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What have they done with the MOOCs?! The impact of MOOCs on Campus Education

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Abstract

In 2013 Delft University of Technology (TU Delft) started to offer Massive Open Online Courses (MOOCs) on the EdX platform. One of the main principles in the MOOC development process was to publish all educational resources under an open license (Creative Commons License) (Ouwehand, 2015). This aligned with TU Delft's Open Access Policy. Another important starting point in the MOOC development process was the aim to improve campus education by integrating MOOC content in those courses.

The impact of MOOCs concerns not only the world outside the university, but more importantly also within the university. Especially for a traditional brick-and-mortar research-based university, like TU Delft, this is a big gain: education has become more important. In the past three years it has become clear that developing a MOOC has led lecturers to re-think their approach towards teaching and to integrate MOOC materials in campus education, which has impact on the way they teach on campus. MOOCs are used on campus in different ways, from a small addition to an existing course to a full integration into a completely redesigned campus course. Moreover, some teachers became conscious of the importance of educational resources under CC License and started to use material from other universities. One of the faculties created a course which uses MOOC materials to help the students to prepare for a master program. This paper describes the way in which MOOCs have been used in campus education and the impact this has had on teaching and learning.

Keywords: Open Educational Resources, Improving, Campus Courses, MOOC, blended learning

1. Introduction

Society is changing continuously and that applies as well to Higher Education. When we think about such changes, this used to happen on a conceptual level first and only then the technology would be changed; nowadays the process of conceptual and technology changes occurs at the same time (Siemens & Tittenberger, 2009). The creation of the first Massive Open Online Course (MOOC) in 2008 was the first step for one of this conceptual and technology big changes in Higher Education. However, MOOCs only got international exposure when traditional brick-and-mortar higher education institutions decided to embrace this movement in Coursera, Udacity and edX. In a way, that big change led higher institutions to feel obliged to offer online courses (Teixeira, Volungevičienė & Mazar, 2014), with more and more universities offering MOOCs, for instance. Although the MOOC word is used indistinctly, traditional universities are experiencing

with new forms of conceptualizing the way they share knowledge and, at the same time, dealing with new type of learners. This also raises the question on how MOOCs impact campus education. Since there isn't too much research about the impact of MOOCs on campus education, the purpose of this paper is to bring this subject into discussion within the scientific community.

2. Extension School innovation program

With the objectives of “Educating the World” and “Improving Campus Courses”, the Extension School program, a TU Delft innovation program which started in 2014, focuses on the production and delivery of high quality open and online courses, such as MOOCs (Van Valkenburg, 2016). The open and online products and the corresponding expertise that are being developed within this program are used to improve online as well as campus education. This means that online teaching methods as well as online course materials that have been developed for an external audience will be used in campus education as much as possible, in such a way that the teaching and learning processes on campus will improve. This re-use in campus education has been stimulated and has happened in different ways.

2.1 Tender procedure

Four times a year, the extension school program offers Faculties the opportunity to submit a proposal to either create a MOOC or other type of online course, or even, with the idea of improving their campus education, to integrate OERs in their campus course. If a proposal is approved, the proposers receive an amount of money as well as educational and technical support to carry out their project. An eLearning developer is assigned to every new project, and guides the new teachers and their course teams throughout the complete course development process, from course design to evaluation. This development process follows a quality cycle, in order to create courses with the highest possible quality.

2.2 TU Delft Extension School's Quality Cycle

The ‘TU Delft Online Learning Education Quality Cycle’ (see figure 1), consists of three main stages: development, running and evaluation of the course. The first stage, course development¹⁸¹, consists of 3 stages as well, namely course planning, which implies designing the course; course building, which means development of all the course activities and resources as well as implementing these elements into the digital learning platform, and finally the testing stage, which entails an extensive beta-test of the newly developed course. During the process the eLearning developer can involve extra expertise if necessary, like an instructional designer, a marketer, a copyright specialist or a multimedia expert. In this way we try to correspond as closely as possible to the specific needs of the course team and the course that is being developed.

