While rigorous it was too heavy. Once lightened into a peer-review feedback indicated, surprisingly, the exercise is now met with appreciation from the academic community. Experience has shown that many leave their comfort zone when creating courses in this space; the quality review process (see Figure 1) provides a grounding exercise to check courses and provide feedback during a time of adopting new teaching approaches.

Courses so far
In December 2014 UCLeXtend had 21 courses go live since launching in 2013 (see Figure 2). The course catalogue provides the functionality for courses to hold a mix of attributes which changes discovery, registration and the approach to learning.

Of these courses so far the majority of courses are delivered fully online to an open audience. The split between the learning approach (cohorts and self-paced) and the cost (free or charged) are both near even.

Extended UCL
The diversity of courses entering UCLeXtend has highlighted that not every public-facing course is the same and what we thought was short courses or CPD is actually much more diverse. To help understand we categorised existing courses and liaised with colleagues over future plans. We developed what we consider a learning landscape and provides us a lens in which to observe this activity.

We also hadn’t given up on running MOOCs – so rather than viewing everything in isolation we see them as part of an ecology of extended education across the institution, as shown in Figure 2. UCL already has a significant public presence via web sites, social media, iTunesU, YouTube etc. We now have a fast-growing ‘controlled’ space on

Figure 1 - The course lifecycle contains at least two quality review points; during Planning and Going live
UCLeXtend. Our internal Moodle platform is established and a core component of our blended campus-based and credit-bearing distance learning environment.

The UCL E-Learning Environments team collated all ‘types of offering’ and created an ‘Extended Learning Landscape’ (see Figure 3) which also outlines the potential impact of the various offerings. We take impact to include potential audience size; potential revenue; potential impact on reputation; and potential to lead to or support continued study. The coloured rows denote impact, columns denote audience type and colour indicates potential delivery platform.

Three significant challenges arise from this emerging mixed-mode landscape;

1. Ensuring that the learning experience of the participants reflects the aspirations, culture and style of UCL.
2. Learning from internal and external experience to ensure that our external activities and offering are evaluated and disseminated internally.
3. Managing the ‘digital estate’ to enable a seamless and coherent experience for participants regardless of which platform they are on. Figure 3 - UCL’s Extended Learning Landscape

Some of these offerings exist already (blended and distance learning; CPD and Executive Education); others are in development or being planned (widening participation, research dissemination); others exist in a more dispersed way (iTunes U, YouTube, UCL OERs, ‘guest-accessible’ resources in Moodle); others have yet to be developed (taster courses; pre-enrolment; MOOCs).

Institutional oversight and coordination is needed to ensure that this extended learning landscape is developed in line with emerging institutional strategic priorities.

Concluding thoughts
Since launching UCLeXtend we have seen a growth in interest in academics wanting to ‘launch a mooc’, develop CPD courses online and talk ‘instructional design’. We have a platform that can host a whole range of courses but there’s still a gap in our capability; building high quality courses. Luckily we have learned a lot from MOOCs and our own experiences. UCL has a small number of distance learning, credit-bearing courses but they benefit directly from this activity. We plan to further enhance or UCLeXtend offering, we’re still planning MOOCs and with all this we plan to refine our educational development frameworks, toolkits and capabilities so we can raise the baseline even further and offer students a research-based blended learning experience that puts them in the centre of a connected, high quality education.

References

RESEARCH TRACK
Proceedings of the European MOOC Stakeholder Summit 2015
How Do In-video Interactions Reflect Perceived Video Difficulty?

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ABSTRACT

Lecture videos are the major components in MOOCs. It is common for MOOC analytics researchers to model video behaviors in order to identify at-risk students. Much of the work emphasized prediction. However, we have little empirical understanding about these video interactions, especially at the click-level. For example, what kind of video interactions may indicate a student has experienced difficulty? To what extent can video interactions tell us about perceived video difficulty? In this paper, we present a video interaction analysis to provide empirical evidence about this issue. We find out that speed decreases, frequent and long pauses, infrequent seeks with high amount of skipping and re-watching indicate higher level of video difficulty. MOOC practitioners and instructors may use the insights to provide students with proper support to enhance the learning experience.

Introduction

Massive Open Online Courses (MOOCs) have swept online education into the mainstream. Most popular MOOC providers, exemplified by Coursera, Udacity and edX, are featured with video lectures, quizzes, tutorials, discussion forums and wikis. With thousands of learners taking MOOCs, learning analytics is making a big leap forward. One typical usage of such big educational data is the attempt to model students’ learning behaviors in terms of their social engagement (Brinton, Chiang, Jain, Lam, Liu & Wong, 2013) and video interactions (Kim, Guo, Seaton, Mitros, Gajos & Miller, 2014). Such models are then used for predicting students’ dropout (Halawa, Greene, & Mitchell, 2014; Sinha, Li, Jermann & Dillenbourg, 2014) and performance (Jiang, Warschauer, Williams, O’Dowd & Schenke, 2014), analyzing demographics (Guo & Reinecke, 2014) and engagement (Kizilcec, Piech & Schneider, 2013) etc.

Since video lectures are the major means for delivering MOOC content, analyzing video interactions has received much research attention. Existing research involving video analysis typically only takes into account macro-level video activity features, such as the number of videos watched (Anderson, Huttenlocher, Kleinberg & Leskovec, 2014), engaging time (Guo & Reinecke, 2014) as well as the navigation styles (Guo, Kim & Rubin, 2014), except for few recent attempts that scale the analytics down to the click-level (Halawa, Greene & Mitchell, 2014; Kim, Guo, Seaton, Mitros, Gajos & Miller, 2014; Sinha, Li, Jermann & Dillenbourg, 2014). Compared to macro-level video activity features, click-level in-video analysis allows MOOC instructors to closely examine how a student interacts with each video lecture, e.g. what types of video interactions are employed, when they happen and how intense they are. This information further reflects the students’ learning status, such as encountering problems during watching the videos, which may provide opportunities for the MOOC practitioners to design proper interventions to support the students’ learning experience.

However, existing MOOC research literature lacks click-level video analysis that helps us infer students’ mind states, e.g. the perceived difficulty of different videos. Our research aims to fill this research gap by providing an empirical investigation of different types of video interactions. Our key research questions are:

1. Do in-video interactions reflect students’ perceived video difficulty?
2. If yes, then how do video interactions of different types and intensities correlate with the difficulty?
By answering these questions, we will gain insights on the effects of video interactions, which has the potential to help the instructors identify the videos that a particular student may have trouble with. In the long run, detecting problems and providing support is likely to increase the students' engagement with MOOC and reduce the dropout rate.

In-Video Interaction Analysis
This paper involves analyzing in-video interactions. Such interactions typically only include limited types of actions, each of which is associated with a time span. Researchers have started investigating in-video interactions well before the MOOC era. In the mid-1990s, Dey-Sircar et al. applied Markov model to develop a tool for evaluating video system designs (Dey-Sircar, Salehi, Kurose & Towsley, 1994). Research work (Shenoy & Vin, 1995) and (Li, Liao, Qiu & Wong, 1996) both apply Markov chains to formulate an effective way of fast-forward/rewind service. These early research works mainly focused on video systems and quality-of-service issues. Research that attempted to understand and model video click behaviors did not come to light until late 1990s, when Branch et al. found that video interaction behaviors, in terms of the time spent on each viewing mode (i.e. play, pause, fast-forward, fast-rewind) can be modeled with lognormal distributions (Branch, Egan & Tonkin, 1999). In order to identify interesting video segments reflected by the users’ video interactions, Syeda-Mahmood et al. designed a user study with MediaMiner system (Syeda-Mahmood & Ponceleon, 2001), where they trained a Hidden Markov Model to learn from the ground-truth browsing states explicitly indicated by users. The goal was to generate video previews that best represent interesting video segments. All of the above studies were conducted in the time when the control menu of the video players were restricted to only continuous interactions, lacking discontinuous interactions (i.e. allow jumping between discontinuous time positions) that are common in today’s player controls, such as seeking forward/backward. These discontinuous interactions were only included for analysis in a recent study by Gopalakrishnan (Gopalakrishnan, Jana, Ramakrishnan, Swayne & Vaishampayan, 2011). However, compared to the continuous interactions, the duration of discontinuous interactions has different meanings, i.e. they refer to video player time instead of the actual time spent on the states, since these actions last for a negligible amount of time, but may result in skipping a large amount of video content.

Method
Our study is based on two undergraduate MOOCs offered in Coursera: “Reactive Programming (RP)”, which covers advanced topics in programing and “Digital Signal Processing (DSP)”, which is an entry-level Electrical Engineering course. An in-video survey is placed at the end of each video (See Figure 1) during the enactment of the courses. Only one question was asked: How easy was it for you to understand the content of this video? These surveys are posteriori evaluations that were answered by the learners right after they finished watching the video, providing ground-truth knowledge that allows us to reveal the hidden relationship between the video interaction and the perceived video difficulty. The surveys were not graded, so the students participated voluntarily. The responses were then coded with integer values from 1 to 5 to represent the difficulty ratings from “Very Easy” to “Very Difficult”.

Figure 1. End-video surveys about perceived video difficulty.

On the MOOC platform, the students are allowed to watch videos as many times as they wanted, but the number of views per video varies. Table 1 lists a descriptive overview of the video sessions of the two courses separated by the video visiting time (either first-time visit or revisit). As students who find videos more difficult are more likely to revisit them, the average difficulty in the revisiting sessions is higher. In this study, we do not investigate video revisiting behaviors and will only focus on the first-time visiting video sessions.
Many students left in the middle of the videos, leading to the so-called in-video dropouts. During the enactment of the two courses, Coursera did not always successfully log the time when in-video dropouts occurred. We filtered out the video sessions that did not contain any video interactions in the last 10 percent lengths of the videos. This eliminates the sessions with early in-video dropouts. The remaining dataset is our target, which contains only the video sessions where the students almost reached to the end. We also removed data entries containing inconsistent timestamps or event types. Finally, we keep 188,138 video sessions with 79.0% survey response rate for the RP course, and 28,994 sessions with 60.8% response rate for the DSP course.

Video Interaction Profiles
Coursera supports four different types of video controls, namely, play/pause (toggle), seek forward, seek backward and adjust video speed. Multiple types of interactions can coexist in the same video sessions, and the effects may interact with one another. For example, a student may pause a few times and increase the play speed in the same video. Then the rated video difficulty may relate to the effects of both interactions. Any of the four interactions can coexist, resulting in complex interactions. As an initial exploration, this paper aims at understanding each individual type of interactions, so analysis of complex combinations are left for future analyses.

We divide the dataset into subsets of interaction profiles. Each of the four video controls is associated with a simple video interaction profile, which we name as pausing, skipping, replaying and speeding respectively. Video sessions with a combination of interactions are called mixed-interacting. In addition, the video player in Coursera is found to maintain cross-video video speed consistency. That is, when a user changes the speed for a video, the new speed is kept as default for her subsequent video sessions. In other words, video sessions without speed changing events may be found to start with higher or lower speed. This phenomenon introduces a new speeding profile called implicit-speeding. The sessions with explicit speed changing events are referred to as explicit-speeding.

By naming the sessions without any video interactions as silent, we finally obtained 6 simple and 1 complex interaction profiles (mixed-interacting) as summarized in Table 2. The three rows (up to down) describe the number of video sessions, the proportion of videos and the average difficulty for each profile.

Note that we only consider whether or not specific types of video interactions occur in the sessions, e.g. the video sessions with replaying profile contain only backward seeks but nothing else, regardless of how much content is replayed. For the pausing profile, we ignore pauses shorter than 2 seconds (probably accidental pauses) or longer than 10 minutes (long breaks). Automatic pauses generated by in-video quizzes are also not considered.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>Videos</th>
<th>Active learners</th>
<th>Visit</th>
<th>Sessions</th>
<th>Response rates</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP</td>
<td>36</td>
<td>22,794</td>
<td>First</td>
<td>265,493</td>
<td>49.1%</td>
<td>2.699</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Revising</td>
<td>205,501</td>
<td>23.7%</td>
<td>2.837</td>
</tr>
<tr>
<td>DSP</td>
<td>58</td>
<td>9,086</td>
<td>First</td>
<td>58,349</td>
<td>32.8%</td>
<td>2.478</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Revising</td>
<td>59,610</td>
<td>12.7%</td>
<td>2.593</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE</th>
<th>Non-Interactive</th>
<th>Interactive</th>
<th>Silent</th>
<th>Implicit-Speeding</th>
<th>Explicit-Speeding</th>
<th>Pausing</th>
<th>Skipping</th>
<th>Replaying</th>
<th>Mixed-Interacting</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP</td>
<td>35,873</td>
<td>2,856</td>
<td>22.54%</td>
<td>6.22%</td>
<td>3.86%</td>
<td>17.46%</td>
<td>1.79%</td>
<td>3.45%</td>
<td>44.68%</td>
</tr>
<tr>
<td></td>
<td>5,479</td>
<td>1,084</td>
<td>18.90%</td>
<td>3.05%</td>
<td>1.82%</td>
<td>19.12%</td>
<td>3.74%</td>
<td>3.12%</td>
<td>50.25%</td>
</tr>
<tr>
<td>DSP</td>
<td>5,479</td>
<td>905</td>
<td>2.51</td>
<td>2.41</td>
<td>2.30</td>
<td>2.43</td>
<td>2.64</td>
<td>2.60</td>
<td>2.51</td>
</tr>
</tbody>
</table>
In Table 2, three interaction profiles stand out. In both courses, nearly half of the video sessions contain more than a single type of video interactions (mixed-interacting); one fifth of the video sessions (silent) contain no interactions at all; pause (pausing) is the most frequently used video interactions. Table 2 also shows that the interaction profiles reflect different perceived video difficulty: the explicit-speeding profile indicates the least perceived difficulty, while pausing, replaying as well as mixed-interacting inform that the students may have more difficulty.

In the upcoming sections, we will extract video interaction features for the simple profiles and build regression models to deeply investigate the relationship between video interactions and perceived video difficulty. Note that the perceived difficulty may depend on user-specific characteristics. Having several observations per user in our dataset allows us to adopt a mixed model, where user is modeled as a random effect. Mixed models are known to be robust to missing values and unbalanced groups. In addition, least-square means (hereafter referred as LS means) mimic the main-effect means but are adjusted for group imbalance. These methods are used throughout our analysis. We will only report the analysis of the RP course due to its larger size, however the results for the DSP course are analogous.

**Implicit-Speeding Profile**

Video sessions of implicit-speeding do not contain video interaction events, but are started with an initial speed other than 1.0. As discussed before, the initial speeds are inherited from previous sessions. It is arguable that the choice of video speed may depend on the students’ language skills or personal preferences. However, in the video sessions with very high or low speed, we find the voices are significantly distorted. We then argue the speed may also relate to other factors, such as the perceived video difficulty.

In this section we attempt to model the effect of initial speed. Coursera video player offers 7 levels of speed from 0.75 to 2 with a stepwise change of 0.25. We compute the LS means for the video sessions with different initial speeds and show the means with confidence intervals in Figure 2. The two numbers separated by a slash (/) under each category are respectively the number of survey responses and the total number of video sessions in the corresponding category.

**Finding 1: Implicit-speeding shows a negative linear effect on the perceived video difficulty.**

Figure 2 shows a linear relationship. Considering the levels are numeric, statistically we assess the effects with a mixed linear model, which shows significant negative effects ($\beta = -0.08, 95\% CI = [-0.10, -0.05], p < .0001$). That is, an increase of 0.25 video speed results in an average decrease of perceived difficulty by 0.08.

![Figure 2. LS Means of Video Session with Different Initial Speed](image)
Explicit-Speeding Profile

Compared to the implicit-speeding sessions, students explicitly change the video speed in the explicit-speeding video sessions. We hypothesize that the following features may relate to the perceived difficulty:

1. **Frequency of effective speed ups/downs.** When we count the frequency of speed change events, we group the speed ups/downs that happen within 10 seconds as a single event, because the learner may simply try out different speeds during this period. We do it for both up and down events, and call these new events effective speed ups/downs.

2. **Amount of average speed change.** In order to obtain the average speed change, we first compute the average speed for the video session, which is the weighted arithmetic mean of the video speeds at all video seconds. Then, we subtract the initial speed from this average to obtain the amount of average speed change.

Considering the initial video speed may influence the analysis of these features, we analyze the video sessions that are started with 1.0, which are the most common observations (36%) for this profile. Both features are continuous, and are distributed empirically lognormal. The average speed changes are of ratio values ranging between -0.25 and 1.0, while the 99% frequencies are integers less than 8. The relationships between the features and the perceived video difficulty are not necessarily linear, so we build Generalized Additive Mixed Models (GAMM) for the analysis. Compared to Generalized Linear Models (GLM), GAMM fits the data points with a spline smoother, which is able to capture non-linear relationship. Our reported statistics will include the estimated degrees of freedom (edf) together with the p-value of an F-test that test whether the smoothed function significantly reduced model deviance. This GAMM modeling technique will be used primarily throughout this paper for analyzing continuous, widespread features.

**Finding 2: Speed-down frequency has a positive linear effect, while the amount of average speed increase has a monotonically negative effect till saturation point 0.4**

Our multiple GAMM regression model with the frequency of speed ups/downs and average speed change as explanatory variables shows that the frequency of the speed-ups does not significantly correlate with perceived difficulty (p=0.73), but the other two have significant effects. The effect of speed-down frequency is positively linear ($\beta = 0.06$, 95% CI = [0.02, 0.09], p < .005), while the effect of average amount of speed change is non-linear with (edf = 2.683, p < .0001) as depicted in Figure 3.

As for the finding of the speed changing frequency, it should be noted that the analysis is based on a subset of video sessions that are started with speed 1.0. There are more higher speed options than lower in this condition. However, we find out that the effect of the speed-up frequency is not significant, while the frequency of change in the other direction is significant. In fact, frequenter speed-downs are only possible if the video speed had already been increased before. Keeping the amount of speed change constant, it is interesting that the events that revert the video speed are stronger indicator of higher video difficulty.
As expected, the amount of speed change negatively correlates with the perceived video difficulty. This effect is only prominent when the amount is less than 0.4, after which the effect saturates. Further increases do not significantly reflect the changes in perceived difficulty.

**Pausing Profile**

Similar to the previous modeling process, for the pausing profile we hypothesize that the frequency and duration of pauses may relate to the perceived video difficulty.

1. **Frequency of pauses.** As discussed previously, we take pauses that last between 2 seconds and 10 minutes into account only. In fact, numerous pauses shorter than 2 seconds or across several days are observed in the dataset. The extremely short pauses do not make much sense in terms of cognitive processing, while the long ones may indicate the learners are taking breaks, when they are out of the cognitive processes for video comprehension. The choices of 2 seconds / 10 minutes as thresholds are arguably arbitrary, i.e. it is difficult to argue why 3 second or 11 minutes are not chosen, but we have tried slightly different values and achieve results that are robust to the choices of thresholds.

   2. **Median duration of pauses.** The durations of pauses distribute exponentially with long tail. We then use the median of pause duration to gauge the time dimension of pauses. This statistic is more robust compared to mean or sum under the given data distribution.

In fact, the data distributions of both features are highly skewed with long tail, so logarithm transformations (natural base) are used before fitting the GAMM model.

**Finding 3: Pause Frequency matters more than duration**

The pause frequency (edf = 3.14, p < .0001) and the pause median duration (edf = 2.439, p < .0001) both show significant non-linear effects on perceived video difficulty when fitted in multiple GAMM regression as covariates. The GAMM fit is illustrated in Figure 4. We can see that the effect of pause frequency has visually larger slope over the pause median duration. Lots of video sessions are found to contain high pause frequency (e.g. more than 10), where the students may constantly encounter problems in the videos. Note that the curve for median pause duration stabilized and maximized at around 4.1, which corresponds to 60 seconds. This indicates that the pauses longer than 1 minute reflect on average a similar level of perceived video difficulty.
Skipping Profile

For the video sessions of skipping profile, we evaluate the following two features:

(1) **Frequency of forward seeks.** A seek event is created when the user scrubs the playhead to a new position or click a new position on the time indicator. In the case of scrubbing, the system automatically generates a number of intermediate seeking events. In this analysis we analyze the number of raw forward seek events.

(2) **Skipped video length.** The skipped video length refers to the amount of video seconds skipped by forward seeks. Some video sessions contain less than 10% unwatched content due to slightly earlier video closing, but they are not considered when we compute this feature.

These two features are also highly skewed with long tail, so we apply natural logarithm before fitting the model.

**Finding 4: Infrequent or large skip suggests higher perceived video difficulty**

The forward seeking frequency shows a negative linear effect ($\beta = -0.13$, 95% CI = [-0.19, -0.06], $p < .0005$). This is not surprising since we anticipate the students to “jump” forward more often when they think the videos are easier. In practice, frequently seeking forward leads to video skimming, which can be seen as an alternative way for speeding up the video. Recall the results in the analysis of the speeding profile: largely decreasing the video speed has a similar negative correlation with perceived video difficulty. The students who interact in this way may find skimming through the content sufficient for understanding the video.

On the other hand, when we keep the seek frequency constant, we find the skipped video length exerts a positive non-linear effect (edf = 1.56, $p < .0005$). The estimated degree of freedom is quite close to 1, so the latter effect is close to a negative linear result, as depicted in Figure 5. This finding contradicts our expectation that more skipped content may indicate the videos are boring and easy. In fact, this may be an indication of higher difficulty. So, if highly frequent forward seeking is for quickly grasping the gist of the video, then large skipping may be “giving up” the video.

Replaying Profile

The video sessions of replaying profile are analyzed in a similar way as we did for the skipping profile. The following two features are analyzed:

(1) **Frequency of backward seeks.**

(2) **Replayed video length.** The replayed video length refers to the video seconds that are re-watched.

Note that the same parts of video can be watched several times. This measure accumulatively sums the replayed video length.

Similar to our analysis of the skipping profile, these two features are highly skewed. We take the natural log of the original features and model them with multiple GAMM regression.
Finding 5: Less frequent or large amount of re-watching indicates higher video difficulty

The replayed video length shows a positive effect on the perceived difficulty (edf = 2.20, p < .0001) as depicted in Figure 6 (Right). We can see that the curve has a monotonically sharp increasing trend until the value on the x-axis reaches around 6, which translates to replayed video length of 300-400 seconds. Afterwards, the curve bends down a little bit and the confidence interval band starts expanding. This shows that the more a student replays the video, the more she may perceive the video as difficult. The effect is shown stronger when the replayed length is less than 5 minutes. The finding generally coincides with our expectations.

However, keeping the replayed video length constant, the frequency of backward seeks surprisingly shows a significant, though visually small negative effect on the perceived video difficulty (edf = 1.36, p < .0005). We have similar findings in the DSP dataset as well. This is interesting, since it suggests that higher average replayed length per seek reflects higher video difficulty. In addition, we found in the sessions containing high number of frequent backward seeks, the events typically occurred within very short intervals, indicating that the students were deliberately looking for specific video frames. In this case, the behavior can be seen as more of “frame-seeking” than “re-watching”.

Discussion and Conclusion

So far we have employed statistical methods to reveal the relationships between video interactions and perceived video difficulty. We identified simple video interaction features that indicate students’ perceived video difficulty. With the mixed model analysis, we can infer the changes of subjective video difficulty of a student from video to video, based on the changes of the aforementioned features. To summarize, video speed decreases, frequent and long pauses, infrequent seeks with high amount of skipping or re-watching suggest higher video difficulty. These findings have answered the main research questions of this paper.

Limitations

Although the results presented in this paper are statistically significant, the magnitudes of the effects are small, i.e. we have not seen the average perceived difficulty changes drastically within the variation range of the presented video features. There are many possible reasons. First, students study MOOCs with various motives, educational background, personal characteristics, habits and learning strategy, and all of these factors may also explain much of the variance in the perceived video difficulty. Second, the students can externalize the perceived difficulty in alternative ways, e.g. instead of adopting a video
interaction style, they may choose to tackle the problem in the forum or search in the internet after watching the videos etc. Third, in this paper we only analyze video behaviors of the first-time watching sessions, video-revisiting behaviors would probably also influence the perceived difficulty of the current or next couple of videos. Last but not least, the perceived video difficulty was posteriorly measured per video, however the video interactions occurred at different parts of different videos. In this paper, we pursue to generalize the effects of the video interaction features rather than video content features, so we did not analyze the video content, which definitely also exert effects.

Impact of the Results
The majority of existing MOOC research focus on predicting students’ dropouts or performance, whose relationships to video behaviors may not be causal. Factors such as learning motives and online learning experiences may confound in between. Since lecture videos play a central role in MOOC learning, how students perceive the videos is an important measure of learning experiences. Despite the limitations presented before, the greatest impact of this paper is the empirical revelation of the variation trends of the perceived video difficulty from the perspective of video interactions. There are usually dozens of lecture videos for each MOOC. The findings in this paper have the potential to help detect how the students may perceive the video difficulty differently among the lecture videos. MOOC practitioners may use the insights to capture the students’ potential change of difficulty perception from their video behaviors, so that proper interventions (e.g. supporting materials) can be introduced for help.

Future Work
Within the scope of this paper, we only analyzed simple video profiles. Future work may include analyses of the complex video profile, which contains multiple types of video interactions. Clustering the data with video features into groups of similar patterns is a tentative method for analysis. In addition, more comprehensive insights about how the students learn require combing video interaction analysis with analyses of other MOOC interactions, such as those happened in the form and quizzes. Video-revisiting behaviors can also be examined.
References


An Evaluation of Learning Analytics in a Blended MOOC Environment

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ABSTRACT

Massive Open Online Courses (MOOCs) present an emerging branch of online learning that is gaining interest in the Technology-Enhanced Learning (TEL) community. Due to the massive nature of MOOCs, the amount of learning activities might become very large or too complex to be tracked by the course participants. Learning analytics can provide great support to learners in their MOOC experience. In this paper, we focus on the application of learning analytics from a learner perspective to support self-organized and network learning in MOOCs through personalization of the learning environment, monitoring of the learning process, awareness, self-reflection, and recommendation. We present the details of a study we conducted to evaluate the usability and effectiveness of the learning analytics module in the blended MOOC platform L²P-bMOOC.

Introduction

Massive Open Online Courses (MOOCs) have become a key instrument in Technology Enhanced Learning (TEL) in the last few years. MOOCs are courses aiming at large-scale interactions among participants around the globe regardless of their location, age, income, ideology, and level of education, without any entry requirements or course fees (Yousef, Chatti, Schroeder, Wosnitza, Jakobs, 2014a). The current MOOC literature categorized MOOCs into two main types: “cMOOCs” and “xMOOCs” (Daniel, 2012). The first design of cMOOCs was established in 2008, based on the connectivist pedagogy approach. cMOOCs enable learners to build their own networks via blogs, wikis, Google groups, Twitter, Facebook, and other social networking tools outside the learning platform without any restrictions from the teacher (Fini, 2009; Siemens, 2013). In xMOOCs, by contrast, learning objectives are pre-defined by teachers who impart their knowledge through short video lectures, often followed by simple e-assessment tasks (e.g. quiz, eTest) (Daniel, 2012). Recently, new forms of MOOCs have emerged. These include smMOOCs as open online courses with a relatively small number of participants and blended MOOCs (bMOOCs) as hybrid MOOCs including in-class and online video-based learning activities (Yousef et al., 2014a).

Despite their popularity, MOOCs suffer from several limitations. Yousef et al. (2014a), for instance, provided an extensive review of the MOOC literature and noted that the lack of human interaction is the major limitation in MOOCs. The authors further stressed that the initial vision of MOOCs that aims at breaking down obstacles to education for anyone, anywhere and at any time is far away from the reality. In fact, most MOOC implementations so far still follow a top-down, controlled, teacher-centered, and centralized learning model. Attempts to implement bottom-up, student-centered, really open, and distributed forms of MOOCs are the exception rather than the rule. Other limitations of MOOCs include pedagogical problems concerning assessment and feedback (Giannakos, Chorianopoulos, Ronchetti, Szegedi, & Teasley, 2013; Hill, 2013) the lack of interactivity between learners and the video content (Grünewald, Meinel, Totschnig, & Willems, 2013), as well as high drop-out rates in average of 95% of course participants (Daniel, 2012; Yousef, Chatti, Schroeder, Wosnitza, 2014b; Yousef, Chatti, Wosnitza, & Schroeder, 2015a).

On the way to address these limitations, blended MOOCs (bMOOCs) that aim at bringing in-class (i.e. face-to-face) interactions and online learning components together as a blended environment...
can resolve some of the hurdles facing standalone MOOCs (Bruff, Fisher, McEwen, & Smith, 2013; Ghadiri, Qayoumi, Junn, Hsu, & Sujitparapitaya, 2013; Ostashewski, & Reid, 2012). In fact, the bMOOCs model has the potential to bring human interactions into the MOOC environment, foster student-centered learning, provide effective assessment and feedback, support the interactive design of the video lectures, as well as consider the different patterns of participants in the MOOC. Due to the massive nature of MOOCs, the amount of learning activities (e.g. forum posts, video comments, assessment) might become very large or too complex to be tracked by the course participants (Arnold, & Pistilli, 2012; Blikstein, 2011; McAuley, Stewart, Siemens, & Cormier, 2010). Moreover, in MOOCs it is difficult to provide personal feedback to a massive number of learners (Mackness, Mak, & Williams, 2010; McAuley et al., 2010; Yousef et al., 2014b). Therefore, there is a need for effective methods that enable to track learners’ activities and extract conclusions about the learning process in order to improve learning among large groups of participants. This is where the emerging field of Learning Analytics can play a crucial role in supporting an effective MOOC experience. Learning analytics refers to “the use of intelligent data, learner-produced data, and analysis models to discover information and social connections, and to predict and advise on learning” (Siemens, & Long, 2011). So far, however, little research has been carried out to investigate the effectiveness of using learning analytics in a MOOC context (Chatti et al., 2014). This paper presents the details of a study conducted to investigate the value of using learning analytics in the bMOOC environment L²P-bMOOC.

**L²P-bMOOC: First Design**

L²P-bMOOC is a bMOOC platform on top of the L²P learning management system of RWTH Aachen University, Germany, was designed to address MOOC limitations outlined in the introduction. Recognizing the potential of bMOOCs to support self-organized learning, L²P-bMOOC supports learner-centered bMOOCs by providing a bMOOC environment where learners can take an active role in the management of their learning activities (Chatti, 2010). Driven by a blended learning approach, L²P-bMOOC fosters human interaction through face to face communication and scaffolding. As a solution to the lack of interactivity between learners and the video content issue, L²P-bMOOC includes a video annotation tool that enables learners’ collaboration and interaction around a video lecture. L²P-bMOOC thus represents a shift away from traditional MOOC environments where learners are limited to viewing video content passively towards a more dynamic and collaborative one. Learners are no longer limited to watching videos passively and are encouraged to share and create knowledge collaboratively. In L²P-bMOOC, video materials are represented, structured, and collaboratively annotated in a mind-map format.

In March 2014, we conducted a case study to evaluate the usability and effectiveness of L²P-bMOOC. We used L²P-bMOOC to offer a bMOOC on “Teaching Methodologies” at Fayoum University, Egypt in cooperation with RWTH Aachen University, Germany. The duration of this bMOOC was eight weeks. It was offered both formally to students from Fayoum University and informally with open enrollment to anybody who is interested in teaching methodologies. A total of 128 participants completed this course. 93 are formal participants who took the course to earn credits from Fayoum University. These participants were required to complete the course and obtain positive grading of assignments. The rest were informal participants undertaking the learning activities at their own pace without receiving any credits. The teaching staff provided 6 video lectures and the course participants have added 27 related videos. This course was taught in English and participants were encouraged to self-organize their learning environments, present their own ideas, collaboratively create video maps of the lectures, and share knowledge through social bookmarking, annotations, forums, and discussion threads (Yousef, Chatti, Schroeder, Wosnitza, 2015b).

To evaluate whether the platform supports and achieves the goals of “network learning” and “self-organized learning”, we designed a qualitative study based on a questionnaire. This questionnaire utilized a 5-point Likert scale with range from (1) strongly disagree, to (5) strongly agree. We derived the results and reported conclusions based on the 50 participants who completed and submitted the questionnaire by the end of the survey period out of 128 participants. The results obtained from this preliminary analysis are summarized in the following points:

The collaboration and communication tools (i.e. group workspaces, discussion forums, live chat, social bookmarking, and collaborative annotations) allowed the course participants to discuss, share, exchange, and collaborate on knowledge construction, as well as, receive feedback and support from peers. The results further show that the majority agreed that L²P-bMOOC allowed them to be self-organized in their learning process.
In particular, the participants reported that it helped them to learn independently from teachers and encouraged them to work at their own pace to achieve their learning goals (Yousef et al., 2015b). The study, however, identified problems concerning assessment and feedback. This shows that the participants had some difficulties in tracking and monitoring their learning activities and those of their peers. Further improvement should be done to address this important issue. This can be in the form of a learning analytics tool that enables to collect, visualize, and analyze the data from learning activities (e.g. comments, likes, newly added nodes) to support self-organized and network learning in L²P-bMOOC (Yousef et al., 2015b).

Learning Analytics in L²P-bMOOC

The evaluation of the first version of L²P-bMOOC showed that it is crucial to investigate learning analytics techniques to support learning in bMOOCs. There are many objectives in learning analytics according to the particular point of view of the different stakeholders. Possible objectives of learning analytics include monitoring, analysis, prediction, intervention, tutoring/mentoring, assessment, feedback, adaptation, personalization, recommendation, awareness, and reflection (Chatti, Dyckhoff, Schroeder, & Thüs, 2012; Mattingly, Rice, & Berge, 2012; Slade, & Prinsloo, 2013; Yousef, et al., 2014b). Despite the wide agreement that learning analytics can provide value to different MOOC stakeholders, the application of learning analytics on MOOCs is rather limited until now. Most of the learning analytics implementations in MOOCs so far are focused on an administrative level and meet the needs of the course providers. Current studies have primarily focused on addressing low completion rates, investigating learning patterns, and supporting intervention (Chatti et al., 2014). In this paper, we focus on the application of learning analytics from a learner perspective to support self-organized and network learning in MOOCs through personalization of the learning environment, monitoring of the learning process, awareness, self-reflection, and recommendation. In the following sections, we discuss the design, implementation, and evaluation of the new learning analytics module in L²P-bMOOC.

Requirements

Driven by the wish to enhance L²P-bMOOC with a learning analytics module, we collected a set of requirements from recent learning analytics and MOOCs literature (Chatti et al., 2012; Yousef et al., 2014a). We further conducted Interactive Process Interviews (IPI) with students to determine which functionalities they are expecting from a learning analytics tool in L²P-bMOOC. Then, we designed a survey to collect feedback from different MOOC stakeholders concerning the importance of the collected requirements. A summary of the survey analysis results are presented in Table 2. The demographic profile of this survey was distinguished into 98 professors (41% Europe, 42% US, 17% Asia) and 107 learners (56% male). All of them had prior experience with MOOCs (Yousef et al., 2014b).

Table 2: L²P-BMOOC Learning Analytics Requirements (N=205)

<table>
<thead>
<tr>
<th>L²P-BMOOC Learning Analytics Requirements</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Provide recommendations and feedback for learners to improve their performance.</td>
<td>4.6</td>
<td>0.67</td>
</tr>
<tr>
<td>2 Provide performance report to learners.</td>
<td>4.5</td>
<td>0.77</td>
</tr>
<tr>
<td>3 Provide learners with analytics tools for awareness and self-reflection.</td>
<td>4.4</td>
<td>0.82</td>
</tr>
<tr>
<td>4 Provide statistics on the course activities.</td>
<td>4.4</td>
<td>0.78</td>
</tr>
<tr>
<td>5 Predict student performance.</td>
<td>4.4</td>
<td>0.85</td>
</tr>
<tr>
<td>6 Analysis and visualization of learning activities.</td>
<td>4.3</td>
<td>0.79</td>
</tr>
<tr>
<td>7 Apply Social Network Analysis (SNA) techniques to identify/visualize relationships between learners.</td>
<td>3.8</td>
<td>1.12</td>
</tr>
<tr>
<td>8 Provide the options for reporting to the teacher.</td>
<td>3.5</td>
<td>1.20</td>
</tr>
<tr>
<td>Learning Analytics Average</td>
<td>4.3</td>
<td>0.87</td>
</tr>
</tbody>
</table>

1. Strongly disagree … 5. Strongly agree
Based on the survey results, we derived a set of user requirements to support learning analytics in L²P-bMOOC, as summarized below:

- **Intuitive User Interface:** An important factor for user satisfaction is a simple and easy to use learning analytics interface. The design of the module has thus to take usability principles into account and go through a participatory design process.

- **User Recommendation:** due to the large number of courses on a MOOC platform, there is a need for a recommendation mechanism that enables learners to discover courses based on their interests and activities on the platform.

- **User Analytics:** Provide statistics on the user activities on the platform. This feature would allow users to track their activities across all courses that they are participating in and quickly navigate to their performed activities such as their annotations, likes, threads, and videos.

- **Course Analytics:** Provide users with a complete picture of all course activities. This feature would allow students to reflect on their activities in the course and teachers to monitor the activities in their courses.

- **Course Activity Stream:** In order to increase awareness, there is a need for a notification feature that can support users in tracking recent activities (i.e. likes, thread discussions, annotations, comments, new videos) in their courses.

- **User Courses:** Provide users with a personalized view of the courses and video nodes where they had a contribution. This would allow users to get a quicker access to the videos that they are interested in.

### Implementation

The design requirements collected above have built the basis for the implementation of the learning analytics module in L²P-bMOOC. The learning analytic dashboard in L²P-bMOOC consists of a navigation menu bar displayed on the top corner inside the main workspace, as shown in Figure 1. Possible actions on the learning analytics dashboard include course activity stream, course analytics, user analytics, user courses, and user recommendation.

![Learning Analytics Dashboard in L²P-bMOOC.](image)
Newsfeed

In order to keep track of what’s new in the learning environment, L²P-bMOOC provides a course activity stream feature called newsfeed, as presented in Figure 2. Learners can use the newsfeed to get notifications on recent activities (e.g. likes, thread discussions, annotations, comments, new videos) in the courses they are enrolled in. By clicking on a specific notification item, the learner can get a direct access to the related activity in its context. The newsfeed page is the first interface displayed to a learner when he or she logs into the system. The notifications can further be filtered by course.

Course Analytics

This feature provides an overview on the course statistics in all courses in L²P-bMOOC ranked by popularity. The statistics are represented as a pie chart with four different fields, namely the numbers of annotations, likes, discussions threads, and added videos, as illustrated in Figure 3. Clicking the pie chart enables the learners to get a direct access to the lectures in the course and their related video maps. This visualization can support the learners’ awareness of the courses with high interactivity. It can also help teachers in the monitoring of the activities in their courses.

My Analytics

Learners can use this feature to get statistics on their activities (i.e. annotations, likes, discussions threads, and added videos) throughout all courses they are participating in. By clicking on e.g. the annotation field in the pie chart, learners can get a direct access to all video nodes where they had annotations, as shown in Figure 4. This feature can support learners in the monitoring of their distributed activities as well as self-reflection on their performance in the learning environment.

My Courses

This feature enables learners to focus on their courses of interest. As shown in Figure 5, learners can get an overview on their courses and the particular video nodes that they are active in (e.g. posted an annotation, added a bookmark, contributed to a discussion). This feature acts as a filtering mechanism for the video nodes of interest, thus enabling a personalized view of the learning environment.
My Recommendations

The aim of this feature is to recommend courses and learning materials based on the learner’s interests and activities. We followed a collaborative tag-based recommendation approach. L2P-bMOOC allows users to tag the different courses on the platform. These tags are used to generate recommendations of courses having the same tags, as shown in Figure 6.

Figure 6. My Recommendations View in L2P-bMOOC

Case Study

In August 2014, we conducted a second case study to evaluate the usability and effectiveness of the learning analytics module. We used the enhanced version of L2P-bMOOC to offer a bMOOC on “Stress Management” at Cairo University, Egypt in cooperation with RWTH Aachen University, Germany. This course was offered informally with a duration of four weeks. A total of 103 participants completed this course. They have undertaken the learning activities at their own pace without receiving any type of academic credits. The teaching staff provided 27 short video lectures and the course participants added another 105 related videos. Participants in the course were encouraged to use video maps to organize their lectures, and collaboratively create and share knowledge through annotations, comments, discussion threads, and bookmarks. The participants further used the learning analytics module to support their activities in the course.

Evaluation of Learning Analytics in L2P-bMOOC

We conducted a thorough evaluation of the learning analytics module in L2P-bMOOC in terms of usability and effectiveness. We employed an evaluation approach based on the ISONORM 9241/110-S as a general usability evaluation and a custom effectiveness questionnaire to measure the added value of using learning analytics in L2P-bMOOC.

General Usability Evaluation (ISONORM 9241/110-S)

The ISONORM 9241/110-S questionnaire was designed based upon the International Standard ISO 9241, Part 110 (Prümper, 1997). We used this questionnaire as a general usability evaluation for the L2P-bMOOC environment. It consists of 21 questions classified into seven main categories. Participants were asked to respond to each question scaling from (7) a positive exclamation and its mirroring negative counterpart (1). The questionnaire comes with an evaluation framework that computes several aspects of usability to a single score between 21 and 147. A total of 43 out of 103 participants completed the questionnaire. The majority of respondents were in the 30-40+ age range. Female respondents formed the majority (58%). Participants have a high level of educational attainment: 95% of participants have a Bachelor’s degree or higher. Nearly 50% reported that they attended more than two TEL courses. The results obtained from the ISONORM 9241/110-S usability evaluation are summarized in Table 3.

