The Design of MOOCs for Health Education

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Abstract — The purpose of this project is to develop a course which connects pupils from middle school and high school to higher education and to enlighten them of the opportunities within health education. The course is developed by associated professors from University College Zealand (UCSJ) in collaboration with students from UCSJ and pupils from middle schools and high schools. It is designed to show the pupils different educational opportunities coupled with their existing curriculum from their current education, all demonstrated in the setting of UCSJ. The course is build up around a Massive Open Online Courses (MOOC) which comprises different E-learnings object. These objects are developed in co-creation between the teachers, students and pupils. In combination with the MOOCs, there has been held face-to-face (F2F) themes days, where application oriented education in healthcare was used and communicated from student to the pupils at the F2F theme days.

The didactic focus is co-creation of the E-learning objects for the MOOCs, and communication from student to pupils, application oriented learning and career choices in the future.

Index Terms — career choices, co-creation, Health education, MOOC.

I. INTRODUCTION

This project is focus on a course where students from university colleges and pupils of middle school and high school have worked together — virtually with both MOOCs and F2F — for 5-8 weeks, focusing on a scientific theme primarily within the health professions. We chose to present four different courses each with a MOOC and related to the health professions: Malaria and International Healthcare, Chemistry and molecular gastronomy, Health care and treatment, Biological methodology (CSI). An additional requirement of the project is that students and pupils from all three levels of education contributes with educational elements to the MOOCs.

The project is funded by UCSJ and Region Zealand. Appreciations are extended to Region Zealand for their contributions to this project. The goal of the project for Region Zealand has been that pupils in middle school and high school gain:

1. A picture of career options;

2. A connection between middle and-high school education and Health profession;

3. A new perspective on educational guidance counseling.

1) In order to motivate teenagers, the project creates a clear connection between education and career options, so that it is perceived to be relevant for the teenagers to spent time in school in the various fields of study. The objective of the project is to create a picture of the career options connected to the health educations, in which the participating teenagers can see themselves. Additionally, a connection is made between theory, practice, and subject.

2) Studies show an evident link between choice of education and the educational level of parents [1]. There is a clear tendency for teenagers whose parents are unskilled or low-skilled to choose shorter educations with a clear professional aim. Thus, the aim of this project is to open the eyes of the teenagers to the healthcare educations offered in Region Zealand.

3) Traditionally, teenagers are introduced to education and career choices through a network of guidance counselors which offers instructions in both middle school and high school. The network of guidance counselors visits schools to present educations and career choices, and offers personal guidance to pupils. In the MOOC, educations are presented in the forms of both smaller E-learning objects and in shorter virtual meetings with people from the health professions. The different E-learning objects illustrate the many options of the professions and appeal to the need for choosing a career with a lot of options.

II. THE PROJECT

The participants in the project were middle schools, high schools, and UCSJ, and UCSJ how were responsible for the project. The project is constructed as a process to develop a model (model development process) where the participants and stakeholders of the project have been co- creational both in terms of content, structure, and design of the project. The participants from middle schools and high schools were entrusted to ensure that the content supports the existing curriculum in middle school and high school. Moreover, the project had to adapt to the preexisting schedules from the 3 educational institutions. Furthermore, it was made a requirement, that the pupils experience different learning environments than their
usual ones.

The model development process allows for a coherent course vertically across the educational levels, allowing a new way to look at collaboration between university and high schools and middle schools in regard to view at career options. The aim was a more active learning arises for the participating students and pupils than in the usual career counseling courses that have been based on short visit to health educations. One condition for the participation of middle schools and high schools is that the content of the model development course supports the currently existing curriculum of the middle and-high school.

In contrast to traditional MOOCs, where an individual can sign up and participate to various degrees, the participation in this MOOC has been mandatory for the registered classes.

III. DESCRIPTION OF THE PROJECT

The project is divided into four different courses each with their own focus within their scientific area. The four different courses have common denominators, as shown in the four points below. These common denominators have been mandatory, parts of the project. Furthermore, the four courses each have their own distinguishing features being built around each of their individual themes, and with the involvement of different combinations of health and teachers educations from UCSJ.

Malaria and International healthcare: The educations of teachers, nurses and biomedical laboratory technicians created a joint course focused around geography, biology, prevention and health promotion, and diagnostics in relation to malaria.

