Design and Early Development of a MOOC on "Sustainability in Everyday Life": Role of the Teachers

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Abstract Universities all over the world have developed Massive Online Open Courses (MOOCs) to attract students and explore new ways of learning. The MOOC "Sustainability in Everyday Life" (SiEL) is currently in its design and early development stage at Chalmers University of Technology. It aims at developing the MOOC participant's capacity to appreciate the complexity of sustainable everyday life by developing skills such as systems thinking and critical reflection on the information flow in public media. This paper aims at sharing first experiences regarding the design and early development of the SiEL MOOC and identifying the role(s) of the teachers and its features during the course design and early development based on these first experiences. An action research approach was used to reach these aims, and the teachers' narratives about these first experiences were used as data source. Three distinct processes (pedagogical, production and interaction) and six roles (owners, teachers, learners, designers, developers and negotiators) were identified. The teachers' roles and the processes and activities taking place during the design and early development are closely linked to each other and need to be carefully considered in order to guarantee a successful MOOC design and development process.

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1   Introduction

1.1   Background

Universities all over the world have engaged in the development and implementation of Massive Open Online Courses (MOOCs) in the past few years. MOOC participants can be of all ages, have diverse educational background, have an interest to learn more about a topic outside of the formal university education system, and be located anywhere on the world. The number of sign-ups varies from MOOC to MOOC, but there are numerous courses with more than 100,000 sign-ups, and the largest course so far exceeds 250,000 sign-ups (EdX 2015).

Very recently, at the end of 2014, Chalmers University of Technology started the development of its first two MOOCs. As one of these two courses, "Sustainability in Everyday Life" (SiEL) was chosen after a university-wide call for proposals earlier in the year. The course is going to be published on the EdX platform under the name ChalmersX. There are several reasons why Chalmers decided to start this development and to choose this course (Janssen and Stöhr 2015):

- Branding of the Chalmers name by bringing one of its main strategic goals, sustainable development, to a digital platform with a global reach,
- Opening up higher education to a global audience, and
- Building up experience at Chalmers in developing, implementing and evaluating MOOCs.

The development of the SiEL MOOC is done by a large development team. This team consists of the authors of the SiEL MOOC proposal (henceforth called the teachers, also the authors of this paper), and several support members that take care of course design and pedagogic support, technical production, implementation on and support of the EdX platform, marketing and documentation. Furthermore, other teachers at the division where the authors of the MOOC proposal reside (the division of Environmental Systems Analysis (ESA) at Chalmers) are involved in providing course material. This paper will exclusively address the SiEL MOOC, and focus on the role and perspective of the teachers involved during the design and early development of the course. Thus, the aims of this paper are: (1) to share first experiences regarding the design and early development of the SiEL MOOC; and (2) to identify the role(s) of the teachers and its features during the course design and early development based on these first experiences.

The paper will continue with a description of the concept of the course. This is followed by a literature review regarding the role of the teacher in a MOOC. This review forms the basis for formulating several questions regarding the role and perspective of the teachers in this course. This is followed by reflections of the teachers about their motivations and first experiences so far. These reflections are then used to answer the formulated questions, and conclusions are made.

1.2   MOOC Design and Early Development Process

Although age distribution and the educational background of future MOOC participants are unknown, we attempted to define a target group including the minimum prerequisites. Helpful in this is the concept of the "informed citizen" that is defined by the European Union as the 15-year old student passing the final national tests in compulsory school (European Union 2015). Therefore, the prerequisite for the course is the knowledge gained during compulsory school.

The design of the course follows the pedagogical idea represented in Fig. 1. Five different topics related to sustainability were chosen based on their importance with regards to sustainability, and their occurrence in Swedish, Dutch, German and French media. These so-called "hot spots" are used to introduce the MOOC participants to the complexities of sustainability in everyday life. The hot spots used in the SiEL MOOC are: energy, food, climate change, globalization and chemicals. A more detailed view of a hot spot is given in Fig. 2. The course introduces each hot spot with a 15-min introductory lecture. This level aims at being a teaser and an introduction to the topic that gives some preliminary answers, but also generates questions and further nourishes the participant's interest. The second level consists of a set of mini-lectures of 5–7 min which further develop different aspects of the hot spots and add more detail to the introductory lecture. The aims of these mini-lectures are: (1) to increase the knowledge about the hot spot; (2) to show a simplified complexity by relating the hot spots to each other thus creating a level of systems thinking; and (3) to put the hot spots into the context of everyday life. It needs to be pointed out that the MOOC participants are assumed to be at the knowledge level of an university freshman at this second level (Fig. 2). The course is concluded with a final exam in which the participants are tested on their ability to make sustainable choices in everyday life situations. The possibility to construct this exam in the form of a game has been explored.