The usability evaluation of the first case study (see Section L2P-bMOOC: First Design) achieved an ISONORM 9241/110-S score of 93.3 (Yousef et al., 2015b). The overall score from the second case study was 123.8 which translate to “Congratulations! Your software is perfectly matched to their users!” (Prümper, 1997). This result reflects a high level of user satisfaction with the usability of L2P-bMOOC. The higher ISONORM score achieved in the second case study as compared to the first one could be attributed to the several improvements of L2P-bMOOC by adding a help guide (e.g. FAQs and system entry errors) as well as a video tutorial explaining the different features of the environment to ensure a better learning experience.

Effectiveness Evaluation

In our study, we focused on learning analytics from a learner perspective to support self-organized and networked learning through (a) personalization of the learning environment, (b) monitoring of the learning process, (c) awareness, (d) self-reflection, and (e) recommendation. The effectiveness evaluation aims at assessing whether these goals have been met in L2P-bMOOC.

The second part of the questionnaire aimed at collecting feedback from the course participants on the different learning analytics objectives outlined above, as shown in Table 4. A 5-point Likert scale was used from (1) strongly disagree to (5) strongly agree.
### Table 3: ISONORM 9241/110-S Evaluation Matrix (N=43).

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>Aspect</th>
<th>Mean</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitability for tasks</td>
<td>Integrity</td>
<td>6.0</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>Streamlining</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fitting</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Self-descriptiveness</td>
<td>Information content</td>
<td>5.7</td>
<td>17.2</td>
</tr>
<tr>
<td></td>
<td>Potential support</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automatic support</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Conformity with user expectations</td>
<td>Layout conformity</td>
<td>5.7</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>Transparency</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation conformity</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Suitability for learning</td>
<td>Learnability</td>
<td>5.8</td>
<td>17.8</td>
</tr>
<tr>
<td></td>
<td>Visibility</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deducibility</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Controllability</td>
<td>Flexibility</td>
<td>6.4</td>
<td>17.0</td>
</tr>
<tr>
<td></td>
<td>Changeability</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuity</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Error tolerance</td>
<td>Comprehensibility</td>
<td>5.6</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>Correct ability</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correction support</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Suitability for individualization</td>
<td>Extensibility</td>
<td>5.8</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>Personalization</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexibility</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>ISONORM score</td>
<td></td>
<td></td>
<td>123.8</td>
</tr>
</tbody>
</table>

### Table 4: The Effectiveness Evaluation of Learning Analytics in L²P-BMOOC (N=43).

<table>
<thead>
<tr>
<th>Nº</th>
<th>Learning Analytics</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My courses helps me to personalize my learning environment.</td>
<td>4.5</td>
<td>0.76</td>
</tr>
<tr>
<td>2</td>
<td>The course analytics helps me to monitor the course activities.</td>
<td>4.7</td>
<td>1.12</td>
</tr>
<tr>
<td>3</td>
<td>My analytics helps me to monitor my own activities in the learning environment.</td>
<td>4.7</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>The newsfeed helps me to keep tracking of all activities (i.e. likes, thread discussions, annotations, comments, new videos) in the learning environment.</td>
<td>4.6</td>
<td>1.30</td>
</tr>
<tr>
<td>5</td>
<td>The newsfeed helps me to improve collaboration with peers.</td>
<td>4.5</td>
<td>1.23</td>
</tr>
<tr>
<td>6</td>
<td>The course analytics helps me to compare my activities with that of others in the course.</td>
<td>4.6</td>
<td>1.19</td>
</tr>
<tr>
<td>7</td>
<td>My analytics helps me to reflect on my own performance.</td>
<td>4.6</td>
<td>0.91</td>
</tr>
<tr>
<td>8</td>
<td>The rating system (Likes) helps me to find valuable learning resources.</td>
<td>4.8</td>
<td>0.57</td>
</tr>
<tr>
<td>9</td>
<td>The recommended resources in the bookmarks help me to better understand the course.</td>
<td>4.5</td>
<td>0.64</td>
</tr>
<tr>
<td>10</td>
<td>I find the recommended courses useful.</td>
<td>4.7</td>
<td>0.61</td>
</tr>
</tbody>
</table>
In addition to ensure the relevance of these questions, we sent this questionnaire to a small panel of 5 learners as well as 5 learning technologies experts. They were asked for their opinions and suggestions for revising the questionnaire. Their feedback included a refinement of some questions and replacing some others. The revised questionnaire was then given to the L2P-bMOOC participants.

The mean average of the effectiveness evaluation was 4.6, which indicates a general satisfaction with the learning analytics module in L2P-bMOOC. The evaluation items of the questionnaire aimed at gauging the effectiveness of the following aspects:

**Personalization of the Learning Environment**
In relation to the personalization of the learning environment, item 1 achieved a mean score of 4.5 which reveals that the evaluators found “My courses” to be useful for the personalization of their learning environment, as they can get a personalized view on their courses and the particular video nodes that they are active in.

**Monitoring of the Learning Process**
The aspect of monitoring of the learning process is shown in Table 4 Item 2 and 3. The agreeability mean of the respondents for both items is quite high at 4.7, which indicates that the different statistics on annotations, likes, discussions threads, and added videos offered in “Course Analytics” and “My Analytics” supported learners in the efficient monitoring of the course activities as well as their distributed activities in all courses.

**Awareness**
Items 4 and 5 concern the aspect of awareness. These items achieved high mean scores of 4.6 and 4.5, respectively. The participants reported that the “Newsfeed” helped them to receive regular updates on the various activities in the learning environment, without the need to access each course. Moreover, they noted that the “Newsfeed” fostered effective interaction and collaboration, as they were able to get notifications and promptly react to the discussions of their peers.

**Self-Reflection**
In terms of self-reflection (items 6 and 7), a mean score of 4.6 was achieved. Most participants reported a high satisfaction with the support provided in “Course Analytics” and “My Analytics” to compare their activities with their peers and reflect on their own performance.

**Recommendation**
As for the questions regarding the recommendation possibilities in L2P-bMOOC (items 8, 9, and 10), most participants agreed that the rating system (Likes), social bookmarking, and the tag-based recommendation of courses were helpful for them to locate valuable learning resources in an efficient manner, thus dealing with the information overload problem that characterizes self-organized and open learning environments.

**Conclusion**
In the past few years, there has been an increasing interest in Massive Open Online Courses (MOOCs) as a new model of Technology-Enhanced Learning (TEL). MOOCs provide an exciting opportunity for the learning analytics researchers, as they capture and store large data sets from learners’ activities that can provide insight into the learning processes. In this paper, we focused on the application of learning analytics from a learner perspective to support self-organized and network learning in MOOCs. We presented the design, implementation, and evaluation of the learning analytics module in the blended MOOC platform L2P-bMOOC. The evaluation revealed a general satisfaction with the usability and the effectiveness of the learning analytics module in terms of personalization, monitoring, awareness, self-reflection, and recommendation.

**Acknowledgments**
The authors wish to thank Prof. Dr. Sayed Kaseb and the team of the “Pathways to Higher Education” project, Cairo University, Egypt for providing the learning materials of this course.
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Video-Mapper: A Video Annotation Tool to Support Collaborative Learning in MOOCs

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ABSTRACT

Massive Open Online Courses (MOOCs) have unique features that potentially can change the existing higher education landscape. MOOCs are an innovative form of Video-Based Learning (VBL) in the sense that they provide opportunities to a massive number of learners to attend free online courses around the globe. Video lectures are the major learning resources being used in MOOCs. However, the lack of interaction between learners and the video content was frequently noted in several studies on MOOCs. In order to enhance learners’ collaboration, discussion, and interaction with the video content, this paper presents the design, implementation, and evaluation details of Video-Mapper as a video annotation tool that enables learners’ collaboration and interaction around a video lecture, thus supporting self-organized and network learning in MOOC environments.

Introduction

Massive Open Online Courses (MOOCs) have unique features that make it an effective Technology-Enhanced Learning (TEL) approach that offers a whole new perspective for Video-Based Learning (VBL). MOOCs incorporate video-based lectures and new ways of assessment in courses that are offered on the Web and have potentially thousands of participants (Yousef, Chatti, Schroeder, Wosnitza, & Jakobs, 2014c). However, one of the most crucial issues with the current MOOCs is the lack of interactivity between learners and the video content (Grünewald, Meinel, Totschnig, & Willems, 2013). Several studies on the nature of MOOCs address the linear structure of video lectures to present knowledge to learners in a passive way (Yousef, Chatti, & Schroeder, 2014a; Yousef, Chatti, Schroeder, & Wosnitza, 2014b; Zahn, Krauskopf, Kiener, & Hesse, 2014). Therefore, there is a need for new design techniques to increase the interactivity and flexibility with video lectures in MOOCs.

Video Annotations

Video annotation can have various forms of attaching a note, comment, explanations, and presentational mark-up attached to a video (Rich, & Hannafin, 2009). In a VBL context, annotation refers to the additional notes added to the video without modifying the resource itself, which aid in searching, highlighting, analyzing, retrieving, and providing feedback (Khurana, & Chandak, 2013). Therefore, there is a need for new design techniques to increase the interactivity and flexibility with video lectures in MOOCs. This paper addresses this challenge and presents design, implementation, and evaluation details of Video-Mapper as a collaborative video annotation tool. The primary aim of Video-Mapper is to shift away from traditional MOOC environments where learners are limited to viewing video content passively towards a more dynamic and collaborative one. Learners are no longer limited to watching videos passively and are encouraged to share and create knowledge collaboratively. The remainder of the paper is organized as follows.

After a review of the related video annotation tools, we describe the Video-Mapper design and requirements. We then present the implementation and evaluation results of Video-Mapper. And finally, we summarize our findings and outline perspectives for future work.
applicability and limitations and point out the main differences to our Video-Mapper tool. We selected the following seven video annotation systems for our analysis due to their particular focus on the collaborative annotation of video content. VideoAnnEx MPEG-7 was implemented by IBM as a collaborative video annotation tool that allows users to semi-automatically annotate video content with semantic descriptions (Lin, Tseng, & Smith, 2003). The center for new media teaching and learning at Columbia University developed the Video Interaction for Teaching and Learning (VITAL) tool that enables learners to view, analyze, and communicate ideas by creating anchors or placeholder as video hyperlink references. Then, teachers linked these hyperlinks within their video lectures (Preston, Campbell, Ginsburg, Sommer, & Moretti, 2005). Theodosiou, et al. (2009), developed MuLVAT as a multi-level video annotation tool based on XML dictionaries that allow users to attach semantic labels to the video segments. WaCTool is a collaborative synchronous video annotation for increasing the communication and sharing resources in a peer-to-peer-based learning environment (Motti, Fagá Jr, Catellan, Pimentel, & Teixeira, 2009). RMIT University developed a media annotation tool (MAT) that allows videos to be uploaded and annotated online. Each annotation is then marked with a specific color along the video timeline (Colasante, 2011). The Harvard University’s Collaborative Annotation Tool (CATool) was developed and integrated with Harvard University’s learning management system Course iSites that gives teachers as well as students the ability to highlight points of interest and enables discussions through text or media annotations (Harvard University, 2012). The Collaborative Lecture Annotation tool (CLAS) is a Web-based system for annotating video content that also includes a learning analytics component to support self-regulated learning (Mirriahi, & Dawson, 2013).

According to Döller and Lefin (2007), we analyze each system for low-level features (e.g. color, shape, annotation panel, video controls, discussion panel) as well as high-level features (e.g. object recognition, collaborative annotations, and structured organization of annotation). A summary of the analysis results and a comparison with the Video-Mapper tool are presented in Table 1.

Our analysis shows that all of these tools support the basic features of video annotation, namely providing annotation panel, video controls, viewing area, custom annotation markers, and external discussion tools e.g. wiki, blog, chat. Only CATool and CLAS are providing more advanced features, such as social bookmarking and collaborative discussion panels. Additionally, the lack of integration between these tools and learning management systems or MOOCs makes their usage unpractical and out of context. As compared to these tools, Video-Mapper is a new approach of representing and structuring video materials where videos are collaboratively annotated in a mind-map view. Video-Mapper provides the opportunity to better organize the course content by different subjects. The social bookmarking, discussion threads, rating system, search engine, and ordering mechanisms for annotations were built into Video-Mapper to support a more effective self-organized and network learning experience in a MOOC environment.

Video-Mapper Design
Collaborative video annotation is widely researched in TEL with small groups of learners in which they can easily follow all changes that have been done with the video lecture (Hofmann, Boettcher, & Fellner, 2010). In MOOCs with massive number of learners, however, this set of annotations and comments might become very large. In the requirements elicitation for an effective collaborative video annotation tool in a MOOC environment, we conducted a literature review, analysed existing video annotations systems, conducted a survey, and interviewed potential users.

Literature Review
We critically analyzed the current research of VBL published in 2003-2013 to build a deep understanding on what the educational benefits are and which effect VBL has on teaching and learning (Yousef et al., 2014a). Moreover, we compiled and analyzed the state-of-the-art that has been conducted on MOOCs between 2008 and 2013 to build a deep and better understanding of key concepts in this emerging field (Yousef et al., 2014c). The review revealed two key points a) only few studies utilized annotation tools in searching, retrieving, highlighting, commenting, analyzing video content, and providing feedback between learners, b) most current MOOC implementations still follow a top-down, controlled, teacher-centered, and centralized learning model in which learners are limited to viewing the video lectures passively. Attempts to implement student-centered and collaborative forms of MOOCs are rather the exception than the rule.
Table 1: Summary of the video annotation systems analysis

<table>
<thead>
<tr>
<th>FUNCTIONALITY</th>
<th>VideoAnnEx</th>
<th>VITAL</th>
<th>MuLVAT</th>
<th>WeCTool</th>
<th>MAT</th>
<th>CATool</th>
<th>CLAS</th>
<th>Video-Mapper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide annotation panel, where learners can enter specific notes for the video lecture.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide full video controls e.g. play, stop, loop, volume.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide video viewing area.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Allow learners to define custom annotation markers.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Support safety and privacy by providing login identity.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Time line marker.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide external discussion tools e.g. wiki, blog, chat.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Assign descriptive annotation list.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Support automatic shot detection.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide different ways for annotations filtering mechanism.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide structured dictionaries for annotations.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Support collaborative annotations.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Support collaborative discussion panel.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide links to related data e.g. Pdf, PPT, lecture note.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide video fragmenting tool e.g. cutting option.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide time line range e.g. start and ending time for each annotation.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide social bookmarking.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Support search mechanism for annotations and comments.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide a rating system e.g. like and dislike, star rating.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide structured organizational annotation methods e.g. mind-maps.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Enable integration in Learning Management Systems (LMS) or MOOCs.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

Survey Results

Based on the literature review and the analysis of the existing systems, we collected design criteria regarding the interface, video lecture organization, and collaboration. Then, we designed a survey to collect feedback from different MOOC stakeholders concerning the importance of the collected criteria (Yousef et al., 2014b). The demographic profile of this survey was distinguished into 98 professors (41% Europe, 42% US, 17% Asia) and 107 learners (56% male). All of them had prior experience with MOOCs and came from 41 different countries and cultural backgrounds in Europe, US, Australia, Asia, and Africa.

A summary of the survey analysis results are presented in table 2. It strengthens the requirement to support self-organized and collaborative learning in MOOCs as well as the importance of good organizational structure of the video lectures. Moreover, most of the survey participants agreed on the importance of integrating collaborative tools which allow learners to subscribe, discuss, and search video content.
Table 2: Descriptive results for the collaborative VBL criteria in MOOCs (N=205)

<table>
<thead>
<tr>
<th>Collaborative video lecture criteria</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provide control features for video clip where appropriate.</td>
<td>4.7</td>
<td>0.53</td>
</tr>
<tr>
<td>2. Support collaborative learning among students.</td>
<td>4.52</td>
<td>0.78</td>
</tr>
<tr>
<td>3. Provide a search box to find different learning materials.</td>
<td>4.51</td>
<td>0.76</td>
</tr>
<tr>
<td>4. Video should be tagged/categorized to enable easier search.</td>
<td>4.45</td>
<td>0.72</td>
</tr>
<tr>
<td>5. Student can download the video lecture in their own devices.</td>
<td>4.43</td>
<td>0.89</td>
</tr>
<tr>
<td>6. Provide opportunities for students to become more self-organized.</td>
<td>4.31</td>
<td>0.81</td>
</tr>
<tr>
<td>7. Use short video clips.</td>
<td>4.29</td>
<td>0.95</td>
</tr>
<tr>
<td>8. Framing: arrange objects/graphics to match screen ratio.</td>
<td>4.28</td>
<td>0.77</td>
</tr>
<tr>
<td>9. Video keywords to help students search for related videos.</td>
<td>4.20</td>
<td>0.92</td>
</tr>
<tr>
<td>10. Offer a subscribe feature to get videos and discussions updates.</td>
<td>4.14</td>
<td>0.88</td>
</tr>
<tr>
<td>11. Standard video format offered as a &quot;HTML5-compatible video&quot;.</td>
<td>4.09</td>
<td>0.86</td>
</tr>
</tbody>
</table>

User Interviews

We further conducted Interactive Process Interviews (IPI) with target users to determine which functionalities they are expecting from a collaborative video annotation tool (Yin, 2003). These interviews involved three female and six male students who were between the ages of 21 and 28 years and all of them had prior experience with VBL. The most important point which stands out from this IPI is that learners focus more on specific sections of the video which contain concepts that they find interesting or difficult to understand, rather than the entire video.

In the second part of the interview session, we presented our idea about using a mind-map as a structured method to view the video lecture augmented by collaborative annotations and requested the users to tell their opinion about the usefulness of the proposed idea. They expressed a positive feedback and saw it as a useful addition for their learning that could help them to see quick overviews of the whole video-based lecture. Some of them also noted that the collaborative features of the tool would encourage them to share knowledge and learn from their peers, thus making the overall process more engaging. Afterwards, we asked the users to suggest possible features that they would need in such an environment.

Summary of System Requirements

Based on the survey results and the user interviews, we derived a set of user requirements to support self-organized and network learning in MOOCs through collaborative video annotation, as summarized below:

- Support the creation of video node maps that correspond to the criteria “Providing opportunities for students to become more self-organized” in Table 2. The tool should let users organize subtopics of each lecture in a map-based form where each node contains a specific video corresponding to a lecture section or the whole lecture itself.

- Support video fragmenting mechanism: The tool should provide possibility to create new video nodes by clipping a certain section from the original video. This feature is aimed to facilitate learners’ practice of viewing only specific sections of complete lectures. This requirement is related to the criteria “use short video clips”.

- Provide collaborative video annotation features: In relation to the criteria “support collaborative learning among students”, learners should be able to annotate sections of interest in the video and reply to each other’s entry. The annotation mechanism should also incorporate an interactive timeline which visualizes all existing annotations with different colors, shapes or icons depending on the type of the annotation. Sample types could be question or related material suggestion that explains a specific concept in the video in more detail.

- Encourage active participation, learner interaction and collaboration through collaboration features, such as social bookmarking, discussion threads, and voting/rating mechanisms.

- Provide a search function as well as a filtering/sorting mechanism (based e.g. on adding date, rating, or number of replies each annotation received) for the video annotations, as suggested in criteria 3 in Table 2. This would help particularly...
in cases when the videos have a large number of annotations, which is expected in a MOOC environment.

• Provide an intuitive user interface: One of the most important objectives of our project was to achieve interface simplicity and ease of use. This factor plays a crucial role for successful tool usage and user satisfaction. The design of our tool has thus to take usability principles into account and go through a participatory design process.

Video-Mapper Implementation
In the ensuing sections, we will describe Video-Mapper with an eye on the implementation details. A presentation of the technologies used in the implementation of Video-Mapper will be followed by a detailed description of the different modules and their underlying functionalities.

Technologies
The software prototype uses multiple JavaScript frameworks and the Node.js platform for implementing the application’s client-side and server-side logic. The main application design paradigm underlying our system is the Model View Presenter (MVP) pattern which has been realized using the Backbone.js framework. Backbone provides clear separation of application’s data and its presentation organizing the code properly for flexibility and future reuse. In order to simplify client side scripting and to make the interface more appealing the popular JQuery and JQuery UI libraries were used for easy DOM element manipulations and common effects, animations and widgets.

The open source JsPlumb visualization library has been used for creation, deletion and manipulation of all map connections that are represented in SVG vector image format. For providing the interactive timeline feature that displays an overview of video annotations, our tool uses the open source Timeline component of CHAP Links Library that is developed as a Google Visualization Chart in JavaScript. In order to realize the cut functionality of our application we have utilized the W3C Media Fragments URI specification that addresses temporal and spatial media fragments in the Web using URIs.

The server-side technology Node.js was chosen for its event-driven, non-blocking I/O model that produces fast and scalable applications. The Socket.IO library provides real time editing features to the application based on WebSockets as main communication protocol. The authentication middleware Passport.js library establishes persistent login sessions for each client. MongoDB stores the map content as JSON-like documents which makes the application scalable, performant and highly available.

Components
In the next sections we will discuss the main components of the Video-Mapper user interface in some detail.

Workspace
The workspace of Video-Mapper consists of an unbound canvas representing the video map structure of the lecture, a course selection section, and a sidebar for new video node addition and editing of video properties, as shown in Figure 1. The drop down list of courses shows available subjects and subtopics which correspond to course lectures. To establish connections between map nodes, the learners can simply drag the arrow icon of the source element and drop it on target nodes. Figure 2 illustrates the possible actions on a video node.
Video Annotations

The annotation section of video nodes is displayed in a separate layer above the main page and can be opened by clicking the “Annotation icon @” attached to map nodes. It consists of three main blocks: Interactive timeline, list of existing annotations and creation form for new annotations (see Figure 3).

The interactive timeline visualizing all annotations is located right under the video and is synchronized with the list of complete annotations. By selecting timeline items users can watch the video directly starting from the part to which the annotation points to. The timeline range corresponds to video duration and can be freely moved and zoomed into. Timeline items also include small icons that help to distinguish three annotation types: Suggestion, Question and Marked Important. Moreover, learners can adjust their own learning processes according to their points of interest and discuss with text or attaching links of relevant materials and discussion threads. Learners also, can insert new annotations while the video is in play mode at the current playback position. Furthermore, if learners believe the annotation contains an interesting or important note they have the option to “Like” it and later filtering items based on the number of likes. The “Trash” icon situated on top right corner of annotations is used to remove it. However, each item can be deleted only by its author.

Search and Sort Functionalities

Due to the long list of existing annotations in MOOC context, learners can perform searching and sorting actions. By entering a specific keyword, user name or annotation type, users can search for items in the list and a set of matching items will be drawn along with updated interactive timeline. Sorting can be done based on date, time on video, rating or number of replies each annotation received.

Video Clipping

In order to respond to the learners’ interest in a specific section of the video lecture, Video-Mapper provides a clipping option that creates a new node representing a specific segment of the video. Clipping videos is supported for both complete and already clipped videos.

Bookmarks and Discussion Threads

The options of attaching links of relevant materials and discussion threads are applicable for the original video lecture as well as the video nodes. Bookmarks represent online resources that can be added by all course participants and ordered based on their rating. They can be displayed in a separate JQuery Lightbox appearing on top of the application page. In contrast to annotations, discussion threads do not refer to any specific time in the video and may be used by course participants to discuss questions or suggestions relating to the general concept that the video node represents.
Video-Mapper Evaluation

We used Video-Mapper as an integral part of the blended MOOC (bMOOC) platform L2P-bMOOC on top of the L2P learning management system of RWTH Aachen University, Germany to offer a bMOOC on “Teaching Methodologies” at Fayoum University, Egypt in co-operation with RWTH Aachen University. We conducted a thorough evaluation of Video-Mapper in terms of usability and effectiveness. We employed an evaluation approach based on the ISONORM 9241/110-S as a general usability evaluation and a custom effectiveness questionnaire to measure whether the goals of self-organized and network learning have been achieved in Video-Mapper.

General Usability Evaluation (ISONORM 9241/110-S)

The ISONORM 9241/110-S questionnaire was designed based upon the International Standard ISO 9241, Part 110 (Prümper, 1997). We used this questionnaire as a general usability evaluation for the Video-Mapper environment. It consists of 21 questions classified into seven main categories. Participants were asked to respond to each question scaling from (7) a positive exclamation and its mirroring negative counterpart (1). The questionnaire comes with an evaluation framework that computes several aspects of usability to a single score between 21 and 147. A total of 50 questionnaires were completed out of 128. Table 3 illustrates the summary of the ISONORM 9241/110-S usability evaluation.

Table 3: ISONORM 9241/110-S Evaluation Matrix (N= 50).

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>Aspect</th>
<th>Mean</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitability for tasks</td>
<td>Integrity</td>
<td>4.8</td>
<td>14.4</td>
</tr>
<tr>
<td></td>
<td>Streamlining</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fitting</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Self-descriptiveness</td>
<td>Information content</td>
<td>4.9</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Potential support</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automatic support</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>Conformity with user expectations</td>
<td>Layout conformity</td>
<td>5</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Transparency</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation conformity</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Suitability for learning</td>
<td>Learnability</td>
<td>5.2</td>
<td>13.9</td>
</tr>
<tr>
<td></td>
<td>Visibility</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deducibility</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Controllability</td>
<td>Flexibility</td>
<td>4.9</td>
<td>13.9</td>
</tr>
<tr>
<td></td>
<td>Changeability</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuity</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Error tolerance</td>
<td>Comprehensibility</td>
<td>2.4</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Correct ability</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correction support</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Suitability for individualization</td>
<td>Extensibility</td>
<td>4.8</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>Personalization</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexibility</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

ISONORM score: 93.3
The majority of respondents were in the 18-24 age range. Female respondents formed the majority (90%). Participants have a high level of educational attainment: 70% of participants are studying Bachelor’s degree at Fayoum University and 30% have a Bachelor’s degree or higher. They also have an experience with TEL courses, nearly, 75% reported that they attended more than two TEL courses.

The overall ISONORM 9241/110-S score from the questionnaires was 93.3, which translates to “Everything is all right! Currently there is no reason to make changes to the software in regards of usability” (Prümper, 1997). In particular, the handling of the Video-Mapper interface was considered by most of the participants to be easy and the majority reported that they did not have difficulties when going through the required learning tasks. The general design of the interface was perceived to be pleasant and interactive. In general, the results reflect a user satisfaction with the usability of the Video-Mapper environment. There is, however, still room for further improvement, especially in the error tolerance category.

**Effectiveness Evaluation**

The second part of the questionnaire aimed at evaluating whether the goals of “network learning” and “self-organized learning” have been achieved in Video-Mapper. A 5-point Likert scale was used from (1) strongly disagree to (5) strongly agree. The results of this questionnaire, as shown in Table 4, indicate the effectiveness of Video-Mapper in supporting self-organized and network learning.

In fact, most participants noted that having such system throughout their study process would be very advantageous as it helps to have visual overviews of lectures that look more attractive and engaging. Many of them found the feature of cutting videos very helpful as it would let them identify and isolate interesting or difficult parts of lectures, which can be (re-)viewed and discussed and annotated directly without the need to load

<table>
<thead>
<tr>
<th>N°</th>
<th>Evaluation Items</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I can interact with other students and the tutor synchronously and asynchronously.</td>
<td>4.4</td>
<td>0.54</td>
</tr>
<tr>
<td>2</td>
<td>I am allowed to create and manage my own group.</td>
<td>4.5</td>
<td>0.82</td>
</tr>
<tr>
<td>3</td>
<td>It is easy to work collaboratively with other students involved in a group project.</td>
<td>4.4</td>
<td>0.74</td>
</tr>
<tr>
<td>4</td>
<td>The communication tools enhance my interaction and collaboration with my course mates.</td>
<td>4.6</td>
<td>0.54</td>
</tr>
<tr>
<td>5</td>
<td>I was supported by positive attitude from my course mates.</td>
<td>4.4</td>
<td>0.86</td>
</tr>
<tr>
<td>6</td>
<td>I share what I have learned in this course with others outside of the learning environment.</td>
<td>4.4</td>
<td>0.73</td>
</tr>
<tr>
<td>7</td>
<td>The learning environment helps me receive support and feedback from other participants.</td>
<td>4.4</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td><strong>Network Learning Average</strong></td>
<td>4.4</td>
<td>0.73</td>
</tr>
<tr>
<td>8</td>
<td>I am allowed to create my own video mind-map.</td>
<td>4.3</td>
<td>0.81</td>
</tr>
<tr>
<td>9</td>
<td>I am allowed to work at my own pace to achieve my learning objectives.</td>
<td>4.4</td>
<td>0.60</td>
</tr>
<tr>
<td>10</td>
<td>I decide how much I want to learn in a given time period.</td>
<td>4.5</td>
<td>0.68</td>
</tr>
<tr>
<td>11</td>
<td>I decide when I want to learn.</td>
<td>4.2</td>
<td>0.78</td>
</tr>
<tr>
<td>12</td>
<td>I am aware of the activities of my peers in the course.</td>
<td>2.8</td>
<td>1.11</td>
</tr>
<tr>
<td>13</td>
<td>I have the possibility to ask other students what I do not understand.</td>
<td>4.1</td>
<td>0.73</td>
</tr>
<tr>
<td>14</td>
<td>I can organize my own learning activities.</td>
<td>4.4</td>
<td>0.64</td>
</tr>
<tr>
<td>15</td>
<td>I can learn independently from teachers.</td>
<td>4.3</td>
<td>0.69</td>
</tr>
<tr>
<td>16</td>
<td>I was in control of my progress as I moved through the material.</td>
<td>4.4</td>
<td>0.73</td>
</tr>
<tr>
<td>17</td>
<td>I can easily keep tracking of all activities (i.e. comments, likes, newly added nodes, etc.) in this course.</td>
<td>2.7</td>
<td>1.33</td>
</tr>
<tr>
<td></td>
<td><strong>Self-Organized Learning Average</strong></td>
<td>4</td>
<td>0.81</td>
</tr>
</tbody>
</table>
full videos. Moreover, the ability to annotate videos provides more solutions to increase the interactivity with the video content and encourage learners in collaborative learning by creating threaded discussions around common points of interests. They also liked the possibility to view relevant websites directly on top of the main application page and avoid difficult navigation of multiple browser tabs. The video annotation aspect was also well appreciated because it allows students to ask questions linking them to respective parts in the video and receive answers not only from instructors but also from their peers. However, items 12 and 17 obtained a low mean score of 2.8 and 2.7, respectively. This shows that the participants had some difficulties in tracking and monitoring their learning activities and those of their peers. Further improvement should be done to address this important issue. This can be in the form of a learning analytics tool that enables to collect, visualize, and analyze the data from learning activities (e.g., comments, likes, newly added nodes) to support more effective self-organized and network learning in Video-Mapper.

Conclusion and Future Work

Video lectures are a powerful resource being used in MOOCs. However, the lack of interaction with the video content was frequently noted in the MOOCs literature. In this paper, we address collaboration in MOOCs and present the details of Video-Mapper as a video annotation tool that supports self-organized and network learning in MOOC environments. The tool was designed following an iterative and user-centered methodology. The preliminary evaluation results revealed a user acceptance of Video-Mapper as a helpful, easy to use, and useful collaborative video annotation tool that has the potential to foster self-organization and networking in MOOCs. Our future work will focus on the enhancement of Video-Mapper with a learning analytics module to support self-organized and network learning in MOOCs through personalization of the learning environment, monitoring of the learning process, awareness, self-reflection, and recommendation.
References


Maintaining the heartbeat: Checkpoints and FishBowls

Yishay Mor (Consultant) and Steven Warburton (University of Surrey, UK).

ABSTRACT

Active and collaborative pedagogies have been recognised as effective and engaging in many areas. At the same time, implementing such pedagogies poses challenges for educators in terms of educational design, orchestration and assessment. These challenges are multiplied with scale, and thus could become catastrophic in massive learning situations. This paper presents some initial findings from the MOOC design patterns project, related to this topic. We used the Participatory Pattern Workshop methodology to examine practitioner experiences from designing such MOOCs, encode these experiences as design narratives and extract design patterns from these. The resulting patterns could be easily implemented in any MOOC which strives to implement similar pedagogical approaches. No less important, the challenges which these patterns illuminate are likely to be confronted by any such MOOC – and being aware of these at design time is valuable, regardless of the path of solution taken.

Introduction

Active, collaborative learning is considered to be more effective than the alternative. For example, a meta-analysis by Anderson et al (2001) found a significant advantage for active learning in STEM. In the realm of teachers professional development, a review by Cordingley et al (2005) highlights the value of collaborative CPD. Voogt et al (2011) demonstrate the potential of engaging teachers in collaborative learning design. However, the common knowledge of active, collaborative, design-based education refers to small group scenarios, which are predominantly classroom (or studio) based. Scaling such pedagogies to massive online learning scenarios poses significant challenges.

The MOOC design patterns project (http://www.moocdesign.cde.london.ac.uk/), funded under the University of London Centre for Distance Education’s Teaching and Research Awards scheme, aimed to explore, define and articulate the emerging design principles and patterns that underpin the development and delivery of massive open online courses, and to demonstrate them by the application to the design of new MOOCS. This project used the Participatory Pattern Workshop (PPW) methodology (Mor, Warburton & Winters, 2012) to review practitioners’ experiences from designing and facilitating MOOCs and extract transferable design knowledge from these experiences in the form of design patterns.

The MOOCs

This paper presents a strand of inquiry from the MOOC design pattern project, which focused on the challenges of active and collaborative MOOCs – in particular, design-based teacher-training MOOCs. We reflect on experiences from three MOOCs: the Open Learning Design Studio (OLDS) MOOC, led by the Open University UK and the HandsonICT pilots II and III, led by the Universitat Oberta de Catalunya. These MOOCs overlapped in their topics and pedagogical approach and shared several other characteristics, yet each one was unique in many aspects. We examine some of the practices common to the three MOOCs and derive educational design patterns from these.
their own definition, with the guidance and support of the course tutors. We structured each week as a series of activities which were designed to provoke particular questions, and to highlight certain ideas, tools or techniques. 

The Hands-On ICT project (http://handsonict.eu/) is an EU funded project promoting the integration of ICT tools in teaching and learning. The 'Learning Design Studio for ICT-based learning activities' MOOC was designed to provide a solution to some of the tasks by engaging teachers in an active, project-based experience of learning design. The course was designed as a set of activities to walk educators in the design process of an ICT-based learning activity ready to be used in their classrooms. This MOOC was first run in Spring 2014 (pilot II) and then revised and re-run in Autumn 2014 (pilot III).

All three MOOCs shared the core topic of Learning Design, and the pedagogical structure of the Learning Design Studio (Mor and Mogilevsky, 2013). All three where produced on a relatively low budget, and self-hosted (i.e., not supported by a MOOC platform). The MOOCs had 1000-3000 registered participants, out of which several hundred were active.

However, the OLDS MOOC was oriented primarily at higher education practitioners and educational researchers, while the Handson MOOCs addressed school teachers. OLDS MOOC was nine weeks long, whereas the Handson MOOCs ran for five weeks. Consequently, while OLDS MOOC was designed to expose participants to a wide range of perspectives, debates, tools and techniques, Handson took a much more focused and minimalist approach.

The Participatory Pattern Methodology

The Participatory Pattern Workshop methodology (PPW) also called the "Participatory Methodology for Practical Design Patterns", is a process by which communities of practitioners can collaboratively reflect on the challenges they face and the methods for addressing them. This methodology has been initially developed in a blended context, through series of face-to-face workshops interleaved with on-line collaboration (e.g. Mor, Mellar, Pachler, & Daly, 2010). However, it has also been used in purely online configurations (e.g. Warburton, 2009).

The PPW methodology is based on the SNaP! framework (Mor, 2013). SNaP! stands for (design) scenarios, narratives and patterns. A Design Narrative (Mor, 2011; Bell, Hoadley & Linn, 2004) is a semi-structured story that illuminates a particular attempt to address a real-world challenge, recounting an incident where the designer attempted to bring about a change in the user’s world. It details the context of this incident, the objectives of the design and the user, the actions they took and their result, the obstacles they encountered and how they dealt with them. Design narratives provide the richness of detail that is essential for understanding the complexity of design work, but they are too specific to support the application of this understanding to novel challenges. Design Patterns (Goodyear & Retalis, 2010; Goodyear, 2005) generalise these understandings to formulate claims identifying a typical challenge which arises in a given class of situations, and suggest a tested method for resolving it. Design patterns originated from Christopher Alexander’s work in the theory of architecture. In his words, a pattern “describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over; without ever doing it the same way twice” (Alexander et al., 1977, p.x). A Design Scenario takes the form of a Design Narrative and projects it into the future, to formulate a testable design proposition. It proposes a story of the predicted effects of a proposed innovation. A story that can be verified or falsified by implementing that innovation.

The PPW methodology guides interdisciplinary groups of practitioners and researchers through a process of sharing their experience through design narratives, extracting design patterns from these, and using these to develop design scenarios. The next section introduces a challenge in the domain of active and collaborative MOOCs. The following section offers a narratives which recounts an attempt to address this challenge. Finally, several design patterns are derived by identifying design elements common to this narrative and others.

Emerging Challenges

A project-based MOOC is situated somewhere between an xMOOC and a cMOOC. Similar to an xMOOC, participants are guided through a sequence of curated resources, activities which refer to these resources, and discussions which offer a space for collective reflection on these experience. Yet, akin to a cMOOC, the social dynamics are central to the learning experience, and are to a large extent emergent. An xMOOC is designed to provide participants fairly uniform experiences, and consequently the ensuing activities and discussions are predictable to an extent. A project, or design, based MOOC relies on participants’ interpretation of creative tasks and the content they produce in response. Furthermore, while the tasks in the MOOC may be presented in a linear sequence, the
actual design process participants undertake is far from linear. In a traditional studio (or project based) classroom this would be addressed by plenary sessions, where students review their progress and the issues they encountered, and discuss these with their peers and their tutors.

Addressing the challenges: OLDS MOOC Convergence sessions
(Source: http://ilde.upf.edu/moocs/v/azm)

To address the challenge above, OLDS MOOC introduced convergence sessions: weekly live video chats where where several facilitators and several participants discussed the last week’s activities. These were structured as one hour google hangout sessions, with an adjacent twitter chat (using an agreed hashtag) where other participants could interact with those in the video chat. Facilitators often shared their doubts and reflected on the past week’s activities in an open and earnest discussion.

The objectives of these sessions where to:
• Give participants feedback and clarifications regarding the last weeks’ activities.
• Allow participants to provide feedback regarding the last weeks’ activities to the course designers and facilitators.
• Offer a first glimpse of next weeks’ activities.
• Offer participants a sense of direct interaction with facilitators, through the proxy of selected representatives.

For each session, the MOOC team would:
1. Set up a “holding page” with all the details and a note saying “the live video will be available here”.
2. Schedule the session well in advance, usually on the same time and day each week, and announce them on the MOOC mailing list. The team would explain that the session is synchronous, but there would be a recording which would be available for asynchronous viewing.
3. Send an open invitation for participants to join the session, and also personally invite participants who had been active in the MOOC’s social media.
4. 2-3 days before the session, create a “circle” in google+ with all the facilitators and participants who are expected to join the live video chat.
5. On the day, open the google hangout session 30 minutes before the session start time, invite all the facilitators and participants who where allocated to the live video chat and run sound checks.
6. Remind all other participants of the hashtag for the session.

Once live, the team would:
1. Have one facilitator chair the session, one monitor the technical aspects, and one monitor the interactions on the twitter hashtag and other social media.
2. Begin with a recount of the last week's activities, followed by impressions and reflections of participants and facilitators. That would take about 15-20 minutes, and flow into an open discussion of 30-40 minutes. We would conclude with a brief introduction of the next week’s activities.
3. Occasionally, guests would present a tool or method relevant to the coming week.

These convergence sessions started almost as an afterthought, and turned out to be one of the central features of the MOOC. Facilitator enjoyed the conversations with co-facilitators and participants very much. In terms of the MOOC experience, these sessions became almost the participation baseline: if you couldn’t complete any other activity this week, you knew that at least you can get the “vibe” by viewing the convergence session.

The combination of a small number of participants in a live video chat and a larger circle interacting through the twitter hashtag offered both facilitators and participants the one element which is most desperately missing in MOOCs: the direct teacher-learner interaction, which provides facilitators an indicator of where the learners are and the learners a sense of where the facilitators want them to go. Although only a small number of participants experienced this interaction in person, the live broadcast of the event allowed others to feel that they are interacting with the facilitators by proxy.

Following the success of the convergence sessions in OLDS MOOC, a similar structure of activity was adopted by the HandsonICT MOOCs, although it was implemented with slightly different technology.

Design Patterns

This section suggests two design patterns derived from the above design narrative, by juxtaposing it with other narratives and identifying the recurring problems and methods of solution. Pattern collections (or “languages”) adopt a common template which allows readers to review, evaluate and apply the patterns more easily. The template used here is based on the built-in template of the Integrated Learning Design Environment (ILDE, Hernández-Leo et al, 2014) used by the MOOC design patterns project.

The first pattern, FishBowl, is a direct generalisation of the convergence session construct used in the
OLDS MOOC and the HandsonICT MOOCs. The second pattern, Check-Points, takes a broader look, acknowledging that the FishBowl is, in one sense, an instance of a larger class of phenomena. These patterns have been reviewed by peers, but nevertheless they are still not in a mature form. The SNaP! framework identifies several phases in the development of a pattern. To qualify as constructive and rigorous “building blocks” for design, they will need to be validated by reference to additional examples and supported by relevant theories.

FishBowl
(Source: http://ilde.upf.edu/moocs/v/b1w)
Simulate intimate interaction between teacher and students in a large scale online course by broadcasting sessions where selected students act as proxies for the cohort.

Problem
In a traditional classroom setting, learners and teachers will occasionally pause the flow of educational activities and discuss their experiences, expectations, concerns - and any issues that have emerged. Such discussions, whether planned or ad-hoc, offer teacher and learners invaluable opportunities to calibrate their view of the state of the course and make any necessary adjustments in their practice. This allows learners to understand if the issues they are struggling with are personal or common to others, to alert the teachers to specific obstacles, and to receive confirmation for their chosen path and learning practices.