Chemistry and molecular gastronomy: The education laboratory technicians includes descriptive biochemistry with the application of carbohydrate chemistry in the clinical field. The students’ existing knowledge of cooking is related to the course of biochemistry by testing different combinations of carbohydrates such as starches in cooking.

Healthcare and treatment: The education of nurses and teachers focuses on the cardiovascular system along with the subjects of anatomy/physiology, nursing, sports, biology and social studies.

Biological methodology (CSI): The education of laboratory technicians and teachers focuses on the teaching of biology and science method in middle school, which was related to biological methods of investigation within forensic science.

IV. EXAMPLE: COURSE DESCRIPTION

The course about Malaria and international healthcare is an example course where the students from UCSJ and pupils from middle school and high school participated in a MOOC which include a F2F theme day (table 1).

Table 1: Overview of project course and elements.

<table>
<thead>
<tr>
<th>Start up</th>
<th>Theme day</th>
<th>Post processing</th>
<th>Evaluation</th>
</tr>
</thead>
</table>

V. CHOOSING THEMES

We were conscious in the collaboration with the educations (middle school/high school and UCSJ) about choosing teaching themes which were already mandatory areas on middle school and high school level. By choosing themes that covers the current curriculum; the schools could allocate time in their existing time schedule and at the same time link this mandatory teaching to application oriented learning in healthcare elements present in the UCSJ educations. The themes were chosen to focus the interdisciplinary aim with a wide appeal to the students and pupils participating in the MOOC. At the same time, the diverse professional qualifications of the involved educators had to be taken into account, so that we had teachers competences to qualify the teaching material which was created into the MOOC by students and pupils.
<table>
<thead>
<tr>
<th>MOOC course, duration</th>
<th>duration 1-2 days</th>
<th>MOOC course duration, 1-2 weeks</th>
<th>3 months after finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to MOOC and work with curriculum.</td>
<td>Work with MOOC elements both practical and theoretical</td>
<td>Work with E-learnings objects from the MOOC</td>
<td>Focus group interview with students and pupils, and teachers of all 3 levels in the educational systems</td>
</tr>
<tr>
<td>Mandatory assignments</td>
<td>Participation of pupils from middle schools and high schools and students from University College</td>
<td>F2F/ virtual meeting with health occupation and health education</td>
<td>Questionnaire surveys with students and pupils</td>
</tr>
<tr>
<td>Virtual meeting, between high schools and middle schools</td>
<td>Participation from the health profession</td>
<td>Post processing of mandatory assignments in MOOC</td>
<td></td>
</tr>
<tr>
<td>F2F meeting: High schools and middle schools or/and UCSJ and High schools</td>
<td>Participation from career counselors</td>
<td>Meeting with career counselors</td>
<td></td>
</tr>
<tr>
<td>Co-creation of E-learning objects to the MOOC</td>
<td>Co-creation of E-learning objects to the MOOC</td>
<td></td>
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VI. PROBLEM-BASED LEARNING

The bridging-course is a model development course containing four primary elements. These four primary elements are: Traditional MOOC elements, the combination of MOOC and F2F, application-oriented learning, and mediating of knowledge on different levels.

**Traditional MOOC elements:**
One of the strengths of using MOOC as a learning tool in teaching is that the MOOC supports a lot of learning approaches, including the manner by which learning among students and pupils takes place in the social meeting between themselves (peer to peer) and the teachers [3]. MOOC’s supports a learning environment where pupils are encouraged to create products, which are then place into the MOOC and is used by others, motivating both pupils and students. As an example, the Biomedical laboratory technician students and teachers chose various methods of analysis, found relevant (English-languaged) videos, and described the theory behind the used methods of analysis which were to be used in the MOOC for the CSI-course. High school students then transformed these learning elements into videos where they explained the methods of analysis in their own words and native language, thereby making it easier to understand for the middle school pupils. The objective for the middle school pupils was then to go through these videos, and then perform the methods of analysis in the laboratory in a F2F situation with the high school students.

Another strength by using the MOOC’s is that students and pupils have an opportunity to access the learning elements which fit the level of teaching of the student/pupil at the time needed as described by Siemens 2006 [2].

