Design considerations when adopting the OpenEdx MOOC platform in campus-based courses: A comparative case study

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PeerJ PrePrints | http://dx.doi.org/10.7287/peerj.preprints.459v1 | CC-BY 4.0 Open Access | received: 11 Aug 2014, published: 11 Aug

Abstract

Massive Open Online Courses (MOOCs) are an innovation in higher education (Grajek, 2014). Faculty has challenges in designing MOOCs since most have mainly experience in developing campus-based courses. As MOOC platform are introduced in campus-based courses, it is important to investigate how this learning environment impacts on the design of MOOCs in relation to online environments. The aim of this study was therefore to investigate the influence of variations in the learning environment on the design of MOOCs.

A comparative case study approach was chosen to investigate two types of learning environments. The focus was on the similarities, differences and trends. The data collection was performed using semi-structured interviews. The answers were analyzed using a qualitative content analysis.

The pedagogical approach and learning content were the components that were mostly influenced. The targeted learners and the assessment of the learning activities were partly influenced. The learning environment didn't impact on the course description, intended learning outcomes and aimed competencies.

The study contributed to knowledge on the influence of the learning environment on the design of MOOCs. Increasing understanding of the learning environment among faculty will contribute to a better design, implementation and evaluation of MOOCs and ultimately for the students' benefit.

Keywords: MOOCs, Online education, Course design, Qualitative study

1. Introduction

New learning technologies constantly emerge, which keeps changing the way technology supports learning and assessment activities in education. On of the latest innovation in higher education is Massive Open Online Courses (MOOCs) (Grajek, 2014). MOOCs platforms were primarily designed to deliver courses in online learning environments. As faculties discovered the potential of MOOCs, they have also started to use MOOC platforms to develop courses for campus-based learning environments. One of the primary challenges faculties face when adopting a MOOC platform to their campus-based courses is how to reconsider its design (Govindasamy, 2001). One of the possible explanations could be the lack of empirical knowledge in how the learning environment impacts on the design of MOOCs.

The aim of this study was therefore to investigate how the learning environment affects the design of the MOOC components by comparing the implementation of a MOOC platform in an online and a technology enhanced campus-based course.

Although MOOCs are popular, challenges have been described. One of most reported challenges is a significant student dropout. Yang et al. (2013) explored students' dropout behavior in MOOCs. In a survey on the Coursera platform student behavior and social positioning in discussion forums were studied. Their analysis showed several important behavioral factors that could predict student dropout (Yang et al., 2013). In another study, Wang (2013) studied the possible reasons behind drop-outs from a social cognitive perspective by analyzing and comparing the same subject and the learning content in both a campus-based course and in a MOOC-based platform. Lack of opportunities in three areas have been identified, namely, self-efficacy, autonomous and self-motivation. The purpose of Wang's (2013) study was to increase understanding of the various challenges students and course designer faces in MOOCs.

An article about how learning in MOOCs can be improved, Williams (2013) presented practical conclusions of research from cognitive science. The conclusion provides practical steps and strategies that can be used by instructors, designers and educators to enhance student learning in MOOCs. Some of these strategies are to add questions to both exercises and online videos to help students reflect on explanations throughout the learning process. This type of course design gives students the right direction with their studies so that they are on track and at the same time provides students with the opportunity to take responsibility for their own learning. Furthermore it is easy to implement in already existing courses (Williams, 2013).

Williams et al. (2013) studied how students' motivation could be increased. In an experiment performed by adding motivational messages to students when solving math problems on the KhanAcademy.org platform, students improved their ability to solve more problems given these motivational messages. The most motivating sentences that improved outcomes were those that emphasized that intelligence and understanding are formable, such as: "Remember that the more you train, the smarter

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you become." Neutral sentences that may even contain positive messages like: "This can be a difficult problem, but we know you can do it" was not as effective as the first one (Williams et al. 2013).

Grünewald et al. (2013) conducted a survey in Germany. The researcher examined a MOOC titled "Internet TCP / IP". The course was active at the end of 2012 and 38% of students who were active participants in the course participated in the survey. The investigation has come up with challenges that are based on didactic and technological affordances to improve MOOCs to support the learning style of various students (Grünewald et al., 2013).