At the same time, these discussions offer teachers invaluable opportunities to validate their teaching strategy and practices, and receive feedback from the learners. MOOCs do not have the capacity to entertain such interactions: learners are dispersed geographically, the numbers are too big for synchronous sessions, and the teacher to student ratio is such that personal interaction is all but impossible.

Context
Applicable to online courses where face-2-face sessions are not incorporated. It works best when the course size (in terms of student numbers) pass the tipping point at which providing individual responses to queries/issues is unmanageable. The course tutor should be involved.

Solution
In a FishBowl session, a small number of MOOC facilitators and participants engage in an intimate conversation, yet this interaction is webcast live and recorded so that all MOOC participants can watch and react to it (figure 1).

Set up a synchronous online conferencing tool to host the fishbowl session. An example would be the use of Google Hangouts to provide the bowl. Invite the fish and advertise the event to the intended audience. Composition of the group can vary but the recommendation would be one or two tutors and a few invited participants.

Conduct the session as a tutorial, where participants reflect on their experiences from the last week’s activities, and tutors comment on those reflections and respond to participants questions.

Examples
• OLDS-MOOC convergence sessions
• HandOn ICT convergence sessions
• University of Surrey MSc Systems Biology taster course

Notes
See literature on the role of “teacher presence” in contributing to the success of online courses, e.g. (Anderson et al., 2001).
Design Pattern: Check-Points
(Source: http://ilde.upf.edu/moocs/v/bvv)

![Image of a sign saying "You Are Here" with an arrow pointing down]

Figure 2: Checkpoints pattern illustration

Problem
In a social, non-linear MOOC (e.g. a cMOOC or a project-based MOOC) interaction between participants is essential to the success of the MOOC. However, participants approach activities in a different pace, and sometimes even a different order, making it hard to synchronize their experiences. Some participants diverge into independent explorations branching out of the MOOC activities. Sharing these could enhance the social learning experience, but at the same time it makes synchronization even harder.

Context
cMOOCs or other MOOCs which have a strong social element and flexibility in the activity flow.

Solution
Create regular “checkpoints”, which offer participants opportunities to synchronize with the course flow and pace, catch up on the social vibe and notice the recent highlights. Such checkpoints could be synchronous events, recorded for those who cannot attend at the time - such as FishBowl sessions or webcasts. They can also be asynchronous events, such as forum posts or mails.

Checkpoints are:
• Scheduled at regular times throughout the MOOC.
• Produced in real time by the MOOC facilitators, reviewing and commenting on recent activity.
• A summary of recent MOOC activity and a preview of upcoming activity
• A showcase of student contributions
• A candid account of issues, difficulties and unexpected developments in the MOOC

Examples
The OLDS MOOC used several such checkpoints:
• A facilitators’ blog
• Daily and weekly summary emails
• Live convergence sessions using google hangouts and twitter.

Related patterns
• Showcase Learning (Robertson, 2014)
• FishBowl

Discussion
Active and collaborative pedagogies, such as project-based learning, problem-based learning, inquiry learning, have been recognised as effective and engaging in many areas. At the same time, implementing such pedagogies poses challenges for educators in terms of educational design, orchestration and assessment. These challenges are multiplied with scale, and thus could become catastrophic in massive learning situations.

It would be a mistake to conclude that such approaches are not sustainable in large cohorts, and revert to a limited pedagogical repertoire. At the same time, it would be unreasonable to assume that the same techniques and practices that work in a small-scale, co-located setting would be transferable to a massive, online one.

As more educators venture into this field, and cautiously experiment with the opportunities it affords, effective practices will emerge. Some of these will be adaptations of age-old practices which are tweaked to comply with the constraints and dynamics of massive online education. Others will be original practices which leverage the unique advantages of this new environment. In both cases, we need mechanisms for rapid, precise and yet critical sharing of the design knowledge that is encapsulated in these new practices.

The convergence session narrative presented in this paper, and the two patterns derived from it, are examples of such elements of design knowledge.
These patterns could be easily implemented in any MOOC which strives to implement similar pedagogical approaches. No less important, the challenges which these patterns illuminate are likely to be confronted by any such MOOC – and being aware of these at design time is valuable, regardless of the path of solution taken.

These two patterns need to be refined, elaborated, substantiated, and possibly refactored. Many more patterns need to be identified and connected with these, to form a language of patterns for active and collaborative learning in MOOCs. Such a language will promote quality education at a massive scale as a common asset. We invite the community of MOOC researchers and practitioners to join us in this enterprise.

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Enhancing Content between Iterations of a MOOC – Effects on Key Metrics

Ralf Teusner, Keven Richly, Thomas Staubitz and Jan Renz (Hasso-Plattner-Institut, Germany).

ABSTRACT

This paper presents our findings of a comparison study conducted on three iterations of a MOOC run on our platform openHPI. We present the main facts shared by the courses and the planned as well as occurred differences. Additionally, we discuss the added technical features such as user groups along with the expected and actual outcomes. We relate our experiences from the second and third iteration to those of the first one. Findings show that demand for high quality content endures, even if the topic is rather specialized. Expectations of participants towards online courses are growing in general due to an increasing amount of organizations offering lectures. MOOCs are compared to school lessons, distance education and seminars. As a result, the pressure on platforms is increasing with regards to content, service and reliability. To cope with that, we share best practices and propose promising improvements to the platform and future courses.

Introduction

Massive open online courses (MOOCs) and their underlying platforms have made all necessary advances and breakthroughs concerning accessibility of education. With the emerge of platforms, such as Coursera, EdX, Khan Academy,iversity etc., courses concerning a great variety of topics reached a broad audience across all countries, regardless of the educational preconditions. Experiments with different approaches concerning content preparation and presentation have been conducted. After the initial hype, researchers are now comparing their results with traditional forms of education in order to adapt and fine-tune MOOCs to appeal. This includes combining novel ideas and tools with proven didactic concepts. Most often, the foundation for each MOOC is a well-defined body of knowledge as in every university course. Presentation does differ in term of video snippets of varying length, accompanied by quizzes or programming tasks where applicable. Such an approach was chosen for the iterations of the course presented within this paper. The course was run on openHPI, a platform for MOOCs hosted and developed at the Hasso Plattner Institute in Potsdam, Germany. This in turn indicates that the course was offered from our own servers, giving us the opportunity to collect interesting data by ourselves and the ability to react to unforeseen challenges directly. Based on the gathered data and the experiences we made, we will justify our findings and conclusions on the following questions:

- What should be done with content of a course to be re-run?
- How to manage participants’ expectations?
- How to incorporate feedback in order to improve the course and the platform?

The remainder of this paper will first give a short summary of the course in general, then point out the overall differences between the iterations, until we finally describe the specific findings and technical circumstances that lead to our conclusions. We close this paper with our suggestions and an outline of our future work that we will look into.

The Course “In-Memory Data Management”

openHPI offers computer science courses in English and German language with varying requirements and key audiences in mind. The course “In-Memory Data Management (IMDM)” addresses learners from business as well as academia. This course was held in English by Prof. Hasso Plattner and focused on the management of enterprise data in column-oriented in-memory databases. Recent hardware and software trends are presented and their resulting consequences for software development
are outlined. The basic concepts and design principles of a column-oriented in-memory database are explained in detail. Beyond that, the implications of the underlying design principles for future enterprise applications and their development are discussed. While the course deals with a hypothetical database based on the prototypes developed within our research group, it shares a majority of concepts with a commercial product. This leads to the fact that the audience of this course was quite mixed, ranging from individuals interested in the algorithms or databases in general, students from other universities who have contact with the commercial product and have specific questions concerning underlying concepts, employees of the commercial vendor who want to educate themselves, and consultants.

For this reason, the content consisting of video recordings, slides, and self-tests was supplemented with additional extensive reading material, purposely written in a semi-formal style to appeal a broad audience. While we did not omit formulas or algorithms, we tried to always accompany them with a running example and step-by-step descriptions. The overall wording of the reading material was aimed to be halfway between scientific and too colloquial. We are convinced that education should be entertaining at least to some degree. Thus, Hasso Plattner embedded real life stories to the content where suitable. Apart from the mere entertaining value, participants remarked in the feedback forms that the stories brought a recognition value and thus improved the learning outcome in general.

Another challenge was to present the highly specialized topic to a broad audience with greatly differing education. Professions of participants ranged from cab drivers to university professors, therefore our participants naturally did not have a standardized previous knowledge. As this is not a huge obstacle for beginner courses, such as an introduction into programming or the architecture of the Internet, the course In-Memory Data Management implicitly has to distinguish the presented concepts from those of ordinary disk-based databases and, therefore, would require a solid understanding of database foundations as well as knowledge about its practical usage. While we aimed to narrow the knowledge gap with the aforementioned detailed reading material, we also reasoned about the amount of content in general. Confronting novice learners with the complete vast amount of content in the field of databases might scare off participants; therefore we limited the content to the absolute necessities. As the architectural understanding of a database is easily achievable on an abstract level, we included the corresponding parts in the first weeks of the course.

The introduction of SQL could not be omitted completely, but was done only to the absolute minimum of fundamental operators we wanted to discuss, as they are heavily affected by the underlying storage mechanisms (SELECT, GROUP BY, INSERT, DELETE, JOIN). These operators were presented to the detail we needed, with a focus on the didactical correlation. A deeper understanding of the relational algebra and further advanced SQL concepts, such as sub-selects, different join types, or schema manipulation were explicitly excluded. This way, we hope to have achieved to offer a path with low entrance barriers and requiring only little prerequisites on the one side, while offering enough technical depth on the other side.

Differences between the Iterations: The Course Itself

We conducted three iterations of the course until now. They were run from September to November in 2012, 2013 and 2014 with more than 13,000 registered participants for each of the first two iterations and more than 9,000 participants for the most recent iteration. All three courses were run over a six-week period (plus two additional weeks for the final exam). For the first two iterations, the content nearly stayed the same. We added some additional excursus in 2013 and rearranged the order of some learning units due to didactical reasons, but kept the core content untouched. All questions used for scoring and grading of the participants were kept on the same level of difficulty, using the same question style (multiple-choice) and almost the same maximum score to allow for better comparability. The third iteration in 2014 was built on the same core content foundation as the previous iterations but it got a different focus point. It was decided that the units covering the (1) implications of the technology on enterprise applications, (2) the effect of the removal of aggregates and (3) the separation of actual and historic data should get more attention. As we wanted to keep the overall required time for the course constant, we therefore had to remove or shorten some other parts. For that reason, we omitted the lecture parts dealing with the parallel execution of certain operations that were already explained in their sequential variant. Additionally, we re-recorded some units completely. The units to be re-recorded were chosen mainly based on three reasons:

• Their existing versions were relatively long.
• We came up with better figures and examples.
• We incorporated user feedback to ease comprehension of difficult parts. In total, about 60% of the videos differed.
Differences between the Iterations: Participants, Scores, and Reception

At first, our expectations with regards to the number of participants in future iterations were exceeded. We expected a smaller number of participants for the second iteration, based on the fact that it consisted of pre-existent, steady material. For the third iteration, the number of participants could not reach the same mark as in the years before, but the decrease of about 40% was still lower than expected. Given the specialized course topic, resulting in a capped audience, we estimated to have reached saturation even earlier. In the following, we will distinguish between active and passive participants. We count participants as active, if they reached at least 1 point in any assignment. The share of active course participants was around 30% during the first two iterations and dropped to 22% in the third iteration. This explains the significantly lower number of certificates issued in 2014. When regarding the ratio of certificates issued per active participant, the ratio stays relatively stable.

**Table 1: Iteration Core Statistics**

<table>
<thead>
<tr>
<th>Year</th>
<th>Timeframe</th>
<th>Participants</th>
<th>Active Participants</th>
<th>Certificates Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>03.09.12 - 28.10.12</td>
<td>13,126</td>
<td>3,782 (28.8%)</td>
<td>2,170 (16.5% / 57.4%)</td>
</tr>
<tr>
<td>2013</td>
<td>26.08.13 - 21.10.13</td>
<td>15,839</td>
<td>4,571 (28.9%)</td>
<td>2,442 (15.4% / 53.4%)</td>
</tr>
<tr>
<td>2014</td>
<td>01.09.14 – 26.10.14</td>
<td>9,116</td>
<td>2,050 (22.5%)</td>
<td>1,030 (11.3% / 50.2%)</td>
</tr>
</tbody>
</table>

Concerning the composition of the audience, we were pleased to see that the share of “international” participants of our course increased. While in the first course iteration a huge part of the audience was from Germany (53%), the shares in the second iteration were more distributed over the top three countries: Germany (32%), India (19%) and the US (18%). In the third iteration, the overall shares were similar to the second one. So after getting the word out after the first iteration, our international visibility stayed intact. Still having the greatest share of participants coming from our country of origin is perceived natural, as the media coverage and our personal networks are stronger in your local environment. The scores reached by the participants in the first two iterations were nearly the same. In the end, we were able to issue 2,137 certificates in 2012 and 2,369 certificates in 2013. The third iteration of the course resulted in a smaller number of certificates issued (1,030), because the total number of participants was comparably smaller. The relative percentage of participants qualifying for the certificate ranged from 11% to 16% for all iterations. Typical distributions of total points across all learners can be seen in Figures 2 and 3. The distribution in the 2014 iteration is biased towards the maximum of points, because we offered a bonus quiz to compensate for points potentially...
lost due to technical issues, resulting in about 15% of all participants qualifying for the certificate to reach the highest possible score. The bonus points mainly affected the better students (>60% of total points achieved). Overall, the participants scores decreased slightly every year when comparing them, particularly for participants reaching only below 50% of the total score.

The share of participants being enrolled in multiple iterations is above 20% for 2013 as well as 2014, significantly more than we expected. An explanation for this high number is, that many repeaters enrolled into one of the archived former iterations, just to get a preview of lectures yet to come or to read in the former forums. The share of repeaters is built on the base of total participants of the current iteration; the share of active repeaters is built on the base of active participants of the specified current iteration. The active repeaters are considerably higher for 2014 than for 2013, probably due to the fact that we offered new content.

<table>
<thead>
<tr>
<th>Table 2: Repeating Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Repeaters</td>
</tr>
<tr>
<td>Repeaters Active in Current and Former Iteration</td>
</tr>
</tbody>
</table>
At the end of each iteration we conducted a survey to get user feedback from all enrolled participants. The overall reception was good to excellent concerning the quantitative analysis. Additional to the quantitative feedback we also asked open questions to gather qualitative feedback. The feedback in these responses was also very positive. However, we want to focus on the (mostly constructive) comments in the following to outline missing features, different didactic approaches and additional feature requests. For all requests requiring code changes, we put the participants off until the next iteration, even if we were optimistic to already introduce the features later in the same iteration. Given that, we were able to exceed expectations and received positive feedback, but even more important, greater satisfaction.

Community Features
The primary focus of openHPI is on learning technical content by leveraging social collaboration between all participants. As shown in various studies (Balaji & Chakrabarti, 2010, Staubitz et al., 2014), success of imparting knowledge is increased by content focused communication between students, e.g. learning groups, discussions, or mentoring. Therefore, we also expect a substantial effect of the student-to-student interaction in online courses. In the three conducted courses, this was mainly noticeable with regards to three main aspects: (1) controversial approaches and questions, (2) additional background knowledge or business/knowledge relations and (3) in depth information retrieval.

1. Controversial questions were mostly triggered by some of the fundamental statements we based the presented concepts on. Because these statements oppose the traditional status-quo in enterprise computing, it seemed like several participants felt uncomfortable with our approaches and the resulting conclusions. Altering fundamental parts in the architecture of enterprise systems is likely to lead to temporary drawbacks or gaps, where one still has to rely on the existing systems until optimized solutions based on the new architecture have been implemented. We appreciate these discussions, since it shows that the learners do not just simply take the presented content as granted, but put it into question and will hopefully reach a deeper understanding thereby.

2. Additional background knowledge was brought in if practitioners posed questions asking how to apply some of the presented concepts to their respective setup or problems. Participants came from different branches of industries and different cultural backgrounds, leading to interesting viewpoints based on requirements we simply did not have in scope.

3. In depth information retrieval occurred several times when students had questions beyond the content covered in the reading material accompanying the respective units or believed that some formalism had to be contrary to the definition we chose. Participants then cited websites or papers to fuel discussions about that, which usually lead to either a clarification or mapping between the definitions or an improvement to the learning material by adding more constraints or side comments.

Forum activity was quite stable over the course iterations. Naturally, the number of entries in the forum differs significantly in absolute numbers, but when relating those numbers to the number of active users, the resulting ratio stays around five entries per ten active users (avg 0.512 entries/user, std 0.0672).

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entries</td>
<td>2188</td>
<td>1919</td>
<td>1101</td>
</tr>
<tr>
<td>Entries per User</td>
<td>0.167</td>
<td>0.121</td>
<td>0.121</td>
</tr>
<tr>
<td>Entries per Active User</td>
<td>0.579</td>
<td>0.420</td>
<td>0.537</td>
</tr>
</tbody>
</table>

Challenges

Technical challenges: When conducting a MOOC, it is almost inevitable that various problems and challenges occur. While we anticipated the most common problems during the first run of the course, some unexpected glitches also happened. The platform openHPI was launched with the first iteration of the IMDM course, therefore we had foreseen to run into some technical problems. The first version of openHPI built upon the open source learning management system Canvasii, which was modified to suit our needs. Teething problems, partly induced by the fact that the Canvas foundation was not particularly build with MOOCs in mind, such as slow website response times caused by...
unnecessary dynamic re-rendering of mostly static content, missing database indices or compatibility issues concerning different browsers were fixed quickly in joint efforts. But especially unexpected requirements which appeared in the middle of the course schedule and which were not adequately supported by the platform proved to be tricky. A typical example for such a requirement is the need for re-grading of parts of an assignment or a whole assignment. This might be necessary because of an ambiguous question phrase in a multiple-choice question, or if there were two correct answers for a question that was intended to have only one correct answer. Measures taken in such cases were decided on in an individual manner. Such measures were often the addition of points for affected learners, granting a second attempt to take the respective assignment again or a removal of the question altogether. Regardless of the action taken, a process we named “re-grading” was necessary in all cases. Since the platform did not support this and the changes were highly individual, such changes were conducted directly on the database. Re-grading is only one example for various changes that are applied only seldom and have many determining factors. Since it is unrealistic to cover all possibilities in the platform, it is of utmost importance that the data model and format allows for convenient access. Unfortunately, the Canvas based version of the platform used for the first two iterations saved all quiz submissions in one attribute encoded in JavaScript Object Notation (JSON), which prevents direct manipulation of the score via SQL. Consequently, additional scripts have been developed to ease re-gradings and to speed up the whole process (Renz et al., 2014).

Another issue that caused some irritations were missing entries for a timeserver in some of our servers. In order to handle the expected amount of participants during the second iteration smoothly also at peak times, normally occurring right before closing deadlines of assignments, we balanced the load across several servers, which can take requests arbitrarily. When a user takes a quiz, she has to hand in her submission within a given time frame. Since no timeserver to synchronize the system times was used, it could occur that one server gave the starting timestamp for the participant’s quiz, while another server supplied the submission timestamp. If those timestamps indicated a timeframe longer than accepted for the quiz, only answers given within the valid timeframe were accepted. Of course, this behavior was localized quickly and the participants affected by this got their submissions corrected, however it shows that also technical foundations that were regarded as given can affect a running course. While fixing this issue, we configured the load balancer to forward all requests to exactly one server, to circumvent the issue and prevent the creation of additional faulty data. In term, this increased response times for users and resulted in a slightly increased drop-off rate for users of our page during the fixing period. With the increased share of international students in the second iteration, also the desire to download parts of the content increased. Especially in rural areas, the local bandwidth often did not allow to stream the videos flawlessly. As a consequence, we offered several packaged delivery versions. These either included just the slides and the reading material, or a complete package also including the standard definition version of the videos. The quizzes and assignments still needed to be taken online, of course. Currently, we are also working on an offline mode for our platform, which is especially beneficial for mobile usage (Streek, 2014). This offline mode allows for caching the videos directly within the browser and also allows taking the self-test quizzes offline.

A feature yet to come is the addition of individual automatic reminders. Missed deadlines and therefore missed points towards the certificate turned out to be the number one reason for decreasing courage of participants. Until now, we therefore send out weekly reminder mails to all participants. Alongside these rather uninteresting reminders, we send recent information about the current weeks and hints to forum discussions that we regard to be especially interesting, in order to also offer a benefit to those learners, that already took the respective assignments. With automatic reminder mails, the teaching team can solely focus on the actual news concerning the course and the forum. Additionally, reminders would only be sent to participants who will actually benefit from them.

The third iteration of the course was run on the current backend behind openHPI, which was written from scratch to suit our needs. We tried to keep the look and feel of the platform’s user interface close to the previous version to enable a smooth switch for the existing users. While we are constantly improving the UI, the majority of changes were applied under the hood of the platform. Better scaling and tremendously simplified customization on the pro side is a great relief in comparison to the old system. However, we also want to point out potential downsides of a rewrite from scratch. Minor glitches and bugs, such as increased load of seldom run operations, might cause occasional timeouts. As our main focus has been on the course participants’ ease of use.
and convenience, the backend presented to the course administrators and teaching assistants currently still lacks several convenience features that were present in the older and thus more matured Canvas backend. Furthermore, several features that were added to the old platform in the timespan between the first and the second iteration of our course, were not yet ported to the new platform. Some features, such as learning groups and private messaging between users, were not adopted and used by the users to the expected amount. Because the adoption of private messaging on the old platform was rather slow in general and did not reach many participants in total, the feature was omitted. Learning groups, despite being used to the desired extent by now, offer further potential with regard to community building and therefore will be extended in the future.

In conclusion, at the end of the third iteration of our course the teaching team agreed that the lack of comfort induced by missing features was more than compensated by the newly built custom tailored features, such as better content organization and improved statistics. Instead of having many features we only partially needed, we could now focus on providing only features that actually helped in conducting the course or in monitoring the activities. Also the causes of timeouts could be sorted out rather quickly with detailed logs. Especially, the improved performance of the platform is very much appreciated by the teaching team as well as the course participants (as deducted by technical support tickets). So in total, the pros outweigh the cons for our use case by far.

Social challenges: The participants’ expectations towards our course differed much from iteration to iteration. We are happy that the overall tone in all three iterations was friendly and respectful, but differences were definitely noticeable. In 2012, despite smaller hiccups on the platform, typos in the reading material or sometimes misleading annotations in figures happened more frequently, but the audience was in general more patient and forgiving than in 2013. The 2013 iteration of the IMDM course was the 5th course on openHPI and therefore presented a higher level of comfort than in 2013. The 2013 iteration of the course was friendly and respectful, but the tone had switched from the former kindly asking to claiming. Additionally, in case of mistakes in quizzes relevant for grading, politeness was not always given. The focus of minor parts of the audience seemed to have shifted from being interested in learning to just getting a certification.

Given these occurrences and impressions, it is more vital than before to offer timely and reasonably expressed support. Asking further for the reasons of such focus on high scores and the certificate also unveiled that some participants mainly applied to increase their job chances. Not being able to change this, it is nonetheless encouraging that such certificates, if only achievable with certain learning efforts and thus representing knowledge gain, seem to have an influence and reputation, even if they are issued free of charge.

Another issue being discussed in every iteration is the determination of the time limits employed on the graded quizzes. In contrast to many other courses, we are rather strict with regard to the assignments. Every graded quiz can only be taken once and the time limits were quite tight. In contrast to “open book” assessments as described in other studies (Guo & Reinecke, 2014), these assessments, while not really being of “closed book” style, forced participants to interact with the content beforehand. Question based skimming of lecture videos was therefore prevented. Lowering the comfort level of the participants is likely to have a negative impact on motivation and success (Wilson & Shrock, 2001). In order not to overshoot with our intention, we tested every quiz and the applied time limit prior to release in order to make sure that it is sufficiently short, but not pressing. Having a closer look onto the average times needed by the participants, we are confident to have reached this goal. As can be seen in Table 1, about 86% to 94% of the submissions were submitted manually before the system triggered the submission automatically, with the average submission time between 45% and 68% of the granted maximal submission time.

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Table 1: Effects of Time Limits

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Exam</th>
<th>Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of given time</td>
<td>57.05%</td>
<td>60.74%</td>
<td>68.39%</td>
<td>55.19%</td>
<td>49.28%</td>
<td>45.01%</td>
<td>53.03%</td>
<td>56.58%</td>
</tr>
<tr>
<td>needed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submissions before</td>
<td>89.81%</td>
<td>88.84%</td>
<td>88.30%</td>
<td>86.71%</td>
<td>93.98%</td>
<td>93.83%</td>
<td>94.40%</td>
<td>88.55%</td>
</tr>
<tr>
<td>Time Limit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Score</td>
<td>77.39%</td>
<td>80.15%</td>
<td>76.47%</td>
<td>80.02%</td>
<td>89.69%</td>
<td>82.99%</td>
<td>78.17%</td>
<td>74.12%</td>
</tr>
</tbody>
</table>

Inferred Best Practices

In order to maintain interest in existing courses, we believe that there has to be a clear distinction between the active phase of a course and the passive phase. In the passive phase, we removed all graded quizzes as well as the reading material from the course. The forum however was still monitored and mail support was also offered. From our perception, it is key to keep the audience satisfied during the course runtime and anticipatory afterwards. Satisfaction is of major importance as many participants, especially international ones, told us that they joined our course due to recommendations of friends and coworkers. Especially the fade out phase of a course should not be forgotten, since it is an integral part of the overall experience and of high importance for the platform and its usage in general. Instead of explicitly focusing on only the active course, we made good experiences with a “transition” phase of two weeks to one month length. Within this timeframe, we conducted qualitative as well as quantitative feedback sessions, could sort out open issues with the certificates and also offer further course suggestions. Apart from the benefits, such as a better carry over rate into our next course, we could also use the “in between” time to probably already incorporate some feedback and transfer knowledge and learnings internally to the next teaching team.

With regard to the activeness in the forum, courses in archive mode were, as expected, used mainly as references. Access to the materials was selective to specific units; users did not pursue the whole course agenda. While users kept joining the course (over the period of ten months until the next iteration about 6,000 people joined), there was only little to no social interaction. For that reason, we think it is advisable to only offer the actual course once a year. MOOCs benefit immensely from the collaboration between participants (Fricke, 2014). Limiting flexibility and access in order to gather a substantial audience therefore is also in the interests of the participants. While recent studies also suggest to individualize courses to better fit to certain subgroups of learners within the audience (Wilkowski, Deutsch & Russell, 2014), we believe that keeping a substantial crowd together is the superior goal as long as it can not be guaranteed that the active audience will be larger than 4,000 individuals and thus can be split relatively risk-less. Also the submission deadlines used in our course followed that aim. While most courses on our platform and also many courses on other platforms favor weekly deadlines, we granted a fortnightly period for participants to solve each assignment. This timespan gave learners, who are doing the course in their spare time the opportunity to do the work of two weeks on one weekend and also allowed them to go on vacation or business travel for over a week without missing points. Encouraged by the positive feedback, the teaching team considers this to be a suitable way to grant participants flexibility on the one hand, while also keeping the audience focused on certain parts of the course to support discussions about the content.

By hindsight, it did not pay of to alter the existing material. Almost all active participants of the later iterations were new to our course, therefore did not benefit from the changed material, or even noticed the effort. While the additional content, mainly new real-world application examples of the presented principles and showcases of prototypical implementations was demanded and appreciated over expectations, the revised material received almost the same feedback as the former counterparts. Of course, some adjustments were simply necessary to comply with the technical progress, but also the parts we streamlined and re-recorded for better understandability, received the same valuation as before, just without participants complaining about the complexity perceived as being too high. Effort wise, it might have been more efficient to just add additional figures and link them to the existing content.

Doing retrospective, we also tried to quantify the requirements and necessary resources to conduct a course. Teachers and teaching assistants have to be versed in the respective topic and be willing to cope with unexpected tasks. An established course body as the foundation for the video recordings and the additional content is also highly recommended. Figure 4 depicts the perceived effort of the different tasks.
The combined workload of the initial course creation for the first iteration is substantially higher than the workload of subsequent iterations. Content creation is substituted by content review and update, requiring far less time. Tooling build for the course such as content management tools and processes can simply be reused. Organizational processes are established as well, leaving only the tasks to service the social aspects of the course, mainly the forum and technical support. The effort for that is reduced only slightly, as most interaction is individually, however some standard texts and a growing knowledge base ease the routine work. Further distributing by delegating some tasks, such as forum support, to participants (Fox et al., 2014), was not possible in our course, since many questions were specific about prototype implementations and could only be answered thoroughly by the respective developers.

Future Work

The fourth iteration of the course is scheduled for the third quarter of 2015 and in general it is planned as a repetition of the last course. Additionally to the existing content, practical SQL exercises will be introduced to improve the learning experience. Based on the already collected data and the insights we gathered, we intend to further validate possible explanations for the perceived effects. While we observed an increase in absolute numbers of participants from 2012 to 2013 with the content untouched, a lower number of participants is expected for 2015 due to saturation and the overall increased range of courses offered on an ever growing variety of platforms (Jordan, 2014). Particularly, we want to evaluate if there are differences between the courses that have been carried out on the new and on the old platform, as well as differences between repetitions of courses and courses with mainly new content and the same topic. By extending the analytical features of the openHPI platform, we want to collect and analyze additional data. For example, we expect that the integration of A/B-testing features will allow us to optimize individual learning outcomes.

Conclusion

With regard to the introduced research questions, we can sum up the following: Conducting further iterations of an existing online course with stable material attracts new users at far less effort. The surplus of time can be used to go into deeper discussions or to gather more materials about side aspects of the content. In order to keep participants anticipatory, offerings of the course should be clearly limited within the passive archive phase in contrast to the actual active runtime. Additionally, timespans between the repetitions should be chosen with the size of the potential audience in mind in order to guarantee vivid social interaction during runtime. In contrast to course advertisement, which should use all available channels, and error reports, which should be restricted to a helpdesk, it is advisable to focus content-based communication onto the forum in order to foster interaction and prevent fragmentation. Feedback with regard to the actual content should be incorporated as fast as possible in order to represent the impact the participants have towards the course. Feature requests have to be checked for impact and effort beforehand. Since feature requests as well as functionality offered on other platforms are partly conflictive, the development direction of the own courses platform has to be chosen with individual goals and own objectives in mind. A broad variety is not only beneficial for courses in general, but also platforms and their technical offerings.

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Supporting language diversity of European MOOCs with the EMMA platform

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ABSTRACT

This paper introduces the cross-language support of the EMMA MOOC platform. Based on a discussion of language diversity in Europe we introduce the development and evaluation of automated translation of texts and subtitling of videos from Dutch into English. The development of an Automatic Speech Recognition (ASR) system and a Statistical Machine Translation (SMT) system is described. The resources employed and evaluation approach is introduced. Initial evaluation results are presented. Finally, we provide an outlook into future research and development.

Introduction

English is undisputable the lingua franca in the academic world and in business life. This has also been mirrored in the global open education movement. Since the first initiatives to share open educational resources (OER) have been initiated by major higher education institutions from the US, English was the primary language for OER repositories. Later, also language and cultural aspects have been taken into account (Kalz, Specht, Nadolski, Bastiaens, Leirs, & Pawlowski, 2010). The same pattern of development also applies for the fast growth of Massive Open Online Courses (MOOCs). North America as a very large English-language area has traditionally a much smaller diversity of languages compared to Europe. Crawford (2000) even discusses this as a ‘war with diversity’ and he provides an account how difficult bilingual education in the US is and how ideological the English-only movement is rooted in the culture.

On the contrary, Europe is a geographical area with a very high diversity of languages and cultures. This diversity is also implemented in the political, legislative and juridical system of the European Commission. The European Commission knows 24 official working languages and employs 1,750 linguists and 600 support staff plus 600 full-time and 3,000 freelance interpreters to keep and support this diversity on its highest democratic levels. Consequentially, this language diversity has also been stressed for the European Higher Education area. In the Bologna process, a balance between national identity and mobility of learners and teachers is sought.

Moreover, in the current knowledge society citizens need to develop key competences to be able to maintain and improve their employability. The EU has identified eight key competences among which seven are in one way or another related to the multilingual and cultural issues discussed in this paper. These key competences are: communication in the mother tongue, communication in foreign languages, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression.

It is important that development of these key competences starts with young people during education and in the phase from moving from education to a working life. Throughout their lives, adults need to develop and update these skills. However, as said before, it is difficult to arrange this purely by the formal educational process. The Expert group on New Skills for New Jobs recommends actions in education and training to develop the right mix of skills in enabling key competences, such as learning to learn, digital competence, cultural awareness, and communication in foreign language (Campbell et al., 2010; Alidou, Glanz, & Nikiêma, 2012). The OER and MOOC movement offer many opportunities for education providers to address these key competences, either directly or indirectly.
For the MOOC movement, many providers are into a paradoxical decision process. Depending on strategic goals aligned with their open education initiatives, they either go for entering an international market with a primarily English speaking audience, or they offer open education for their national audience and in their national language. According to data of the European MOOC Monitor from September 2014, 346 from 770 open online courses (45%) in Europe are delivered in English (see Figure 1).

Languages of European MOOCs  
(n=770)

<table>
<thead>
<tr>
<th>Language</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>45%</td>
</tr>
<tr>
<td>Spanish</td>
<td>14%</td>
</tr>
<tr>
<td>French</td>
<td>32%</td>
</tr>
</tbody>
</table>

Figure 1. Languages of European MOOCs

Initially MOOC providers then will design the MOOC for the chosen market and that puts limitations both on the provider and participant. On the other hand, MOOCs are by definition open and therefore MOOCs regularly have a really worldwide audience and as a side-effect very diverse language competences of participants can be assumed (Liyanagunawardena, Adams, & Williams, 2013). Consequently many participants will fail to make the best out of their MOOC learning experience.

One way to deal with some of the language barriers would be to add subtitles to videos in multiple languages and translate the main content of the MOOC. In addition to addressing language barriers subtitling and translation also increases accessibility and reduces the risk of exclusion of participants with special needs. Although subtitles are commonly associated as means to assisted hearing-impaired persons, there are also very useful for participants who have not yet mastered the course language and even for participants who have some form of mastery of the language when they for example are in a noisy environment, or assist those who prefer to read instead of watch and listen.

For MOOC providers this would have additional benefits as it would allow them to open up to niche markets or promote niche products to wider markets. For participants there can be an implicit benefit in that multilingual MOOCs will stimulate the development of the intercultural and language key competences. However, manual transcription and translation of video and content is time consuming.

In this paper we present the approach taken in the EMMA project that is based on language technology. The EMMA project (European Multiple MOOC Aggregator) aims to integrate and extend separately developed technological components to create and test an innovative learning environment for the delivery of MOOCs. While language technology has a lot of potential application examples in the educational domain (Berlanga et al., 2009) in this work we focus on software that will be used for automated generation of transcription of videos and translation of content. Results will be reported on transcription and translation of videos only.

The approach and method used by EMMA is designed to support several languages, some of which have been tested extensively. Because Dutch is a new language for the system, we will only introduce results for the automated transcription and translation of Dutch-spoken videos that are being used in our MOOCs. Last but not least we discuss the results and provide an outlook into future research and development.

Method: Cross-language exploitation of video and course content

The success of MOOCs is mostly caused by its universal and open access. However, in practice, the universal access to MOOCs is not as such for hearing-impaired people and those not knowledgeable about the language in which the course is delivered. Enriching MOOCs with the transcription and translation of their audiovisual content and the translation of textual content significantly enhances accessibility, opening MOOCs to the worldwide community. Transcription and translation of course might benefit other e-learning courses as well, but in particular in MOOCs the potential is much larger because MOOCs typically are advertised as open courses and attract participants from all over the world. Moreover, many MOOCs are designed as so-called xMOOCs, where videos form a major if not only medium for the course designer to bring across learning content. Due to the lack of interaction with the teacher
multilingual content could greatly assist the non-native participants. Even native participants can benefit from transcription as shown by Ding et al. (2014). These authors report about experiences from a bilingual MOOC in bioinformatics. Lecture videos in the MOOC were recorded in Chinese and subtitled in English. Interestingly, the English subtitles were not only beneficial to non-native Chinese students but also to Chinese native speakers.

Several different approaches are reported in the literature with regard to cross-language translation, subtitling and support. Most of the time content and videos are manually transcribed and translated by the course designer and authors of the content. When quality is important, professional translators are employed. This is a rather expensive approach.

Unfortunately, even using the current state-of-the-art technologies, transcriptions and translations for MOOC content can be reviewed are far from perfect. Nevertheless, these automatic translations and translations could be reviewed by course designers, teachers or even volunteers to produce accurate enough materials for students will little effort. In fact, this computer-human approach has shown to reduce the effort needed from a completely manual approach (Serrano, 2014).

Automatic Speech Recognition (ASR) and Statistical Machine Translation (SMT) have made important progress over the last years achieving accurate enough results for many applications (Hinton et al., 2012, Bojar et al. 2014). Indeed, automatic transcription and translation of MOOCs define a new challenging application for ASR and SMT technology. Automatic transcription and translation of video lectures was studied in the transLectures project, in which automatic transcription and translations of video lectures were produced and post-edited via a web interface (Silvestre-Cerdá et al., 2012). User evaluations corroborated the notable increase in productivity to generate transcriptions and translations for video lectures in comparison to do it from scratch. In addition, lecturers and students show their satisfaction with this computer-assisted transcription and translation system in terms of usability.

In the current work, we describe the ASR and SMT systems that have been developed to transcribe and translate the contents of MOOCs offered on the EMMA platform. In this paper, we focus on the case of courses from educational sciences offered by the Open Universiteit in the Netherlands (OUNL). Specifically, Dutch videos extracted from MOOCs are first transcribed and then translated into English.

In the following, we first describe the resources collected to create the transcription and translation systems. Next, ASR and SMT technology behind these systems is briefly described. Finally, results are discussed and prospects of future work are proposed.

Collection of resources

State-of-the-art ASR and SMT systems are usually built from a large amount of data from different domains. As a result, these are general-purpose systems that cannot properly deal with content coming from specific domains. For instance, general ASR and SMT systems will have difficulties transcribing or translating specific vocabulary included in MOOCs. Fortunately, the quality of ASR and SMT systems can be significantly improved by adapting them to the specific domain of the MOOC content in question.

As mentioned above, the first step to build ASR and MT systems is to collect audio and textual resources. These resources can be classified as in-domain and out-domain resources. In our case,
in-domain resources are those materials related to the MOOC to be transcribed and translated, while the rest of resources are considered out-domain. An alternative classification of these resources is the type of resource, instantiated as annotated speech, lexical annotation, Dutch text, English text, and parallel Dutch-English text. The first three types of resources are used to build the ASR system, whereas the last two are employed to create the SMT system. Table 1 depicts the basic statistics for all resources obtained.

Table 1: ASR and SMT resources

<table>
<thead>
<tr>
<th></th>
<th>Annotated Speech</th>
<th>Lexical Annotation</th>
<th>Monolingual Dutch</th>
<th>Monolingual English</th>
<th>Parallel Dutch-English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration (h)</td>
<td>122</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sentences (M)</td>
<td>-</td>
<td>-</td>
<td>52.1</td>
<td>115.9</td>
<td>33.3</td>
</tr>
<tr>
<td>Running Words (M)</td>
<td>1.5</td>
<td>0.4</td>
<td>631</td>
<td>2007.3</td>
<td>509.3 (D) - 473.0 (E)</td>
</tr>
<tr>
<td>Vocabulary (K)</td>
<td>62.4</td>
<td>-</td>
<td>3956.9</td>
<td>7282.3</td>
<td>2326.5 (D) - 2836.3 (E)</td>
</tr>
</tbody>
</table>

In Table 1, annotated speech refers to the collection of speech documents together with its corresponding time-aligned transcriptions. These speech documents are a subset of those included in the Corpus Gesproken Nederlands (CGN) (Oostdijk, 2000), which contains over 800 hours of annotated speech. At the moment, our current Dutch transcription is trained on a selection of 122 hours, containing over 1.5 million of words from a vocabulary of 62.4 distinct words. This selection has acoustic conditions that are similar to those of the OUNL MOOCs.

Lexical annotation refers to phonetic dictionaries of Dutch, that is, a list of Dutch words with its corresponding transcription(s) at the phoneme level. Phonemes are the elemental unit of human speech. In this work, two phonetic dictionaries were involved: the CGN lexicon and the WEBCELEX lexicon.

The monolingual Dutch electronic text comes from different publicly available sources, such as the European Commission or Wikipedia. In addition, a small set of in-domain text documents were provided by the Open University of the Netherlands. A similar compilation of resources was carried out for the monolingual English electronic text.

Parallel Dutch-English refers to textual resources that contain the same sentences in Dutch and English. Most of these resources have been obtained from the OCRopus website, but also from some European Union portals, such as Europarl TV. These parallel texts should be considered out-domain. Again, all the resources used are freely available for research and educational purposes.

Automatic Speech Recognition for Dutch

The ASR system developed for Dutch is based on a probabilistic approach to the transcription problem. Basically, given a speech signal, the system will search for the most probable transcription. This probabilistic approach to the transcription problem results in a system integrating three underlying models.

1. The acoustic model, which estimates the probability of the phonemes that are being uttered in the speech signal.
2. A lexical model, which specifies how the phonemes are built up into words.
3. A language model, which estimates the probability of the sequence of words being transcribed.

Acoustic model

The acoustic model corresponds to a hybrid between a Hidden Markov Model (HMM) and a Deep Neural Model (DNN), which correspond to the current state-of-the-art ASR systems (Hinton et al., 2012). Basically, the HMM splits the speech into segments and the DNN classifies these segments into the corresponding phonemes. This model is trained using the data shown in the second column of Table 1. The training process of this model is composed by multiple passes and employs a wide range of techniques from Pattern Recognition (PR). PR is a research area which studies and develops methods to help machines to recognise objects, logical structures (such as a language) and patterns from input signal as humans do. For the sake of clarity, we will only give a summary of this process.