¹⁸¹ To a deeper understand please read Meijerink, Kiers & Marquis (2016)



Figure 1: 'TU Delft Online Learning Education Quality Cycle' (Jorge cs., 2016)

In addition to the tailored guidance by the eLearning developer, the course teams have the option to participate in several workshops depending on their own needs (e.g. Acting in front of a camera, moderating a big online community in a MOOC, etc.). In this way they are enabled to develop the necessary skills to develop and manage an online or blended course. Finally, at the end of the quality cycle, the course is evaluated in order to understand the lessons learned and what should be improved for the next run. Although it is well recognized, inside the institution, that the development of online education, including MOOCs, has improved campus education and that it is a good strategy to promote blended teaching, when compared to other innovative movements done before (Kiers, 2016), there was no data structured in a way we could confirm this general feeling. In order to have this problem solved, this research was developed.

3. Research

In interest of gaining insight in the impact of MOOCs on campus education and the way MOOCs are used on campus this study was carried out. Until April 15th 2016 TU Delft has run and finished a total amount of 23 MOOCs¹⁸². To retrieve the information about the use of the MOOCs in Campus Education, different sources were used:

- E-Learning developer responsible for the development of the course
- Product manager of MOOCs and Faculties' Account Managers
- Evaluation Reports and Papers
- Course teams

3.1 Description

First, a list of all MOOCs was created and based on that list, all courses which were still running or in development on the 15th of April 2016 were removed (final list in Table 1). Next, the e-Learning developers were asked to complete a document in which they identified their awareness about the use of the MOOCs they worked on, in campus education. Secondly, we talked to the Product Manager of MOOCs and the Faculties' Account Managers to know any more detail about what they knew about what the lecturers were doing with the MOOCs in their campus education. In a third moment, the evaluation reports from MOOCs were analyzed to retrieve extra information and the papers written by TU Delft's Extension School Members

¹⁸² One of the first MOOCs was split in 2, so we only considered the actual 2

were viewed as well. Finally, an e-mail was sent to the course teams of the MOOCs which we had no information about to understand if and how their MOOC was used on campus.

Table 1: MOOC ran and finished before April the 15th 2016 (final date for the third quarter in the academic calendar year of 2015/2016).

MOOC Name	Course ID	Faculty
Introduction to Aeronautical engineering	AE101x	Aerospace Engineering
IMAGE ABILITY: visualizing the unimaginable	VisualX	Architecture
Sustainable urban development (AMS)	AMS.URB.1x	Architecture
The basics of Transport phenomena	TP101x	Applied Sciences
Industrial biotechnology	IB01x	Applied Sciences
Topology for condensed matter: untying quantum knots	TOPOCMx	Applied Sciences
Urban sewage treatment	CTB3365STx	Civil Engineering and Geoscience
Water and climate	CTB3300WCx	Civil Engineering and Geoscience
Drinking water treatment	CTB3365DWx	Civil Engineering and Geoscience
Building with Nature	BwN101x	Civil Engineering and Geoscience
Functional programming	FP101x	Electrical Engineering, Mathematics and Computer Science
Credit Risk Management	TW3421x	Electrical Engineering, Mathematics and Computer Science
Solar Energy	ET3034x	Electrical Engineering, Mathematics and Computer Science
Data Analysis: Take it to the MAX()	EX101x	Electrical Engineering, Mathematics and Computer Science
Pre-university calculus	Calc001x	Electrical Engineering, Mathematics and Computer Science
Circular economy: an introduction	CircularX	Industrial Design
Product design: the Delft Design approach	DDA691x	Industrial Design
Open Government	OG101x	Technology, Policy and Management
Responsible Innovation: Ethics, Safety and Technology	RI101x	Technology, Policy and Management
Framing: learn how to debate and create powerful messages	Frame101x	Technology, Policy and Management
Next generation infrastructures	NGIx	Technology, Policy and Management
Creative problem solving and decision making	TPM1x	Technology, Policy and Management
Leadership for engineers	LfE101x	Technology, Policy and Management

All the data was aggregated in the document that the e-Learning Developers had started to complete and after that a content analysis was done to 1) identify the purpose of using the MOOC materials, 2) identify what kind of materials were used and in which LMS it was offered.