The research field Design for Learning provides tools and methods to support the design process. Studies have suggested tools to help visualize the design for learning in MOOCs. A recently published study presented a conceptual framework as a basis for course providers under MOOC design process (Alario-Hoyos et al., 2014). Another study suggested that MOOCs should be classified and designed according to twelve criteria. These are the degree of openness, massiveness, use of multimedia, communication, the extent of cooperation among learners, learning pathway, the level of quality assurance, incentive for reflection, the level of assessment, how informal and formal it is, autonomy and diversity (Conole, 2013).

The fast development of MOOCs has resulted in an increased need to support the development of better methods for describing and designing MOOCs. Researchers on MOOCs have consequently recognized the need to develop more knowledge about the impact and importance of design in MOOCs (McAuley et al., 2010; Ostashewski & Reid, 2012). A limitation in the manner the MOOCs design have been investigated from the design for learning perspective is that it has been conducted independently from the context or learning environment in which MOOCs were used.

The aim of this study was therefore to investigate how the learning environment affects the design of the MOOC components by comparing the implementation of a MOOC platform in an online and a technology enhanced campus-based course.

2. Method

2.1 Study design

A comparative case study approach was chosen for this study since the focus was on the investigation of the specific phenomenon "How the learning environment affect the design of MOOC components " through two cases (Mills 2010, Johannessen & Tufte, 2003). Figure 1 shows an overview of the different steps undertaken during the study.

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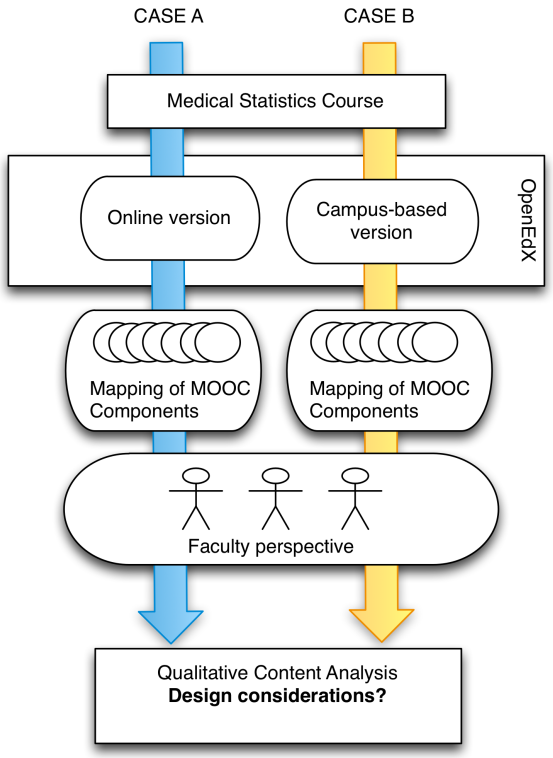
Figure 1: Overview of the study process



The two cases were selected based on a number of criteria. These criteria were that the two cases should be based on the same course taught by the same course providers, use one of the well known MOOCs platforms, and be active during the study, and that they are given in two different learning environments.

Allen and Seaman (2003) have defined four types of learning environments and these are characterized based on the degree of online learning activities. In the traditional learning environment, there are no online learning activities while on campus-based; respectively the hybrid-learning environment constitutes with a combination of face-to-face and online learning activities. Finally, the online learning environments learning activities is delivered almost exclusively via the web.

Table 1. Characteristics of the case studies

	Case A	Case B
Learning environment	Online	Campus-based
Proportion of course delivered using the OpenEdx MOOC platform	> 80%	< 30%
Course	Course in medical statistics	
Learning objectives and competencies	Identical	

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Learners	Graduate students
Faculty	Identical
Platform	Identical (OpenEdx)
Teaching term	Same (spring 2014?)

The selection of the cases framed which respondents to include in the study. Four candidate participants were identified as appropriate for inclusion the study since they were involved in both courses. They were involved in the administration, implementation and design of the courses. Three of the identified participants agreed to participate in the study: a teacher/course coordinator, a teacher assistant and a course administrator.