First, speech files are preprocessed to reduce the noise and variability of the signal. Then, given the numerical vectors extracted from the speech signal and their transcription, the standard HMM model is trained from all samples, resulting in a universal model representing all speakers (Rabiner, 1989).
Once this standard model is trained, a speaker-adapted model is estimated using Constrained Maximum Likelihood Linear Regression (CMLLR) (Gales, 1998). Basically, this model normalises each speaker to be more homogeneous to the others. Last, a DNN is trained for each HMM trained, that is, the standard and the CMLLR. In this work, the estimation of the acoustic models has been carried out using the translectures UPV toolkit (TLK) (del-Agua et al., 2014), which is freely available.

**Lexical Model**

A lexical model provides the information of how each word in a language should be pronounced. Obviously, the lexical model to be employed in an ASR system depends on the phonetics of the language under study. In case of Dutch, the pronunciation of a word is ambiguous, i.e. the same word might be pronounced in different ways and simple pronunciation rules are not available. In order to generate the phonetic transcription of each word, a statistical grapheme-to-phoneme model (Bisani, 2008) has to be trained. This model infers the phonetic transcription of new words from a limited set of phonetically annotated words.

**Language model**

In this work the language model (LM) employed for Dutch ASR corresponds to a linear mixture of interpolated n-gram models trained on the textual resources available (Bellegarda, 2004). More precisely, our LM is based on n-gram models that are estimated for each available individual resource. For instance, a LM will be trained on text extracted from European Commission website, another one from Wikipedia and so on. An n-gram model is a probabilistic model which estimates the probability of a sentence as the probability of consecutive groups of up to n words (Chen and Goodman, 1996). Once, individual LMs are trained for each resource, LMs are combined using a linear mixture optimised on in-domain textual content. This was in our case text extracted from the content of the MOOCs of the EMMA platform. This language model has been trained with the SRI Language Modeling Toolkit (SRILM) toolkit (Stolcke, 2002), which is freely available for research and educational purposes.

**Statistical Machine Translation for Dutch**

As in ASR, state-of-the-art machine translation systems also follow a probabilistic approach to the problem. In this case, given a sentence in an input language, the system calculates which is its most probable translation. Statistical Machine Translation (SMT) systems are composed by two models: the translation and language models. The language model corresponds to the same as described for ASR, but for the English language, since it is language to which we are translating. The translation model corresponds to a model trained using the current state-of-the-art Moses toolkit (Koehn et al., 2007), which estimates a statistical phrase-based log-linear model. This model is built by extracting bilingual phrases (understood as segments of consecutive source-target words) from word-aligned parallel text corpora. Then, several scoring models are estimated from these extracted bilingual phrases.

Again, similarly to ASR, SMT systems do not significantly improve with the inclusion of large amounts of out-domain resources. So, representative data from MOOCs are needed in order to train an effective SMT system. In the case of EMMA, this means translated MOOC-related material. However, this kind of in-domain translated material is usually scarce, and a selection of out-domain parallel sentences could be used to improve SMT performance instead.

In this regard, intelligent selection techniques have been proposed to extract from the out-domain parallel corpora those bilingual sentences that would be useful to train the in-domain SMT system and provide better translation quality. This is especially appealing in the MOOC context, where courses to be translated correspond to specific domain content that cannot be easily translated by a general-purpose SMT systems. Intelligent selection techniques are based on similarity measures computed between the in-domain and out-domain texts. Using these measures, relevant texts from the out-domain data are extracted. Finally, the SMT system will be trained on the in-domain data plus the selected set of the out-domain corpora.

**Results**

In this section, we describe the experiments performed to assess the quality of the described ASR and SMT systems for Dutch. These experiments have been performed on the contents of MOOCs from the Open University of the Netherlands. As evaluation approach we have chosen an empirical approach stemming from pattern recognition. This evaluation consists in an experiment in which some annotated data, i.e., a set of video lectures to be transcribed or a text to be translated, are automatically transcribed and its error estimated in comparison with the correct transcription or translation. Specifically, this annotated data is split into two sets: development and test. First, the development set is employed to tune system parameters. Then, the test set is automatically
transcribed or translated using the best parameters obtained on the development set. The transcription and translation quality is measured on both, the development and test sets. The quality on the development set corresponds to an optimistic measure of the system performance, as the system has been tuned on it. On the other hand, the quality gauged on the test set represents a more realistic performance measure, as this data set has been involved neither on the training phase, nor on the tuning phase.

Dutch ASR Evaluation

This section describes the evaluation of the ASR system developed for automatically transcribing Dutch video lectures. Concretely, four videos included in the first units of the MOOC on E-learning from the Open University of the Netherlands were selected for the evaluation. Next, these four videos were automatically transcribed using a general-purpose ASR system. A lecturer of the course volunteered to review the automatic transcriptions using post-editing with the transLectures player interface. An example of the interface can be observed in Figure 2. Once this process was completed, reviewed transcriptions were compared to automatic transcriptions in order to automatically assess the accuracy of the ASR system.

The time devoted to the review process is measured in a measure called Real Time Factor (RTF). RTF measures the ratio between the time needed to post-edit the transcription and the total duration of the video. In our case, the review process took 6 RTF, that is, post-editing the transcription of 1-hour video requires six hours. This result is quite satisfying for a first evaluation, as the manual transcription from scratch by non-expert transcribers is usually reported to cost 10 RTF.

The four selected videos account for 1.8 hours of speech, which is a good quantity for an empirical evaluation. Next, as explained before, the videos were split into two sets: the development set and the test set. It must be noted that, the sets contain two different speakers each, resulting in speaker-independent sets. Table 2 shows basic statistics of these sets.

Figure 2. Example of transLectures editing interface for Dutch

Table 2. Statistics of Dutch ASR evaluation data

<table>
<thead>
<tr>
<th>Set</th>
<th>Videos</th>
<th>Duration</th>
<th>Running Words (K)</th>
<th>Vocabulary(k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>2</td>
<td>00:53:19</td>
<td>8.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Test</td>
<td>2</td>
<td>00:52:51</td>
<td>9.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>01:46:10</td>
<td>17.5</td>
<td>2.3</td>
</tr>
</tbody>
</table>

The quality of the ASR system is evaluated in terms of Word Error Rate (WER). WER is measured as the mean number of natural editions (substitutions, deletions and insertions) that have to be applied to transform the automatic transcription into the reviewed transcription. WER is thoroughly employed in the ASR literature and it has been shown to correlate well with human evaluation. Table 3 shows the results obtained in the evaluation.

Table 3. WER results of Dutch ASR

<table>
<thead>
<tr>
<th>Set</th>
<th>WER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>27.2</td>
</tr>
<tr>
<td>Test</td>
<td>27.5</td>
</tr>
</tbody>
</table>
results of Table 3 reflect that the current Dutch ASR system incorrectly recognizes one word out of four on average. This result is in line with those obtained by state-of-the-art ASR systems, such as that used in YouTube. When comparing the transcription quality of our videos being processed by the general-purpose YouTube ASR system, WER was 38.6, which is 9 points worse than the 27.5 obtained with our ASR system. This difference is mainly due to the application of adaptation techniques to the specific content of the videos, which the general-purpose YouTube ASR system does not perform.

In order to better analyse the transcription results of our system we performed an error analysis. Several transcription errors are caused by intermingling English words into the Dutch speech (the ASR system only expects Dutch words), non-native Dutch speakers (mostly Germans) and out-of-vocabulary words (unknown words for the ASR system).

Dutch to English SMT system evaluation

This section describes the evaluation of the SMT system developed for automatically translating Dutch into English for OUNL MOOCs. First of all, the needed parallel data for the evaluation was generated. We selected as the evaluation data the transcriptions of the same four videos that were reviewed in the ASR evaluation together with the introductory web texts of the two OUNL MOOCs. Similarly as in ASR, the translation of the evaluation data was performed by applying post-editing. First, a general-purpose SMT system was built with out-domain data. Next, this system was employed to automatically translate all the Dutch texts into English. Last, the lecturer reviewed the translations using the transLectures interface as shown in Figure 3.

The translation review process took 12.2 RTF to be performed. This result is quite satisfying compared to the generation of manual translation, which costs 30 RTF on average. The main reason behind this result is the good quality of the general-purpose SMT system, which would be further improved when the in-domain data was generated during the translation review process. Similarly to ASR, the reviewed translations were split into two sets: a development set and a test set. Table 4 shows the basic statistics of these datasets.

As in ASR, the SMT system for Dutch was automatically evaluated on the development and test sets in terms of the Bilingual Evaluation Understudy (BLEU) score (Papineni, Roukos, Ward & Zhu, 2002). BLEU is the geometric mean of n-gram overlapping (precision) between the automatic and the reviewed translation, penalised by the ratio between the automatic and the reviewed translation.
when the former is shorter than the latter. Several authors state that BLEU score correlates well with human judgement (Coughlin, 2003). For this reason, BLEU has become the conventional accuracy measure in SMT.

In our evaluation experiments, SMT systems based on different data selection techniques were compared in terms of BLEU score. Table 5 depicts the results for the best performing technique on the development set and its accuracy on the test set.

Table 5. Results of the SMT system for Dutch to English

<table>
<thead>
<tr>
<th></th>
<th>BLEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>38.5</td>
</tr>
<tr>
<td>Test</td>
<td>38.0</td>
</tr>
</tbody>
</table>

As observed in Table 5, the resulting BLEU score is at the same level of state-of-the-art and commercial systems (Bojar et al., 2014). When submitting our testset to Google Translate a BLEU score of 33.3 was obtained. Like ASR the difference in quality can be attributed to the adaption in our system to the contents of the texts. It must be noted also that, the RTF obtained in the user evaluation was 12.2 for a general-purpose SMT system which obtained a 35.7 BLEU score on the test set. Therefore, it is expected that the translations generated by the system reported in Table 5 will require less RTF to be reviewed.

Discussion
This work is a first approach to the automatic transcription and translation of Dutch MOOCs on the EMMA platform. The results obtained are encouraging, as the systems developed are in range of state-of-the-art system performance on this application. These results were also corroborated on user evaluations devoted to generate the evaluation data to automatically assess the ASR and SMT systems. User evaluations consisted in a review process based on the post-editing of automatic transcriptions and translations. In both cases, the average time devoted to review automatic transcriptions and translations was reduced by 50% with respect to do the same task from scratch. Moreover, it must be noted that user evaluations were performed on transcriptions and translations generated by general-purpose systems, it is expected that ASR and SMT systems tuned on in-domain resources produce higher quality transcriptions and translations that further reduce the review effort.

Future work includes the improvement of current ASR and SMT systems incorporating more in-domain material. In addition, as foreign words and non-native speakers have shown to be an important source of errors, a multilingual approach to ASR is needed to deal with the peculiarities of our application and improve the overall system performance.

Acknowledgements
This work is partially funded by the EU under the Competitiveness and Innovation Framework Program 2007–2017 (CIP) in the European Multiple MOOC Aggregator (EMMA) project. Grant Agreement no. 621030.

References


Reconsidering Retention in MOOCs: the Relevance of Formal Assessment and Pedagogy

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Pieter de Vries and Thieme Hennis, Delft University of Technology, Netherlands.

ABSTRACT

The motivation to enrol in a MOOC is more diverse than the motivation for a conventional course. This diversity requires re-conceptualization of the terms for enrolment, participation, and achievement. The paper addresses the concept of retention and focuses on engagement relative to assessment. Student retention is often used to determine the value of higher education. In this paper we argue that retention data about specific groups of students can supply valuable insights to improve MOOC design and align expectations. The paper reports three short studies conducted to gain insights into disengagement from assessment, based on the data gathered in the first five DelftX MOOCs. The empirical part of the paper demonstrates that retention rates in relation to formal assessment vary from course to course. In the analysed case, fewer learners disengaged from the formal assessment in the course with highest degree of student autonomy, high learning support and scaffolds. Consistently across courses, learners who received lower grades on the first assessment task, tend to disengage from further assessment.

Introduction

Massive Open Online Courses (MOOCs) evolved from the technological affordances that allowed scaling traditional online education. As a result, MOOCs inherited the language and concerns associated with its predecessors, formal online courses. However, there are certain idiosyncrasies that challenge immediate translation of existing evidence from the field of online education into the emergent area of scaled online learning. Due to their open registration policies where any student can join at any time, MOOCs have a higher degree of asynchronicity than other courses taught at distance. Asynchronicity is associated with distance education where students are at times ‘out of sync’ with each other engaging with the content at their convenience, rather than at commonly scheduled times (Mullaney, 2014). MOOCs challenge the boundaries of the traditional cohorts of learners even further by allowing students to also be ‘out of sync’ in relation to the time they can start or stop taking the course. This heightened asynchronicity is exacerbated by the diversity of motivations for enrolment in a MOOC. In a conventional course, students enrol to receive credit and formal recognition of mastery, providing the student cohort with a shared goal. In contrast, students undertaking a MOOC are driven by a variety of goals, from sampling course content, to being interested in a subject, and are not bound to an interest in credentialing. Primary motivation for enrolment and participation can simply be associated with the intellectual challenge and opportunity to socialize with peers around a topic of interest (Eynon, 2014).

Despite these differences, in making sense out of MOOCs, researchers and practitioners tend to apply the language that is well defined by the formal educational contexts. De Boer et al. (DeBoer, Ho, Stump, & Breslow, 2013) argue that the concepts of enrolment, participation, curriculum and achievement are not entirely useful to describe scaled online learning, and need to be re-operationalized and re-conceptualized. In line with this position, this paper addresses the refinement of the concept of retention, widely applied to evaluating MOOCs, and controversial within the MOOC academic discourse. The paper discusses the patterns of engagement with formal assessment as associated with the learners who demonstrate commitment to taking the course, but differ in their decisions to sustain that commitment. The discussion is supported by exploratory analysis of the course level data from the first five MOOCs delivered by the Delft University of Technology.
commitment but don’t sustain it in the same way, may provide insights into who was more vulnerable to disengagement, as well as time when additional support or re-design may be required to meet the needs of these learners.

Action Phases and Commitment to Learn

Thousands of MOOC participants report their intention to finish the course through pre-course questionnaires (De Vries et al, 2015, in press), but fewer complete, or even start the course. Researchers explain such phenomenon of holding a strong goal intention but not achieving the goal by people’s failure to self-regulate during goal striving (Gollwitzer & Sheeran, 2006). The ability to self-regulate is crucial for progressing in distance education where, along with the convenience of engaging with the content at their own pace, the students are required to be more active in managing their own learning (Moore & Kearsley, 2011).

Effective MOOC learners also possess effective self-directed learning skills (Kop, Fournier, & Mak, 2011; Milligan & Littlejohn, 2014; Milligan, Margaryan, & Littlejohn, 2013).

Gollwitzer (Gollwitzer, 1990) points out the distinction between goal setting and goal striving seen within the so-called “Rubicon model”. It includes four distinct phases: pre-decisional and post-decisional phases that both precede taking action, and goal initiation and implementation phases that are associated with the action. The first two phases are characterized by wishing and deliberating, i.e. evaluating the wish in comparison to other competing wishes. Upon forming the goal intention, individuals move to the next phase of planning, within which they are attempting to commit to a certain course of action, but are not yet engaged in the action itself. According to Gollwitzer, the shift from deliberating and planning to implementation depends on the strength of person’s commitment to implementing the goal (ibid.).

With the reference to the Rubicon model, and by considering the little effort invested into the actual course enrolment, one can assume that some learners who enrolled in the MOOC may as well be in the pre-actional phase where registration for the course just signifies intention. As the course begins, students who interact with course’s content, as well as those who complete course activities would indicate higher commitment levels.

Through our exploratory work with the course data, we observed that in the case of the DelftX MOOCs, 95% of all students who received certificates of completion in five MOOCs engaged with the
formal assessment process, i.e. course assignments, from the very first beginning of the course. This observation is in line with a study by Coffrin, Corrin, de Barba & Kennedy (Coffrin, Corrin, de Barba, & Kennedy, 2014) who suggest that early marks in MOOCs are a good predictor of the grade at the end of the course.

It is quite logical that students who received formal certification engaged in the course assignments. Research reported in this study starts with the premise that MOOC participants who did not receive formal certification but engaged in formal assessment early in the course, showed the same levels of commitment and investment of efforts as the students who certified, without sustaining the same levels of commitment. This study approaches students’ engagement with early assessment activities as an indicator of commitment beyond that of intending to learn to the actual implementation of this goal. This way the study singles out learners whose engagement with the MOOC can, indeed, be conceptualized as retention. To further investigate this argument, we conducted a series of inquiries that address patterns of engagement and disengagement with formal assessment, students’ retention rates and contexts within which disengagement occurred.

Data Description
Analyses reported in this paper were conducted using the course level data from five MOOCs delivered by Delft University of Technology (TUD) in 2013-2014. The TUD has been an active member of the Open Movement since 2007, and joined the edX consortium in 2013 to strengthen the presence in the field of open and online education. TUD’s first five MOOCs represent a variety of applied hard and soft science courses at bachelor’s level, on topics of solar energy, infrastructure systems, water treatment, aero engineering and credit management (Table 1).

Table 1: First generation of DelftX MOOCs.

<table>
<thead>
<tr>
<th>MOOCs</th>
<th>Period</th>
<th>#Enrolled</th>
<th># Certified</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 ET303 4TU Solar Energy (SolarX)</td>
<td>16.09 – 06.12.2013</td>
<td>57.091</td>
<td>2.730 (4.8%)</td>
<td>Bcs</td>
</tr>
<tr>
<td>#2 CTB3365 Introduction to Water Treatment (WaterX)</td>
<td>16.09 – 25.11.2013</td>
<td>29.088</td>
<td>545 (1.9%)</td>
<td>Bcs</td>
</tr>
<tr>
<td>#3 1110X Introduction to Aeronautical Engineering (AeroX)</td>
<td>03.03 – 19.5.2014</td>
<td>15.820</td>
<td>578 (3.7%)</td>
<td>Bcs</td>
</tr>
<tr>
<td>#4 TW3421 Credit Risk Management (CreditX)</td>
<td>18.04 – 30.6.2014</td>
<td>20.925</td>
<td>709 (3.4%)</td>
<td>Bcs</td>
</tr>
<tr>
<td>#5 NGI101x Next Generation Infrastructures. Part 1 (NGix)</td>
<td>23.04 – 08.07.2014</td>
<td>16.091</td>
<td>517 (3.2%)</td>
<td>Bcs</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>139.015</td>
<td>5.079 (3.7%)</td>
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</tr>
</tbody>
</table>

Analysis

Study 1.
The first study reported in this paper was framed along the descriptive research question: What are the patterns of students’ disengagement with formal assessment in DelftX MOOCs?

To provide a visualization of patterns of engagement with formal assessment, we have plotted the number of students engaging in regular homework assessments and mid-course/final exams along the time sequence when they were offered to students (Figure 1). It could be seen that in some courses, e.g. AeroX, over 80% of course participants who attempted the first homework did not engage in further assessment activities leading to the certification; while in other courses, such as CreditX almost 70% of the students who attempted the first formal assessment activity finished the course with formal certificate. In other words, in the analysed cases, the rates of retention among the students who intend to receive formal certificate and demonstrate their intention by engaging in formal assessment vary from 19% to 76%, depending on the course.
Figure 1 also indicates that the highest drop of participation in formal assessment activities occurs between the first and the second homework assignments. It should be noted that across five courses the first and the second assignments did not follow similar deadlines; e.g. in AeroX the first and the second homework were due within the same week, in SolarX – within the first two several weeks, in NGIx – until the end of the course. We observed that the courses where the time difference between the two first homework assignments deadlines was smaller, the drop in participation is sharper. Regardless of the timeframe, most students disengage from formal assessment after they attempt the first homework.

Other insights gained from this simple visualization of the patterns of engagement in formal assessments are that more people attempt exams rather than homework. That can be explained by the differences in assessment design within MOOCs: in courses where homework assignments carry more weight towards the final grade, the participation numbers in on-going homework assessments are higher. In courses where learners had a choice as to how many assignments to complete (e.g. NGIx) they preferred to engage with earlier homework tasks more than with the later ones. Finally, besides the sharp drop between the first and the second homework, we can see the changes in participation after Exam/Test grades are out. There may be different reasons for this: students may be only interested in some parts of the course, or, they may realize that further engagement in formal assessment will not yield a passing grade.

To conclude, some similarities were observed upon initial look at the retention in formal assessment. All five courses demonstrated a sharp drop of participation after the learners attempted the first assessment activity. This observation led to the investigation of the relationship between the first formal assessment activity and further participation in the formal credentialing, as will be reported in Study 2. Additionally, we observed vast differences in the drop of the participation rates across courses, suggesting that course contingent factors may be at play. Study 3 refers to the pedagogical analyses conducted for the evaluation of DelftX MOOCs, to address the differences between the courses, as well as contextualize the patterns of engagement with formal assessment, including a possible relation between timing of assessment and retention.

**Study 2**

The second study reported in this paper tested three hypotheses about the relationship between student performance on the first homework assignment (HW1) and their further engagement with formal assessment, including graded homework assignments, exams, and receiving of the certificate at the end of the course. More specifically, we assumed that there is a relation between poor performance on the first graded assignment and disengagement from further engaged assessment. A poor result may have impacted students’ motivation, or informed the students about the misalignment of their expectations with those of the teaching staff, and possibly leading to the re-evaluation of students’ intention and consequently disengagement from formal assessment.
Hypothesis A. Students who disengaged from the formal assessment process after the first homework assignment were more likely to receive lower grades. An independent-samples t-test was conducted to compare grades for the first homework for students who went on to complete the second homework and for students who didn’t. Such analysis for the NGIx course could not have been implemented, due to a different grading policy. In all four cases, there was a significant difference (p<.000) between the scores for the first homework assignment (HW1) in the group of students who completed both first and second homework and the group of students who did not complete the second homework (Table 2). In other words, in analyzed cases students who scored low on the first homework assignment disengaged from the second homework assignment (HW2).

Table 2: Comparison of the first homework grade between the students who completed the second homework and the students who did not

<table>
<thead>
<tr>
<th>Course</th>
<th>Students who attempted HW1</th>
<th>Mean grade HW1 for students who did not complete HW2</th>
<th>Mean grade HW1 for students who did complete HW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SolarX</td>
<td>6720</td>
<td>0.34</td>
<td>0.62</td>
</tr>
<tr>
<td>WaterX</td>
<td>3382</td>
<td>0.37</td>
<td>0.52</td>
</tr>
<tr>
<td>CreditX</td>
<td>1004</td>
<td>0.56</td>
<td>0.85</td>
</tr>
<tr>
<td>AeroX</td>
<td>1747</td>
<td>0.29</td>
<td>0.75</td>
</tr>
<tr>
<td>NGIx</td>
<td>NA</td>
<td>N/A due to “pass/fail” assessment</td>
<td>N/A due to “pass/fail” assessment</td>
</tr>
</tbody>
</table>

Hypothesis B. Students who disengaged with the formal assessment prior to the first test are more likely to have lower grades on their first homework assignment (HW1). An independent-samples t-test was conducted to compare grades for the first homework assignment for students who went on to complete the first formal test and for students who didn’t. Similarly, there was a significant difference in the scores for the first homework in the group of students who completed the first test and in the group of students who did not complete the first test (p<.000). Such trend was observed in all four analyzed MOOCs (Table 3). To conclude, in this analysis students who scored low on the first homework assignment disengaged from attempting the first formal test.

Table 3. Comparison of grade HW1 between the students who completed the first test (Test1), and the students who did not.

<table>
<thead>
<tr>
<th>Course</th>
<th>Students who attempted HW1</th>
<th>Mean grade HW1 for students who did not complete Test1</th>
<th>Mean grade HW1 for students who did complete Test1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SolarX</td>
<td>6720</td>
<td>0.39</td>
<td>0.64</td>
</tr>
<tr>
<td>WaterX</td>
<td>3382</td>
<td>0.4</td>
<td>0.55</td>
</tr>
<tr>
<td>CreditX</td>
<td>1004</td>
<td>0.56</td>
<td>0.89</td>
</tr>
<tr>
<td>AeroX</td>
<td>1747</td>
<td>0.39</td>
<td>0.76</td>
</tr>
<tr>
<td>NGIx</td>
<td>NA</td>
<td>N/A due to “pass/fail” assessment</td>
<td>N/A due to “pass/fail” assessment</td>
</tr>
</tbody>
</table>

Hypothesis C. Students who completed the course have higher first Test grades. An independent-samples t-test was conducted to compare z-scores of the grades received on the first formal test by students who received the certificate of completion, and those who did not. There was a significant difference in the z-scores of the grades for the first test by the students who received the certificate of completion (M=0.49); p < 2.2e-16. These results suggest that students who scored higher on the first Test did not disengage from the formal assessment process in all five analysed MOOCs.
Study 3.
The third study reported in this paper inquired into the contexts in which the disengagement from formal assessment occurred, and addressed the following research question: What are the differences between the pedagogical contexts within which patterns of disengagement occurred?

Building on the work by Weller (2014) and Swan et al. (2014), we have evaluated a number of pedagogy-related aspects in the five MOOCs (for further review, see De Vries et al. (2015, in press).

The evaluation revealed that all five MOOCs differed in learning design, academic disciplines, the degree of teacher’s control and learner autonomy, as well as decisions towards social aspects of learning, e.g. forum placement in the courseware, or forum facilitation strategies, as well as assessment design. Generally speaking, courses that had elements of pure non-life sciences (Biglan, 1973), incorporated lower student autonomy, higher workload, and a less flexible assessment strategy had higher dropout rates early on in the course. Courses with higher retention rates had relatively lighter workload, higher student autonomy, and a more flexible assessment strategy.

In the five courses we analysed, the course where most students persevered in their intention to receive a formal certificate for a MOOC, had the highest degree of student autonomy, high learning support and scaffolds (in line with basic instructional design principles (Margaryan, Bianco, & Littlejohn, 2014). In this course, the workload was reported as lower than in other courses, assessment tasks embraced were both of problem-solving nature, as well as comprehension check. Furthermore, the course provided extensive technical support for the use and application of software, offered in the course as a tool, and did not assume learners skills in relation to this software. Finally, the course had high individual feedback from the teacher, but it should be noted that high individual teacher’s feedback has also been present in courses with much lower retention. It should also be noted that the first assessment in this course took place three weeks into the course, which implies that had the instructor started assessment earlier, the pattern of disengagement could have looked more similar to that of the other courses.

Conclusions and Discussion
Analyses reported in this paper used non-domain specific data from a series of MOOCs to examine the relation between engagement and assessment that affects retention. Retention was conceptualized as sustaining the commitment to pursue the certification of completion, with the focus on the MOOC participants who demonstrated commitment to participate in the course by attempting the first formal assessment task. Through series of t-tests, we identified that consistently in all five MOOCs learners who received much lower grades on the first homework disengaged from further homework assignments or the first test or exam, lowering their chances to receive the certificate of completion.

Visualizations of the patterns of engagement in the courses showed that most of the learners withdrew from formal assessment either after the first homework assignments or after the grades for exams/tests were out. Finally, by referring to course pedagogy, we observed that courses with higher early disengagement, and consequently lower retention, were more demanding in terms of workload, had less flexible assessment strategy requiring learners to keep up the performance. These activities occurred on the timeline selected and regulated by the staff, since we observed lower levels of student autonomy in courses where fewer participants persevered in formal assessment.

The findings presented in this paper are by no means to provide generalizations, but rather to ask questions as to whether there is a place for a more conventional concept of retention when we talk about MOOCs, as well as who is disengaging, from what, and when. We argued that retention could be approached to understand learners who show high levels of commitment, as exemplified by...
their attempts of homework. The low grades of the students who disengage could signify that they quit before attempting to finish homework due to its difficulty or the time it requires. It could also mean that the homework tasks are not well designed and ambiguous, leading to lower grades. Inquiring into the specific group of learners whose skills or expectations are misaligned with what was offered by instructors, and understanding the demographics of that group can lead to adjustment of the purpose and the target group for the course.

By positioning retention rates in their pedagogical contexts, we turn attention to the lack of research in MOOCs that addresses the relationship between the course design and observed patterns of interaction. The qualitative observations reported in this paper may be used to design experiments to provide various kinds of evidence for patterns of engagement in relation with course-related factors, such as learners’ autonomy, teacher’s feedback, workload, academic discipline, and assessment design and timing.

One of the obvious limitations of the paper is that it does not address the differences in assessment between the courses we analysed. This reveals the existing challenge of evaluating assessment tasks by those outside of the discipline. Educationalists notice obvious differences in the frequency, volume, flexibility and overall design of assessment, but are not fully equipped in identifying the levels of difficulty, as well as the relevance of the assessment tasks in relation to the overall course delivery.

Finally, in this paper, we did not consider learner-related demographics in relation to retention after first homework assignment. Since there is a relationship between performance on first homework assignment and commitment to further formal assessment, then it is relevant to know whether it related to student-related factors, and if so, which students are more affected by their (perceived) performance.
References

- Eynon, R. (2014). Conceptualising interaction and learning in MOOCs (pp. 1–8).
Do MOOC students come back for more?
Recurring Students in the GdP MOOC

François Bouchet, LIP6, Université Pierre et Marie Curie, France
Rémi Bachelet, Ecole Centrale de Lille, France

ABSTRACT

Today, most students enrolling in a MOOC already have attended to another MOOC before. We study here a subcategory of these students, who register to the same MOOC several times, which we call Recurring Students (RS). Using data collected during three 5-week sessions of the GdP MOOC (N > 14,000 on average per session), we show there is a significant and increasing proportion (over 10%) of RS. While their re-enrollment seems influenced by changes in course content, they succeed in the same proportions or less than new students (NS). A more granular analysis, separating RS who had previously completed a track (Recurring Successful Students - RSS) from those who hadn’t (Recurring Unsuccessful Students - RUS), reveals that RUS complete the new session in the same proportion as NS, whereas RSS fail more. As a conclusion, we propose recommendations to address these students, which could be valuable for other multiple-session MOOCs.

KEYWORDS
Massive open online courses, MOOC, recurring student, returning student.

Introduction

As MOOCs are becoming a part of the educational landscape, more and more students who register are already familiar with them, a situation affecting the way they behave and interact with the platform. Whereas some MOOCs are very similar from one session to another, some others are significantly improving over time with addition of new features and content. They may also offer more content than can be assimilated during the time provided for a single session, or provide a satisfying social experience. This phenomenon raises a question: are those changes significant enough to attract the same students over once more? Do they prefer to move on once they have completed the MOOC or do they sometimes come back for a more advanced track?

In this paper, we investigate the question of the existence of this specific kind of MOOC attendants, who would not only be familiar with MOOCs in general, but with the very MOOC they are attending to in particular. We will refer to those hypothetical students as “recurring students”, not to confuse them with “returning students”, a term often used to qualify students who get back to studying at a later age after having worked as professionals for some years (Fomin, 2013; Leppel, 1984). To assess the importance of the phenomenon, we use data collected during 3 sessions of a same MOOC on the same platform across 2 years to answer to our first research question: do recurring students actually exist, and if so, how frequent are they? Then, we analyze how those recurring students might differ from the ones who attend to the MOOC for the first time, in order to characterize their differences by drawing conclusions on how their MOOC experience should be adapted to cater best to their specific needs. Thus, we investigate:

1. How to identify recurring students: is asking students whether they are recurring students a reliable way to identify them as such or should we rely on other indicators such as email addresses or unique IDs?

2. Their behavior relatively to the (optional) initial questionnaire MOOC participants typically are presented with before the session starts: do recurring students answer in the same proportion as new students despite the fact they might have already answered to such a questionnaire during their first session and do they spend as long to fill it in when they choose to do so?
3. The differences between new students and recurring ones in terms of performance on the MOOC: are recurring students the ones who had failed to complete the MOOC at first and who want a second chance at obtaining the certificate it delivers? Are they, on the contrary, the students who had performed well and who want to go further by trying to obtain a more advanced certificate or by simply checking what new content has been added between the two sessions? And in either case, how does the fact of being a recurring student impact their performance in the second session of the MOOC they are attending: is it improving or degrading?

The novelty of this study is making it very exploratory and no theoretically based a priori hypotheses could be formulated on the nature of the results expected. Recurring students, and more generally the problematic of comparing the evolution of students across different MOOCs is, as far as the authors are aware, a new problematic that hasn’t yet been studied by the MOOC community, according to the proceedings on the most popular conferences on this topic (EMOOCs, Learning At Scale…) and extensive reviews of the domain (Liyanagunawardena, Adams, & Williams, 2013).

This is not particularly surprising considering there are not many MOOCs that have collected data across numerous sessions, and even less that have done enough changes (between two sessions) to have reasons to expect former students returning to attend a new session. The closest related works could be the ones studying the question of student retention (Adamopoulos, 2013; Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014), which aim at keeping students involved in a given MOOC, even if in our case, we are considering it across different sessions of a same MOOC.

Context

Data used in this paper comes from three different sessions of the GdP MOOC (GdP meaning “Gestion de Projet”, the acronym for “project management” in French). Its first session (GdP1) took place in Spring 2013. It was the first xMOOC to be organized in France, relying on a previous Open Course Ware (OCW) website (Bachelet, 2012a) and experience of running a distance learning course (8 editions, 400 laureates from 2010 to 2012 (Bachelet, 2012b)).

This first session, hosted on the open source MOOC platform Canvas Network, was set up with almost no financial resources using a personal home studio and run by an open team of volunteers, but was nonetheless supported by l’Ecole Centrale de Lille (a French Graduate Engineering school), with a platform run by Instructure, a US company.

Enrollment opened 2 months before the start of the MOOC, which began mid-March 2013 and lasted 5 weeks. Two individual tracks were offered: Basic and Advanced, and two corresponding certificates were delivered to participants who met the requirements specified for each track. A “Team project” track was also proposed after the individual tracks, which run 14 projects and was instrumental in recruiting volunteers supporting the next editions of the MOOC (since the team track is of a different nature, we will not describe it in details in this paper). Due to a change in the MOOC platform hosting between this session and the following ones, data from GdP1 (which has been previously analyzed in details in (Cisel & Bachelet, 2014)) was not used in this paper. While the basic track requires 20-25 hours of work, the Advanced track requires to both complete the Basic track and to submit one essay per week while taking part in the peer assessment of 4 other papers (for a total of 40-45 hours of work).

GdP2 (Fall 2013) had a functional analysis course added to the curriculum. From this session on, the Canvas platform was hosted by the French startup UNow, which provided engineering and technical support. Basic and advanced tracks started mid-September 2013. This session was 5 weeks long, with one additional week dedicated to the final exam. A one week add-in SPOC session on Project Evaluation was organized after the end of the MOOC in November for employees of the Francophone University Association (AUF), and the Team project track started mid-October with project proposals, and ended mid-December with final presentation and report. In addition to the previously mentioned free tracks, it became for the first time possible to be awarded European University Credits (ECTS) by Centrale Lille, by taking either a webcam (ProctorU) or an in-presence table exam (AUF campuses in two developing countries).

All non-foreign Centrale Lille first year engineering students (approximately 200 of the 1011 students of this track) were enrolled in the advanced track, as required by their curriculum (Bachelet, 2013).

GdP3 (Spring 2014) followed the same principles and had the same core content, but the number of courses was doubled: the MOOC started with a common-core syllabus and then an elective course system offered seven possible specializations. Students could choose one or several specializations, but had to pass at least one in order to obtain the basic certificate (Bachelet, 2014).

GdP4 (Fall 2014) included 1,500 students enrolled through their university, a new mind mapping module available during the Pre-MOOC (the preparation phase before the MOOC officially starts), and a new version of the core course was...
shot for better video quality. In the advanced track, self-evaluation was implemented in addition to peer evaluation, and the quality of peer grades given by each student was assessed and subject to grade bonuses (Bachelet & Carton, 2014).

Table 1 provides a summary of the key numbers associated to each session of the MOOC, and the success rates were calculated as follows:

- **Entry rate**: ratio of the number of students submitting at least one short quiz divided by the total enrollment in the MOOC.
- **Basic track success rate**: ratio of the number of students submitting at least one short quiz divided by the number of students awarded with basic track “pass” (i.e. an average of 70% of maximum points and 60% success in the final exam)
- **Advanced track success rate**: ratio of the number of students submitting at least one assignment divided by advanced track “pass” (i.e. basic track “pass” plus an average of 70% of maximum points).

<table>
<thead>
<tr>
<th></th>
<th>GdP1 (data not used)</th>
<th>GdP2</th>
<th>GdP3</th>
<th>GdP4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td>Spring 2013</td>
<td>Fall 2013</td>
<td>Spring 2014</td>
<td>Fall 2014</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>4 weeks</td>
<td>5 weeks including 1 elective course</td>
<td>5 weeks including 1 elective course</td>
<td>6 weeks including 2 elective courses</td>
</tr>
<tr>
<td></td>
<td>+ 1 week for final exam</td>
<td>+ 1 week for final exam</td>
<td>+ 1 week for final exam</td>
<td>+ 1 week of exams</td>
</tr>
<tr>
<td><strong>Platform</strong></td>
<td>Canvas Network</td>
<td>Canvas by UNow</td>
<td>Canvas by UNow</td>
<td>Canvas by UNow</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>4 weeks core course</td>
<td>5 weeks core course</td>
<td>4 weeks core course + 1 elective course</td>
<td>4 weeks core course + 2 elective courses</td>
</tr>
<tr>
<td><strong>Tracks available</strong></td>
<td>basic, advanced, team</td>
<td>basic, advanced, team</td>
<td>basic, advanced, team</td>
<td>basic, advanced, team</td>
</tr>
<tr>
<td><strong>Attendance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>enrolled</td>
<td>3493</td>
<td>10848</td>
<td>11827</td>
<td>19171</td>
</tr>
<tr>
<td>entry rate</td>
<td>66%</td>
<td>53%</td>
<td>50%</td>
<td>42%</td>
</tr>
<tr>
<td><strong>Track success</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>basic</td>
<td>57%</td>
<td>61%</td>
<td>38%</td>
<td>41%</td>
</tr>
<tr>
<td>advanced</td>
<td>78%</td>
<td>78%</td>
<td>67%</td>
<td>73%</td>
</tr>
</tbody>
</table>

Detecting recurring students

**Methodology**

The first issue that had to be solved was to find a reliable method to identify recurring students. We considered two complementary approaches: questionnaires and session IDs.

In the three sessions of the GdP MOOC considered here, before the beginning of the actual MOOC, the students had been asked to fill a questionnaire to know them better. This optional questionnaire includes items regarding demographic information (age, gender, country, professional status, highest diploma obtained, etc.) as well as regarding their previous experience with MOOCs in general, and in sessions 3 and 4, also about their potential previous experience with the GdP MOOC itself. To provide an incentive to answer to this questionnaire, students who decided to reply were granted 2 to 6 additional points (depending on the number of questions they replied to), which represents less than 2% of the minimal number of points required to complete the basic track of the MOOC.

Moreover, on the UNow platform, a student normally has to register only once to be given a unique ID. This ID remains identical for any MOOC they attend to on the platform, including if they attend to a new session of the same MOOC.

In order to compare the two approaches, based on answers to the optional initial questionnaire and student IDs, we considered data coming from the GdP3 (data from the GdP2 could not be used here because not only the question regarding a previous participation to the GdP hadn’t been asked, but also because the student IDs differed when the GdP was transferred to the UNow platform). In the GdP3, as students could reply only to some questions and not others, the participation to the initial questionnaire has to be considered on a per item basis.
Results

Using student IDs only on data from GdP2 and GdP3, we found that out of the 12158 in the GdP3, 1020 (8.39%) had participated to the GdP2 and therefore fitted our definition for recurring students. Using the initial questionnaire data, we found that 4927 students (40.5%) replied to the question regarding their experience on MOOCs, with 1924 (39.1%) declaring they had already participated to a MOOC before. Among those, 662 (34.4%) declared they had participated to the GdP MOOC before (either the first or second session), 311 (47.0%) of those declaring more specifically to have participated to the GdP2 (i.e. 93.7% of the students who answered the questionnaire declared they did not take part in the GdP2).

When comparing the declaration of those students with what could be determined with the student IDs, 46 (14.8%) of the students who declared to have participated in the GdP2 before had an ID indicating the contrary. Conversely, we found that 36 (0.7%) of the 4927 students who had declared not to have participated in the GdP2 (either by saying they didn’t participate in any MOOC before, or by explicitly declaring that they had not participated in the GdP2) had actually had some activity on that session of the MOOC.

Discussion

The first clear result is that either way we try to identify them, Recurring Students (RS) exist and represent a significant proportion of the students registered to a MOOC, even if they are by far outnumbered by New Students (NS). The proportions of discrepancies, although fairly low overall, could seem intriguing at first, but several elements can explain it. First, we found that almost half (47.2%) of the students who had declared not to have participated in the GdP2 declared to have participated the contrary. Conversely, we found that 36 (0.7%) of the 4927 students who had declared not to have participated in the GdP2 (either by saying they didn’t participate in any MOOC before, or by explicitly declaring that they had not participated in the GdP2) had actually had some activity on that session of the MOOC.

Table 2 reveals that the proportion of RS increased in GdP4 compared to GdP3. Interestingly, the number can be broken down into 2332 GdP4 students who were registered to the GdP3, 585 students who were registered to the GdP2, with an overlap of 321 students who attended to the 3 sessions considered here, suggesting the potential existence of some "serial recurring students", although more sessions should be considered in order to confirm this hypothesis.

Categorizing recurring students based on their previous success

We make the hypothesis that RS are not a homogeneous group but that they could be distinguished according to at least one dimension: their success in the first session of the MOOC they have attended to. Indeed, we can assume that the motivation of a recurring student who had previously completed the MOOC (i.e. a Recurring Successful Student – RSS) might be to focus on newly added content of the MOOC or elements they hadn’t covered the first time (e.g. completing the advanced track after having completed the basic one). On the contrary, a recurring student who hadn’t previously completed the MOOC (i.e. a Recurring Unsuccessful Student – RUS) might be more interested in simply re-reading content they had not understood well, or retrying to pass quizzes what they failed at first.