The learning outcomes of the SiEL MOOC aim at developing the participant's capacity to appreciate the complexity of sustainable everyday life by developing skills such as systems thinking and critical reflection on the information flow in public media. Furthermore, the course aims at giving the participants a sense of empowerment that enables them to move towards a more sustainable way of living (citizen stewardship).
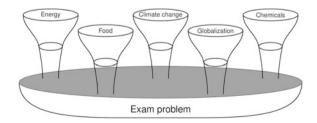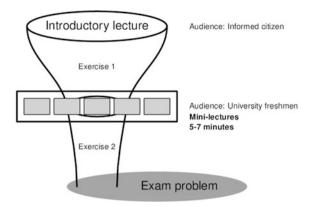

Fig. 1 The pedagogical idea used to design the SiEL MOOC

Fig. 2 Detailed view of a "hot spot" in which one of the selected topics is used to introduce the MOOC participants to the complexities of sustainability in everyday life

1.3 Literature Review

In recent years MOOCs have received a lot of media attention. While many MOOC developers believe that MOOCs are worth this hype, neither does a large majority believe that MOOCs deserve the formal credit of an educational institution, nor do they believe that it will be given in the future (Kolowich and Newman 2013). With the increased media attention, the existing MOOCs have also been scrutinized more heavily. For instance, skeptics remain doubtful about the educational value of MOOCs or question if MOOCs can give participants a satisfying learning experience (Kellogg 2013). Margaryan et al. (2015) analyzed the instructional design quality of 76 MOOCs based on First Principles of Instruction (Merrill 2002), and found that while most MOOCs are well-packaged and well-organized, the instructional design quality is low. This indicates that there is room for improvement regarding the design and development of MOOCs. MOOC design was identified, among others, as a research theme by Gašević et al. (2014). There are already examples of research in this field, see e.g. Guàrdia et al. (2013) who described ten MOOC design principles. It seems however that this research field is currently more focused on approaching the research problematic from a learner's perspective, and seems less concerned with the role and perspective of the teacher during the design and development of a MOOC (Ross et al. 2014). Nevertheless, a few studies were found in the literature that focus on this particular topic.

One study that focuses on supporting teachers in the description and design of MOOCs was published by Alario-Hoyos et al. (2014). In this study the so-called MOOC Canvas was developed which defines eleven interrelated issues of logistical, technological, pedagogical and financial nature that are addressed through a set of questions, and offers teachers guidance during the MOOC design process. In the MOOC Canvas the eleven issues are arranged under an available resources category and a design decisions category. Currently, the MOOC Canvas has only been applied to MOOCs about subjects related to technology and education, and requires validation by applying it to MOOCs that address other subjects. Ross et al. (2014) looked more closely at the role of a MOOC teacher and worked to demonstrate that

paying attention to the complexity of the teacher's experience and identity might ultimately be essential to the success of the MOOC as a new educational format. The authors described their experiences in teaching a MOOC and indicated that perhaps the most difficult issue they dealt with was to what extent they needed to take responsibility for what was happening in the MOOC. Another important issue related to the role of the teachers in this MOOC was their presence and visibility. The authors conclude by saying that "we need a richer and more robust conceptualization of the teacher within the MOOC" (p. 67).

2   Research Method

The investigation into the role of the three principal MOOC teachers during the design and development of the SiEL MOOC was done using an action research approach. Action research is grounded in experience, and is action-oriented and participative (Reason and Bradbury 2001). Furthermore, Baskerville and Myers (2004) argue that action researchers need to be participant observers, and that a collaborative team is involved in reasoning, action formulation, and action taking. To the authors' knowledge little action research into MOOC design and development and the role of the involved teachers during this has been done. One study found in the MOOC literature where an action research approach was taken to study MOOC design described the MOOC design process, and participant engagement and experiences but did not focus on the role of the teachers (Vivian et al. 2014). Therefore, we chose to use the action research approach because, besides being the designers of the SiEL MOOC concept (see Figs. 1 and 2) and authors of this paper, we are all involved in the MOOC design and development.