2.2 Conceptual framework

The MOOC canvas conceptual framework (Alario-Hoyos et al., 2014) was chosen in order to be able to systematically compare the design of MOOCs. The MOOC canvas consists of two categories: the available resources and the design decisions. The available resources consist of several aspects such as human resources, intellectual resources, equipment and platform. Course providers must be aware of these aspects before they design MOOCs to avoid overworked MOOCs.

The design decisions are based on seven different components that determine the design of MOOCs: general description, target learners, pedagogical approaches, objectives and competences, learning contents, assessment activities and complimentary technologies. We used the design decisions components in our study as a framework to compare and discuss the components that make up the design of a MOOC.

2.3 Measures

Mapping of courses

We mapped the course design in both cases based on the components described in the MOOC canvas (Alario-Hoyos et al. 2014). First we created an account on edX.org in order to participate in an edX introductory 101 course that teaches students and course providers how to use all the features and tools available in the OpenEdx platform. Next we accessed the courses that were included in the study in order to map the components of the courses and to compare between the online course (Case A) with the technology enhanced campus-based course (Case B).

Interview of participants

An interview guide was developed with aim to inquire the faculty's perspective on how the learning environment affects the design of the components of MOOCs. Interview questions about the MOOCs design have been categorized according to MOOC canvas components and also created the base for themes in the interview guide. The interview was composed of open questions related to the components from the conceptual framework. An example would be the MOOCs component "target group", with four interview questions: Can you tell us a little about the target group in campus-based MOOC: a comparison with online MOOC? What is the students' background in both courses? From which countries are the students from in both courses? What motivated the students to attend the course? This ensured that the interview covered all MOOCs components/themes.

Interviews were conducted at the course providers' workplace. Each interview began with a brief presentation of the researchers and the aim of the study and how the interview material would be used. Each interview took between 25 minutes to one hour and all interviews were then transcribed literally. Respondents were given fictional names presented later in the results section (Teacher: Adam, administrator: Kim and teaching assistant: Robin).

Analysis

A qualitative content analysis has been chosen to process the collected data (Graneheim & Lundman 2004), to highlight the course providers' perception of how the design of MOOCs influenced by the learning environment. Content analysis was done with the help of organizing, coding and sorting by themes occurring in the data. This has been done based on Graneheim and Lundman (2004).

After the literal transcription of all the interviews, we read the material through several times to get the whole image of the collected data. Then we highlighted the sentences that contained information that was relevant to answer our research question. Graneheim and Lundman call these sentences for meaningful units (Graneheim & Lundman, 2004). Then we shortened down the meaningful units while maintaining its meaning. This activity is called condensation (Graneheim & Lundman, 2004). After condensation we named these condensed units with one or more code words (campus-based or online MOOC) and finally we grouped these condensed units in categories according to the seven design components of MOOCs presented in the conceptual framework.

Each group of condensed units (?) is ranked in a category depending on their content, so that each category contains the sentences/text concerning that particular category. That way we can find out what was said about each theme in the campus-based or online MOOC and discover similarities, differences and patterns. To analyze patterns a few code words was created to group similarities and patterns within each category. To strengthen the credibility of the study, all data that answered the question was included. To increase reliability, each one of the researchers conducted the analysis

and interpretation of the data in its place and then implemented a comparison between the two interpretations (Graneheim & Lundman, 2004).

Ethics statement

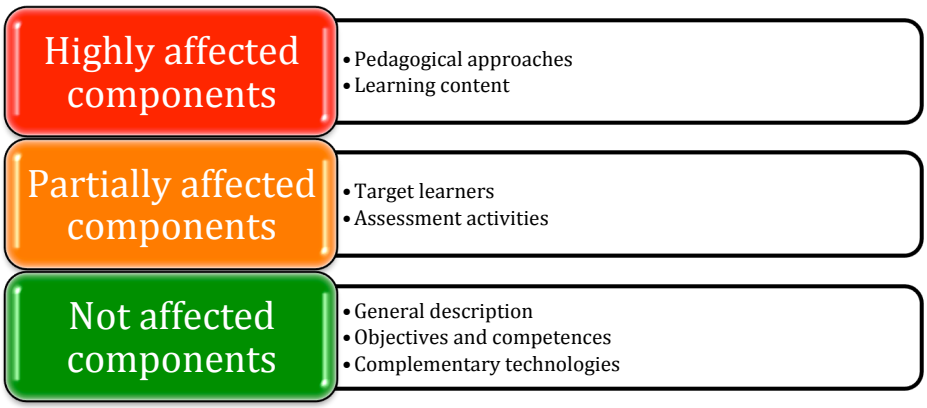
The study was conducted as part of an internal quality improvement project with staff as participants. The study followed ethical principles of information, consent, confidentiality and use (Johannessen & Tufte 2003). The participants were informed about the aim of the study; that their participation was voluntary and that they could withdraw from the study at any moment during the study process. In the informed consent form, the participants were informed that interviews would be recorded and that the recordings would be destroyed as soon as the results were analyzed. Confidentiality of the participants was achieved by anonymization all the personal information. Finally the data collected would only be used only for research purposes.