To distinguish RSS from RUS, we need an operational definition of "success". Here we considered a student had successfully completed the MOOC if they had obtained at least the basic certificate (regardless of whether it was the free or monitored version). Using this definition, we determined that 38.0% of the RS in the GdP3 were RSS, a proportion that dropped to 23.9% in the GdP4. Table 2 provides the numbers of RS and RUS in GdP3 and GdP4. For the GdP4, a recurring student who had completed the GdP2 (resp. GdP3) but failed the GdP3 (resp. GdP2) appears counted both as a RSS and as a RUS (132 students are in this case). To avoid this issue, in the remainder of this paper we consider RS in GdP4 as being only the students who had attended to the GdP3.
Table 2. Recurring students in the sessions 2 to 4 of the GdP MOOC using students IDs

<table>
<thead>
<tr>
<th>Session</th>
<th>Total number of students</th>
<th>New Students (NS)</th>
<th>Recurring Students (RS)</th>
<th>Recurring Successful Students (RSS)</th>
<th>Recurring Unsuccessful Students (RUS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students (NS)</td>
<td>10841</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>GdP3</td>
<td>12158</td>
<td>11138 (91.6%)</td>
<td>1020 (8.4%)</td>
<td>388 (38.0% of RS)</td>
<td>632 (62% of RS)</td>
</tr>
<tr>
<td>GdP4</td>
<td>19103</td>
<td>16507 (86.4%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recurring students’ behavior relatively to the initial questionnaire

Although proving the existence of RS is interesting per se, e.g. as an indicator of the MOOC quality, it is interesting to understand how the behavior of RS is specific. In this section, we analyze the differences between RS and NS in terms of answers provided to the initial questionnaire.

Methodology

We analyzed the differences in the replies to the optional initial research questionnaire for GdP3 and GdP4 according to 3 parameters:

- the propensity to answer to the questionnaire, which is a boolean value indicating whether or not the student replied to the questionnaire,
- the number of questions answered in the questionnaire (GdP3 only, as in GdP4 one was forced to answer all items for the questionnaire to be counted as completed),
- the time in seconds spent answering the questionnaire.

For the propensity to answer to the questionnaire, for the GdP3 data, we dichotomized the data by considering that a student had replied to the questionnaire if they had at least answered one question (as opposed to those who didn’t take part at all). In both cases, we performed a Pearson’s Chi-square test to evaluate whether answering the questionnaire was dependent on being a RS or a NS, and whether it was dependent on being a RSS or a RUS.

Results

Propensity to taking part in the questionnaire

Table 3 summarizes the results obtained for each comparison for both GdP considered. We can highlight that although there was a very strong dependency between the fact of being a RS and answering less to the questionnaire in the GdP4 (p = 9.83*10^{-17} < 0.001), the proportion of students who had answered to at least one question was exactly the same for NS and RS in the GdP3 (p = 0.999), and the difference was barely stronger when considering students who had replied to the whole questionnaire (p = 0.633 > 0.05). It is particularly interesting since the proportion of answers among the NS in both GdP is fairly similar.

A second result is the fact that in both sessions, RUS have been answering statistically significantly more to the initial questionnaire than RSS (p = 0.005 < 0.01 for the GdP3, p = 0.0004 < 0.001 for the GdP4).

Table 3. Proportions of answers to the initial questionnaires by new, recurring, recurring successful, and recurring unsuccessful students in GdP3 and GdP4

<table>
<thead>
<tr>
<th>Answer to the questionnaire</th>
<th>GdP3</th>
<th>GdP4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NS</td>
<td>RS</td>
</tr>
<tr>
<td>Answered (%)</td>
<td>44.2</td>
<td>44.2</td>
</tr>
<tr>
<td>Not answered (%)</td>
<td>55.8</td>
<td>55.8</td>
</tr>
</tbody>
</table>
Number of questions answered in the questionnaire

Overall, no obvious differences appear between the distributions of the number of questions answered for NS, RS, RSS and RUS (cf. Figure 1), except for the aforementioned result according to which RUS answer more to the questionnaire than RSS.

Time spent answering the questionnaire

In the NS/RS analysis, we found no significant differences between the 463 RS who spent on average 931 seconds on the initial questionnaire and the 4861 NS who spent on average 938 seconds (p=0.786). When splitting RS into RSS and RUS, we found that RSS spent on average 880 seconds on the initial questionnaire whereas RUS spent 857 seconds on it. The difference between RSS and RUS wasn’t statistically significant (p=0.686) but RUS answered statistically significantly faster than NS (p=0.044 < 0.05). The temporal distributions for both comparisons are shown on Figure 2.

Recurring students’ performance

Methodology

For this analysis, first we considered the total number of points obtained by students in the GdP3, for both the basic and advanced tracks. When a student had taken both a monitored and unmonitored test, we considered the maximum number of points they obtained. We also excluded students who scored less than 5 points overall, which includes students who haven’t answered to any quiz and the ones who only replied to the initial questionnaire (which completion provided students with a couple of bonus points). The nature of the distributions (cf. Figure 3) prevented us from performing a t-test to compare them.

We also considered the Boolean value representing the fact of having completed or not the current
session, and performed a Pearson’s Chi-square test to check the validity of two null hypotheses: (1) being a recurring student and completing the current session are independent of each other, (2) having completed the previous session and completing the current session are independent of each other.

Results
For the basic track, RSS obtained less points (M=156.8, SD=145.9) than RUS (M=181.5, SD=143.0) and RS globally obtained less points (M=174.1, SD=144.1) than NS (M=205.5, SD=145.4). In the advanced track though, RSS obtained more points (M=219.1, SD=223.2) than RUS (M=204.7, SD=182.1), but RS (M=209.1, SD=195.4) still globally obtained less points than NS (M=233.3, SD=190.1). The corresponding distributions are shown on Figure 3.

Regarding the independence of completing the current session on being a recurring student, as shown in Table 4, we found that for both sessions 2-3 and 3-4, being a recurring student was strongly correlated with having lower chances to complete the current session (p=8.18*10^-9 and p=4.28*10^-26 respectively). On the contrary, regarding the independence of completing the current session on having completed the previous one, we found a dependency for sessions 2-3 where RUS had statistically more chance to complete the current session than RSS (p=0.024 < 0.05), but no dependency for sessions 3-4 where RUS and RSS had similar chances to complete session 4 (p=0.785).

Table 4. Proportions of new and recurring students who completed GdP3 and GdP4

<table>
<thead>
<tr>
<th>Completion of the session</th>
<th>GdP3</th>
<th>GdP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>RS</td>
<td>RSS</td>
</tr>
<tr>
<td>Completed (%)</td>
<td>18.3</td>
<td>11.1</td>
</tr>
<tr>
<td>Did not complete (%)</td>
<td>81.7</td>
<td>88.9</td>
</tr>
</tbody>
</table>

Figure 3. Number of points obtained in the basic (top) and advanced (bottom) tracks by (from left to right) new, recurring successful, and recurring unsuccessful students in the GdP3
Discussion

Overall, we see that the analysis of recurring students is improved by splitting them into two categories: those who had previously completed the MOOC (by at least obtaining a basic certificate) and those who did not. The fact that recurring unsuccessful students answer more the initial questionnaire than successful ones but that they answer faster could be an indication that they are more interested in obtaining the few bonus points granted to students who fill in this questionnaire. This is therefore a clear hint that they came back in order to obtain a certificate they failed to obtain the first time. However, the fact that they overall complete the MOOC less than the new students shows that despite the fact it is their second attempt and therefore the second time they are getting exposed to the majority of the content, they still struggle to understand the learning material and could therefore benefit from an individualized support, from peers or from the pedagogical team.

Concerning the recurring successful students, the fact they complete less the MOOC (even the advanced track) than the new students, combined to the observation that they answer less to the initial questionnaire, suggest that they come back for the new or advanced content exclusively, but that they are not motivated enough by the perspective of obtaining the advanced certificate to bother completing again the basic content. Indeed, with the way the MOOC is currently organized, it is not possible for a student to complete the advanced track without having completed the basic one first. It could therefore be beneficial for those students to be identified as recurring students and to be granted with bonus points.

Regarding the significant differences in the proportions of answers to the initial questionnaire in GdP3 and GdP4, we believe it can be explained by the way the questionnaire was integrated within the MOOC. Although the content of the questionnaire did not change much between both sessions, its presentation (as a separate questionnaire in LimeSurvey for the GdP2 vs. as an integrated questionnaire to the platform for the GdP3 and GdP4) could explain that recurring students didn’t recognize it, and were therefore more willing to fill it in. We therefore believe that lower proportions of answers, as it was the case in GdP4, is more likely to happen again in future sessions. For this aspect as well, detecting recurring students as such would be beneficial, as we could consider to simply ask them to update their previous replies instead of having them filling the whole questionnaire in once more.

Conclusion and future works

In this paper, we have revealed the existence of a specific type of MOOC attendants, the recurring students. We have shown that those students need to be split between those who had previously completed the MOOC and those who hadn’t, and that they displayed different behaviors in the way they answer to the initial questionnaire (less overall) and on how likely they are to complete the MOOC (less likely for both categories of students, but for different reasons). Another interesting aspect is the fact that the phenomenon seems to be growing, as we found more recurring students in our 4th session than in our 3rd, although this trend would need to be confirmed in upcoming sessions. Recurring students exist and are here to stay, and as such we can only recommend to other MOOC designers to work on detecting them and trying to support them (for the unsuccessful students) or to take into account their previous experience in the MOOC (for the successful ones).

We analyzed how students who have been attending to two sessions (M then N) behave in session N, using some elements of information stemming from M such as whether they had completed M or not. In a future study, we plan to investigate how students who returned in N behaved while taking their first session M, in order to determine predictive factors indicating that a student might become a recurring student. This information could be valuable to target them preferentially when advertising a new session, and possibly to focus more on them as they might become prominent community members, for instance by helping other students about to drop-out once those are detected (Bani, 2014). We also plan to detect those students in upcoming sessions in order to ask them additional questions on their motivation for re-enrolling, to have a better understanding on who they are and to be able to subcategorize them better.
References


What do we know about typical MOOC participants? First insights from the field

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Martin Ebner, Department of Social Learning/Graz University of Technology, Austria

Abstract

Massive Open Online Courses became a worldwide phenomenon. Especially in Central Europe it is a subject of debates whether universities should invest more money or not. This research study likes to give first answers about typical MOOC participants based on data from different field studies of the Austrian MOOC-platform iMooX.

It can be pointed out that the typical learner is a student or an adult learner, strongly interested in the course topic or just interested in learning with media and finally with self-contained learning competencies. The research work concludes that MOOCs broaden the educational field for universities and are a possibility to educate the public in a long run.

Introduction & Research Question

During the last years MOOCs became a big issue in higher education. After the first hype MOOCs are meanwhile the subject of intensive scientific research. The related research areas touch on a number of scientific questions, e.g.: Do MOOCs really enhance teaching and learning or are they just old wine in new bottles (Ebner et al., 2014)? Do MOOCs need a special instructional design (Kopp & Lackner, 2014) and what advantages, challenges and obstacles come with them? What conditions are necessary to anchor MOOCs firmly at the university? How long will MOOCs remain free for the general public (Kopp, 2014) and are there any business models for MOOCs (Fischer et al., 2014)?

The focus of all these considerations is - of course - on the participants, the learners. A recent study of the European University Association (Gaebel et al., 2014) shows that participation in MOOCs provided by European universities varies greatly and that participation consists in a combination of own students, other domestic learners and international learners, in which the ratio between the three groups also varies from university to university. The same applies to completion rates, which vary between 4% and 50%, depending on the institution and the course. The median completion rate is 15%, though only nine European institutions answered the survey.

The aim of this paper is to learn more about the average MOOC participant as well as her/his intentions to participate in a course and to complete the course. Thus, demographic data is just as interesting as the motives for course participation and the competences of the participants. The research data is gained through several surveys, which were conducted during the first three MOOCs offered by the Austrian MOOC-platform iMooX (www.imoox.at). Due to the limited responses it is not possible to draw an overall picture of the typical MOOC participant, but the paper will show some significant tendencies on how a MOOC participant can be characterized and it will answer the questions about what a participant in an iMooX course looks like, what participants expect from iMooX courses as well as from the iMooX platform and what competences they bring along by enrolling for an iMooX course as well as which skills they gain by participating.

The Austrian iMooX platform

The Austrian MOOC platform iMooX was established by the University of Graz and the University of Technology of Graz with the help of public funding. The main aim of the project is to provide “education for all”, i.e. not only for students but for the widest possible public. Therefore, the target group also includes people who do not have high school diplomas or university degrees. All offered materials undertake a scientific claim, but they are also obliged to the philosophy of lifelong learning. An additional special feature of iMooX is the fact that all materials are provided as Open
Educational Resources (OER) under a creative commons license.

Since iMooX is the one and only Austrian MOOC platform it gained considerable interest from media. This meant that some 1,000 persons registered within a few days after the release of the platform and some more enrolled for the first three offered courses. For the operators of the platform it was very interesting from the start to know who the participants are and what motives they have to attend the courses. Thus, the decision was made to conduct a corresponding survey to enhance the design of the courses and the platform with the help of the given feedback. Unfortunately – and due to the fact that there was not enough expertise available at the beginning – the surveys embedded in the three courses differ slightly. Therefore, the answers to the questionnaires also vary a bit, but since the basis of the surveys was always the same, in principal all data and results can be considered as valid and comparable.

By now there are nine courses available at iMooX and another ten to fifteen courses will be released during 2015. A survey will still be carried out in each course, but with a lower scope, in order not to unnecessarily bother the participants. This said, the following data and results refer to the polls from the first three courses.

A first analysis of iMooX participants

During the summer term 2014 iMooX offered its first three courses (Learning online - from what is possible and feasible, Mechanics - collision of two bodies in the plane and Bulb moments from Experimental Physics). These courses were attended by 1,333 participants and 101 graduates (7.6%). In the courses Mechanics and Experimental Physics each participant had to complete a questionnaire at the beginning as well as at the end of the course to evaluate the iMoox platform and the offered course. The outcome of the evaluation at the beginning of the course was 53 filled questionnaires of the course Mechanics and 63 of the course Experimental Physics. In the course Learning online the evaluation was done only at the end of the course, with 83 filled questionnaires. The questionnaire included ten issues and information about demographic data. The aim was to identify the satisfaction with the courses and the platform.

The following summary supplies information about the “typical” iMooX-user in the summer term 2014 based on the evaluation results.

Gender, age and education of the iMooX user

Participants of the iMooX courses were predominately male i.e. 65% of the learners were male (see Fig.1). One reason could be the topics of the courses such as Experimental Physics and Mechanics, which are typically preferred by men. This result is similar to a survey at the Stanford University. In this survey 83 people completed the survey, 34 female and 49 male. The overall age range of respondents was 28 to 69 (cf. Rodriguez 2012:8). Another issue is that the MOOC-format attracts people who are interested in technology and new course formats (cf. Koutropoulos et al. 2012:3). Again, these are favorite issues of a male population. Fig.1 also shows that there is no significant difference between the courses, and that – following the trend - more technical related courses attract male learners.

![Figure 1. Gender of participants.](image)

<table>
<thead>
<tr>
<th>Gender of iMooX-participants</th>
<th>N=196</th>
</tr>
</thead>
<tbody>
<tr>
<td>average</td>
<td></td>
</tr>
<tr>
<td>mechanics (N=53)</td>
<td>35%</td>
</tr>
<tr>
<td>(N=53)</td>
<td></td>
</tr>
<tr>
<td>physics (N=63)</td>
<td>23%</td>
</tr>
<tr>
<td>(N=63)</td>
<td></td>
</tr>
<tr>
<td>Lin (N=80)</td>
<td>45%</td>
</tr>
<tr>
<td>(N=80)</td>
<td></td>
</tr>
<tr>
<td>N=196</td>
<td></td>
</tr>
</tbody>
</table>
The typical iMooX user’s age was between 20 and 34 years (44%) (see Fig. 2). Further 29% were between 35 and 49 years old. In summary we can determine that nearly three quarter of the interviewees were between 20 and 49 years old. At least a quarter of the participants were between 50 and 64 years old, a target group that in Central Europe normally has a low representation at universities (at least in German-speaking countries). Only less than 2% are younger than 18 or 5% older than 65 years.

If we take a look at the education level of the participants, most participants obtained either a school leaving certificate or an academic study. Based on the fact that iMooX is run by two universities mainly students attend the courses. Especially in the course Learning online 40% of the graduates were students. Two-thirds of these students were self-enrolled, only one third took part by teacher’s requirement. Nevertheless, also employees, persons on maternity leave or taking time off took part in the courses. This result is similar to empirical data from Linnaeus University. Participants of online courses from this university are generally older than 25, already have a university degree, families and full-time employments (Creelman/Reneland-Forsman 2013:43).

![Age of iMooX-participants](image1.png)

**Figure 2. Age of participants.**

Fig. 3 shows that MOOC participants are a highly educated target group. 89% of the participants obtained at least a school leaving certificate (high school) and more than the half hold at least an undergraduate degree (57%). 41% of the learners are highly experienced learners due to the fact that they obtained a master degree and even 9% of the participants completed a PhD study. This result is remarkable, if we compare the data with the educational background of the Austrian population: In this case 19% complete a primary or secondary education, 51% a vocational education, 15% obtain a school leaving certificate and only 15% complete an academic study (cf. Statistik Austria 2014).

![Graduation of iMooX-participants](image2.png)

**Figure 3. Graduation of participants.**
Although the iMooX participants were highly educated, only a few have gained experience with online courses. As pointed out in Fig.4 60% had not attended an online course previously and only 13% declared that they have visited more than three online courses until participating in an iMooX course. (This result is similar to our registration survey in the winter term 2014/15. Only one third declared to enjoy learning in online courses. Let us assume that only these participants have experiences with online courses.) An evident fact is that the participants were generally interested in education. About 63% (from a basic population of 116) of the respondents declared that they invested more than five hours per month into education during the last year. More than a quarter invested more than € 500 in education. According to the interviewees the ability to learn (69%) and the interest in new knowledge (66%) are the most important competences during an online course.

Motives of the iMooX user

One part of the evaluation was to assess the motives for the course attendance of the iMooX participants (see Fig.5). The results indicated that gaining experience with online courses (75% agree this “full” or “rather”) as well as the course topic (86% agree this “full” or “rather”) were the driving facts. Further important reasons for participating were the request for further training (61%), the individual professional life (51%) and the personal interest in open online courses (47%). Only one third of the interviewees said that also their place of domicile is a valid reason for attending an open online course. These reasons may differ from previous assumption, where distance learning is often the only option for further education because of family and geographical matter (cf. Mahieu/Wolming 2013:2-3). Insignificant factors at our survey were physical handicaps (9%, two-thirds of these persons were between 20 and 49 years old) and the participation in the course of friends, acquaintances or relatives (15%).

This result is very similar to the ongoing iMooX registration survey at the beginning of the winter term 2014. The iMooX team investigated the reasons for iMooX registration. Overall, 483 participants were asked until the 30th of September 2014. Once again this result confirmed that the topic (64%) represents the most important factor for a registration to an online course. More than

![Motives for the course attendance](image-url)
half of the respondents (56%) declared that gaining experience with online courses was the main reason for their registration.

Evaluation of the iMooX platform and the iMooX courses

Noteworthy is also the satisfaction of the participants with the iMooX platform. First of all we examined the usability and user friendliness of the platform, which included the assessment of the graphic presentation, navigation, structure and classification as well as the overall assessment of the platform (see Fig.6). Fortunately, the majority of the interviewees evaluated the platform with “excellent” or at least “good”. The best results (84%) could be found for the overall assessment as well as for the structure and classification of the platform (81%). Similar results were reached for the evaluation of the course contents (see Fig.7). In this evaluation field the best results were also achieved for the general course evaluation. 80% of the learners were very highly or highly satisfied with the course. For 78% of the participants the learning content and structure were “excellent” or at least “good”. Furthermore, 77% rated the design of the texts and 76% the graphic presentation with “excellent” or at least “good”. In summary the majority of the participants assessed the platform plus the three offered courses with “excellent” or at least “good”.

Figure 6. Evaluation of the platform.

Figure 7. Evaluation of the courses and the course units.
Activity and competences of iMooX users

The number of certificates showed that the completion rate is about 7.6%, which is comparable to other research studies (Hanan & Ebner, 2014). Generally, the majority of MOOC participants (about 88%) are lurkers or drop the course (cf. Koutropoulos et al. 2012:2f). In this regard it is particularly interesting how many course units were completed by the participants. This can be - among other things - analyzed by the frequency of quiz starts. Quizzes at iMooX and general at MOOCs are a kind of knowledge check. These checks can be found at the end of each unit and support the users in reviewing their increase of knowledge.

The quiz of the first learning unit was started most frequently in all three courses. As Fig.8 shows the number of quiz starts in the course Learning online - from what is possible and feasible was altogether 4,044. It must be taken into account that each user has theoretically the possibility to start/complete each quiz 5 times, which means that the first quiz was started on average 4 times/learner. The second quiz was started/completed 1,947 times. Fig.8 demonstrates also the decrease of the quiz activities during the course. The result of the course Learning online is more or less the same in comparison to the number of quiz starts in the courses Mechanics and Experimental Physics. Compare this result with the result from Rodriguez (cf. Rodriguez 2012:9).

![Number of quiz starts during the course Learning online](image)

**Figure 8. Number of quiz starts.**

![Necessary competences for completing the course](image)

**Figure 9. Which competences do you need as a learner to complete a MOOC?**
Summary of the survey
In summary it can be stated that the typical iMooX user in the summer term 2014 was male, between 20 and 34 years old and she/he obtained either a school leaving certificate or an academic study. The most important reasons for participating in an online course at iMooX were the topics of the course and to collect experiences with MOOCs. iMooX had a positive connotation, the learners were very satisfied with the offered courses and the platform. Further, the activity of iMooX participants during the different courses is of interest: the activity of the MOOC participants decreased with the increase of course units, but at least 7.6% of the participants finished the entire course. These graduates mentioned that the ability of self-contained learning, the intention to learn as well as their interest in new knowledge were decisive for completing the course. Finally, it must be pointed out that the limit of this study is that the evaluation form was mainly filled out by learners who completed the course. In other words we only got response from the most successful population and did not know why others skipped the course at an earlier stage.

Discussion
The evaluation of the summer term 2014 at the iMooX produced some interesting results:

- Fig. 2 shows that the majority (44%) of the participants are students aged between 20 and 44 and that more than the half (54%) of the learners are older than 34 years, which means that our MOOCs particularly address the sector of adult education. This educational field is currently not in the scope of universities at least in German-speaking countries. As Kopp et al. (2014) pointed out further strategies on how to offer education, also to the adult sector in a long run, are needed.
- The idea of iMooX is not only to offer MOOCs for free and as Open Educational Resource but also to attract a broad public for learning. Nevertheless, Fig. 3 shows clearly that only 11% of the (successful) learners have no school leaving examination. In other words a typical MOOC participant is a very highly experienced learner. This fact corresponds with Fig. 9 because learners rated the competence of self-contained learning as most important. It must be mentioned that the ability of self-contained learning is a precondition to pass an online course successfully. Due to the fact that our primary and secondary schools do not have a strong focus on teaching such competencies, learners with low education simply do not have the ability to succeed.

- Fig. 5 shows also an interesting outcome. Due to the fact that especially in Central Europe the education is primarily face-to-face the need for distance education is rather low. MOOCs will not solve a distance problem but will help to support time flexibility.
- Learning only happens in a user-friendly environment (Ebner & Holzinger, 2003). Learners have to concentrate on the content and should not be stressed by the hosting information system. Fig. 6 and Fig. 7 show that learners like the iMoox platform, which was developed with the idea to present a smart, innovative and less complex interface.

- Finally, Fig. 8 shows an exponential decrease of learners over the duration of the course. This result correlates highly with other research studies summarized by Khalil & Ebner, 2014. Due to the fact that all courses show similar curves the duration of the MOOCs should be discussed. From our point of view we lost most of the learners until week 5. From week 5 onwards the number of participants was more or less stable. In the future the idea of short MOOCs (sMOOC) should be taken into account so that it is easier for learners to succeed (for example to split one course into two).

Conclusion
In this contribution we took a first closer look at our learners. The evaluation results opened our minds towards new strategies we have to address, especially for the adult learner. Furthermore, the main competence to pass the course successfully is the ability of self-contained learning. If we would like to bring learning content to a wide and broad public this is maybe the crucial factor we have to ensure on the learner’s side.

Finally, it must be pointed out that this study is a first insight to learners’ profiles and lot of further research will be necessary to increase the power of Massive Open Online Courses.
References


A Tale of Two MOOCs: Analyzing Long-Term Course Dynamics

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Rémi Bachelet, Ecole Centrale de Lille, France
Philippe Silberzahn, EMLYON Business School, France

ABSTRACT

This paper discusses the evolution of learning engagement patterns and learners’ profiles across sequential iterations in two MOOCs. Both courses were relatively stable over time from the demographic point of view, with punctual but notable variations. In both cases, registrants who completed the course tended to decrease in proportions over time as the proportion of bystanders increased, but they were nevertheless responsible for most of the course activity in terms of video consumption or quiz submission. We observed that the statistical associations between engagement in the course and learners’ demographic variables were more acute in specific tracks, suggesting that the impact of sociocultural and socioeconomic variables on engagement patterns strongly depends on the context of the course.

Introduction

One of the most striking consequences of Massive Open Online Courses (MOOCs) openness (Daniel 2012) is undoubtedly the high heterogeneity of their registrants, whether we think in terms of socioeconomic status, sociocultural background, motivations, or behaviors (Ho et al. 2014). Their engagement patterns are as heterogeneous as their profiles, and the monolithic distinction between completers and dropouts is not necessarily appropriate to describe the diversity of situations (Kizilcec et al. 2013). Most of the time, a large proportion of registrants could still represent a significant part of the course activity despite the fact that they do not complete the course. While these questions have attracted considerable attention from researchers and practitioners lately, few studies have focused on the long-term evolutions of these learning engagement patterns in a given course (Anderson et al. 2014, Ho et al. 2014). Increasing attention is laid on the relationships between these engagement patterns, intentions (Campbell et al. 2014), or sociodemographic variables (Guo et al. 2014, Ho et al. 2014).

These questions are relevant to both course designers who would like to understand ongoing dynamics and wish to adapt course design accordingly (Grünewald et al. 2013), and to researchers who want to capture ongoing trends at a more global scale. In both cases, even comprehensive studies based on large numbers of MOOCs are limited by numerous confounding effects, as long as they rely solely on different courses. Indeed the comparison of MOOC dynamics is made difficult by the high heterogeneity in course structure and content, despite the multiplication of comprehensive studies (Adamopoulos 2013, Ho et al. 2014). In this paper, we analyzed two MOOCs that have been organized at least thrice, in an attempt to address the question of the evolution of learners’ profiles and course dynamics over time. To what extent have engagement patterns and registrants profiles evolved across iterations, and most importantly, how has the relationship between learners’ behavior and profiles evolved over time?

Courses description

The case studies we analyzed in this paper are a five weeks long entrepreneurship course called Effectuation (Professor Philippe Silberzahn, EMLYON Business School), which will thereafter be referred to as MOOC1, and a four weeks long project management course, ABC de la Gestion de Projet (Rémi Bachelet, Ecole Centrale Lille), which will thereafter referred to as MOOC2. Both were hosted by a MOOC agency which used the open source LMS Canvas from Instructure, with the notable exception of the first iteration of MOOC2, which was organized on Canvas.net, a different portal based on the same technology. Some data on video consumption were missing in this first edition of MOOC2. In the case of MOOC1, it was necessary to submit a peer evaluated mid-term assignment and to pass an exam to earn the certificate. In both
Available Data
Student activity reports, gradebooks and survey responses were downloaded from the platform. Regarding video consumption, we used a proxy as we considered that the video had been viewed when the page where it was embedded was opened, regardless of the number of times this page was loaded. We manually removed from subsequent analyses the videos that were not part of the course strictly speaking, such as weekly introductions or tutorials. The global activity of the course was defined from the video perspective as the total number of views, without taking into account multiple views, and from the quiz perspective as the total number of submissions, without taking into account multiple submissions.

Participants were asked to fill in a survey at the beginning of the course; response rates ranged from 40% to 60% of enrollees. IP addresses were not collected; all available data on countries of residence come from these surveys; the Human Development Index of these countries were retrieved from U.N data (U.N. 2012). In both courses, the students who could gain credits by completing the course were excluded from our analyses since they were not strictly speaking following a self-directed learning approach. They represented a significant contingent in the case of MOOC2. Participants were categorized based on their level of engagement: those who obtained a certificate were called “completers”, those who submitted at least one quiz or assignment but did not complete the course were referred to as “disengaging learners”; those who did not submit any quiz or assignment were referred to as “auditing learners” if they had viewed at least 10% of available course videos, and bystanders (Anderson et al. 2014) if their fell below this threshold. We admit that the term “disengaging” is somehow debatable since submitting a quiz is not a strong engagement, but as was demonstrated in this paper and other reports (Ho et al. 2014), it is more engaging than just watching a video. Anonymized data was analyzed with the open source statistical software R 2.12.

Results
Evolution of learners profiles across iterations
The proportions of the different categories of learners evolved significantly over time (Table 1, Table 2). For instance, in the case of the MOOC1, the number of registrants decreased from 8,996 in the first iteration to 4,236 in the third one. The proportion of completers decreased from 27% to 20%, while bystanders increased from 42% to 50% of registrants; auditing and disengaging learners were stable around 7% and 25%, respectively (Table 2).

In the case of MOOC2, the number of registrants increased from 3,495 in the first iteration to 14,835 in the fourth iteration (Table 2). The proportion of “basic certificate earners”, “advanced certificate earners” and disengaging learners decreased from 26 to 12%, 13 to 2%, and 35 to 23%, respectively. In the same amount of time, the proportion of auditing learners and of bystanders increased from 3 to 10% and 24 to 52%, respectively. Differences in participants categories between iterations were all statistically significant according to chi-square tests (p-value <0.001).

Course activity and engagement patterns
We then measured the share that the different categories of learners represented in the course activity. From the video consumption perspective, across all iterations of both MOOCs, bystanders and auditing learners represented a maximum of 1.5 and 6.2% of the course activity, respectively (Figure 1). Disengaging learners and completers represented up to 49%, and 73% of the course activity, respectively. Additionally, completers represented up to 74 and 78% of quiz submissions, in MOOC1 and MOOC2, respectively.

We then analyzed engagement patterns at a finer scale, for both disengaging and auditing learners (Figure 2). We focused on the proportions of videos that had been viewed and of the quizzes that had been submitted rather than on the last week or last day participants were active, and used deciles to fall in the conditions of validity of survival analyses. By doing so we wanted to avoid considering as similar, the participants who had watched all of the course videos and those who started the course on the...
Table 1: Course demographics. Note that the percentages we reported were valid for survey respondents only.

<table>
<thead>
<tr>
<th></th>
<th>MOOC1</th>
<th>MOOC1</th>
<th>MOOC1</th>
<th>MOOC2</th>
<th>MOOC2</th>
<th>MOOC2</th>
<th>MOOC2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VI</td>
<td>V2</td>
<td>V3</td>
<td>VI</td>
<td>V2</td>
<td>V3</td>
<td>V4</td>
</tr>
<tr>
<td>Women</td>
<td>40</td>
<td>36</td>
<td>35</td>
<td>32</td>
<td>36</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>Men</td>
<td>60</td>
<td>64</td>
<td>65</td>
<td>68</td>
<td>65</td>
<td>61</td>
<td>58</td>
</tr>
<tr>
<td>Lower management positions</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>17</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Higher management positions</td>
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<td>45</td>
<td>49</td>
<td>52</td>
<td>48</td>
<td>52</td>
<td>40</td>
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<td>Jobseeker</td>
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<td>14</td>
<td>14</td>
<td>11</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Students</td>
<td>26</td>
<td>18</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Others</td>
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<td>15</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>11</td>
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<tr>
<td>HDI Low</td>
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<td>10</td>
<td>10</td>
<td>24</td>
<td>22</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>HDI Intermediate</td>
<td>8</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>HDI Very High</td>
<td>79</td>
<td>84</td>
<td>83</td>
<td>67</td>
<td>67</td>
<td>69</td>
<td>73</td>
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<tr>
<td>Below 2h</td>
<td>56</td>
<td>52</td>
<td>52</td>
<td>56</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Between 2 to 4h</td>
<td>35</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Above 4h</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>It is my firts MOOC</td>
<td>73</td>
<td>70</td>
<td>48</td>
<td>91</td>
<td>87</td>
<td>92</td>
<td>82</td>
</tr>
<tr>
<td>I had completed at least a MOOC prior to registration</td>
<td>20</td>
<td>21</td>
<td>37</td>
<td>20</td>
<td>21</td>
<td>37</td>
<td>20</td>
</tr>
<tr>
<td>I had registered in at least a MOOC but completed none</td>
<td>6</td>
<td>9</td>
<td>14</td>
<td>6</td>
<td>9</td>
<td>14</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 2: Learners profiles across iterations. We represented the absolute numbers and the corresponding proportions in parenthesis; these percentages were computed relatively to the total number of registrants.

<table>
<thead>
<tr>
<th></th>
<th>MOOC1</th>
<th>MOOC1</th>
<th>MOOC1</th>
<th>MOOC2</th>
<th>MOOC2</th>
<th>MOOC2</th>
<th>MOOC2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VI</td>
<td>V2</td>
<td>V3</td>
<td>VI</td>
<td>V2</td>
<td>V3</td>
<td>V4</td>
</tr>
<tr>
<td>Enrollees</td>
<td>8996</td>
<td>4078</td>
<td>4236</td>
<td>3495</td>
<td>10268</td>
<td>12055</td>
<td>14835</td>
</tr>
<tr>
<td>Bystanders</td>
<td>3735</td>
<td>1805</td>
<td>2130</td>
<td>831</td>
<td>4823</td>
<td>5763</td>
<td>7781</td>
</tr>
<tr>
<td>%</td>
<td>41.5</td>
<td>44.3</td>
<td>50.3</td>
<td>23.8</td>
<td>47.0</td>
<td>47.8</td>
<td>52.5</td>
</tr>
<tr>
<td>Auditing registrants</td>
<td>587</td>
<td>302</td>
<td>311</td>
<td>97</td>
<td>131</td>
<td>254</td>
<td>1442</td>
</tr>
<tr>
<td>%</td>
<td>6.5</td>
<td>7.4</td>
<td>7.3</td>
<td>2.8</td>
<td>1.3</td>
<td>2.1</td>
<td>9.7</td>
</tr>
<tr>
<td>Disengaging</td>
<td>2219</td>
<td>1068</td>
<td>957</td>
<td>1235</td>
<td>2512</td>
<td>3846</td>
<td>3440</td>
</tr>
<tr>
<td>%</td>
<td>24.7</td>
<td>26.2</td>
<td>19.8</td>
<td>35.3</td>
<td>24.5</td>
<td>31.9</td>
<td>23.2</td>
</tr>
<tr>
<td>Completers (Basic)</td>
<td>2455</td>
<td>93</td>
<td>838</td>
<td>894</td>
<td>1725</td>
<td>1831</td>
<td>25.6</td>
</tr>
<tr>
<td>%</td>
<td>27.3</td>
<td>22.1</td>
<td>19.8</td>
<td>34.3</td>
<td>21.4</td>
<td>14.3</td>
<td>12.2</td>
</tr>
<tr>
<td>Completers (Adv.)</td>
<td>1255</td>
<td>59</td>
<td>341</td>
<td>438</td>
<td>607</td>
<td>467</td>
<td>341</td>
</tr>
<tr>
<td>%</td>
<td>12.5</td>
<td>5.9</td>
<td>3.9</td>
<td>12.5</td>
<td>5.9</td>
<td>3.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Initial survey respondents</td>
<td>5385</td>
<td>2205</td>
<td>1693</td>
<td>2250</td>
<td>5227</td>
<td>7129</td>
<td>7008</td>
</tr>
<tr>
<td>%</td>
<td>59.9</td>
<td>54.1</td>
<td>40.0</td>
<td>64.4</td>
<td>51.2</td>
<td>59.1</td>
<td>47.2</td>
</tr>
</tbody>
</table>
last week but watched only a handful of videos. We reported the results in Figure 2 for MOOC1 only, since the results were very similar for MOOC2.

Figure 1. Proportion of the course activity for the different categories of learners (Completers, Disengaging and Auditing learners, or Bystanders) from the video consumption (Left) or the quiz submission (Right) perspectives

As far as video consumption was concerned, we could observe a clear distinction between disengaging learners who had submitted at least a quiz and auditing learners (Figure 2 Left). Across all three iterations, a maximum of 2.9% of auditing learners and a minimum of 9.4% of learners who had submitted a quiz or more watched all available course videos; the median survival time were the first decile for auditing learners, and the second decile for disengaging learners. Among auditing learners, the sharpest decline occurred between the first and the second decile, which is likely to correspond to the middle of the first week of the course. It suggests that almost all auditing learners, and most disengaging learners did not go beyond the first week. The differences in video consumption behaviors between disengaging and auditing learners were statistically significant in the three iterations of the course according to the survival analyses we carried out (Table 3).
Table 3: Differences in video consumption behavior between auditing and disengaging learners in the three iterations of MOOC1. coef stands for coefficient of the log-rank test, H.R stands for Hazard Ratio. The higher the coefficient, the lesser the amount of videos that have been viewed by auditing learners compared to disengaging ones.

<table>
<thead>
<tr>
<th></th>
<th>Coef.</th>
<th>H.R.</th>
<th>Se (Coef.)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOOC1 V1</td>
<td>0.58</td>
<td>1.78</td>
<td>0.06</td>
<td>&lt; 2.0 \times 10^{-16}</td>
</tr>
<tr>
<td>MOOC1 V2</td>
<td>0.51</td>
<td>1.66</td>
<td>0.08</td>
<td>2.0 \times 10^{-10}</td>
</tr>
<tr>
<td>MOOC1 V3</td>
<td>0.84</td>
<td>2.33</td>
<td>0.14</td>
<td>4.7 \times 10^{-10}</td>
</tr>
</tbody>
</table>

We carried out log-rank tests to identify most impacting factors with regards to video consumption behaviors within these different categories of learners. Regarding auditing learners, we failed to detect any impacting factor; however, across all three iterations, we detected consistent differences between disengaging learners from more developed countries and those from least developed countries; the hazard ratios were equal to 0.40 (p-value < 10^{-16}), 0.53 (p-value = 3.9 \times 10^{-5}), and 0.45 (p-value = 3.9 \times 10^{-5}), for the first, second and third iteration, respectively. It suggests that disengaging learners from least developed countries tended to disengage more than twice faster than disengaging learners from more developed countries. As far as quizzes were concerned, around half of the disengaging learners who had submitted a quiz submitted at least another one (Figure 2 Right). The proportion of disengaging learners who did all quizzes ranged from 14 to 21%. In contrary to video consumption, we failed to detect any consistently impacting factor through survival analyses.

Identifying factors associated with course completion

In a previous analysis of the first iteration of MOOC2 (Cisel 2014), we had shown that completers differed significantly from auditing participants by their socio-economic status, and by the HDI of their country of residence, among other parameters. We first studied the evolutions of socioeconomic and sociocultural characteristics of survey respondents across the different iterations of the two MOOCs (Table 1) and then focused on the relationship between learners’ profiles and their engagement in the course in order to identify the most impacting factors. We reported the odd-ratios of the corresponding logistic regression in Table 4.

Some characteristics evolved significantly over time. For instance, we observed that over the three iterations of MOOC1, the proportion of students decreased from 26% to 11%, and that the proportion of participants who had not followed a MOOC prior to the course decreased from 73% to 48% (Table 1). There were also significant differences among the two courses regarding the amount of time that participants were willing to invest in the course. Only 10% of the respondents of MOOC1, at most, were willing to invest more than four hours a week, whereas they were at least 36% in MOOC2. This parameter was strongly associated with completion rates, especially for the advanced certificate of MOOC2. In the second iteration of MOOC2, completion rates were up to twelve times higher among those who wanted to invest more than four hours a week than among those who declared they were willing to invest less than two hours a week. They were also usually lower among respondents that had followed a MOOC prior to the course, but without completing it. We failed to detect consistent trends regarding socioeconomic status, except for MOOC2 advanced certificate, where respondents with higher management positions and job seekers tended to perform better. Additionally, respondents from more developed countries usually showed higher completion rates more than those from least developed countries in MOOC2, a trend that we could not detect in MOOC1.

Discussion

The two MOOCs followed strikingly different trajectories in terms of numbers of registrants; contrary to MOOC1, the number of registrants of MOOC2 increased sharply, especially over the first iterations. Quantitative and qualitative differences among courses’ potential audiences may be responsible for such differences. A management course with no prerequisites may target a larger audience than an entrepreneurship course. Consequently, the pool of potential learners may remain larger for a longer time than in the case of a more specialized course. However, comparisons with other courses in the same situation should be done to validate this hypothesis; indeed, other processes such as marketing around the courses could be at stake, as the professors in charge suggested, communication strategies differed significantly across iterations.
Table 4: Identification of factors influencing course completion in the different iterations of MOOC1 and MOOC2.

Numbers represent odd-ratios (O.R) of a logistic regression. For instance, an O.R of 2 means that the completion rate for this category was twice the completion rate of the reference (Ref). In MOOC2, a distinction was made between the two certificates (Ba.: Basic certificate, Adv.: Advanced certificate).