A lot of the e-objects and learning elements were placed into the MOOC at many different levels before the start of e.g. Malaria and International healthcare, so that the elements were adjusted to middle school pupils, high school students, and teachers [3].

**MOOC in combination with F2F:**
This MOOC is not constructed as a traditional MOOC course, where the pupil signs up for a course and at the end can sign up for an exam. This model development course is characterized by the MOOC functioning as a platform of resources with different learning elements, which can be combined according to the individual teaching course. The MOOC also contains exemplary descriptions of how to use the E-learning objects. The process has been a continuous development of the configuration and combination of the elements, the teaching method, E-learning objects, and the content of the individual themes.

We have been inspired by Venka Simovska, which thesis is to look at learning through interaction where student participation is transformed through common activities, and they hereby become more competent members of the learning communities. Simovska argues that the processes of structuring knowledge in different manners promotes learning. The pupils move the focus of learning to exchange, meta-cognition, and cooperation, making it possible to link their everyday knowledge to the scientific health care knowledge [4].

For example, in the CSI MOOC the students’ reference framework from the media (television) linked to the biological methods of analysis and methodology that are used within the scientific paradigm. Equally, the students’ everyday knowledge of cooking is moved into the laboratory in the course about Chemistry and Molecular Gastronomy, where they experiment with known and
unknown kinds of starches, with which they work theoretically with regards to chemistry and descriptive biochemistry. The pupils can then see how chemistry can be used whilst cooking.

The course have had strong elements of co-creation since the students co-created new and relevant information for the E-learning objects in the MOOC. Furthermore, the students created further E-learning objects during the project days in the form of presentation material and video clips of their performances, which can inspire and motivate other users of these MOOC’s. These processes for cooperation in productive activities greatly enable common learning processes, which subsequently leads to a common reference framework and a common basis for structuring knowledge. This interacting structuring of knowledge is a part of Simovska’s interpretation of learning through interaction, taking place in communities of learning consisting of zones of proximal development [4]. The teacher is given a facilitating role and which is responsible for giving the students new means of action, new kinds of knowledge, and lead to structuring knowledge through action. This structure of knowledge can link ”learning” with ”living”, and can thereby help to promote the students and pupils’ competence to act—with a focus on the later choice of education and career. This kind of course with learning through interaction, where E-learning objects in the MOOC combined with F2F teaching, gave a good dynamic with motivated and committed teachers, students and pupils on the theme days.

The MOOC has contributed to the theoretical basis of knowledge, which has helped support the activities of the project days so that the application-oriented learning has been able to be carried out at a higher level of learning than initially assumed. The courses could not have been done without the MOOC’s since the MOOC’s gave the students and pupils opportunities to increase their level of knowledge in the exact areas where there was a need. The teachers were been able to form their teaching from the E-learning objects according to the need of the individual classes without having to use excessive resources for planning. The combination of MOOC and F2F were existential for the courses, because the students and pupils here actively meet the learning expectations through imitation, meaning that the individual pupil attempts to mimic what others have done, and the students have hereby functioned as role models for each other, or, more specifically, as instructors. The Brothers Dreyfus have pointed out that computers never will be able to completely replace teaching and social learning because they do not carry this option for imitation [5].

Application oriented learning in Healthcare:
Application-oriented learning is rooted in the experimenting, examining, and activity based methods of working, where the focus is on the pupil’s active participation and learning [6]. The activities are hereby predominantly centered by the pupils rather than the teachers. The use of specific healthcare materials contributes to the pupils’ understanding of theoretical parts of the teaching, and the material is characterized by practical and functional learning resources. This specific material will help the pupils to connect the applied science and theoretically curriculum.

For example, pig hearts were used for dissection during the course of Healthcare and Treatment in order for the students and pupils to link their theoretical knowledge of the anatomy of the heart, the blood flow through it, and the size of the heart, with the actual pig heart in their hands. This exercise gave the students and pupils an understanding of their theoretical knowledge, which the students also expressed during the exercise.

The advantages of using applied-oriented learning is further justified by the increased motivation of the students, since they experience the teaching being centered around them, and becomes much more hands-on which supports those students that are weaker theoretically.

All four courses had elements of application-oriented learning, which were used actively during the theme day. All the students had previously acquired a basic theoretical level which related to the application-oriented learning. This theory-acquisition took place either through the MOOC, or by F2F teaching with their assigned teachers.