3. Results

The aim of this study was to investigate how the learning environment affects the design of the MOOC components by comparing the implementation of a MOOC platform in an online and campus-based course.

The impact of the learning environment on the components of the MOOC platform is summarized in Figure 2. The impact is divided into three levels, the highly affected level where main differences have been identified, the second partially affected level where some difference could be shown and finally the third level where no differences were identified.

Figure 2: Level of impact of the learning environment on the components of the MOOC platform



3.1 Affected MOOC components

The components that were highly affected by the learning environment are the pedagogical approaches and learning content.

Pedagogical approaches

Learning activities were mostly student-centered in the online course (case A) while in campus-based course (case B) activities evolved around the teacher as the primary source of knowledge and the one steering the learning activities. In the online course, there were only two physical meetings, the introduction, which is not mandatory and the last day of the seminar where the summative assessment takes place. Interaction took place thereby via forum, email and phone. In the discussion forum the students asked questions and active students responded to help each other. When students answered incorrectly then the teacher intervened by leading the students on the right path.

Discussion forum seems to have limitations. Course providers reported that the student's found it difficult to express themselves, and reluctant to the fact that other students could read their forum postings. "In the online course, questions are a bit more abstract, it is difficult for students to express themselves <...> and all the other students can read the question and that's why students find it embarrassing to post questions ... so it's easier to go up to the teacher" (Kim, interview, April 16, 2014). Most students in the online course prefer to send their questions directly to one of the course providers and they can sometimes even call the teacher. Online students are in need of a direct interaction with course providers.

In the online course, the number of commonly asked questions decreased compared to previous courses according to course providers. Collecting the frequently asked questions and posting them in a FAQ have achieved this. Students were informed to consult the FAQ before contacting the faculty. The teachers decreased the time spent on answering the same question over and over again and the workload created by the large amount of emails to answer. Interaction is promoted in the campus-based course directly during the lecture, after the lecture or during coffee breaks. Students in the campus-based course got therefore a daily support, and this promoted the interaction between teacher-student and student-student.

Course providers used self-assessment questions in the online course to motivate the students because self-assessment questions provide to the students with an opportunity for self-assessment and reflection. However course providers noticed that students in the campus-based course do not need self-assessment questions because they motivate each other by discussing issues or ask the teacher directly. Furthermore, students in the campus-based course have a full day of manual statistical computation exercises in place to find out what they can and what they need to improve.

> "We try to motivate online students in some way and self assessment questions are very important. We use self assessment questions in the online course in order to help the students so that they can understand better the content because they have no way to ask the teacher face to face, so self assessment questions creates such opportunities" (Adam, interview, April 25, 2014).

Learning content

Lectures in the campus-based course were replaced with video-based lectures in the online course. The possibility to repeat the lectures, in the online course, was perceived as important by the interviewee since it raises the students' learning and self-confidence according to the course providers. Video-based lectures benefited from the use of technology such as images and animations. However, the possibility to ask the lecturer questions during his presentation was difficult to compensate for in the online course according to course providers. On the other hand, the availability of web-based self-assessment questions provided the students with the opportunity to reflect and self-assess their knowledge and understanding.

According to the course providers, a video-based lecture must be structured, have the right length, use different graphs, images and animations to explain difficult concepts, and demonstrate the key elements of lecture content in some way.