P-value < 0.05: * / P-value < 0.01: ** / P-value < 0.001: ***

<table>
<thead>
<tr>
<th></th>
<th>MOOC1 V1</th>
<th>MOOC1 V2</th>
<th>MOOC1 V3</th>
<th>MOOC2 V1</th>
<th>MOOC2 V2</th>
<th>MOOC2 V3</th>
<th>MOOC2 V4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td>1.11</td>
<td>0.98</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>Ref.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>positions</td>
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<td></td>
</tr>
<tr>
<td>management</td>
<td>0.99</td>
<td>0.87</td>
<td>1.66*</td>
<td>0.99</td>
<td>0.77</td>
<td>1.54</td>
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<tr>
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</tr>
<tr>
<td>Jobseeker</td>
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<td>0.77</td>
<td>1.54</td>
<td>0.98</td>
<td>0.77</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>1.25*</td>
<td>0.71</td>
<td>2.33***</td>
<td>1.25*</td>
<td>0.71</td>
<td>2.33***</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0.76</td>
<td>0.73</td>
<td>1.68*</td>
<td>0.76</td>
<td>0.73</td>
<td>1.68*</td>
<td></td>
</tr>
<tr>
<td>HDI Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref.</td>
<td></td>
<td></td>
<td></td>
<td>1.22*</td>
<td>1.17*</td>
<td>0.61*</td>
<td></td>
</tr>
<tr>
<td>HDI Intermediate</td>
<td>0.85</td>
<td>0.87</td>
<td>0.68</td>
<td>0.85</td>
<td>0.87</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>HDI Very High</td>
<td>1.22*</td>
<td>1.17*</td>
<td>0.61*</td>
<td>1.22*</td>
<td>1.17*</td>
<td>0.61*</td>
<td></td>
</tr>
<tr>
<td>Below 2h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref.</td>
<td></td>
<td></td>
<td></td>
<td>1.22*</td>
<td>1.17*</td>
<td>0.61*</td>
<td></td>
</tr>
<tr>
<td>Between 2 to 4h</td>
<td>1.51***</td>
<td>1.48***</td>
<td>1.76***</td>
<td>1.51***</td>
<td>1.48***</td>
<td>1.76***</td>
<td></td>
</tr>
<tr>
<td>Above 4h</td>
<td>1.75***</td>
<td>1.54**</td>
<td>2.02***</td>
<td>1.75***</td>
<td>1.54**</td>
<td>2.02***</td>
<td></td>
</tr>
<tr>
<td>It is my first</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref.</td>
<td></td>
<td></td>
<td></td>
<td>1.06</td>
<td>1.08</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>I had completed at least a MOOC prior to registration</td>
<td>0.96</td>
<td>0.97</td>
<td>0.62***</td>
<td>0.54***</td>
<td>1.24</td>
<td>1.32</td>
<td>1.32</td>
</tr>
<tr>
<td>I had registered in at least a MOOC but completed none</td>
<td>0.60***</td>
<td>0.62**</td>
<td>0.45***</td>
<td>0.70</td>
<td>0.89</td>
<td>0.56***</td>
<td>0.70</td>
</tr>
</tbody>
</table>

From the learning engagement perspective, certification rates tended to decrease as was observed in Introduction to Solid State Chemistry (Ho et al. 2014). In the management course (MOOC2), the core of most engaged participants slightly decreased as the number of enrollees was increasing. This relative decline in the advanced track was striking, with a six-fold decrease in the proportion of advanced certificate earners. We believe that the first iteration of a course attracts proportionally more engaged participants than following iterations, maybe because people eager to learn a topic are rather proactive; it is likely that these learners are aware of the launch of the course from the first iteration and consequently register sooner than less motivated learners; consequently, their share decreases across iterations.

In both courses, the proportion of bystanders rose over time, a trend that was also observed in the Probabilistic Graph Model course (Anderson et al. 2014). At a global level, the proportion of early-adopters, likely to be motivated participants, has logically decreased as MOOCs were expanding their audiences. At the same time, we observed a
sharp increase in the proportion of registrants who had already completed at least one MOOC prior to registering to the courses. However, the impact of this experience on engagement in the course is not clear. One may expect that participants with more experience in online learning are more likely to complete the course, but we generally observed quite the opposite. We believe that sampling behaviors that were detected within courses (Kizilcec et al. 2013) are probably transposable at a larger scale, and that a significant proportion of learners register to more courses than they can afford to follow given their time constraints. Given the sampling bias, this proportion is likely to be way higher than what was reported in the course statistics; indeed, these learners are probably among bystanders, a category of learner that is unlikely to respond to our surveys and that we consequently do not know very well.

Despite the fact that they always represented a minority, disengaging learners had a non neglectable share in the course activity by completers were responsible for most of it, from both the video and the quizzes perspectives. Consequently, one should be cautious when comparing different MOOCs or different iterations of a given MOOC from the audience perspective; the mere number of registrants is an unreliable indicator, likely to be driven by fluctuations in the number of bystanders. Even when the number of registrants is important, most of the course activity is actually driven by the core nucleus of highly engaged learners, which represents a rather small proportion of the audience. Indeed, auditing and disengaging learners tend to dropout very quickly, mostly before the end of the first week for the former and before the end of the second week for the latter, a pattern consistent with what was reported by Ho et al (2014), among others. These patterns are likely to be course-dependent. For instance, in a video-intensive MOOC with little or very complicated activities, the proportion of highly engaged auditing learners may be higher than what we observed in our two case studies. The different categories of participants were relatively stable across iterations from the sociocultural and the socioeconomic perspectives, as was often reported (Ho et al. 2014). In both MOOCs, a significant proportion of learners were already registered in previous iterations of the course (data not shown) and had come back most probably because they had failed to engage as much as they would have liked in the first place. Nevertheless, this proportion always fell below 10% and the phenomenon of multiple registrations is unlikely to be responsible for stability in course demographics. We observed punctual but significant variations in the proportions of students for instance. Since those proportions did not vary in the same directions, it is unlikely that these variations reflected a growing or a decreasing interest of French students for MOOCs. They were probably linked to communication strategies around the course; this illustrates the sensitivity of course demographics to recruitment strategies, especially for MOOCs with a limited audience.

Interestingly, the impact of characteristics such as socioeconomic status or country of residence on completion rates was revealed mainly in the most demanding track of the management course, a result we had already observed in the first iterations of MOOC2 (Cisel 2014, Cisel 2014b). We also detected the influence of geographical origin at finer scales, in video consumption behaviors for instance. Lower completion rates in least developed countries have repeatedly been reported (Ho et al. 2014), which is consistent with our results. Technical issues such as low bandwidth may be at stake, but further investigations would be needed to get a better understanding of this phenomenon. Similarly we should investigate why registrants with higher management positions and jobseekers were relatively more engaged than others in the most demanding tracks. Such a phenomenon could be linked with the nature of the course. An advanced certificate from a practical management course could have more value on the labor market than a certificate from an entrepreneurship course, and therefore constitute a stronger motivation for specific categories of learners.

Finally, the amount of time participants were willing to invest in the course was the best predictor of course completion, especially for the track involving a heavy workload. This result suggests that self-declared data about learners’ intentions (Campbell et al. 2014) could be used along with predictive algorithms (Halawa et al. 2014) to enhance our ability to identify potential dropouts. It is indeed important to make the distinction between the different categories of dropouts, and especially voluntary withdrawal, if we are to tailor pedagogical responses accordingly. Interestingly, this parameter was one of the main differences between the two courses, with many more learners in MOOC2 who were willing to invest more than four hours a week in the course. This suggests that certain courses attract learners with higher levels of engagement, or that learners willing to obtain the certificate adapt their time schedule according to their objective, whatever the required workload.

Analyzing the different iterations of a given course could provide valuable insights into the evolutions of MOOCs audience and dynamics on the long-term, at a global level or at the course level. In that purpose, we need to design comprehensive studies focused on these long-term dynamics. In that purpose,
standardization efforts in survey design need to go beyond questions about motivations to register (Schneider & Kizilcec 2014), and should also focus on parameters such as time constraints, MOOC consumption behavior, and most importantly on learners’ intentions. Importantly, cross-correlations between survey and log data should be more systematic; common identifiers are often absent from datasets, impeding interesting discoveries.

In response to recurrent criticism against MOOC low completion rates, some major figures have claimed that many registrants benefit from these courses despite the fact that they do not obtain a certificate. This assumption is quite debatable, since exploring a fraction of the available course material is unlikely to bring valuable learning outcomes. Millions of accounts have indeed been created on platforms such as Coursera or edX over the past two years, but it is likely that most of the MOOC movement is driven by a core

of a few hundreds thousands of learners. However, even if it seems that this nucleus is mainly composed of educated people from the most developed countries, its characteristics and its evolutions are not known well yet. To what extent is it renewed by the arrival of new learners? Are we witnessing the apparition of professional learners, always following at least a MOOC in one of the many platforms that have appeared lately? Or do these addict learners represent a minority? In order to tackle these issues, increasingly numerous studies on completion rates will not suffice; we need to design comprehensive studies that go beyond the course level and probably beyond the platform level. One should not be blinded by the impressive amount of enrollments; we still need to assess whether we are facing an increasingly global phenomenon, or merely the constitution of a relatively small community or self-regulated learners.

Acknowledgement

We acknowledge Unow, a French MOOC agency specialized in MOOC design, and professors Philippe Silberzahn and Rémi Bachelet for providing access to the course data.

References


Can demographic information predict MOOC learner outcomes?

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School of Education, University of Leeds, UK

ABSTRACT
There has been much written about the disruptive nature of Massive Open Online Courses on Higher Education, and online learning over the last two years. During that time, universities have been delivering online courses to many thousands of participants from around the world. Studies are beginning to use the data gathered from participants before, during and after courses to understand and evaluate these online learning courses. Generally, to date studies have focussed on the drop-out rate of learners from courses. This study uses pre-course survey data and online learner behaviour data gathered from five MOOCs delivered by the University of Leeds in 2014 to understand which learner characteristics might impact on completion. The results show that four characteristics are significantly associated with degree of completion. However, further examination of the data reveals anomalies and suggests that the MOOC population is much more complex than the headline data implies.

Introduction
Massive Open Online Courses (MOOCs) have caused unprecedented debate within the academic community over the last 3 years, with some commentators speculating that they will result in a revolution in Higher Education (Agrawal, 2013). Since the advent of the modern form of MOOCs in Canada in 2008, their popularity with online learners globally has risen rapidly. The first MOOCs were cMOOCs or connectivist MOOCs, which encouraged networks of learners to connect and create learning communities using a variety of web tools. In 2012, the creation of the Coursera and Udacity platforms heralded the first xMOOCs, which are more didactic in nature, providing courses with video lectures, discussion and quizzes to many thousands of online participants. In 2013, the Open University launched FutureLearn in the UK. By January 2014, these main xMOOC providers, along with the edX platform, had offered almost 700 xMOOCs and enrolled more than 8 million users worldwide (Perna et al., 2014). The FutureLearn platform has over 800,000 registered participants and partnerships with over 35 universities and other organisations from the UK and countries around the world. FutureLearn has a social constructivist pedagogy underpinning its design, and is labelled as a social learning platform, by virtue of its ‘water-cooler’ style discussion areas provided alongside learning content (Ferguson & Sharples, 2014).

MOOC learners are an extremely heterogeneous group, consisting of male and females learners of all ages from across the world, with a wide range of prior educational attainment, prior online experience, employment status and motivations. However, focus has been drawn to the relatively high proportion of male 26-35 year old professionals with a bachelor’s degree taking online courses on the large xMOOC platforms (Ho et al., 2014), even though this group normally only represents around a quarter to half of the learner cohort. Interestingly, FutureLearn has more women registered than men: around 58% are women. However, over 70% of people registered on the platform already have a degree or higher and over 50% are working. FutureLearn users are from a wide age range: the largest group (23%) are aged between 26 and 35, but around 13% are over the age of 55 (Press Association, 2014). Other platforms have similar learner profiles (Breslow et al., 2013; Palin, 2014; Perna et al., 2014), and whilst there are emerging patterns about ‘typical’ MOOC learners, there are platform differences. As yet there is not a shared understanding of the most appropriate definition of a MOOC student (Perna et al., 2014).

A continual criticism of MOOCs has been their low completion rate, with reported rates of between 5% and 12% (Jordan, 2014; Perna et al., 2014). However, as discussed by a number of commentators, completion rates in MOOCs are not necessarily an
indicator of educational success, as participants may achieve their learning goal through engaging in only a proportion of the course (Liyanagunawardena et al., 2014; Reich & Ho, 2014). Despite a lack of agreement as to what constitutes success, there is a growing body of literature that has analysed the characteristics of learners on MOOCs and how these characteristics are related to success in terms of completion. Kizilcec et al. (2013) examined MOOC completion rates, and categorised ‘completion’ into four classifications of engagement trajectories (‘auditing’, ‘completing’, ‘disengaging’ and ‘sampling’), to gain insight into those learners who may have varying motivations for enrolling on a MOOC and therefore may ‘drop out’ after what they feel is a satisfactory point.

There have been very few empirical studies of the relationships between MOOC learners’ demographics and completion rates. Guo and Reinecke (2014), in their study of four edX MOOCs with data from 140,546 students, found that age was positively correlated with the volume of coverage, which in turn was positively correlated with grade. However, Breslow et al. (2013) found no correlation between age and ‘success’, where ‘success’ was defined as achievement in terms of the grade awarded rather than completion. Guo and Reinecke (2014) also found that learners from countries with lower student-teacher ratios (e.g. the US and European countries) covered more content and gained higher grades. Cisel (2014) found when examining data from the first French MOOC, that geographical location was associated with achievement. Also, learners from countries with a high HDI (Human Development Index) had higher achievement (Cisel, 2014), something which Kizilcec et al. (2013) also found for levels of engagement. Cisel (2014) also found that employment status had an impact on achievement: unemployed learners achieved higher grades than students in work. However, Cisel found no association between gender and achievement, nor did Breslow et al. (2013). Although much has been written about learners on MOOCs having a high level of prior educational attainment (Breslow et al. 2013; Palin, 2014), Breslow et al. (2013) only found a marginal association between highest degree earned and achievement.

Method

The aim of this study is to explore MOOC participants’ patterns of engagement on five MOOCs delivered by the University of Leeds on the FutureLearn platform. The five courses were: Physical actor training (Actor); Anatomy: Exploring the abdomen (Anatomy); When Worlds Collide (WWC); Innovation: the key to business success (Innovation); and Starting a business (Enterprise). Participants’ online learning activity was combined with their responses from a pre-course survey to explore relationships between completion and demographic factors, including age, gender, prior online learning experience, educational attainment, country of residence and employment status. The study attempts to answer the research question ‘Do MOOC learners who complete courses to differing degrees share any similarities in terms of demographic profile?’

Building on the work of Kizilcec et al. (2013) we have categorised learners into four groups according to classifications adopted by FutureLearn to identify learners’ level of engagement:

1. Learners who only engaged in the first week of the course, termed ‘Week 1 only’;
2. Learners who complete the first week, and return to the second week but do not complete the course, termed ‘Returning learners’;
3. ‘Completers’ - those who complete at least 50% of the steps and all of the assessments (required by FutureLearn to be eligible for a certificate);
4. ‘100% engaged’ - those who complete all the steps and assessments.

Data collection

Data for this study was collected by FutureLearn and supplied to the University of Leeds. FutureLearn users are advised that data collected on the platform may be used for research purposes, and this study was conducted in accordance with the FutureLearn Code of Practice for Research Ethics. Two data sources have been used in this study: (1) responses from a pre-course survey sent to all enrolled learners prior to the start of all courses, and (2) online learner activity populated by participants visiting course ‘steps’ and completing course activities. FutureLearn uses the term ‘step’ to define the chunks of content within each course. A step can be a video, a discussion, some textbook style content etc. Data from each source has been linked using a unique code for each participant (where available) for analysis in this study. All data is completely anonymous and individuals can not be identified by the University of Leeds. The results provided in this study offer a preliminary analysis of this large and complex data set.

Data Analysis

The data provided by FutureLearn is categorical and therefore all analyses in this paper employed non-parametric methods. The chi-square test
was applied to assess whether differences in the distribution of learners across groups are statistically significant at the p<.05 level. This was performed for all independent variables across all five courses combined and at an individual course level. For some courses, the expected group sizes did not meet the minimum required to meet the assumptions of the chi-square test, therefore, where possible Fisher’s exact test was run instead, with the categories of ‘week 1 only’ and ‘returning learners’ collapsed into ‘non-completer’ and the categories of ‘completers’ and ‘100% engaged’ collapsed into ‘completer’. Age data was collected in the form of age group. Therefore it is not possible to calculate means; rather, estimated median ages have been calculated for each learner group. The median split test has been used to gauge whether the groups differ significantly by age.

Results

Enrolments on the five courses totalled 27,859 FutureLearn users, which includes learners, educators, administrators and moderators. Many enrolers did not engage meaningfully with their course. For the purposes of analysis we have excluded any learner who enrolled but did not complete at least two steps of the course. 16,365 users enrolled on the five courses and completed at least two steps. Table 1 shows how these users are split across course and by completion group. Our aim in this study is to compare degree of completion by various demographic variables. Therefore, for analysis purposes we are including only those learners who completed some or all of the pre-course survey (We are assuming that no educators, administrators or moderators completed the pre-course survey and thus define those who did as ‘learners’). 2,338, or 14.3% of engaged enrolers completed the survey. Table 1 shows the number of learners categorised into the four groups according to degree of completion of their course. The largest group of learners is on the Enterprise course, followed by Innovation, and the smallest number is on When World Collide. In terms of completion, overall and for each course, except When Worlds Collide, the largest group is those who did not complete the first week. For each course and overall, the smallest group is ‘completers’.

Table 1: Course statistics, overall and by course, and by completion group

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Actor</th>
<th>Anatomy</th>
<th>WWC</th>
<th>Innovation</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants(^2) (enrolled(^1))</td>
<td>16365</td>
<td>1172</td>
<td>3784</td>
<td>1087</td>
<td>5179</td>
<td>5002</td>
</tr>
<tr>
<td></td>
<td>(27859)</td>
<td>(3467)</td>
<td>(8590)</td>
<td>(3514)</td>
<td>(14958)</td>
<td>(12901)</td>
</tr>
<tr>
<td>Course duration</td>
<td>3 weeks</td>
<td>3 weeks</td>
<td>2 weeks</td>
<td>3 weeks</td>
<td>2 weeks</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Learners who completed pre-course survey(^1)</td>
<td>2338</td>
<td>131</td>
<td>496</td>
<td>113</td>
<td>752</td>
<td>846</td>
</tr>
<tr>
<td></td>
<td>(44.27%)</td>
<td>(41.22%)</td>
<td>(42.34%)</td>
<td>(24.78%)</td>
<td>(50.24%)</td>
<td>(50.24%)</td>
</tr>
<tr>
<td>Week 1 only</td>
<td>1035</td>
<td>54</td>
<td>210</td>
<td>28</td>
<td>318</td>
<td>425</td>
</tr>
<tr>
<td>(% of course)</td>
<td>(44.27%)</td>
<td>(41.22%)</td>
<td>(42.34%)</td>
<td>(24.78%)</td>
<td>(42.29%)</td>
<td>(50.24%)</td>
</tr>
<tr>
<td>Returning learners</td>
<td>639</td>
<td>44</td>
<td>145</td>
<td>31</td>
<td>251</td>
<td>168</td>
</tr>
<tr>
<td>(% of course)</td>
<td>(27.33%)</td>
<td>(33.59%)</td>
<td>(29.23%)</td>
<td>(27.43%)</td>
<td>(33.38%)</td>
<td>(19.86%)</td>
</tr>
<tr>
<td>Completers</td>
<td>132</td>
<td>13</td>
<td>51</td>
<td>22</td>
<td>17</td>
<td>29</td>
</tr>
<tr>
<td>(% of course)</td>
<td>(5.65%)</td>
<td>(9.92%)</td>
<td>(10.28%)</td>
<td>(19.47%)</td>
<td>(2.26%)</td>
<td>(3.43%)</td>
</tr>
<tr>
<td>100% engaged</td>
<td>532</td>
<td>20</td>
<td>90</td>
<td>32</td>
<td>166</td>
<td>224</td>
</tr>
<tr>
<td>(% of course)</td>
<td>(22.75%)</td>
<td>(15.27%)</td>
<td>(18.15%)</td>
<td>(28.32%)</td>
<td>(22.07%)</td>
<td>(26.48%)</td>
</tr>
</tbody>
</table>

Table 2 provides details of the characteristics of the data sample, overall and by course. The median age of the sample is 36.17 years old (n=2338) and contains more females (59.83%, n=1397) than males (40.17%, n=938). Average age is fairly consistent across courses. The Actor and Anatomy courses have a strong female bias with over 70% female enrolers, the When Worlds Collide and Enterprise courses also have a female bias but not so strong. Only Innovation has more males (50.13%, n=377). Overall, less than half, 42.7%, (n=986) of learners had taken a course mostly or fully online before. The Innovation course learners were the least experienced with just 34.47% (n=253) having this type of experience. Across the courses, the majority (55.89%, n=1305) of learners were UK-based, which leaves a substantial minority of 44.11% (1030) who were not. The next largest
group came from the US (3.4%, n=80) followed by India (2.9%, n=68). The geographical location of learners varied quite widely across courses, from 76.62% (n=379) of learners on the Anatomy course being UK-based to just 38.91% (n=293) of the Innovation learners. Overall, these learners are most likely to be educated to degree level, with a large majority (75.08%, n=1747) educated to degree level or above. The most highly educated course is When Worlds Collide with 83.19% (n=94) of learners having a degree or higher. The least educated are the learners on the Anatomy course, with 63.82% (n=314) of learners having at least a degree, although this still means almost two-thirds of learners on this course are already educated to degree level. Overall, the majority of learners were working, and within that category most were working full time.

Table 2: Characteristics of learners in sample, overall and by course

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Actor</th>
<th>Anatomy</th>
<th>WWC</th>
<th>Innovation</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age (years)</td>
<td>36.17 (2338)</td>
<td>39.37 (131)</td>
<td>40.07 (496)</td>
<td>38.50 (113)</td>
<td>34.34 (752)</td>
<td>36.06 (846)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>40.17 (938)</td>
<td>28.03 (37)</td>
<td>27.88 (138)</td>
<td>37.17 (42)</td>
<td>50.13 (377)</td>
<td>49.87 (344)</td>
</tr>
<tr>
<td>F</td>
<td>59.83 (1397)</td>
<td>71.97 (95)</td>
<td>72.12 (357)</td>
<td>62.83 (71)</td>
<td>49.13 (375)</td>
<td>50.13 (499)</td>
</tr>
<tr>
<td>Online experience¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>42.70 (986)</td>
<td>57.30 (1323)</td>
<td>51.52 (68)</td>
<td>48.48 (64)</td>
<td>45.40 (222)</td>
<td>54.60 (293)</td>
</tr>
<tr>
<td>N</td>
<td>57.30 (1323)</td>
<td>48.48 (64)</td>
<td>45.40 (222)</td>
<td>54.60 (293)</td>
<td>45.40 (222)</td>
<td>45.40 (293)</td>
</tr>
<tr>
<td>Country of origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>42.70 (986)</td>
<td>57.30 (1323)</td>
<td>51.52 (68)</td>
<td>48.48 (64)</td>
<td>45.40 (222)</td>
<td>54.60 (293)</td>
</tr>
<tr>
<td>Non UK</td>
<td>57.30 (1323)</td>
<td>48.48 (64)</td>
<td>45.40 (222)</td>
<td>54.60 (293)</td>
<td>45.40 (222)</td>
<td>45.40 (293)</td>
</tr>
<tr>
<td>Prior educational attainment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than secondary</td>
<td>1.68 (39)</td>
<td>5.30 (7)</td>
<td>2.24 (11)</td>
<td>0.88 (1)</td>
<td>0.93 (7)</td>
<td>1.55 (13)</td>
</tr>
<tr>
<td>Secondary</td>
<td>23.25 (541)</td>
<td>15.15 (20)</td>
<td>33.94 (167)</td>
<td>15.93 (18)</td>
<td>19.47 (146)</td>
<td>22.62 (190)</td>
</tr>
<tr>
<td>Degree</td>
<td>47.83 (1113)</td>
<td>49.24 (65)</td>
<td>41.46 (204)</td>
<td>49.56 (56)</td>
<td>48.67 (365)</td>
<td>50.36 (423)</td>
</tr>
<tr>
<td>Masters</td>
<td>23.98 (558)</td>
<td>27.27 (36)</td>
<td>18.29 (90)</td>
<td>28.32 (32)</td>
<td>27.73 (208)</td>
<td>22.8 (192)</td>
</tr>
<tr>
<td>Doctorate</td>
<td>3.27 (76)</td>
<td>3.03 (4)</td>
<td>4.07 (20)</td>
<td>5.31 (6)</td>
<td>3.20 (24)</td>
<td>2.62 (22)</td>
</tr>
<tr>
<td>Degree and above</td>
<td>75.08 (1747)</td>
<td>79.54 (105)</td>
<td>63.82 (314)</td>
<td>83.19 (94)</td>
<td>79.60 (597)</td>
<td>75.83 (637)</td>
</tr>
<tr>
<td>Empt Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not working</td>
<td>20.77 (475)</td>
<td>25.00 (24)</td>
<td>23.89 (118)</td>
<td>30.09 (34)</td>
<td>13.34 (99)</td>
<td>23.75 (200)</td>
</tr>
<tr>
<td>Education</td>
<td>14.12 (323)</td>
<td>12.50 (12)</td>
<td>23.48 (116)</td>
<td>15.93 (18)</td>
<td>11.19 (83)</td>
<td>11.16 (94)</td>
</tr>
<tr>
<td>Working (ft/pt)²</td>
<td>65.11 (1489)</td>
<td>62.50 (60)</td>
<td>52.63 (260)</td>
<td>53.98 (61)</td>
<td>75.47 (560)</td>
<td>65.08 (548)</td>
</tr>
</tbody>
</table>

1. Online experience – the sample is split into those who have taken a course fully or mostly online (Y) before and those who have not (N)
2. Learners who are working are also split into those who are in full-time employment and those in part-time employment (%)
based learners than non-UK: ‘completers’ has the largest proportion of UK-based with 65.65% (n=86), whilst ‘returning learners’ has the least with 53.36% (n=341). For all groups the majority of learners are educated to degree level or above. ‘100% engaged’ has the highest proportion of learners with a degree or above (76.88%, n=409), with ‘returning learners’ having almost the same proportion (76.81%, n=487) and those who drop out in the first week have the lowest proportion with 73.01% (n=752), but these proportions are very similar across all four groups.

### Table 3: Characteristics of learners in sample, overall and by completion group

<table>
<thead>
<tr>
<th>% of overall and for each completion group (n)</th>
<th>All learners</th>
<th>week 1 only</th>
<th>returning learner</th>
<th>completer</th>
<th>100% engaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age (years)</td>
<td>36.17 (2338)</td>
<td>34.30 (1035)</td>
<td>36.54 (639)</td>
<td>42.79 (132)</td>
<td>38.49 (532)</td>
</tr>
<tr>
<td>Gender</td>
<td>M F</td>
<td>M F</td>
<td>M F</td>
<td>F M F</td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td>40.17 (938)</td>
<td>59.83 (1397)</td>
<td>39.96 (412)</td>
<td>60.04 (619)</td>
<td>39.03 (249)</td>
</tr>
<tr>
<td>Online experience¹</td>
<td>N Y</td>
<td>N Y</td>
<td>N Y</td>
<td>Y N Y</td>
<td>N Y</td>
</tr>
<tr>
<td></td>
<td>42.70 (986)</td>
<td>57.30 (1323)</td>
<td>39.37 (402)</td>
<td>60.63 (619)</td>
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<td>55.89 (1305)</td>
<td>44.11 (1030)</td>
<td>55.87 (576)</td>
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<td>53.36 (341)</td>
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<td>2.05 (13)</td>
<td>3.82 (5)</td>
<td>1.88 (10)</td>
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<td>50.16 (318)</td>
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<td>23.66 (150)</td>
<td>28.24 (37)</td>
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<td>3.00 (19)</td>
<td>6.87 (9)</td>
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<td>73.01 (752)</td>
<td>76.81 (487)</td>
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<td>20.77 (475)</td>
<td>17.46 (176)</td>
<td>22.93 (144)</td>
<td>20.63 (26)</td>
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<td>67.06 (676)</td>
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<td>(73.37/26.63)</td>
<td>(75.00/25.00)</td>
<td>(65.82/34.18)</td>
<td>(70.55/29.45)</td>
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1. Online experience – the sample is split into those who have taken a course fully or mostly online (Y) before and those who have not (N)
2. Learners who are working are also split into those who are in full-time employment and those in part-time employment (%)

Which of these demographic characteristics has a significant effect on degree of completion and can we discern whether those who complete more of their course share any similarities in terms of demographic profile?

We carried out chi-square analyses to test the extent to which these characteristics are significantly associated with degree of completion. There is very strong evidence of an association between age and degree of completion (chi-square = 59.7, df=18, p<0.001), with older learners completing more of their course (see Figure 1).

We have examined gender for the whole sample, both at the level of the four completion groups and with collapsed groups of ‘completer’ and ‘non-completer’ and have not found any evidence to
suggest that gender has an effect on the degree of completion, although there are some differences by course, which for the whole sample cancel each other out. This suggests that gender differences may well be a function of the content and/or the design of the course and this area merits further research. There is strong evidence of an association between prior online experience and degree of completion of the course (chi-square = 11.28, df=3, p=0.010) (see Figure 2).

Figure 1. Completion group by age (%)  
Figure 2. Completion group by online experience (%)  
Figure 3. Completion group by educational attainment (%)  
Figure 4. Completion group by employment status (%)  

Does prior educational attainment impact on degree of completion? The association is significant (chi-square = 9.83, df=4, p=0.043), and for most groups it appears that the higher the prior educational attainment the more likely the learner is to complete (see figure 3). However, contrary to expectation given this trend, those who have less than secondary education have the highest completion rate at 38.5% (n=15).

There is also strong evidence of an association between employment status and degree of completion of the course (chi-square = 15.75, df=6, p=0.015), with those not working being more likely to complete more of their course (see Figure 4).
Discussion

The analyses above have shown that four of the variables investigated have a significant association with degree of completion: namely age, prior online learning experience, prior educational attainment and employment status. Some of our findings concur with previous studies. The relationship of age with completion is similar to the findings of Guo and Reinecke (2014), although Breslow et al., (2013) found no such relationship. Knox suggests that MOOCs may be overwhelming and that they ‘can disorientate learners who may be expecting the orderly setting of the classroom or lecture hall’ (Knox, 2014, p.170). It is not surprising therefore that we found that learners with experience of participation in an online course previously complete more of their course. Although no prior qualifications are required for access to any of these MOOCs, over three-quarters of learners on these MOOCs have a degree or higher, with this rate reaching as high as 83.19% for When Worlds Collide. Our analysis has found that the higher the prior educational attainment the greater the completion. Those who have been through education successfully are used to ‘finishing’ things or at least completing the requirements for a qualification. Breslow et al. (2013) also looked at this variable, but only found a marginal association. We have also found, in common with Cisiel (2014) that those learners not working are more likely to complete more of their course. This is not too surprising as this group of learners probably have more free time. We did not find overall statistical significance for gender, which aligns with the findings from Breslow et al. (2013) and Cisiel (2014). However, when we looked at gender at course level we did find it was significant for two courses, although be aware that the groups are small (n = between 5 and 29) and any findings should be treated with caution. Is it related to the content, the design, the length, the number of steps, the types of steps, or something else entirely? However, when these results are examined more closely there are anomalies within our findings. When we found that age and completion were strongly associated, and that those who were not working were more likely to complete more than those working or in education, it was thought that this may be accounted for by a group of retired learners who have more time than most learners completing all, or most of, the course they enrolled on. However, despite the trend for older learners to complete more, the oldest group, aged 66+, are slightly less likely to complete than the 56-65 age group. We also found that prior educational attainment is associated with degree of completion, except for the group of learners who had the lowest level of prior educational attainment. Learners who had less than secondary education (the lowest category of educational attainment) were likely to complete more of their course than any other group, even than those with doctorates. Again, the ‘less than secondary education’ group is small (n=39) in relation to the whole sample and their results should be treated with caution.

What these anomalies suggest is that whilst we can find trends in the behaviour of learners, there are also anomalous groups which buck these trends. More detailed analyses which examine small groups such as those who have less than secondary school education may help us to understand them better. Are they ‘unemployed’ rather than retired and thus have more time on their hands and a particular motivation to finish the course, to make themselves more employable? Actually, when this group was examined further we found that it contains 39 learners, 55% of whom are under 18, and 53% of them are in full time education, i.e. they are still in full-time compulsory education and have not yet finished secondary education, rather than being older learners who did not reach this educational attainment. The two courses that these learners were most likely to be enrolled on are the two that are aimed at school level learners; Enterprise and Anatomy.

Limitations

Motivation of the learner may also have a significant effect in terms of the learners’ goals and intentions in relation to the course (Hew & Cheung, 2014; Wang & Baker, 2014). For example, if a learner enrols intending to audit a course, success for them may consist of remaining engaged with the content but without completing assignments. Our four completion categories miss those learners whose intention from the outset was to audit the course, a category which Kizilcec et al. (2013) does include. They are captured in the ‘Returning Learners’ in our categorisation, but this group includes others too. However, Breslow et al.’s (2013) work suggests that learners may not be dropping out where they feel it is a satisfactory point for them individually and that there may be other reasons for non-completion. Yuan and Powell (2013) also argue that it is important to find out more about those who drop out, and suggest looking at why and at what stage they drop out.
Conclusions

We have found that learners who are older, not working, those with prior online experience and having a high prior educational attainment are more likely to complete more of their course. Much of this is not surprising, but we have also found that some groups of learners buck these trends. In order to understand the different groups of learners enrolling on MOOCs and whether they complete their course, or even whether they want to complete their course, further analysis is required. This more detailed analysis should examine the learner’s context, e.g. they may be school students on a course aimed specifically at them, which is highly relevant to some other aspect of their formal education and thus motivation to complete 100% of the course is high. Or they may be a young university student with limited time who wants to know more about a particular area of statistics, for example, who enrolls on a MOOC finds out what they need and exits.

Our future work will explore analyses which group learners by multiple characteristics, and thereby provide a starting point to build portraits of different types of learners, with different motivations and intentions, as well as different characteristics, which may then help us to understand who might need support to achieve their learning goals.
References


Are there restrictions on the roll-out of MOOCs in EU universities and high schools on the basis of applicable EU Data Protection law?

Cédrine Morlière, Bird & Bird LLP, UK

ABSTRACT

This article provides lessons to be learned from legal requirements and good practice recommendations on the processing of students’ data in Belgium, France, the Netherlands, Italy, Denmark and Switzerland. Educational institutions need to be aware of the rights of their students as encoded in EU law and policy, and MOOC providers also need to be compliant with these rules.

A Privacy Impact Assessment should be carried out by school institutions before rolling out MOOCs in their official education offer, paying special attention to anonymization techniques, information and consent requirements, and transfers to 3rd parties. Local authorities may consider helping school institutions in this compliance and privacy awareness exercise.

KEYWORDS

MOOC, Data Protection, student data, e-learning, Big Data, Privacy Impact Assessment

Background

This paper will shed light on some of the significant issues regarding the protection of students’ data in the context of Massive Open Online Courses (MOOCs). In order to get a broad view of possible restrictions, the author questioned law practitioners and consulted the websites of Data Protection authorities (DPAs) in several EU countries, namely Belgium, France, Italy, the Netherlands and Denmark. The author also obtained information from inspiring debates regarding the protection of student data in Switzerland where applicable local Data Protection law is similar to the EU regime. The examples of possible legal restrictions which are referred in this paper should be regarded as an appetizer - food for thought on the roll-out of MOOCs under current and future Data Protection law.

Since this paper is not aimed at legal experts, references to law are limited but used to the extent where necessary. Last update of the paper: 20 March 2015.

Why does EU Data Protection Law matter for MOOCs?

In Belgium, the roll-out of MOOCs in French-speaking universities and higher educational establishments was discussed before the Parliament of the Walloon-Brussels Federation in December last year; the minister in charge of higher education, Jean-Claude Marcourt, stated that further analysis is necessary before embarking on the use of MOOCs awarding official certifications. Upon his request, a report on diverse aspects of e-learning technologies including MOOCs is being prepared by the Belgian Academy of Research in the area of higher education, which comprises the representatives of Belgian French-speaking universities. Data Protection considerations should not be overlooked or underestimated in such analysis, neither in Belgium nor in other EU countries where similar questions arise, such as in the Netherlands, where the protection of student data in the context of e-learning tools used in lower schools is being extensively discussed at a Parliament level.

The processing of student data throughout MOOCs

The processing of student data is a key feature of MOOC platforms, which typically collect different types of personal data from students and process them for a variety of purposes.
First, MOOCs offer huge potential for data analysis for educational purposes; data on learning patterns, pages viewed, test or peer review results, etc. - whether or not anonymized and/or aggregated – can be provided by the MOOC platform to the partnering educational institution upon request; the MOOC platform often proposes to analyze such data in view of providing adapted educational content to the MOOC student and/or analysis to the partnering institution. Most of the MOOC platforms also reserve the right to share statistical results with third party companies, whether or not they are of an educational nature.

Second, MOOC platforms often reserve the right to share the student data with third parties for non-directly related educational purposes: students’ profiles are built in order to provide them with advertisements related to the products and services of the platform or third party, whether or not they are of an educational nature. In addition, the MOOC platform's general terms usually contain a copyright licence assignment to their benefit, allowing them to further reproduce and disclose the user-generated content posted by students on the MOOC, and the included personal data where the case may be, such as personal opinions displayed in a paper on a given topic, or comments posted on a related social website. Indeed, some MOOC portals reserve the right to share such data with the related social media platforms and publish notices on the student’s Facebook wall and/or reuse Facebook posts or tweets made by the student relating to the course. Students’ personal data and study results can also be shared with future employers in the context of job-match services.

Third, MOOC platforms can offer the opportunity to obtain a certification upon completion of the MOOC, where the case may be, via third party certification service providers. Several means, including those that utilise biometric data, are used by third party certification providers to authenticate the takers of the certified tests.

**Where does EU Data Protection law apply to MOOCs?**

Student data is considered as "personal" under EU Data Protection law to the extent that it identifies or is likely to identify (or single out whether or not by name) a student directly or indirectly (e.g. by reference to an identification number or to one or more factors specific to economic, cultural or social identity).

Personal data is granted protection under EU Data Protection law in every instance in which it shall be processed in any form, i.e. collected, and/or recorded, organized, stored, retrieved, consulted or disclosed to third parties, etc.

A key concept in Data Protection law is the “data controller”, i.e. the entity which, alone or jointly with other entities, determines the purposes (and means) of processing personal data in a processing operation.

EU universities and high schools should in our view be considered as data controllers in relation to their processing of students data, since their official tasks (e.g. the provision of educational services) include the processing of student data. MOOC platforms often act as secondary or joint data controllers with regard to the processing of data for their own business purposes (e.g. marketing activities) or for the provision of e-learning statistics to higher education institutions.

By and large, EU Data Protection law, the general principles of which are currently embedded in the Data Protection Directive 95/46 of 24 October 1995, does currently apply to MOOC platforms run by one or more EU-based "data controller(s)". This will be the case, for instance, where a MOOC service provider and the partnering educational institutions are established in the EU.

EU Data Protection law also applies to platforms run by non-EU controllers (e.g. US MOOC platforms) that process EU student data through tracking technologies (e.g. cookies) placed on the EU student computer, which incidentally, is a common practice for most MOOC platforms.

Under the future Data Protection legal framework, which is currently being debated at the level of the Council of the EU, it is very likely that any e-service provider - whether or not based in the EU - will have to abide by EU Data Protection law where EU citizens (e.g. students) are targeted or profiled. US-based MOOC platforms would thus be obliged to apply EU Data Protection law to any targeted or profiled EU student.

In this context, the author believes that it is key for universities or high schools wishing to encourage the use of MOOCs in their official educational offer, to be aware of Data Protection restrictions in law and/or good practice recommendations issued by EU DPAs.

**EU Data Protection law in a nutshell**

Data controllers must also ensure that the principles of EU Data Protection law are complied with where they process personal data. In a nutshell, such principles, embedded in the EU Data Protection Directive 95/6, prescribe that personal data must be:
process lawfully: there must be a basis in law for processing data. For instance, a legal basis can be the data controller’s legitimate interest, the concerned individuals’ consent, or a legal obligation to process data incumbent on the data controller. The available grounds for processing vary between different countries;

(ii) processed fairly and in observance of individuals’ rights, such as being adequately informed about the data processing, accessing their data and having them corrected or removed where the data is no longer relevant;

(iii) collected for specified, explicit and legitimate purposes (e.g. the furtherance of educational or other purposes) and not further processed in a way incompatible with those purposes (the so-called “purpose limitation principle”);

(iv) adequate, relevant and not excessive in relation to the purposes for which they are collected, and retained no longer than necessary for such purposes.

Specific contractual measures may be prescribed by law in the case of a data transfer to a non-EU country in view of adducing adequate safeguards under EU law, in line with the above mentioned principles. In addition, the Data Protection Directive prescribes the implementation of adequate security measures in order to protect personal data from confidentiality or security breaches, such as accidental loss or unauthorized access.

The above mentioned EU Data Protection rules and principles have been implemented in each EU Member State’s local Data Protection law, and have also inspired the Swiss lawmaker. MOOC partners should take account of those principles, as implemented in local applicable law.

Possible restrictions on the processing of student data in EU Data Protection law

MOOC partners should be aware of possible Data Protection related restrictions where rolling out MOOCs in the context of an official educational offer, e.g.

(i) restrictions on the provision of optimized e-learning solutions;

(ii) possible uncertainties on where the validity of the students’ consent is required; and

(iii) restrictions to the transfer of student data to third party service providers.

The abovementioned concerns are illustrative and not exhaustive - e.e limited the scope of our research to preliminary findings and will for instance not address specific requirements applying to “sensitive data” such as biometric data (e.g. palm vein scanning), which can be used by MOOC certification service providers in order to authenticate the identity of certification test takers.