4. Results and discussion

The 23 MOOCs have been used in different ways in a campus course and the extent to which a MOOC is reused on campus differs as well. From the data collected it wasn't possible to retrieve information about one of the MOOCs (AMS.URB.1x). Another MOOC(DDA691x has not been used on campus yet. There are two reasons for this. Firstly, it is not based on a campus course, but on a book, and secondly, it is on such an introductory level that it is too easy for TU Delft campus students. A third MOOC teacher (Frame101x)

indicated that the MOOC has not been used on campus yet, but probably will be used on campus later on this academic year. The first results show that, at least, 87% of the MOOCs are used somehow in campus education.

In the matrix below (Table 2) we have placed the 20 MOOCs according to the amount of MOOC materials which have been used on campus (vertical), and the pedagogical purpose for using the materials (horizontal).

In our research we identified 4 types of usage of a MOOC materials (vertical):

- **Use of the full MOOC:** this means that everything of the MOOC is reused in the campus course. The delivery platform is the campus LMS.
- **Reuse of MOOC content:** in these courses large parts of the MOOC have been reused, such as the videos, activities and assessment. The delivery platform is the campus LMS.
- **Reuse of videos:** only the videos of the MOOCs are reused in the campus course. The delivery platform is the campus LMS, videos are directly embedded from YouTube.
- **Students follow the MOOC:** The students have to create an account on edX and enroll in the MOOC directly. The delivery platform is edX.

In the didactical usage of the MOOCs we identified 3 very popular purposes and some others we have listed under other purposes:

- **Pre-requisites for a course:** Teacher recommends the students to do it before the course starts.
- **Flipped classroom:** this is the most popular purpose in which the traditional lectures are replaced by the content of the MOOC. Classroom time can be spent on more active forms of education.
- **Additional reading:** the MOOC content is offered as extra resources for the students.

Table 2: Use of MOOCs in campus education

	Pre-requisites for course(s)	Flipped classroom	Additional resources	Other purposes
Use full MOOC in TU Delft's LMS		TP101x CTB3365STx CTB3365DWx ET3034x	TPM1x	VisualX TOPOCMx
Reuse (part of) MOOC content (videos, activities, ...) in Delft's LMS		CTB3300WCx TW3421x IB01x	BwN101x TW3421x	NGIx LfE101x
Reuse of videos only in Delft's LMS	AE101x		CTB3365STx CTB3365DWx	
Students follow the complete MOOC in EdX	CTB3365STx CTB3365DWx FP101x Calc001x IB01x	EX101x CircularX RI101x	CTB3300WCx	AE101x
Additional info: One course – VisualX, TP101x, TOPOCMx, BwN101x, FP101x, ET3034x, EX101x, CircularX, RI101x, TPM1x, LfE101x More than one course – AE101x, IB01x, CTB3365STx, CTB3365DWx, CTB3300WCx, TW3421x, Calc001x, NGIx				

Most of the courses are used for flipped classroom (for example Hermans (2016)) and different lecturers use different strategies. They either use the MOOC materials (all or part) in the TU Delft's LMS or the students need to go to the edX platform and study the MOOC materials there. Some MOOCs are used in different courses for different purposes; usually this is related to the fact that the MOOC is used in a bachelor course or a master course. For instance, CTB3365STx and CTB3365DWx are used as flipped classroom in the same bachelor course, and in the master as additional material in different courses. Finally, only a few courses use the videos, which shows the importance of having activities connected to them in order to provide a deeper learning experience.

When we analyze the other purposes the following was found:

- AE101x – Students can do the MOOC and go to the exam without going to classes
- VisualX – The first run was in campus education, so the campus students were the beta testers of the MOOC
- TOPOCMx – The MOOC was used to create a complete new campus course
- NGIx – Part of the MOOC was used in a bridging course to prepare for the master program SEPAM. They also used some of the videos from this MOOC in one of the minor programs.
- LfE101x – used in honor program course

4.1 Evaluation reports and papers

Although the general information obtained in the results allow us to have an overview of the use of MOOCs in campus education, in the reports it is possible to have a deeper notion about its use.