3.2 Partially affected components

The partially affected components are the target learners and assessment activities:

Target learners

Although target group is the same (PhD students) in both courses, students expressed varied preferences in relation to their learning environment of choice. Students located far from the campus tended to choose the online course. Course providers have also noticed that students in the online course were more motivated, self-propelled, had higher digital literacy and had a higher prior knowledge of the subject The difference in IT knowledge was confirmed by the course providers who indicated that students who preferred the campus-based course were "older students who have a harder time with computers and to understand how it fits together, so there are many who have a hard time and that it should work and watch video. It is not always easy, leading to a preference for the campus-based course" (Kim, interview, April 16, 2014).

Assessment activities

The second component that was partially influenced by the learning environment is the assessment activities. The summative part of the assessment was affected. The activities are usually assessed formatively and summatively. Formative assessments in the course consisted of computer exercises. Computer exercises are the same for both cases. There were four formative computer labs and students needed to score 100% correct in order to pass. Students could repeat the exercises as many times as they wished. Course providers considered the students ability to repeat exercises as a motivating factor that drove the learning process of the students. Learning was reinforced by understanding what they were doing wrong and returning when needed to the textbook, video lectures and lecture notes. It also promoted an increased and natural interaction between students and teachers.

Course providers formulated questions in a way that allowed students to reflect while they interacted with the learning material on the computer. This was all about comprehension questions and capacity for reasoning. Students' would first need to understand the content, think about the questions, do manual calculations, go back to the textbook or video lectures if necessary, and then proceed with the solution of the

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question. The questions were characterized according to the course providers of challenge and control. That is to say "questions have to be challenging for the students while the student maintains control, which means that there is the application of the lecture and exercise" (Adam, interview, April 25, 2014).

The summative assessment meant in both courses that every student received an individual task (data sets) that he or she should resolve on his or her own. Each student came up with different answers. These answers were discussed later in a seminar. Course providers believed that it was very important that each student should receive a unique dataset to prevent cheating. Students "can not take each other's answers because they have different data sets" (Kim, interview, April 16, 2014). The learning environment influenced the design of the seminar. The students in the campus-based course (learning environment A) should discuss their answers during a longer workshop (2 days) while the students in the online course had only one day in which to carry out this activity (1 day). Course providers' kept it a bit more compressed. "Those who go online course do everything in a single day, morning and afternoon. While passing the campus-based course, the workshop is divided in two days" (Robin, interview, April 22, 2014). This is because students in the online course desired as few physical meetings as possible, which meant that there was no opportunity for them to attend the multi-day seminar.

3.3 Unaffected components

Unaffected components are composed of aspects that were identical in both learning environments and these were: general description, objectives and competences, and complementary technologies. As expected, the learning environment does not have any effect on the design of these components.

General description

Regarding general description, both campus-based and online course had the same course name (basic course in statistics), the same course duration (2 weeks) and the courses coved the exact same area of knowledge "statistics in quantitative research".

Objectives and competences

Both courses had the same learning objectives as well as the skills that students needed to have after they have been taking the course. "They are completely identical in terms of learning objectives ... and skills… objectives and competences are the same because the goals are the same" (Kim, interview, April 16, 2014).

Complementary technologies

The course providers did not use other complementary tools when they designed both campus-based and online course. They used only those available in OpenEdx platform. However the course providers used an external survey tool for the course evaluation in both courses and they believed that the course evaluation was essential to assure the quality of the courses.

4. Discussion

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Designing OpenEdX components for learners with different characteristics

In the campus-based setting, assumptions made for the online learning environment need to be revisited. The target learners in online courses includes students for whom the online learning environment has opened up opportunities for those who work full time and/or have family and students sitting in other places in the world to still take the course. Such students do not have the opportunity to participate in the campus-based course, which means that the online course is an obvious choice for them. As opposed to the campus-based setting, students who choose online courses often have higher digital skills, are more motivated and more self-driven in their learning process. Previous research showed that computer knowledge required in participating in an online course effectively (Soon et al., 2000) and another study showed that a lack of computer literacy can be a barrier to successful studies (Schrum & Hong, 2002). The challenge for students with a lack of computer knowledge needs to be taken into account when designing the MOOCs for campus-based education.