Restrictions to the provision of optimized e-learning solutions (predictive or statistical data processing regarding e-learning patterns and test results)

One of the usual promises of MOOC platforms is to adapt the courses, initially aimed at a mass public, and tailor them to each student (e.g. providing adapted exercises and content), on the basis of a refined analysis of each student’s learning pattern. In turn, MOOC platforms often reserve the right to carry out statistical analyses of the student’s behaviour, in order to provide reports to the educational institutions using their services. The provision of such optimized e-learning services can be subject to specific restrictions under applicable Data Protection law, as illustrated by recommendations from the Dutch and French DPAs.

The Dutch Snappet case

On 14 July 2014, the Dutch DPA issued a decision against the use by primary schools of Snappet e-learning tools, i.e. e-pads and embedded e-learning software (apps). The Snappet app provided teachers with reports on the learning results of each concerned student, benchmarked with results of students of the same year, using a pseudonymous identifier per child. The reports were used by Snappet in particular to predict the student’s future curriculum including possible learning difficulties such as dyslexia.

The Dutch DPA investigated the app, taking into account that the processing of student data for individual predictive career path purposes “could trigger all kinds of consequences for the student’s social life”. The Snappet apps were found to be in breach of Dutch Data Protection law for several reasons:

(i) Snappet had not informed the schools adequately of all the purposes for which the data was being processed, including Snappet’s own use of the data for statistical studies in partnership with other research institutions;

(ii) Snappet’s allegation that no personal data was processed (because it was anonymised) and that the processing was therefore not in scope of Dutch Data Protection law, was wrong; the data was merely pseudonymised so that students could be re-identified; this lack of transparency deprived the school of legitimate control over the students’ data;

(iii) the processing by Snappet was not proportionate to the initial purposes for which the data was processed.
collected by Snappet, i.e. the provision of IT services to the school in furtherance of the school’s legal educational tasks, Snappet should therefore have asked the children’s consent for each known processing activity beyond the provision of school mandated educational services (i.e. Snappet’s own business-related statistical purposes); and

(iv) there was no basis in law allowing Snappet to provide analytical services on the students’ learning difficulties and predicted career paths, since the children’s legal representatives had not been consulted.

The Dutch DPA concluded that the processing by Snappet was unlawful, and the findings of the DPA were published on its website by way of sanction. In such circumstances, the investigated company needs to adapt its processing activities within a short delay, or incur the risk of further legal proceedings by the Dutch DPA.

The French DPA recommendations on student surveys

The French DPA ("CNIL")’s guide for high schools and research contains recommendations on how to carry out student surveys related to their career paths. The CNIL tolerates such surveys on the condition that (i) clear information has been provided to students, e.g. upon subscription to university for the purpose of the data processing and that answering such surveys is not mandatory, and (ii) the students have the right to oppose to such processing. In addition, the results must be kept confidential and the data must be aggregated and anonymized. The CNIL also imposes additional methodological safeguards in order to ensure the anonymity of the data; only statistical results may be kept after completion of the study, and the original identifiable or pseudonymized data must then be destroyed or archived.

Lessons learned and considerations under the future EU Data Protection framework

It is each data controller’s responsibility to ensure that data is processed for the purposes which are covered by an appropriate legal basis such as the data controller’s legitimate interest or the individual’s consent, in line with local rules or DPA guidance. Where consent needs to be collected, it is recommended to clarify which MOOC partner will take care of this duty. Adequate information on the purposes of data processing must be provided by the MOOC platform, not only to the student, but also to the partnering education institution, in order for each stakeholder to assess its duties under applicable Data Protection law, especially where the processing of student data for statistical or scientific purposes is concerned.

The processing of data for such purposes has not been harmonized under the current Data Protection Directive and is thus embedded in local Data Protection law.

Where the data is anonymised, consent requirements can be avoided, subject to specific local requirements. It is thus key for data controllers to determine whether the statistical or scientific processing activities are based on anonymous data. Where general terms and conditions of MOOC platforms indicate that no personal data is processed and/or that data processed for statistical purposes are anonymous, responsible data controllers should obtain confirmation that the data is truly anonymized in line with EU standards (cf. the guidance on anonymization techniques issued by the so-called “Working Party 29” which comprises the EU DPAs). This is particularly true for US MOOC platforms in the context where the US definition of “personal information” does not (always) match the EU definition of personal data which includes data that can indentify an individual indirectly, whether or not by name.

Where the statistical reports are not based on anonymised data, the individual (student)’s informed consent will be required to process the data, based on prior information on the precise purpose of processing (e.g. predictive reports on the individual career path and learning difficulties). Local specificities should be taken into account. In Belgium, for instance, it is possible to avoid the consent requirement and process data for further statistical purposes where data is merely pseudonymized and/or where the collection of consent would prove impracticable, subject to further conditions such as a notification with the Belgian Data Protection Commission, and only on condition that the processing of data is made “in the public interest”, which restricts the exemptions to legally mandated tasks of public interest (subject to interpretation).

Similar conditions for processing personal data further for scientific and statistical purposes are currently being debated at the EU level as part of the revision of the Data Protection Directive, and should hopefully be clarified. Several countries call for a clear definition of the “public interest” in the context of which statistical or scientific research could be carried out without the individuals’ prior consent. Where consent is required, the draft text adopted on 13 March 2015 by the EU Justice and Home Affairs Council (the “partial general approach”) seems to broaden the possibilities to...
process data for scientific or statistical purposes even where specific consent has not been obtained from the concerned individual. No exhaustive information on the precise purposes of processing would be required; the individual should “have the opportunity to give their consent only to certain areas of research [or] parts of research projects to the extent allowed by the intended purpose” (p. 5). Some countries and stakeholders, including Belgium and France, have reservations on this text which, according to Working Party 29’s press release of 17 March 2015, would render the fundamental purpose limitation principle “meaningless” due to new possibilities to “further process data even if the purpose is incompatible with the original one as long as the controller has an overriding interest in this processing”.

If a consensus can be reached on those issues, the further use of student data by MOOC platform providers and educational institutions for statistical and scientific purposes could be drastically eased.

Possible restrictions due to uncertainties on the validity of the students’ consent

Special attention should be paid by MOOC platforms and high schools in the provision of adequate and clear consent (including opt-out) mechanisms as part of the registration process where consent is required. For instance, subject to local specificities, for the provision of job match services, for the provision of individually tailored e-learning patterns statistics or career path predictive services, or for some marketing activities which are not deemed to be covered by the controller’s legitimate interest under local law.

Several parameters can impact the validity of consent and lead to uncertainties, which are expected to be reduced under the future Data Protection legal framework.

The MOOC students’ age

Since high school or university students can enrol on a MOOC below the age of majority, account should be taken of age-related local specificities regarding consent (under applicable Data Protection and/or Civil law), such as specific parental consent requirements in Italy for “children” under the age of 18 years. Where children of a younger age are concerned their capacity to consent could indeed be challenged, subject to local specificities. Discussions surrounding the future amended EU Data Protection framework could create the opportunity to harmonize or at least streamline rules on the protection of children data, which may ease the compliance duties of MOOC data controllers.

At present, the draft EU Data Protection Regulation proposal refers to the threshold of 13 years old, after which no (additional) parental consent would be required. If passed, this rule would facilitate the roll-out of MOOCs not only in universities but in middle or even lower schools, as envisaged by stakeholders (see the paper “Support de la conférence Enseignement.be - Salon Education 2014”, published on the website of the Brussels-Walloon Federation paper, Enseignement.be, p. 14).

The way of collecting consent

The way of collecting such consent is subject to local specificities in law or policy. Stakeholders would benefit from more clarity and harmonization under the future Data Protection framework, where the case may be.

For instance, rules and guidance on how to collect consent vary from country to country; depending on local requirements, it must be explicit (e.g. expressed via a tickbox) or can be implied (such as further browsing after seeing the privacy related information). The requirement for an “explicit” consent has been removed from the latest version of the draft Data Protection Regulation (proposed partial approach of 4 March 2015). The outcome of this debate will have an impact on the whole Internet sector, since implied consent solutions lead to a higher success rate than where an explicit mechanism is required.

In addition, individuals whose data are processed ("data subjects") need to be “free” to consent under current EU Data Protection law, meaning in a MOOC context that students should be free to consent to all or part of the suggested processing activities without detriment. This point is also debated in the context of the Revision of the Directive. The new legal framework will hopefully clarify to what extent it is permissible to incentivize consent (e.g. by granting an extra advantage or service), especially in the context where there would be an imbalance between the data subject and the service provider (e.g. where the data subject cannot reasonably obtain equivalent services from another source without consent). At present, it is recommended to offer consent-free options and avoid making the access to a service (e.g. a MOOC course) dependent on the consent to specific processing activities that would not be necessary for the provision of the service.

The future Data Protection Regulation also aims to harmonize the level of information to be provided to data subjects on the intended processing activities in order to collect a valid consent. There is a suggestion for using self-explanatory icons, the meaning of which a consensus should be reached. In the meantime, bearing in mind that consent can
be considered invalid if it is not based on clear and understandable information, any available means to clarify and simplify the information on the data processing and its purposes should be used on MOOC platforms, since the mere inclusion of information in general terms or in a privacy policy is not considered sufficient by Working Party 29. It is therefore recommended to at least provide short form information notices with key mandatory information at the stage of the subscription, with a reference (hyperlink) to a more exhaustive long-form version and user-friendly consent managing tools allowing the data subject to opt-out and/or consent to selected types of data processing activities where the case may be.

Bearing in mind the current uncertainties concerning the way of collecting valid consent, any further processing of data based on the students’ consent should therefore be carried out with caution. Such legal basis can prove weak if data controllers do not take all available measures to ensure that a valid consent is collected.

Restrictions to the transfer of student data to third party service providers
Where student data is to be shared by educational institutions with third party service providers (e.g. cloud computing providers), the Danish DPA’s Odense Municipality case (see below) and the association of the Swiss Cantonal Data Protection Commissioners (Privatim)’s recommendation on cloud computing in schools have shown that educational institutions should carefully negotiate all aspects of the data transfer to the hosting service provider, such as the location of the servers, the data retention policy, and the institution’s control over the student data once transferred. Subject to a precise view on the concrete data flows, we believe that similar concerns could impact the sharing of student data between educational institutions and MOOC platform providers where student data is hosted.

The Danish Odense Municipality’s case
In Denmark, an authorization is required in order to transfer personal data to third parties such as a cloud service provider. In February 2011, the Danish DPA dismissed the Danish Municipality (Odense)’s request for an authorization to enable teachers to use Google Apps’ online office suite with calendar and document processing features, i.e. cloud services of Google enabling teachers to store school related data such as information about lesson planning and assessments of lesson plans and the students’ educational development. The application was also to be used by teachers to take notes on the classes and on the students’ participation, and to prepare letters to parents regarding their children.

The Danish DPA took the view that the “Odense Municipality, in reality, had[ed] no control of how the data will be processed”. The main criticism was that that there was a lack of clarity on the location of the stored data in the cloud, and that Odense Municipality was therefore not able to ensure that the required security measures are upheld in data centers and/or adequate contractual safeguards are added as required under Danish Data Protection law. The Danish DPA therefore recommended that Odense Municipality enter into adequate agreements with non-EEA data centers in view of adding adequate safeguards and/or would mandate Google to enter into such agreements on behalf of Odense Municipality.

The Swiss guidance on cloud computing in schools
Similar concerns were raised in Switzerland in October 2013 by Privatim, an association of the Swiss cantonal data protection commissioners, in its leaflet on the use of cloud computing in a school environment: the leaflet reminded schools that it was their duty to ensure a lawful treatment of student data in a cloud computing context. Privatim’s leaflet also clarified that several conditions have to be met, among which a written agreement between the school and the provider of the cloud computing services. Privatim insisted that it should not be possible for the service providers to modify the terms and conditions of such agreements unilaterally under applicable Swiss data protection regulations. In addition, Data transfer requirements should be met when data is transmitted abroad (e.g. putting adequate data transfer agreements in place where the data recipient is not located in a country considered by the Swiss authority as providing adequate protection). Furthermore, the place where the data collected by the cloud computing service provider is processed should be known to the school and any changes should be approved.

The 2013 leaflet concluded that it seemed doubtful that public schools could use the services of the likes of Google Drive, Dropbox and Microsoft Office.
365, considering the services providers use general business conditions and retain the right to modify it at any time, at best upon prior notice, have their data centers outside of Switzerland and use contracts that almost never provide a place of jurisdiction in Switzerland.

The aforementioned stumbling blocks have been overcome, since Privatim announced on 19 March 2014 on its website that Microsoft had adapted its contractual conditions to Privatim’s requirements for its “Office 365” product.

Lessons learned
As illustrated in the above Danish and Swiss case law, educational institutions should be aware that the hosting of a MOOC platform should be preceded by detailed negotiations about all relevant Data Protection aspects. Whereas EU Data Protection Authorities could not require third party provider data centers to be located on the national soil (due to EU rules on the free flow of data within the EU), the remainder of the Swiss recommendations are relevant in an EU context. The Swiss case also shows that terms and conditions of service providers may need to be adapted, especially where they provide for unilateral rights to modify Data Protection related conditions. The best way for schools and universities to prepare for such negotiations is, in our view, to conduct a Privacy Impact Assessment of the concerned MOOC platform, as further explained below.

Good Practice Recommendation: carry out a Privacy Impact Assessment
Before enrolling MOOCs in their official educational offer, educational institutions should evaluate the MOOC platforms from a Data Protection point of view and make a preliminary Privacy Impact Assessment (”PIA”), i.e. an assessment of the privacy risks posed by the platforms, and of how to mitigate those risks with remedial measures and mechanisms for demonstrating compliance with applicable Data Protection law.

How to conduct a PIA
Some DPAs provide useful guidance on how to conduct a PIA (e.g. the UK DPA’s Privacy Impact Assessment Handbook). The PIA should consist of checking whether each data protection obligation (see our section “EU Data Protection law in a nutshell”) will be complied with in the context of the intended MOOC related data processing activities. Any compliance risks should be identified and remedied.

For instance, it should be established whether there is a legal basis for each intended processing activity.

Subject to local specificities, school institutions will have a legal duty or a legitimate interest under Data Protection law to process student data for educational purposes, in line with their legally mandated educational tasks. Any processing beyond this legal mandate, e.g. a partnership with job-matching service providers or with social media providers, would in principle require another specific legal basis such as the student’s consent. The PIA will need to assess whether there are any risks that the intended processing would not be considered unfair or illegitimate, and if so, propose remedial measures or actions.

For example, the school should also check whether there is a way for the student to correct or erase his personal data from the MOOC platform. If not, measures should be taken in order to ensure compliance with the student’s correction and erasure rights. In case there is no clear policy on how long the platform retains the personal data, an appropriate policy should be put in place by the MOOC platform provider.

The applicable security measures should also be checked against local legal requirements and best practice standards.

Part of the PIA should concentrate on consent rules: before enrolling a MOOC into an official educational offer and/or encouraging students to follow a MOOC, it would be worth examining whether students are able to oppose at any time to such processing of their data (e.g. in case of predictive and/or statistical processing of the data). Where the student’s consent needs to be obtained, is the acceptance mechanism clear and valid under the applicable law?

Impact of the future Data Protection Regulation on PIAs
The completion of PIAs is currently a best practice in most EU countries. A PIA can however be imposed or recommended in some circumstances by DPAs such as the French CNIL, for example, as part of an authorization procedure.

PIA’s are however likely to become mandatory for some processing activities under the forthcoming EU Data Protection Regulation. Indeed, according to the latest public drafts of the proposed Data Protection Regulation organisations would have to conduct a PIA before carrying out any “processing operations which are likely to present specific risks to the rights and freedoms of data subjects by virtue of their nature, their scope or their purposes” (par. 70 of the Draft EU Data Protection Regulation).

Data controllers processing student data in the context of MOOCs are likely to be subject to the obligation to conduct such assessment, since the
processing of children’s data in large scale filing systems, or the processing of large scale data (e.g. more than 5000 data subjects) are examples of data processing activities that require a mandatory PIA under the draft Data Protection Regulation. Organisations failing to conduct such PIA or to consult with DPAs when the PIA reveals issues to be addressed, would face a potential fine (currently set at 2 or 5 % of the worldwide organisation’s turnover) under the future Regulation. Data controllers of MOOC data should be prepared!

Conclusion and discussion

The current EU regulation framework does not prohibit MOOCs, nor the processing of student data for statistical and scientific purposes, or for marketing purposes. Nor does it prohibit in the transfer of student data to third party IT hosting service providers such as MOOC platforms. There are however rules that need to be followed in order to carry out such processing activities or transfers in line with EU Data Protection law and local rules. The legal framework, indeed, varies from country to country. It is therefore recommended that universities and high schools assess the privacy risks and possible remedial measures before enrolling a MOOC in their official educational offer. Such prior assessment, called a Privacy Impact Assessment (PIA) is likely to become mandatory under the future EU Data Protection legal framework.

Special attention should be dedicated to information and consent mechanisms, transfers to third parties, anonymization techniques where the case may be, as well as to students’ rights to access the data, to have them corrected or removed.

The compliance exercise of MOOC providers and school institutions may be eased under the future Data Protection legal framework, if further harmonization is reached on key concepts such as the processing of personal data for scientific and statistical purposes, consent and information requirements.

Local authorities may consider helping school institutions in this compliance and privacy awareness exercise. For instance, the extent to which e-learning tool providers can process student data has been extensively discussed at Parliament level in the Netherlands, beginning this year, which debates resulted in concrete initiatives to provide Dutch school institutions with adequate PIA checklists and model contracts. We believe that any similar useful experiences should be shared and discussed at the occasion of the EMOOCs 2015 Conference.

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The Same MOOC Delivered in Two Languages: Examining Knowledge Construction and Motivation to Learn

Miri Barak, Technion – Israel Institute of Technology, Israel

ABSTRACT

This study describes a massive online open course that was delivered in two languages: English and Arabic, providing innovative contents in nanotechnology to a wide range of population. The goal was to examine English and Arabic participants’ knowledge construction and motivation to learn. Findings indicated a significant effect for language; overall, the English MOOC participants received statistically significant higher scores in the course assignments, compared to the Arabic speaking peers. The main difference was indicated in the percentage of participants who submitted the final projects - 3% in the English MOOC as oppose to less than 1% in the Arabic MOOC. Our findings raise an epistemological conflict. On one hand, it is important to provide access to knowledge to a wide range of non-English speakers; however, on the other hand, they might find themselves learning in a ‘cultural bubble’, excluded from interactions with participants from diverse ethnicities.

KEYWORDS

Knowledge construction; Motivation to learn; Multicultural; Non-English speakers

Introduction

In the past decade, many studies on online learning focused on large-group interactions, including: communities of learners (Barak & Rafaeli, 2004; Selwyn, 2010), online forums (Barak & Dori, 2009; Jackson & Seiler, 2013), social networks (Selwyn, 2010) and various web 2.0 applications (Barak & Ziv, 2013; Lankshear, & Knobel, 2007). In the past three decades, sociocultural studies focused mainly on examining learning processes of school students and teachers. Only few studies examined adult learning in higher education while applying a sociocultural perspective. This evolving line of research holds important implications due to recent changes in the way knowledge is delivered by elite universities. Recent studies call attention to the profound role that cultural background plays in the learning process (Suriel & Atwater, 2012). Each culture has a unique set of traditions and conventions which affect the individual’s learning processes. The sociocultural theory maintains that learners bring with them a set of ideas and belief systems, adopted from the social and cultural group to which they belong (Palincsar, 1998). It is generally agreed upon that culture is directly connected to language since the latter is a verbal expression of the former. Language allows us to express our thoughts; therefore, our thinking is influenced by the language which we use. Nelson Mandela is known to say “if you talk to a man in a language he understands, that goes to his head; if you talk to him in his language that goes to his heart”. With this in mind and with the guidance of the sociocultural theory (Lemke, 2001; Palincsar & Herrenkohl, 2002), we designed a massive online open course (MOOC) in Nanotechnology and Nanosensors that was delivered via Coursera in English and Arabic. By this, we hoped to give access to valuable information in, science, engineering, and medicine to a wide range of non-English speakers (Barak & Haick, 2014). We hoped that the course, delivered in two languages, will contribute to the education of scientists and engineers worldwide, allowing them to share ideas for the benefit of mankind, bridging over geographical and political borders. This is in consistent with the vision of the Technion – the Israeli Institute of Technology, aiming at promoting the values of innovation, entrepreneurship, and international cooperation.
Theoretical Background

Socioculturalism is a prominent theory that lies on the interface between educational psychology and sociology. It articulates the important contributions that society and culture has on individual cognitive development. Guided by the work of Vygotsky (1987), the sociocultural theory maintains that cognitive development occurs while learners are engaged in collaborative activities. It poses an opposition to cognitive theories that perceive education as merely a systematic knowledge acquisition process, disconnected from the context and surroundings in which it occurs. The sociocultural theory maintains three major propositions for promoting knowledge construction and meaningful learning. The first proposition is related to the notion of scaffolding in the process of learning. Based on the zone of proximal development (ZPD) model (Vygotsky, 1978), scaffolding is perceived as an imperative process for reducing the distance between a learner’s actual and potential developmental level. According to the ZPD model, social processes enhance deep learning by driving the learner to think at a higher level and move forward to the next cognitive stage (Lemke, 2001; Wertsch, 1991).

The second proposition asserts that learning occurs while using mediator aids (Vygotsky, 1978; Wertsch, 1991). Mediator aids include physical tools such as picture cards, linguistic tools such as written or oral instructions, or symbolic tools such as mental images (Kozulin, 2003; Wertsch, 1991) identified writing, diagrams schemes, mnemonic techniques, and computers, as mediators that facilitate cognitive development of learners. According to the sociocultural theory, cognitive development is possible only when the meaning contained in the mediator aids is correctly interpreted by the individual. This demands a well-structured system that provides learners with a variety of tools for expressing and communicating their ideas in an accurate way. Such a system should promote co-construction of knowledge while reducing misunderstandings and misconceptions.

The third proposition calls attention to the profound role that cultural background plays in the learning process (Suriel & Atwater, 2012). Each culture has a unique set of traditions and conventions which affect the individual’s learning presses. The sociocultural theory maintains that learners are not ‘blank slates’; they bring with them a set of ideas and belief systems, adopted from the social and cultural group to which they belong (Palincsar, 1998; Ragupathi, 2014). The cultural context of cognition influences the way in which learners construct knowledge and meaning (Gurin, et al. 2002). Students coming from different cultural backgrounds can differ in terms of learning methods, communication style, and rules of behavior (Hofstede, 1984). These differences can either impede or facilitate learning, according to the context in which they are applied (Gurin, et al. 2002). In light of the aforesaid, this study was set to examine the learning outcomes of two groups of MOOC learners that study the same course, one in English and the other in Arabic.

Research Goal and Participants

The goal of our study was to examine participants’ learning outcomes in terms of knowledge construction and motivation to learn, while comparing between the English and Arabic students. Since the two MOOCs were developed and delivered by the same lecturer and teaching assistants, with the same contents, and assignments, our null-hypothesis was that no significant difference exists between the participants of the two courses in their learning outcomes. The research questions were:

1. Are there differences between the two MOOCs in: participation rates, knowledge gain, and motivation to learn?
2. What types of learners participate in the MOOCs?

More than 11,000 participants from 173 countries, all over the world, accessed the English MOOC in Nanotechnology and Nanosensors to view the first week video lectures. The Arabic MOOC included 2,000 participants from 122 countries, mainly from the Middle East and Asia, but also from Europe and the US. This study focused on 323 participants who answered the pre- and post-questionnaires, 289 from the English MOOC, and 36 from the Arabic MOOC (Table 1).

Research Settings

The Nanotechnology and Nanosensors MOOC was designed to present innovative contents and advanced approaches for the fabrication of nanosensors in diverse science and engineering fields. The course introduced nanotechnology principles and the vital role of nanomaterials in novel sensing applications. The course was 10 weeks long, discussing broad and interdisciplinary areas that encompass chemistry, physics, biology, medicine, material science, and electrical engineering. It included three types of graded assignments: 10 weekly quizzes, three open-ended questions (e.g. If you could have an additional sense, what sense would you wish for? What nanosensor can imitate such a sense?), and a final project. The final project...
Table 1. Participants’ demographics by courses

<table>
<thead>
<tr>
<th>Gender</th>
<th>% English</th>
<th>% Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>73.0</td>
<td>76.5</td>
</tr>
<tr>
<td>Female</td>
<td>27.0</td>
<td>23.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>% English</th>
<th>% Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-25 years</td>
<td>31.1</td>
<td>38.2</td>
</tr>
<tr>
<td>26-35 years</td>
<td>27.7</td>
<td>35.3</td>
</tr>
<tr>
<td>36-45 years</td>
<td>11.4</td>
<td>17.6</td>
</tr>
<tr>
<td>46-55 years</td>
<td>13.1</td>
<td>3.1</td>
</tr>
<tr>
<td>56 and over</td>
<td>16.6</td>
<td>5.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vocation</th>
<th>% English</th>
<th>% Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>41.5</td>
<td>47.1</td>
</tr>
<tr>
<td>Industry/business</td>
<td>20.8</td>
<td>14.7</td>
</tr>
<tr>
<td>Researcher/Professor</td>
<td>26.6</td>
<td>29.4</td>
</tr>
<tr>
<td>Hobbyist</td>
<td>8.7</td>
<td>8.8</td>
</tr>
<tr>
<td>Other</td>
<td>2.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discipline</th>
<th>% English</th>
<th>% Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>45.0</td>
<td>29.4</td>
</tr>
<tr>
<td>Sciences</td>
<td>44.6</td>
<td>41.2</td>
</tr>
<tr>
<td>Business</td>
<td>4.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Medicine</td>
<td>4.5</td>
<td>17.6</td>
</tr>
<tr>
<td>Other</td>
<td>1.7</td>
<td>5.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic background</th>
<th>% English</th>
<th>% Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>High school graduate</td>
<td>9.7</td>
<td>14.7</td>
</tr>
<tr>
<td>Learning for a first a degree</td>
<td>7.6</td>
<td>11.8</td>
</tr>
<tr>
<td>College or university graduate</td>
<td>33.6</td>
<td>35.3</td>
</tr>
<tr>
<td>Masters or doctoral degree</td>
<td>49.1</td>
<td>38.2</td>
</tr>
</tbody>
</table>

Pearson Chi-Square test indicated no statistically significant differences between the research groups in respect to gender, age, vocation, discipline, and academic level.

The course was delivered at the same time in two languages: English and Arabic. All learning materials were prepared twice, including the course guidelines, teaching staff messages, presentation slides, learning assignments, and the video-lectures. The translation to Arabic was a challenging process due to the fact that there are many dialects. Another challenge was our effort to close the gap between the spoken Arabic language and the scientific language that is written mostly in English, especially in emerging scientific fields such as Nanotechnology.

Research Methodology

The study employed the mixed methods approach, following the convergent parallel model, in which the qualitative and quantitative data are prioritized equally (Creswell, & Plano Clark, 2007). The qualitative data was collected and analyzed using a discourse analysis protocol (Gee, 2010). The quantitative data was collected through web-mining and pre- and post-tests, applying the experimental design model (Campbell & Stanley, 1963). Accordingly, the two constructs examined in this study- knowledge construction and motivation, were collected via the following research tools:

Knowledge test - included eight multiple choice questions about nanotechnology and nanosensors which were based on the course contents. The questions’ validity was established by the course
lecturer and the teaching assistants. The test was administered twice, at the beginning and the end of the MOOC.

Motivation questionnaire – included 20 items, on a 1 (strongly disagree)-to-5 (strongly agree) Likert- type scale, adapted from Glynn and colleagues (2011). The items were divided into four categories: Intrinsic motivation, Career motivation, Self-determination, and Self-efficacy, each includes 5 items. The reliability of the questionnaire, established by Cronbach’s coefficient alpha was 0.94 for items in all categories. For each category, Cronbach’s coefficient alpha was: Intrinsic motivation (α=0.73), Career motivation (α=0.94), Self-determination (α=0.90), and Self-efficacy (α=0.90). The motivation questionnaire was administered twice, at the beginning and the end of the MOOC.

Document analysis - administered to examine participants’ learning outcomes in the online forums, identifying types of collaborative learners and their motivation to learn. The information obtained from the documents was used to corroborate evidence collected from the other research tools.

Findings

Data analysis indicated that in the English MOOC, 75% of the enrollers accessed the course and viewed the first week video lectures; at the end, at week 10, only 28% sustained, 6% answered the weekly quiz, and 3% submitted the final project. In the Arabic MOOC, 62% of the enrollers viewed the first week video lectures, and at the end, only 2% answered the weekly quiz, and 1% submitted the final project. In both MOOCs the sharp decrease in participants’ views of the videos (the blue lines in Figure 1) occurred after the first week; leveling out between weeks 4 and 5. A similar phenomenon was indicated with regards to the answering rate of the weekly quizzes (the red lines in Figure 1). The peer-graded assignments received the lowest engagement rates; however they were relatively constant throughout the course duration (the green triangles in Figure 1). It seems that peer-graded assignments can serve as an early indicator for participants’ seriousness and obligation toward learning the course.

The examination of participants’ achievements in the post-test (holding the pre-test scores as covariant) indicated a significant effect for language. Overall, the English MOOC participants received statistically significant higher adjusted mean scores, compared to their Arabic speaking peers (Table 2).
Table 2. Post-test questions and ANCOVA test results by group.

<table>
<thead>
<tr>
<th>QUESTIONS IN THE POST-TEST</th>
<th>English MOOC Means (SD)</th>
<th>Arabic MOOC Means (SD)</th>
<th>F</th>
<th>p &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the dimensionality of nanowires?</td>
<td>69.00 (46.50)</td>
<td>41.00 (50.00)</td>
<td>9.40</td>
<td>0.01</td>
</tr>
<tr>
<td>2. What is the size range of Nanostructures?</td>
<td>78.00 (41.60)</td>
<td>74.00 (44.80)</td>
<td>0.01</td>
<td>NS</td>
</tr>
<tr>
<td>3. What is the best description of “bottom up” fabrication?</td>
<td>79.00 (40.60)</td>
<td>44.00 (50.40)</td>
<td>15.15</td>
<td>0.001</td>
</tr>
<tr>
<td>4. Which would be a better characteristic of a sensor?</td>
<td>57.00 (49.60)</td>
<td>26.00 (44.8)</td>
<td>7.72</td>
<td>0.01</td>
</tr>
<tr>
<td>5. What are quantum dots (QD)?</td>
<td>71.00 (45.60)</td>
<td>50.00 (50.80)</td>
<td>2.53</td>
<td>NS</td>
</tr>
</tbody>
</table>

The analysis of participants’ grades in the final projects indicated advantage of group-work compared to individual-work. Participants who studied in groups of 3-to-4 received the highest grades on the final project in both courses (Figure 2). The same pattern was indicated with relation to the course final grades.

Post adjusted means for ‘motivation to learn nanotechnology’ indicated highest rates (on a scale of 1-to-5) for Intrinsic motivation in both the English and Arabic MOOCs (Mean = 4.15, SD = 0.69; Mean = 3.90, SD = 0.97, respectively). No statistically significant differences were indicated between groups for each of the motivation categories (Figure 3).
In both groups, the career motivation was rated relatively low; however, the participants, who successfully completed the course assignments, expressed positive opinions about the advancement of their professional career. For example, the following message was sent to one of the teaching assistance by J.B., a participant in the Arabic MOOC:

It wasn't that easy but your course taught me many things about nanomaterials and nanosensors which I wish to apply in my career as a therapist ...I'd like to learn more for the benefit of other people.

The analysis of students’ posts in the online forums indicated three types of MOOC learners in both courses, detailed in the following paragraphs:

**Random visitors** - the vast majority of participants who enter the course in the first week, but do not take part in its learning activities. Those participants are “passive participants”; They are inquisitive about the course; they examine the syllabus, view the first lecture videos, and even try answering the first quiz. Some wanted to see what it is a MOOC in general and others were curious about nanotechnology because it is “the future of engineering and modern medicine” [R.C. a random visitor]. However, they had no prior intentions to complete the course. Findings indicated that the Arabic MOOC included more Random visitors than the English course.

**Novice students** - participants who were new to MOOC learning and had no idea how to use the online platform or how to study from distance in an efficient and meaningful way. Those participants encountered many difficulties, some technical – how to operate the system; but most related to their lack of experience in regulating their learning. Novice students struggled to stay in the course in the first 3- to 5 weeks, but gave up once the learning materials and the course requirements became too complex and demanding. Findings indicated that the Arabic MOOC included more Novice students than the English course.

L.H. is an example of a novice student:

Starting out with this course as my first MOOC, I was very satisfied with the [learning] materials. However, over the last few weeks I’ve noticed my interest going down, down, down...I feel that I’m no longer putting in as much effort as I did when I started out. I took it upon me to start working on the final project individually, but I really don’t think I’ll be able to finish this course with the current tempo...

**Expert students** – participants who enrolled to the course with a firm conviction and intention to complete it. Most of them are graduate students in other universities or employees in the nanotechnology industry, or in related jobs, viewing the course as a good opportunity for advancing their knowledge and professional career. Expert students are those who use self-regulation strategies by applying cognitive, meta-cognitive, and resource management skills. They apply mastery learning by viewing each video lecture several times and read thoroughly the course e-book. They apply elaboration strategies, such as processing, while summarizing the learning materials, creating analogies, and posting questions and answers in the online forums. Expert students are the small percentage of students that are most likely to complete the course. M.T. is an example of an expert student:

My questions pertain to nanostructure terminology and definitions. In the lectures, definitions for OD, 1D, 2D and 3D nanostructures appear to be based on their unique properties and their physical dimensions. However, I noticed that in ISO Technical Specification (ISO/TS 27687:2008) entitled “Nanotechnologies – Terminology & definition for nano-objects – nanoparticle, nanofibre and nanoplate”, they have terminology and definitions that are solely based on their physical dimensions... My question: which set of terminology and definitions would be more appropriate? Or would both of sets of terminology and definitions be acceptable (and if so, which ones would be more commonly used and/or more appropriate in research and industry, and why)?

These findings are in accordance to a similar study that typified learners by their patterns of engagements (Milligan, Littlejohn & Margaryan, 2013). Since our course was the first MOOC presented in the Arabic language, many Arabic speaking students enrolled just out of curiosity, acting as Random visitors. Many others were identified as Novice students who lacked the experience of learning from distance. Data indicated that as the learning materials became more complex, addressing topics such as quantum dot sensors and nanowires, they gave up and dropped out the course. These findings may explain the differences between the English and the Arabic student’s participation curves.

**Summary**

Language mediates the way learners think and speak and it is an important cultural factor (Gee, 2010). Delivering a MOOC in two or more languages expands the range of participants (Barak & Haick, 2014). In this study, the Arabic MOOC provided access to innovative information for people whose native language in not English, acting as a lingua franca for communication between people from similar origin and culture. This is in line with the sociocultural approach, which places much emphasis on the language that learners use to interact and co-construct knowledge. Findings indicated
that our null-hypothesis was correct, we found little differences between the participants from both courses related to their knowledge about nanotechnology and their motivation to learn. The main difference was indicated in the percentage of participants who submitted the final projects - 3% in the English MOOC as oppose to less than 1% in the Arabic MOOC. Nowadays, the English language is considered a global language and therefore most MOOCs are developed and delivered in English. However, non-English speakers should be a major concern for MOOCs providers. Even among those who speak English, many are still more comfortable learning in their mother tongue. With that said, it is important to raise a conflicting notion. If each MOOC will be delivered in a specific language, the idea of connectivity across geographically and culturally diverse people will be diminished. On one hand there is a desire to include non-English speakers in MOOCs, but on the other hand, they might find themselves learning in a “cultural bubble”, immersed within themselves, excluded from the rest of the world. Therefore, the use of languages and cultural immersion are important issues that should be further examined and understood in the context of MOOC design and development.

Reference

Does peer grading work? How to implement and improve it? Comparing instructor and peer assessment in MOOC GdP

Rémi Bachelet, Drissa Zongo and Aline Bourelle, Ecole Centrale de Lille, France

ABSTRACT

Large scale peer assessment is arguably the most critical innovation required for development of MOOCs. Its core principle is to involve students in the evaluation and feedback process of correcting assignments. However, it has been criticized for being less rigorous than instructor assessment, too demanding on students and not reliable or fair due to student biases. This paper is drawn from data and practical hands-on experience from MOOC GdP2, in which assignments were both graded by instructors and by peers. Using data from 4650 papers, each graded by 3-5 peers and by an instructor, we test hypotheses and discuss a series of questions: How to train MOOC students to grade their peers? Is peer grading as accurate as instructor grading? What data pre-processing is to be used prior to testing hypotheses on peer grading? Which grading algorithm is best for processing peer-produced data? Is anonymity in peer assessment preferable to increased student interaction? We also present the improved peer grading systems we implemented in MOOC GdP 3 and 4 thanks to this research.

KEYWORDS

Massive open online courses, MOOC, peer assessment, peer grading.

Introduction

Despite recent attempts at improving platforms and course quality, the pedagogy of most MOOCs today rely mostly on two things: video courses and quizzes. The strength of these technologies comes from how easily they can be deployed on a massive scale, but their weakness lies in their inability to process, grade and provide feedback for complex and open-ended student assignments and overall supporting activities for critical thinking. We believe that the solution to this challenge is not machine grading (Burrows, Gurevych & Stein, 2014), but peer grading, and more broadly, peer assessment. More than a promising solution to evaluate assignments on a massive scale, peer assessment holds the promise of major learning benefits, developing student autonomy and, in Bloom’s taxonomy, higher levels of learning (Bachelet 2010, Sadler & Good 2006).

But is it really possible to implement peer evaluation? Does it provide reliable results? How to minimize student’s workload while retaining accurate peer grading? In this paper, we shall address a series of questions through experience of four MOOC GdP sessions and quantitative data from the second session of the MOOC:

1. Qualitative/experience testing: How to train MOOC students to grade their peers and provide them with constructive feedback as well?
2. Quantitative data/hypothesis testing: Is peer grading as accurate as instructor grading?
3. Quantitative data/hypothesis testing: What data pre-processing is to be used prior to testing hypotheses on peer grading?
4. Quantitative data/hypothesis testing: Which grading algorithm is best for processing peer-produced data in order to deliver grades which are similar to instructor grading?
5. Quantitative data/hypothesis testing: How many peer grades are required to provide an accurate final grade?

Amongst the four sessions of the “fundamentals of project management” MOOC, the second session is the best fit for exploring these issues, mostly because:
• We have a significant dataset: 1011 to 831 assignments were submitted each week, for 5 weeks, 4650 assignments total.
• A large variety of assignments: 1/a concept map, 2/a series of slides comparing alternative projects, 3/a meeting report with an allocation of tasks, 4/ specifications and functional analysis of a project and 5/a Gantt chart
• Last but not least, a comparison of instructor and peer grading was readily available: there were both 3- 5 peer grades and one instructor/AT grading (considered as the “true score”) for each student assignment.

Context

MOOC GdP1 was the first xMOOC to be organized in France, it was developed from an existing Open Course Ware (OCW) website (Bachelet, R. 2012a) and experience of running a distance learning course (8 editions, 400 laureates from 2010 to 2012, see Bachelet, R. 2012b). It was set up with almost no financial resources using a personal home studio and run by an open team of volunteers. Three external actors brought support: École Centrale de Lille sponsored the project, various Free Google services were used (Google groups, Drive, Hangouts, YouTube) and the US Company Instructure hosted the course on the Open source MOOC application Canvas. Enrollment opened January 11, 2013, course started March 18 and offered two individual tracks: Basic and Advanced. A “Team project” track was also proposed after the individual tracks, it ran 14 projects and was instrumental in recruiting volunteers supporting the next editions of the MOOC.

MOOC GdP2 followed the same principles, but was one week longer, adding a functional analysis course. Beside the free tracks, it became for the first time possible to be awarded European University Credits (ECTS) by Centrale Lille, by taking either a webcam (ProctorU) or an on-site table exam (AUF campuses in two developing countries). Technical support for Canvas was provided by the French startup Unow. All non-foreign Centrale Lille first year engineering students (approximately 200 of the 1011 students of this track) were enrolled in the advanced track, as required by their curriculum.

Basic and advanced tracks started September 16, 2013. MOOC GdP2 was 5 weeks long, plus one week dedicated to preparing the final exam. A one week add-in SPOC session on Project Evaluation was organized from November 4 for employees of Agence Universitaire de la Francophonie, and the Team project track of the MOOC started mid-October (sharing project ideas, putting the teams together) and ended mid-December with a final video presentation and report.

Attendance was as follow - enrolled: 10848, completing at least one quiz for the basic track: 5711, submitting at least one deliverable for the advanced track: 1011.

Success rates (Bachelet, R. 2013) were:
• Entry rate, 53%; this ratio is the number of students submitting at least one short quiz divided by total enrollment in the MOOC, thus there was a 47% population of “no-show” and auditors.
• Basic track pass rate, 61%; calculated as follow - the number of students submitting at least one short quiz divided by the number of students awarded with basic track “pass” (i.e. an average of 70% of maximum points and 60% of maximum points on the final exam)
• Advanced track success rate 78%; the number of students submitting at least one assignment divided by advanced track “pass” (i.e. basic track “pass”, plus an average of 70% of total maximum points).

Advanced track: organization and assignments

Students undertaking the advanced track were required to submit an assignment each week, in relation to a topic covered in the week’s course. After that, each student was randomly allocated 4 assignments submitted by other students. He/she had to: 1/provide feedback to the student (comments could be global, specific to a grading category or “comment bubbles” inserted on the pdf assignment) and 2/grade from 0 to 100 (70/100 being the expected “pass” grade) according to a 4-items rubric. Instructions for evaluation as well as other systems were provided to help grading and feedback, which will be described more thoroughly below. Students had 5 days to complete the peer evaluation process after which it was closed and the teaching team started awarding final grades.