Based on the literature review and on the aims of this paper, we sought to answer the following questions pertaining to the design and early development process of the MOOC and the role of the teachers:

1. What actions did the teachers take to initiate and make progress during the design process?
2. What have the roles of the teachers been during the design process?
3. How did the teachers manage to engage and to convey their ideas to the project group and their colleagues?
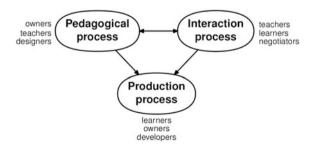
The data for answering these questions were provided by means of the teachers' narratives about the design and early development process of the MOOC. The narratives were written in chronological order describing and reflecting on meetings and other activities (workshops, seminars) that took place over a 9-month period, from early May 2014 until early February 2015. Due to the teachers' different backgrounds and tasks during these activities, different perspectives of the same activities were described in these narratives. The narratives were then analyzed and systematically reflected upon in order to answer the formulated questions.
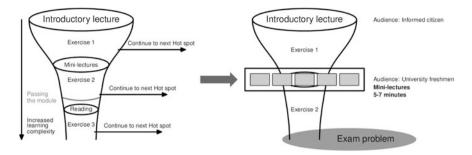
3 Summary of the Teachers' Narratives

During the analysis of and reflections upon our narratives (i.e. the teachers' narratives), we realized that the different activities we were engaged in may be grouped into three different types of processes, namely, the pedagogical process, the interaction process and the production process (Fig. 3).

3.1 Pedagogical Process

The pedagogical process is our exploratory journey in the world of MOOCs and has been (and most likely will continue to be) very creative. We have received a lot of useful input from the other stakeholders involved (the MOOC development team, our colleagues at the division of Environmental Systems Analysis (ESA) at Chalmers) in the MOOC design and development process, e.g. on the peculiarities of running a MOOC, and on the topics of the mini-lectures that are part of each hot spot. Nevertheless, we ourselves put in the largest effort creating the pedagogical concept of the MOOC by evaluating different options. This happened during very open and dynamic sessions in which we brainstormed, discussed, and generated and structured our ideas. Many of the main elements in the course design were conceived during these sessions, e.g. the hot spots, trying to give the participants a sense of empowerment, citizen stewardship and the overall course learning outcomes. An example that reflects this creative environment is the evolution of the hot spot from the MOOC proposal up to its current form (Fig. 4). As shown, the fundamental premise stayed the same but the details of the design evolved to become more transparent, including the evolution of the MOOC participant through the course. Furthermore, we have been learning how to shape these ideas within the setting of a MOOC. The products of this process are intellectual goods for which we have a strong feeling of ownership and, consequently, about which we are rather unwilling to make compromises.

Fig. 3 Classification of processes taking place during the MOOC design and early development and the roles of the teachers in these processes

Fig. 4 Evolution of the design of the hot spots used in the SiEL MOOC, from MOOC proposal on the *left* to its current form on the *right*

3.2 Production Process

The production process has for us been characterized by informing and being informed, and by generating ideas. We have for instance had speaker training and one of us coached the speaker for one of the introductory lectures. However, we are currently only in the beginning stages of production. So far, the introductory lecture on globalization and the so-called teaser (the promotional video for the SiEL MOOC that will be on the EdX course website) have been recorded. Our interaction with the production team has been smooth, supportive and cooperative. Other practical topics that we addressed were the use and capabilities of the EdX platform, the use of social media (Facebook, Twitter, Google+, Instagram) for the promotion of the course and during the course, and the different formats that can be used in the design of the mini-lectures. In this process, we also have a sense of ownership with regards to the actual content of the recorded material. For instance, during the preparation of the teaser we argued with the production team about the story board where our ideas were not in complete agreement. We ended up finding a good compromise. Our colleagues at the division of ESA at Chalmers are instrumental in this process because several of them will record introductory lectures and mini-lectures.

3.3 Interaction Process

The interaction process is the process where we needed to make the other members of the MOOC development team and our colleagues at the division of ESA like our pedagogical ideas and go along with them. For instance, in the very early stages (before our MOOC proposal was chosen) we were asked to further clarify the aims and goals of the MOOC in an interview. Another important example was the introduction of the MOOC to our colleagues who, despite a healthy amount of skepticism and scrutiny, were positive about it. In both cases we were (more or less) promoting our ideas. Other activities were attending a one-day seminar about

MOOCs organized by the Chalmers Library where we learned about other MOOC initiatives in Sweden, and presenting the SiEL MOOC and our motivations and first experiences at the KUL conference at Chalmers (Janssen and Stöhr 2015). Within the interaction process we have also negotiated about several aspects that are part of the MOOC, see for instance the example about the teaser story board (in the previous section on the production process). Negotiation has also been a part of creating the content for each of the hot spots and will probably also be a part of motivating our colleagues to use one format or another for their mini-lectures. This process is about listening and being open-minded in order to improve an original idea where necessary. We need to guarantee that, for instance, the person doing an introductory lecture or mini-lecture has ownership of his or her idea and feels enthusiastic about what he or she is doing.