Most MOOCs are used in a flipped classroom approach based on integrating the MOOC into the campus course it was originally based on. Students have to study parts of the MOOC, for instance, one full week or just a couple of relevant videos, to prepare for class. Contact hours are used for answering questions, discussions and working on group or individual assignments. There is a cyclical relationship between the campus course and the MOOC. First materials of the campus course are improved to use in the MOOC. Then, when the MOOC runs, participants share their own cases and provide feedback to the MOOC materials, and those cases and improved materials can be reused in the next run of the campus course again. By using the MOOCs in campus education teachers gain new ideas to improve their MOOC, and so the quality of both courses will be strengthened. A nice example of this is the draft book on Solar Energy, that was improved by MOOC participants of the Solar MOOC (ET3034x) and now is used in campus education as well.

The MOOC components can either be transferred to Blackboard, or campus students can participate in a live run of the MOOC on edX, self-paced or instructor-led. The advantage of using Blackboard is that all materials are in the same environment, and especially when not all MOOC components are relevant, only the useful elements can be put in Blackboard. The advantage of using the edX platform is that students have the complete MOOC learning experience, including interaction with the international community.

Other impact of MOOCs on campus from the teachers' perspective:

- Students:
 - All teachers interviewed feel that students are more engaged in the learning process compared to previous years. For the teachers a flipped classroom approach is less boring because they don't have to repeat the same lecture every year. One lecturer made a remark about not everyone having the profile for "flipping the classroom".
 - Some students study the MOOC material together, which allows them to prepare in an easier way for the course.
 - In most of the cases there was an increase in the final grade and a decrease in the number of retention (e.g. Smets, 2014). However, it is not clear which variables have influenced this results.
- Use of OER:
 - Some teachers, in the process of building their MOOC, found other MOOCs related to their topic and reuse the material from those MOOCs. Others got acquainted with OER and started to use in their campus courses.
- Teaching methods:
 - To flip the classroom allows either to have deep discussions about the material or side discussions about topics which weren't in the MOOC.
 - Some teachers decided to remove the option of having the grade based on the exam, giving the opportunity for students to have a continuous assessment.
 - The teacher has to rethink his contact hours compared to the number of EC-points, in order to adjust to new teaching and learning approaches.
- Selection and credits:
 - In some faculties MOOCs are used in the selection process of new first year students. For instance at Aerospace Engineering, parts of the Introduction to aeronautical engineering MOOC are used is a so-called mini MOOC which is part of the decentralised selection process (TU Delft LR, 2016).
 - Credits for MOOCs is another example of a way in which campus students can benefit from MOOCs. This is a virtual exchange of online courses that is being set up with the main objective that campus students can enhance their portfolio. Students can select MOOCs from a list of trusted universities around the world to get credit as part of their honours programme, graduate programme or electives.
- Professionalization of teachers:
 - Teachers that developed and delivered an open or online course have learned a lot about designing and teaching an online course in a way that is more effective than the best training in the world. They have a better notion of the possibilities you have to enhance student's learning process with the use of ICT. They know how to create good interactive assignments, quizzes, exercises and good video's. How to spark students, how to communicate with students online, how to use a discussion forum to share and help each other, to organise peer feedback, and alternative ways to give feedback and to assess. They are educated in online learning. This has impact on the way they teach on campus. Some MOOC teachers indicate that they are asked to help colleagues with their courses, so hopefully this knowledge is also transferred to other teachers at TU Delft.

5. Conclusion

The study shows that the majority of MOOCs are used in campus courses. The way they are integrated differs per course, but range from pre-requisite to a full integration into the campus course. Teachers as well as students benefit from this.

One of the important lessons is that just listing the videos as additional content doesn't positively affect the students. It is necessary to redesign the campus course and really integrate to MOOC materials as integral part of the learning process. Further research should be made to try to understand which kind of variables could be influencing the increase in the grades and the decrease of retention rate.

It seems to be quite natural for teachers to reuse their own MOOC in their own campus course. Therefore, most MOOCs have been used in the campus course it was originally based on. Furthermore, some MOOCs have also been used in full whereas others have only been partially used in other courses and by other teachers, for instance in electives or minor programmes. The start of reusing our own MOOCs in campus education opens the door for reusing content of others. We will further stimulate this to improve the adoption of OER in our campus education.

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