Assignments were: 1/a concept map, 2/a series of slides comparing possible projects, 3/a meeting report with an allocation of tasks, 4/ specifications and functional analysis and 5/a Gantt chart (figures 1 to 3).

Each assignment required 4-9 hours of work, depending on previous skills and knowledge. Plagiarism was detected using Euphorus (1-3% of submissions, later removed from our dataset).
Table 1: Assignments overview (from Bachelet, R. Petit, Y. (2014)).

<table>
<thead>
<tr>
<th></th>
<th># OF PAPERS SUBMITTED</th>
<th>average final grade</th>
<th>standard deviation of grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>paper 1: concept map</td>
<td>997</td>
<td>61.6</td>
<td>20.71</td>
</tr>
<tr>
<td>paper 2: investment study (slides)</td>
<td>1011</td>
<td>69.5</td>
<td>21.5</td>
</tr>
<tr>
<td>paper 3: meeting report</td>
<td>944</td>
<td>72.5</td>
<td>16.24</td>
</tr>
<tr>
<td>paper 4: functional analysis</td>
<td>867</td>
<td>69.6</td>
<td>20.96</td>
</tr>
<tr>
<td>paper 5: Gantt chart</td>
<td>831</td>
<td>74.2</td>
<td>22.56</td>
</tr>
</tbody>
</table>

Fig 1.1 Week 1 assignment: concept map
Fig 1.2 Week 2 assignment: investment study.

Fig 2.1. Week 3 assignment: meeting report
Fig 2.2 Week 4 assignment: functional analysis.

Fig 3. Week 5 assignment: Gantt chart.
How to train and empower MOOC students so that they can grade their peers and provide them with constructive feedback?

Several systems were developed, some generic to MOOCs and peer grading in general, and some dedicated to grading specific assignments of MOOC GdP2.

Generic peer Evaluation training:
- Peer grading and evaluation was claimed from the start as a major requirement of the advanced track ("learning agreement" presented in the teaser and "introduction to advanced track" video).
- After submission of the first essay, a video was dedicated to explaining the rationale and importance of peer assessment in MOOCs and how to write motivating and constructive feedback.

Specific peer Evaluation training:
In addition, specific resources were available to guide peer evaluators in assessing each assignment: a benchmark version of the assignment, a video (sometimes), an interactive grading rubric and a discussion thread (1649 total forum posts on assignments and peer evaluation in GdP2). Guidelines on how to use the platform for peer grading were also provided.

Fig 4.1 "Introducing peer evaluation in the advanced track" fig 4.2 "Generic peer Evaluation training".

Anonymity

Unlike most other studies of peer assessment in MOOCs, while anonymity is possible in MOOC GdP (using a pseudonym as one’s platform profile), it is rarely used. On the contrary, students are encouraged to exchange messages via the Canvas platform message system, even only for a “thank you” to their evaluators. Messages make it also possible to ask an evaluator to revisit the assigned grade or to give additional feedback. Though we have no data on messages exchanged on these occasions, we believe that there is much more to gain by fostering social contacts between students than there are risks of conflicts or bias in grading. Biases in grading can be controlled using either instructor grading (MOOC GdP 1 and 2) or a grading process and algorithm (MOOC GdP 3 and 4). Though the legitimacy of student grading is often questioned. Conflicts between persons are rare: Instructor staff can be called upon if student’s interactions get sour: we had to intervene on only one such occasion in the 4 editions of MOOC GdP (more than 10,000 assignments assessed by 3-4 peers).

Critics point out that there is a bias assessing someone you can identify (besides googling the person, you can know him/her first hand, especially for the 200 Centrale Lille students). To minimize biases, the final grade was issued by an instructor in GdP1 and 2 while a control and a reward system was designed for GdP 3 and 4 (described below).
What data pre-processing is to be used to test hypothesis on peer grading?

Before starting quantitative analysis of grades, we studied the data distribution and consistently found the same pattern (figures 5.1 and 5.2):

Two problems were highlighted:
1. A peer/instructors grading discrepancy with the "0" grade.
2. The shape of the grades distribution does not seem to be a Gaussian/Normal distribution ("bell curve").

The discrepancy with the "0" grade is illustrative of plagiarism: peers issue a "normal grade", while instructor's grade is 0. It is simple to fix: we pre-process and filter these grades out. The second issue: the shape of the grades distribution not being a normal distribution, is confirmed visually (data distributions is "left-skewed"), as well as by a Shapiro-Wilk normality test. This constitutes a major hurdle since all standard statistical tests for hypotheses work under the assumption that data fits a normal distribution.

We used EasyFit (Schittkowski, K. 2002) to test a match with a series of known distributions, without finding a single simple best fit for all assignments. As a consequence and in order get a closer fit to a normal distribution, we decided to go for a basic pre-processing variable change matching the simplest fit, a Log-normal distribution: ln(100-grade). Figure 6 displays the very same data as above, after the change of variable and filtering out plagiarism.

While the new data distribution is not really a normal distribution, it is now much closer to it. Using this new dataset to conduct confirmatory data analysis improves the validity of our study.

Is individual peer grading as accurate as instructor grading?

Literature on peer grading offers contrasting views on this issue (Bachelet 2010, Doiron, G. 2003, Sadler & Good 2006). In Sadler & Good (2006), peer grades are highly correlated with instructor grades \( r = 0.905 \), while we find an average correlation of 0.772 with a p-value < 2.2e-16 (Pearson correlation, data processing with R version 3.1.1). In our dataset, with consideration to the difference between instructor and peer grade results are as follow: 36% of grades are extremely similar (±5 points on a scale of 100), 60% very similar (±10 points), 85% dissimilar (±20 points off).

Now what precision can reasonably be expected? It is widely recognized that different instructors grading an essay does not give the same grade. But what actual precision does instructor grading provide? While we did not find research in English on this question, French education science research on grading (docimologie) can provide us with a benchmark on the convergence when different instructors grade a given essay. According to
Suchaut, B. (2008): 5, 10 and 20% convergence of individual instructor’s grades to average grade is: 39%, 65% and 91%. While this is better than the 36%, 60% and 85% we get with student grading, we need to test whether processing several peer grades instead of using only one will perform better.

Which grading algorithm is best for processing peer-produced data in order to deliver grades which are similar to instructor grading?

Beyond “one shot” individual grading, MOOCs allows for improving grading accuracy by using several peer grades. Our goal with students taking part in MOOC GdP2 was to require 5 peer assignments grades, but with platform allocation issues and defections they were 0-6 grades given, and on average 3.57 to 4.67 peer grades for each assignment (with 6 to 11% of students not taking part in peer evaluation at all). Is it possible to improve the precision of grading by using not one, but several peer grades? Before that, we need to determine the best algorithm for processing peer grades. While sophisticated methods exist, like Calibrated Peer Reviews, Credibility index (Suen, H. 2014), or Bayesian post hoc stabilization (Piech, C. et al. 2013), we shall stick to the most common and understandable methods which are grades average and grades median.

Each has strong and weak points (average uses all available data, while median is “robust” as it filters out extreme values…). While using the average is the usual way to go, Coursera MOOC platform uses median. In order to find the best method, we study two “error functions”: the difference either of the average or the median of students grades with instructor grades. Our research shows using the average as slightly more accurate (1 point on a 100-points scale), see figures 7.1 and 7.2 below.
How efficient is the average peer grade algorithm?

With consideration to the difference between instructor and peer grade and using all the available peer data 56.6% of average grades are extremely similar to instructor grades (±5 points on a scale of 100), 82.6% very similar (±10 points) and so, approx. 17% of assignments are graded more than 10 points off). Figures 8.1 and 8.2 show a comparison of average peer grades and instructor grades: it highlights the fact that 1/ the peer average algorithm gives very slightly higher grades (2.6 points on a 100 scale) and 2/ 13.9 average std deviation.

This claim is supported by literature on instructor grading consistency, (Suchaut B. 2008) which shows that instructors grading a series of identical assignments have a consistency measured by standard deviation of

In this regard, this peer evaluation system performs better than instructors.

![Fig 8.1. Average peer grades vs. instructor grades in Assignment 1 and Fig 8.2 in Assignment 5](image)

**x axis is instructor grade, y is average of students grades**

How many peer grades are required to correctly estimate “best grade”?

Does grading precision improve with the number of peer grades we take into consideration? How many are required to have an optimum end grade? To study this question using R version 3.1.1, we make a series of “what if” simulations in which 1, 2, 3, 4 or all peer grades are used to calculate the average peer grade. Then checking what proportion of the final grade is close to instructor’s grades.

Data shows that taking into account more peer grades consistently improve the accuracy of grading, though with decreasing returns.

Although in this case peer grading quickly performs better (with two peers), than instructor’s grading (as stated before according to Suchaut, B. 2008 5, 10 and 20% convergence of individual instructor’s grades to average grade is 39%, 65% and 91%), it is our opinion that the best “return for work” appears with 3-4 peer grades, as our graph shows a quick improvement going from 1 to 3 peer grades.
Improving peer evaluation monitoring and grades processing in MOOC GdP3 and 4. This study was conducted with GdP2 data, but since then we have experimented new avenues of work and improved the design and management of the advanced track:

- During MOOC GdP3, we estimated students grading bias with a benchmark assignment and calculated final grades using the average of bias-corrected grades. We also saved a lot of teaching-staff time by drastically reducing instructor grading in favor of peer grading; instead of using 100% instructor grading, we implemented “targeted instructor grading”. Based on a series of warning indicators (such as “too few peer grades”, “non-consensus amongst peers”) we were able to make progress, going from 100% instructor grading to 10% instructor grading. We also initiated a messaging system before they grade the next assignment, providing feedback to peer graders that were clearly ‘off’, grading to high or too low.
- In MOOC GdP4, using the results presented in this paper, we were able to estimate the quality of grades issued by peers and act on this information: a dedicated VBA/Excel application (Benbitour M. H., Bachelet, R., Zongo D., 2014) was developed to provide feedback on whether each grade was correct, high or low and reward accurate

![Fig 9: 5, 10 and 20% accuracy of average peer grades to instructor grades vs. number of peer grades](image1)

![Fig 10: Application of this research – providing feedback and rewarding peer grading in MOOC GdP4](image2)
grading with bonus points (or issue negative points when grossly inaccurate grades we given or when grading work was simply “not done” see figure 10). We were able to track whether peer grading improved with time and successive assignments. We also detected assignments with less peer grades and set up an extra peer assignment attribution session in order to insure the availability of at least 3 peer grades for each assignment. Also, we implemented self-evaluation of submissions (using the additional self-grade in a new algorithm). Adding self-evaluation is an important advance, as Sadler & Good (2006) point out it is the best source for learning (even better than peer evaluation itself). In the new system, developed for Canvas in association with Unow, students were asked to get a fresh look at their own work and grade it after having evaluated at least 3 other student’s assignments.

Conclusions and recommendations to researchers and MOOC designers

While it has promising potential, peer grading is not easy to implement: not only does it require careful work, beta testing and setting up a new case study each session, but also dedicated data processing and expertise in the instructors and technical teams. Carefully setting up the peer assessment protocol itself is paramount: deadlines, reminders, targeted messages, deciding how each student gets feedback on the quality of the grades that were assigned to him/her and. Rewards for accurate grading must be provided, along with penalties when grading is incorrect or has not been submitted. Moreover, although the instructor team is not required to grade all papers anymore, monitoring and manual grading is still required on occasions.

Our final recommendations to practitioners are:

- Researchers should first look closely at peer grades distribution: it needs to be filtered and a variable change can bring considerable improvement in hypothesis testing validity.
- How many assignments should a student be required to grade? We recommend four as the best compromise to obtain a quality final grade, accounting for peers who could drop out of the process and to leave time to work on issuing one additional grade, which would be a self-assessment.
- What algorithm should be preferred? Use average if grading data has been correctly checked and filtered. Otherwise, median is probably the best way to go.
- The optimum threshold to switch from automatic peer grading to instructor grading remains to be determined. We used three criteria: less than 2 peer grades, non-consensus (i.e. peer grades standard deviation > 20) and presence of a 0 grade. Thus in GdP4, respectively 10%, 9% and 1.6% of assignments 1, 2 and 3 were graded manually (Bachelet, R. Carton P-A. 2015).

Before concluding our paper, we have to stress one more time the major importance of using quality learning materials, good peer training and sound incentives so that the conditions for peer assessment are optimal. Hard work and dedication of instructors, as well as MOOC platform ergonomics and functionalities are also paramount. It is regrettable that all these vital elements in peer grading are overlooked in most studies: having " lots of data" and "sophisticated algorithms" is important, but secondary to setting up the best possible conditions for peer evaluation and peer learning.
Software and data sources all retrieved 15/02/2015


References


* Though experimental conditions are not the same, Suchaut (2008) is the only benchmark we could find as to the convergence of grades when different instructors grade the same assignment. It was carried out on 6 assignments, each graded by 32 to 34 instructors, submitted for national exam baccalauréat in economics and social sciences. This is not the best possible benchmark: given the resources, this experiment should be carried out in conditions closer to MOOC peer grading, i.e. same student paper, same rubric and grading training, and same online platform.
Self-Directed Learning in Trial FutureLearn courses

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ABSTRACT

Self-Directed Learning (SDL) in Massive Open Online Courses (MOOC) is gaining interest, as online learning is increasingly learner-centred and autonomous. Most SDL research starts from the premise that SDL happens more frequently in connectivism MOOC (cMOOC) than in the more instructor-led MOOCs. In this study the authors look at SDL experiences from learners enrolled in two MOOC courses during the early trials of the FutureLearn platform. The meaning and experiences of the phenomenon of being enrolled as a learner in FutureLearn was gathered through various research instruments (online survey, learning logs, one-on-one interviews). The resulting data was collected pre-, during, and post-course. The key categories for each sub-question of the research are shared in the results and analysis section. This study concluded that SDL is indeed taking place in FutureLearn courses, which points towards SDL happening beyond the connectivist MOOCs.

Introduction

In this study the authors look at Self-Directed Learning (SDL) experiences from learners enrolled in two trial (= invitation only) FutureLearn courses. This paper offers an account of the study by providing a brief overview of SDL and Massive Open Online Course (MOOC) literature to point out research gaps. In the following sections the research questions and the used methodology are described. While sharing the key categories that emerged from the data analysis, this study provides insights into the SDL that has taken place in the two trial FutureLearn courses.

Literature review

The literature study starts with the concept of SDL as used in this study, after which a brief account is given of the major elements of SDL as they are proposed in current literature in relationship to contemporary online learning: multiple learner contexts, technology & mobility, individual & collaborative learning, and SDL research as perceived to be happening in the first connectivist MOOC and into the broad realm of MOOC platforms by previous researchers.

Self-Directed Learning (SDL)

The concept of SDL as investigated in this study relates to research into adult learning by Merriam (2001), based on the andragogy concept of Knowles (1975), and it adds technology as an influencing factor for SDL. Knowles (1975) described self-directed learning broadly as “a process in which individuals take the initiative, with or without the help of others, to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes” (p. 18). Knowles (1975) also provided the following characteristics for SDL: (a) self-directed learning assumes that humans grow in capacity and need to be self-directing; (b) learners’ experiences are rich resources for learning; (c) individuals learn what is required to perform their evolving life tasks; (d) an adult’s natural orientation is task or problem-centered learning; (e) self-directed learners are motivated by various internal incentives, such as need for self-esteem, curiosity, desire to achieve, and satisfaction of accomplishment.

SDL has been linked to online learning. Garrison’s (1997) model of SDL includes the perspectives of SDL as a personal attribute as well as a learning process involving online learning. The fact that MOOCs can be learner-centered (Kop, Fournier & Mak, 2011; Siemens, 2012; Sharples, 2013; Downes, 2013) also adds to the SDL in online learning, as researchers suggest that such online learning can give more control of the instruction to the learners (Garrison, 2003; Gunawardena & Mcissac, 2003). The actual amount of liberty given to the learners in terms of content creation, course participation, interactions, and room for topic emergence (i.e. learner-centered options) depends
on the pedagogical approach accompanying the MOOC. An interesting addition is also given by Song and Hill (2007) who built a conceptual model for understanding SDL in online environments. They looked at SDL in relation to the online context and how this context influences the amount of control that is given to (or expected of) learners, and how it also impacts a learner’s perception of his or her level of self-direction. This possible reciprocal influence of the online context with SDL is of interest to this study and the sub-questions investigate whether or not personal context (e.g. life, technology) influences SDL.

Multiple learner contexts

In her 2005 research of everyday mobile adult learning for the MOBILearn project, Vavoula found that 49% of the reported learning episodes took place away from home or the learner’s own office. Vavoula concluded that there was no consistent relation between the topic of learning and the location of learning, but learning did occur in multiple learner contexts. Those multiple contexts arise due to the mobility of the learner. Vavoula’s (2005) study which was based on personal diaries kept by the adult learners showed that people create settings for learning out of technology or resources that are ready-to-hand. The research of Song & Hill (2007) introduced a research-based conceptual model for understanding SDL in an online learning context. Song and Hill mentioned that “we do not have an adequate understanding of the impact of a specific learning context (i.e. physical classroom instruction, a web-based course, a computer-based instructional unit) on self-direction” (Song & Hill, 2007, p. 29). Kop and Fournier’s (2011) connectivist MOOC study researching the Personal Learning Environments, Networks and Knowledge (PLENK) course related to the mLearning and online learning results to the fact that learning happens outside of the learner’s home or office as mentioned by Vavoula (2005) and Song & Hill (2007). Kop and Fournier found that the most important restricting factors to participation in the PLENK MOOC were issues outside the course, related to people’s everyday lives, such as time, job, family, and other commitments, which was true for 80.6% of respondents to the lurkers (non-interacting, consuming learners) survey. As such learner’s daily contexts spanning both the professional and personal realm, need to be examined for their SDL experiences, and from Vavoula’s research the idea of diaries (or learning logs) seemed to be a good way to map the learner contexts, as well as their learning preferences and actions.

Technology and learner mobility.

FutureLearn is designed for access with multiple devices by learners from different contexts (Sharples, 2013). The use of multiple devices brings along challenges for the learner with regard to their contexts (Vavoula, 2005; Song & Hill, 2007), as well as their mobile and technological skills (Sharples, Taylor & Vavoula, 2007), and these skills have a bearing on the social interactions with other learners or with a MOOC’s course (de Waard, 2013). As such technology and location are elements that might influence SDL as they are part of the learning process, and they are part of the research sub-questions.

Individual and collaborative learning

The realities of today’s global online learning represent a significant shift in comparison with the previous generation of online learning: “new technologies have changed the educational landscape. It is now possible for self-directed learners to participate informally in learning events on open online networks, such as in Massive Open Online Courses” (Kop & Fournier, 2011, p. 3). But rightly so, Kop & Fournier immediately added that this “raises new challenges and opportunities for the self-directed learner, who might no longer be able to call on a trusted educator for support in his or her learning endeavor” (p. 3); the learners will become more self-dependent, more autonomous. With the new structures and environments in place where people can learn autonomously, one might question if people will be able to do so effectively (Kop & Bouchard, 2011), and they point to the need for a more in-depth understanding of SDL in MOOC.

Learning is also no longer limited to the individual. Although learning itself is seen as learner-centred, there are more social spaces to connect with peers. The need for SDL in online learning is picked up by Song & Hill (2007). They mention that “students need to have a high level of self-direction to succeed in online learning environment” (p. 29) and they proceed 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). Reaching successful autonomous learning is also an important
factor of SDL concluded from the research by Milligan, Margaryan, and LittleJohn (2013). And although turning to peers, external content, or tools for help is an option, in the end this can pose a problem for some individual learners, as this implies overcoming potentially personal or psychological barriers (personal character, identity, self-esteem, views on technology, ego, language) as emerged from the de Waard (2013) study. This means that individual, as well as collaborative learning needs to be investigated through the research sub-questions, as part of the overall SDL study.

SDL across the MOOC spectrum

One of the ongoing discussions around MOOCs focus on models that provide learners more control in the roll-out or conceptualization of the course (these MOOC are mostly described as connectivist or cMOOCs), and MOOCs that provide less learner control, and offer a more instructor-led MOOC model as described by Rodriguez (2012).

While Siemens (2005) in his ground-breaking work on connectivist theory mentioned that emphasis is placed on distributed, self-led exploration of topics, rather than on the expertise of authorities in connectivist MOOC; it is the intention of the authors of this paper that SDL can happen in every type of MOOC, as the learner is at the centre of his/her own learning, and as such directs their own learning to their own perceived needs and preferences. Ross, Sinclair, Knox, Bayne, and Macleod (2014) proposed that “cMOOCs, express the goal of education differently from xMOOCs – not access to expert knowledge, but facilitating self-directed learning”. The authors feel that if learners are allowed to dip-in and out of MOOC, if their self-efficacy allows them to choose what they need from a MOOC, and generally adapt or direct their learning in order to achieve personal learning success, than SDL is used and reached no matter which type of MOOC, or even which type of online learning is chosen. With the learner at the helm of their learning, SDL comes into place and happens.

Fournier, Kop, and Durand (2014) mentioned that “in an open online learning environment, the control of learning no longer rests with an educational institution but with the learners themselves” (p. 2). This is interpreted by the authors of this paper to point towards the SDL enabling factor of open, online learning environments, no matter which category they belong to (xMOOC, cMOOC, pMOOC,...).

Clow (2013) suggested that complete or temporary 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. This jumping in and out of the MOOC was also noted by Bentley et al. (2014) who stated that “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 the oldsMOOC” (p. 23), but which did not mean that learners were active all the time. This idea offers another interpretation of drop-out, and one that seems more accurate than the old paradigm of “drop-out” which has its historic basis in the classic curriculum based and evaluated learning. This new interpretation of temporary climbing out of a course as a result of self-directed learning strategies, can fit all MOOC learning, as the learner can easily look up the full program of the MOOC and decide to follow or leave specific weeks or sub-topics based on their previous knowledge, or simply based on their interest or self-directed learning strategy. So early exit can be an indication of SDL, but it could also be an indication of failure to self-direct and manage personal time and resources. So drop-out is neither a firm indicator of SDL, nor is it an indicator of the opposite.

Learner success is a very personal concept in SDL, as often no standardised curriculum or assessment is provided to measure success. In the study on signals of success and self-directed learning described by Bentley et al. (2014) OldsMOOC, a connectivist MOOC on learning design run in 2013 was analysed for self-directed learning success. Bentley et al. (2014) do point to the multiple interpretation of MOOC success based on the interviews and their own experience, and they conclude that they “intended to learn different things and differently adapted the experience to meet their context and their needs” (p. 22).

Taken into account the previous SDL research, it becomes clear that it is mostly focused on SDL in cMOOCs, this leaves a research gap for SDL in the broader range of MOOCs, such as the FutureLearn courses.

Reading through the literature it becomes clear that various elements seem to be part of the overall online SDL experience. But the research also indicates that there is a research gap concerning SDL, especially of SDL which might or might not take place in what is generally described as non-cMOOCs. FutureLearn courses offer a broad range of pedagogies (e.g. social learning, instructor-led learning,...) which makes them an interesting learning environment for investigating SDL. Especially as a range of learning factors are described in the literature as being part of SDL: the influence of...
daily life (personal and professional), technology, individual and collaborative learning, actions taken by the learners to self-direct their learning, and the perception of learning success.

Research questions

From the literature two research gaps appear: the need for a more in-depth investigation in self-directed learning by online learning participants covering different contexts, learning interactions, and technologies; and the need for research into SDL in non-cMOOCs, which also comprises the FutureLearn platform.

From these research needs the following research questions were chosen for further study by the authors:

**What are the learning experiences of adult participants engaging in individual and collaborative self-directed learning using multiple devices in a FutureLearn course?**

The central question is broken down in 4 sub-questions related to different sections that represent possible experiences of significance to the participants engaged in FutureLearn courses:

1. What are the elements of daily life affecting the learning experience?
2. What are the technical aspects influencing learning experiences for learners?
3. How do the MOOC participants perceive the effect of individual or collaborative learning on their SDL?
4. Which actions (if any) did the learners undertake to adapt their learning?

**Methodology: Combining phenomenology and grounded theory**

As this study focuses on new research investigating SDL in FutureLearn courses, it was necessary to choose an exploratory methodology. After careful consideration, two methodologies where chosen in a sequential order to plan and analyse this study.

In order to plan the study, a phenomenological methodology was used to organize the different stages of questioning the learners, and to set up research instruments. Once the data was collected a grounded theory (GT) approach was chosen to analyse the data (Charmaz, 2006). The combination of setting up a study relying on a phenomenological rationale to plan the study, and then letting it be followed by a grounded theory approach to analyse the data was based upon complimentary characteristics of both methodologies (Creswell, 2006). One of the complimentary characteristics is that both phenomenology and GT fit research looking for meaning as perceived by the research subjects. Phenomenology is a methodology which fits research that investigates the meaning individuals give to a phenomenon (e.g. learning experiences), whereas GT permits data like learning experiences to be analysed.

**Data collection**

This study uses elicited data (research participants sharing written, digitally delivered, and audio data). In order to obtain meaningful data of the SDL experiences, the research consisted of three phases:

**Phase 1 - expectations (pre-course):** gathering the expectations of the FutureLearn participants by collecting data through an online survey delivered to all study participants two weeks in advance.

**Phase 2 – keeping learning logs (during course):** participants kept two learning logs: a weekly log looking at the overall learning evolutions; and a daily learning log filled in for each day a participant engaged in the course, and which probed for actual learning experiences.

**Phase 3 – reflections (post-course):** structured one-on-one interviews. The interviews investigated differences between the learning expectations and the actual experiences in regard to SDL as they are perceived by the FutureLearn participants.

This type of approach goes back to Schön (1984). Schön was credited with bringing reflective practice to professionals as an evaluative process related to professional development using: reflection-in-action (in this case during the course) and reflection-on-action (in this case post-course). Thompson and Thompson (2008) added another dimension to the Schön practice called reflection-for-action (pre-course). Using this 3-step approach fits this study as during all the phases the learners will gain additional insights into their SDL, which will translate into possible new meanings regarding their SDL.

**Data analysis**

The study used a mixed method approach, where the quantitative data coming from the closed questions in the online surveys and the learning logs, were used as indicators for meaning. This was followed by analysing the qualitative data from the open questions in the learning logs and structured one-on-one interviews to get a more in-depth meaning of the learning experiences of the research participants.

**Coding procedure: the data analysis followed the grounded theory coding methods as suggested by Charmaz (2006).** The qualitative data went through three coding phases:

1. Initial coding: a birds-eye of all the gathered data was taken and written down in first impressions.
2. Line-by-line coding: the line-by-line coding had multiple iterations, until the categories were saturated and no strong new categories could be identified by the authors while going through the data once more.

3. Focused coding: focused coding began to synthesize and explain larger segments of data in order to find patterns, underlying relationships or issues that directed towards underlying themes.

**Research Design**

In order to come to a deeper understanding of the self-reported learner experiences of adult learners engaging in individual and collaborative SDL using multiple devices in a FutureLearn course, it was important to establish which overall elements related to SDL were emerging while studying on the first trial courses rolled out in the FutureLearn platform. The learners had to be studied throughout the duration of the course (covering pre-, during, and post-course experiences and reflections), and with research instruments that allowed the various sub-questions to be answered in a non-directive way (using learning logs).

**Learning environment**

The UK led FutureLearn initiative has developed rapidly from 2013 onward and is now rolling out courses for a broad public. The platform offers free courses built upon a socio-constructivist pedagogy which mixes mobile learning and social learning approaches (Sharples, 2013). FutureLearn was chosen as the platform to conduct this research due to its characteristics: enabling mobile access, individual and collaborative options, conversational learning, as well as its instructor-led options. The two trial courses were invitation only courses to enable learners to test the FutureLearn platform before the public courses were rolled out, and as such enable some last moment fixes where necessary.

**Target population and sample**

The target population of the study consists of people that indicated an interest in following sample courses from FutureLearn. They could express their interest in these courses by registering for the FutureLearn platform or answering social media or news article calls for registration. This resulted in more than 1000 people being enrolled in the trial courses of FutureLearn. The courses were rolled out from 27 August 2013 to 10 September 2013. The trial consisted of two courses (The secret Power of Brands and New Ecology), each of them providing two weeks of content and interactions to the participants.

A purposeful sample of 59 FutureLearn course participants was selected from the cohort of learners engaged in FutureLearn. The participants were contacted via email whether they would be willing to be involved in the study. All of the participants who signed the consent form were included in the study. At the end, 11 participants were actively participating in all three phases of the research. They completed 19 weekly learning logs and 34 daily learning logs. Additionally, 11 structured interviews were conducted. Polkingthorne (1989) puts forward 5 – 25 people to get a good sample for a phenomenological study, as such the sample in the study reflects a good phenomenological study sample.

**Analysis and results**

The findings address the sub-questions by matching the key categories that came out of the coding phase. For ease of reading, the FutureLearn online courses are abbreviated to MOOC in this section.

**Key categories for: What are the elements of daily life affecting the learning experience?**

**Time/planning.** Time management and planning was a recurring and frequently mentioned factor. It covered both interferences coming from other commitments, as well as planning learning itself. However, looking for a deeper meaning of that concept, time constraints could come from professional as well as personal interferences, and they could be related to unforeseen events, as well as events that already had the potential of becoming an interfering factor with MOOC learning (e.g. "I was doing the initial registering and watching the first few videos in my work hours and was concerned this may be cheeky taking time at work").

**Personal traits.** Personal traits are allowed to interfere with the learning (e.g. "laziness", "general grumpiness with the passing of years"). The personal characteristics are seen as interfering/stimulating factors for interrupting or continuing learning. While looking at the deeper meaning of the data that was shared on personal traits, participants did share that their personal characteristics – or those personality traits they imagined they had – interfered with their learning (e.g. "I started to feel guilty for not engaging with the course [personal goal setting/expectations] and could easily see how this guilt made me less likely to re-engage through procrastination and avoidance").
Leisure/casual learning. Registering for a MOOC comes on top of planned activities or out of curiosity. (e.g.: "Currently studying counselling and welding at the same time as well as trying to learn a new job and do up an old house"). When investigating the deeper meaning of this frequently mentioned casualness towards MOOC learning, the idea rose that MOOC learning might replace other leisure time activities. When questioned on the topic during interviews, learners mentioned that the fact that MOOC were free, and the fact that it did not add to their professional development as main reasons to stop learning at the point they were no longer interested.

Health as driver. Health influences learning, but in case of MOOCs, there seems to be an additional benefit for people with health problems. The participation is not always with the aim to participate in all actions or certification, but more to find meaning and solace during difficult times (e.g. "currently off work on long term sickness - so a nice diversion"). This category harboured people who faced health problems themselves, as well as those who were caring for others.

Personal learner identity. The personal self-perception of the learning identity influences the learners’ personal learning expectations. This can come from an identity focusing on age, prior learning success or failure, and self-image. E.g. for prior learning and identity: "Lack of recent learning in a constructive way". An interesting addition to the personal identity came from older learners mentioning age-related self-conscious barriers (e.g. "My age of 85. My short term memory is not what it was!!").

Key categories for: What are the technical aspects influencing learning experiences for learners?

The technical aspects were mentioned frequently by the participants. However some of those technical remarks were related to the user interface, or related to the trial stage the courses were in. These remarks were taken out of the data analysis, only those technical remarks related to learning were kept.

Technology as driver (good/bad). Technology creativity/capacity included: willingness to face and overcome technological adversity, e.g. ‘Trying to get a proper run on the videos [getting to grips with content]. Managed to get the videos up and running on the laptop, no joy on the desk top” versus "I gave up early on [personal motivation due to difficulty of access] as struggled to access some parts due to format and slowness of the site’. Technological challenges seem to lead to different results depending on the learner and their learning context, specifically the influencing factors on learning, and the learners’ current learning willingness or capacity.

Learning mobility. It is not only about access in a location (e.g. "I was travelling"), but about comfort related to a location (e.g. "The pc is in the study = quiet working space with desk"). Location potentially brings learning opportunities - sitting in a quiet room, or travelling - but it requires the technology to be responsive, so that the focus can be on the learning and not on the technology. (e.g. "ergonomics [of tablet] works well on the couch after a day at the desk" versus "Not all features were available on iPad e.g. the feedback section"). Location and mobility in relation to devices offer opportunities, but the technology might not always fit in with that technology, in that case technology and location offers barriers as well.

Technology ownership/preference. Some learners clearly expressed a device preference, which led them to use that device for learning, e.g. "I am a Mac user". In some cases owning a certain device led those learners test the course with this “new” device for learning purposes.

Key categories on: How do the MOOC participants perceive the effect of individual or collaborative learning on their SDL?

Collaborative learning. An interesting aspect was that collaboration or non-collaboration, and specifically learning from others was not limited to other course participants or tutors. Table 1 suggests that 2/3 reds of the learners did interact with other people. Most social interactions were with other course participants or people outside the course. Interactions with people outside the course is of interest. When asked during interviews the peers external to the course were colleagues, friends, and family. The interviewees mentioned that choosing the external peers to discuss the course content with was not based on the peers’ experience, but rather on their presence in real life and their trust or respect in terms of those peers’ thinking capacities, e.g. “I like the chance to test my thinking out but can also do this by discussing what I have learned with my partner, friends and colleagues too”.

Interactions with peers. This includes learning or adjusting learning while engaging with others. (e.g. “Found out how other participants made notes”). Individual learning, Table 1 shows that 37% of the learners does not collaborate. Sometimes this was a reaction on the learner context (e.g. “no one around
to help me physically or academically so had to deal with the course on my own per say”). Group size was also mentioned as a barrier for participation (e.g. “There were too many people on the course for meaningful discussion to take place, so I ended up not participating”), as was individual preference (e.g. “I live on my own, and I like to study on my own”). Reflection was often mentioned as individual learning (e.g. “I did a little more skim reading of discussion than I might have done otherwise and did more mental rather than actually responding to questions.”).

Interaction expectations. Some interactions that influenced learning came from non-course peers (e.g. “I have been discussing what I learned on the course with my partner and sharing the ideas with him which I find a useful way to learn interactively outside the course”). A subcategory was the tutors and the course team as motivators. Interactions with the course team or its tutors resulted in a positive learning dynamic for some (e.g. “an email from the course leader thanking people for participation and saying the materials are still available for us to complete encouraged me”), while others perceived it as more of a hindrance to their learning due to the course team not being as responsive as the learner hoped they would be, e.g. “Mailed the course team for helping me with signing in, but still no reply”.

Confidence in group/self-esteem. Although this characteristic is touched in factors of daily life (specifically personal traits), it also has a bearing on learning interactions, and whether people are willing to interact, e.g. “the group is too big for me to feel i can usefully contribute to discussion”.

New virtual interactions. As the course offers different ways for learners to interact, this results in the learners themselves having to learn how to collaborate with these new technologies (e.g. “Not a fan of “social networking site” type stuff but gave it a bit of a go here and found I did learn from it - so that was a pleasant surprise”). The interactions included an individualistic approach “For me some of the blogging discussion took some getting used to”. The novelty of the interactions also resulted in a change in the learners’ interactions, e.g. “I have decided not to worry too much about the discussions and skim them if they seem interesting but not to feel guilty if I don’t participate”.

Key categories on: Which actions (if any) did the learners undertake to adapt their learning?

Most of the data related to this sub-question were provided through answers gathered during the learning log and interview phase of the study, as learning adaptations were happening as the course was experienced, or were noticed while reflecting upon the learning after the MOOC was taken. Balance known/new. This category of adaptations looked at how learners moved from what they knew to incorporate what was new in the FutureLearn courses, e.g. “difficulty in dealing with a lot of unstructured comments”. Exploring new technologies for their learning options (e.g. remark on conversational discussions “I changed the way I thought of the discussions – not as ‘discussions’ to contribute to in a logical and more controlled way, but as triggers for thought to dip in and out of and skim randomly”). These adaptations were sometimes based on individually found or constructed adaptations, e.g. “With my previous MOOC, I got into a routine [adapted learning strategy] of when I would watch videos and complete the work each week as it had a coherent structure so I could plan ahead [SDL planning]”.

Technology as facilitator. This type of learning adaptation is related to the sub-question on technology, e.g. “started to use the comments/notes function in the course”. But for this sub-question the focus is on making a learning adaptation, not on the technology influencing learning, e.g. “I was able to open two windows with the course on one and Internet searching on the other”.

Changing learning pace. This related to dedicating time or adapting the learning approach, e.g. “I felt I had fallen behind with the course as the first week was almost over but I hadn’t completed all of the activities. I put aside some time on my day off to finish week 1”. It might be of interest to see whether this extra time, or change in learning pace, is being

<table>
<thead>
<tr>
<th>Result</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Other course participants</td>
<td>32</td>
</tr>
<tr>
<td>People outside of the course</td>
<td>21</td>
</tr>
<tr>
<td>One or more course facilitators</td>
<td>11</td>
</tr>
<tr>
<td>Nobody</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 1. data coming from weekly learning logs from learners involved in both courses, answering “who did you interact with for this part of your learning?” (weekly learning logs, n=19)
influenced by outside factors, for instance an increase in workload (with resulting higher learning pace), or a renegotiation of learning time with family members.

All four sub-questions provided key categories that show that learners are actively participating in their learning process within FutureLearn courses. They mediate, adapt and direct their learning while taking into account daily events, technical aspects, individual and collaborative preferences and realities, and they adapt their learning actively. As such, the authors conclude that at least some of the learners are actively engaged in Self-Directed Learning within FutureLearn courses. As this study focuses on trial FutureLearn courses, it is clear that a more profound study must follow these first findings. A study that will use full FutureLearn courses as they will be rolled out once FutureLearn has been made publicly available to all internet enabled learners. As such, the results from the study only reflect a small part of the insight potential that will emerge once the full FutureLearn courses are investigated in follow ups studies. However, some new questions can be raised based upon studying the trial courses.

Looking at the daily influences, many of the elements listed by Knowles (1975) with regard to motivation and internal incentives emerged (e.g. the need for self-esteem, curiosity, desire to achieve, manage time, and satisfaction of accomplishment), and an additional element was identity, which might be of interest for future research. During the analysis the emerging categories related to SDL also included references form the learners towards self-chosen use of the course resources, and the solutions that learners came up with to solve problems they met either in terms of content, or in terms of using the course technology. All of these experiences point towards SDL as proposed by Knowles (1975). The learner context also emerged as an influencing factor of SDL, as learners rethought learning, were either stimulated or hindered by their life, location or technological options. This puts the learning experiences in parallel with the research conclusions of Garrison (2003), Gunawardena & Mcissac (2003), and Song and Hill (2007).

Downes (2013) stated that “MOOC success is not individual success”. However, some learners who preferred studying individually for this course did share a sense of successful learning at the end of the course. As such the authors follow the practical and philosophical suggestions of Hendricks (2013) to add an individual approach to learning as well as a collaborative learning approach as having potential for SDL success.

Especially when taking into account learning as a subjective process, where the learner directs their learning on the basis of personal motivation. In addition, Downes (2013) did state that ‘you (as a student) define what counts as success ... That’s why we see many different levels of activity’. This learner success (both based on individual and collaborative learning) came out of this study, and it fits Downnes’ statement on the different levels of activity, as individual learners sometimes choose not to interact with others, while more collaboratively oriented learners expanded their knowledge by connecting with peers. Future research might reveal whether individual or collaborative learning actually results in different types of success, or perceptions of success.

Kop, Fournier & Mak (2011) found that prior experience with tools and types of learning used in a MOOC increases chances of success for the learner. Milligan, Margaryan, and LittleJohn (2013) also concluded that learners consider that achieving the level of self-direction necessary for successful learning in a MOOC is related to prior experience and its resulting self-efficacy. Bentley et al. (2013) also claimed that self-efficacy not only supports SDL, it appears to be dynamic, as it grows further with interaction in the MOOC. With this in mind, the authors of this study believe it is important that future research should include a focus on experienced online learners and SDL. By investigating experienced online learners, the recorded discussions on coping with technology might decrease in favour of strategies related to content and interactions, thus enabling a more focused research angle on SDL which transcends the challenges and benefits of the technologies used.

As Kop, Fournier, and Mak (2011) indicated, by manifesting a “learner-centred” environment, MOOCs can provoke anxiety about presence and orientation in relation to large-scale activity, to which Knox (2014) added a sense of losing identity and individuality. However, in this research the perceived identity was sometimes the driver for registering and following a MOOC. A topic for future research is to explore the extent to which identity contributes to the challenges of SDL.

The sample of this study was big enough for a phenomenological study, but in order to get a deeper understanding of all the elements of self-directed learning, it would be good to increase the sample
size. This would imply a multi-level approach, and using a mixed methods approach.

A note of warning also has to be added to the actual data collection. Elicited data from the learners share of course some of the advantages and disadvantages of surveys, interviews and documents. The participants share what they feel comfortable with, which inevitably keeps out what they find consciously or unconsciously personal or irrelevant for the research. Additionally this data collection relies on participants’ prior writing and speaking skills and practices (Charmaz, 2006). With the onset of new ways to collect learner data (e.g., through personal learning analytics), more objective measures to gather learning experiences might be possible.

Overall, this study adds to the body of knowledge on self-directed learning in the first trial versions of the FutureLearn courses, which provides a partial insight into MOOC courses overall. The follow-up study will ensure added insights in full-grown FutureLearn courses.

Conclusion

The authors hope that the paper has given insights into the SDL experiences as self-reported by learners that were engaged in two trial FutureLearn courses. This paper provides a brief overview of SDL and MOOC literature to point out research gaps related to SDL and the full MOOC platform spectrum, as well as SDL in general. By rolling out the rationale behind the research questions and the used methodology, the authors hope to have provided a transparent overview of the study. By sharing the key categories that emerged from the data analysis this study concludes that SDL is indeed taking place in FutureLearn courses, which might indicate that SDL happening in courses across all MOOCs. This study adds to the body of knowledge on self-directed learning in FutureLearn courses.

References