3.4 Interaction Between the Processes

The three identified processes are interlinked, that is, each process interacts with the other two processes (Fig. 3). The production process receives inputs from both the pedagogical and interaction process, whereas the latter two processes provide inputs to one another. The outcomes of the pedagogical process have been direct inputs to the production process, for instance, by coaching an introductory lecture speaker. They have also been used to inform the stakeholders about the MOOC design and development process, for instance, informing our colleagues about the SiEL MOOC. The outcomes of the interaction process have been inputs for the production process, for instance, the result of the discussion about the teaser story board. They have also been used to improve our pedagogical idea of the MOOC via feedback from our colleagues. The production process could provide inputs to the other two processes, but in this case these would most likely indicate the limits on the capacities of the production team (budget, man hours, etc.). These limits have so far not been reached.

4 Roles of the Teachers

4.1 Definition of the Teachers' Roles

The interaction between the identified processes affects the roles we, the teachers, play in each process, and we have tried to identify these roles (Fig. 3). We identified six roles that we have had during the design and early development of the MOOC so far: owners, teachers, learners, designers, developers and negotiators. Our role as owners is thanks to the strong sense of ownership we have for the pedagogical idea of the MOOC and the sense of co-ownership for the course material that is developed by ourselves, our colleagues and the production team. We act as teachers when we explain our pedagogical idea for the MOOC and when we inform and interact with

others regarding our ideas about the course. We are learners when we are exposed to others' ideas about MOOC design and development or learning new skills that are needed during the production of the MOOC. We are designers when we are brainstorming and generating ideas for the course design or about specific content, and we are developers when we are involved with the hands-on development of the course material. Lastly, we become negotiators in order to enthuse all others that are involved with the MOOC design and development.

4.2 Teachers' Roles in the Identified Processes

In each process we assumed a different set of roles, and there are overlaps between these sets of roles (Fig. 3). Taking the roles of owners, teachers and designers in the pedagogical process helped us to create and design a very clear and transparent pedagogical idea that we felt strongly about and that we were able to successfully communicate to the other stakeholders involved. The roles we have had in the interaction process enabled us to inform, to receive and process new knowledge and to communicate with the other stakeholders such that we were able to find compromises if needed. The roles we took up in the production process enabled us to develop our own ideas for the content in collaboration with the other stakeholders. The roles we have during the production process will be defined with more detail once more introductory lectures, mini-lectures, and other course material such as the exercises and the exam problem have been developed.

In both the pedagogical and production process one of the roles was to facilitate interaction with the other processes: we acted as teachers in the case of the pedagogical process, and as learners in the case of the production process. This helped us to engage the other stakeholders and to clearly convey our idea about the MOOC. Furthermore, in both these processes we took up the role of owners, reflecting a keen motivation to translate our pedagogical ideas into high-quality course material. Our role as teachers is apparent in the pedagogical and interaction process, and as learners in the production and interaction process. This reflects both the importance of the interaction process itself and our willingness to inform the other stakeholders and to be informed by them. Our roles as designers, developers and negotiators are specific to the pedagogical, production and interaction processes, respectively. These are more specialized roles that are needed in these processes.

4.3 Importance of the Teachers' Roles

Our assumed roles during the design and early development of the MOOC have been instrumental in a so far smooth overall process. Our ability to switch between these roles, or combinations of roles, has apparently contributed to this. Furthermore, our strong feeling of ownership has driven the design and development of the

course to a great extent. The roles through which we have interacted with the other stakeholders are of high importance and have guaranteed good and sufficient communication.

5 Conclusion

This paper is an exploration of the roles of the teachers during the design and early development of the "Sustainability in Everyday Life" MOOC at Chalmers University of Technology. We thus have not included the complete design and development process of this course. Nevertheless, this preliminary study gives some insight into the roles of the teachers involved. The teachers' roles and the processes and activities taking place during the design and early development are closely linked to each other and need to be carefully considered in order to guarantee a successful MOOC design and development process.

Work in the near future will focus on including the remainder of the design and development process in our assessment of the teachers' roles. This will include the design and development of exercises for the assessment of the knowledge gained by the MOOC participants and how this fits into their learning process. Furthermore, we will evaluate the MOOC once it has been given for the first time. We will also compare the design and development process of the MOOC with this process for on-campus courses in order to identify elements that may strengthen each process. We will also explore the use of material developed for the MOOC in on-campus courses.

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