The results of the studies found in this area point in the direction that application-oriented learning has a positive effect on the students' performance, and a positive effect on their motivation. The studies regarding efforts after leaving school are few, and the area calls for more research [6].

Communication of knowledge on several levels:
The courses have provided opportunities for the students from UCSJ and high school to experiment and acquire abilities within the field of didactics, in that they have had to communicate their technical knowledge to students and pupils with lower levels of knowledge than themselves. Nordenbo has researched which competences a good teacher should possess. These three competences are: [7].

- Academic competence
- Relational competence
- Facilitating competence

The students have the opportunity to experiment with all three competences during the bridging course Healthcare and Treatment. Specifically, students from UCSJ have communicated knowledge to high school students and middle school pupils, and high school students have communicated their professional knowledge to the
middle school pupils. This has taken place during two project days.

It is very relevant to acquire these competences when all three of them are looked at from a future professional education, since a nurse has to be able to relate to a patient, exercise leadership in the sense of handle and manage the treatment process of a patient, and at the same time have the technical knowledge that the actual decisions are based on.

Kolb's learning circle which serves as an analytical template for systemizing the learning processes explains when students and pupils have to present their knowledge, how reflection takes place based on the individual's experiences in a dynamic process – and not with a specific result in mind. This realization takes place in a cycle with four stages: A specific experience, reflection on an observation, which through an abstract conceptualization becomes an active experiment.

Both the students and pupils have been through the reflection process, where specific situations regarding health and treatment are integrated into earlier experiences. In the process of reflection, the specific situation is brought into play with previous experiences, the theoretic basis, and into new contexts involving students at various levels of education. These specific situations have then been conceptualized in the actual meeting with the students and in the experiments that they have conducted [8].

This form of work in the course has greatly motivated both students and pupils, since they are challenged with having to communicate their knowledge. Their knowledge thus becomes special and unique, and has to be worked with, in a different manner, in order to make it accessible for students at other levels of education. This helps to strengthen their own level of knowledge, and for the students' part, their own professional identity.

VII. THE MENTOR NETWORK

Each course has had a network of mentors attached, which consisted of participants from the healthcare professions and students from the healthcare education. Furthermore the career counselor’s network participated in the network, in order to provide guidance for the middle school pupils and high school students in regards to choice of education. A task was included in the MOOC, designed to facilitate contact between the students and the mentor network. The goal was to give the students and pupils an overview of the healthcare professions the Region Zealand offered educations for, and which work and career options these would offer. The intention was to motivate more teenagers coming from unskilled or low skilled families to complete a bachelor education in the field of healthcare.

The various courses experimented with the creation of a contact between pupils and the mentor network. For example, some pupils produced questions for a mentor of the network, who would then be interviewed through Skype connection in regards to that person's work and career choices. At the same time during the course, the pupils had been to lectures with another mentor about his job and career path, where the focus was put on the mentor having had an interesting career path, for instance a laboratory technician who has been working for Doctors Without Borders.

VIII. EVALUATION

The project is designed to collect data according to three elements:

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1. Academically yield
2. Motivation for pupils and student in the project
3. The students’ acquired knowledge of the healthcare professions
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Data is collected from focus group interviews with participation from educators, students and pupils, and a survey for groups of students and pupils from middle school and high school. The survey was designed with a test group and a control group, and the primary focus of Region Zealand was to find out, whether the participation in the courses had an effect on the knowledge about the educations. The results have not been completely worked out, but there seems to be a tendency for the test subjects to have gained a higher knowledge of the educations of the Region than the control group.

IX. PERSPECTIVES

In order to pursue the positive experiences with the application-oriented learning in healthcare and the established network of the University College, middle school and high School, it is being considered conceptualizing the individual courses. This could be an option in regards to obtain funding, continue the work on the individual courses and adapt them to the specific wishes and needs that the educational institutes have. Further funding could open up options to expand the existing MOOC’s with more E-leanings objects, involve more students and pupils in each course, and increase the co-creational part. It could also make it possible to link the existing courses to other professions.

In order to measure the effect of the pupils’ participation and observe their future choice of education and career, it would be interesting to spend resources on a cohort study and thereby put focus on future courses in a combination of MOOCs and face-to-face teaching both with involvement of students and pupils at several levels of education.
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