Designing OpenEdX components for a teacher centric scenario

The interviewees highlighted computer exercises as a factor that enhances student learning. Repeating the computer exercises stimulate students' thinking and reflection, and motivates students to interact with course material. This calls Moore (2007) for the interaction between student and learning materials. Moore believes that this type of interaction raises new concerns and ideas of the students. Furthermore the student is engaged in a reflective, intellectual and mental conversation with him/herself about the learning material (Moore, 2007). In addition, computer exercises are a factor that promotes communication between teacher-student and student-student in both courses.

What types of learning activities to choose, teacher-centered or student-centered activities? Harden and Crosby (2000) argue that teacher-centered activities focused on the teacher, the teacher's task in this case is to transfer knowledge to students. Student centered activities focused on student learning, however, it is the students who are doing something to achieve the learning, rather than what the teacher does to convey knowledge (Harden & Crosby, 2000). In student-centered learning, students are more active, more responsible of their own learning and more autonomous (Lea, 2003). Same computer exercises should be included to a certain degree even in campus-based courses to help students to be more active, more responsible and more autonomous.

Designing OpenEdX components in the presence of high physical interaction

In the campus-based course, the physical proximity of teachers and students promotes interaction between teacher-student, student-student. The interaction took place during the lectures, after lectures or during breaks. In the online course, the interaction is weaker, one reason may be that students are reluctant to use the functions of the platform and prefer a direct interaction with the teacher via e-mail or phone, which can lead to (experienced) high workload for the course providers.

Nyberg and Strandvall (2000) believe that the interaction between the teacher and the student has a very significant impact on student learning and motivation regardless of

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the learning environment, which affects the conditions for successful studies (Nyberg & Strandvall, 2000). One way to compensate for the weak interaction between students and teachers in the online course is by using "self assessment questions." This is to motivate students and enhance their learning. Bound (1995) argues that self-assessment is a good way for students to monitor and control their own learning, in order to ensure that they complete the course learning objectives. Self-assessment also helps the students to determine the most effective and important elements to focus on. It also contributes to the development and increase of student reflection, self-awareness and self-understanding (Bound, 1995).

Designing OpenEdX components in conjunction with external tools

The aim of this study was to investigate how the learning environment affects the design of the MOOC components by comparing the implementation of a MOOC platform in an online and a technology enhanced campus-based course. It was therefore expected that both courses would be identical in terms of the name and length in weeks and that the courses would cover the same topics, and that the learning outcomes and competencies that students are expected to have after they have taken the course are equivalent. Otherwise the courses would not be relevant to the study if they, for example, had covered different areas of expertise or learning objectives. One explanation for not using other complementary tools in addition to what was already in OpenEdx platform is that OpenEdx platform is relatively newly implemented at the department, which means that course providers probably need time to become familiar with the features and technologies that the OpenEdx platform offers; a prerequisite for the integration of other technical tools becomes necessary. Another explanation may be that the course providers do not need other complementary tools for the moment because the students were satisfied with the courses so far, according to the course evaluations.

Course evaluation is used in both courses in order to identify weaknesses in the courses and try to find solutions to any deficiencies. Course evaluation is therefore an important tool to improve the quality of education. With evaluations course providers can develop, monitor, secure and improve courses and programs. Thomson and Irele (2007) have described other important purposes of evaluation. These are to justify the investment of resources, to examine the quality and efficiency, and to measure progress towards the course objectives (Thomson & Irele, 2007). Duning et al. (1993) places great emphasis on the evaluation of the technical design related activities in order to supplement with all necessary equipment and tools needed in these activities (Duning et al., 1993).

5. Conclusions

The aim of this study was to investigate how the learning environment affects the design of the MOOC components by comparing the implementation of a MOOC platform in an online and campus-based course. The empirical knowledge resulted from this research is important for all course providers that designs, implements, and evaluates MOOCs and for the students who are supposed to make a choice between

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attending an online course or a campus-based course. Learning environment affects the design of MOOCs components in three different ways. The highly affected components are: the pedagogical approaches and learning content. A partial effect on these components: target learners and assessment activities. No influence at all on the following components: general description, objectives and competences, and complementary technologies.

6. Acknowledgments

We wish to thank Magnus Persson for his active contribution during the data collection and data analysis. We gratefully acknowledge Karolinska Institutet for access to the OpenEdx platform and the provision of the context for this study.

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