Development of Virtual Online Course Packages

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INTRODUCTION

It is discussed in this paper how a number of universities of applied sciences in Finland have formed a consortium to jointly develop a set of online course material and how it will be used in various ways in the education of Information and Communications Technology (ICT) classes. The objectives of such development effort are threefold: 1) improving the availability of online course content to be offered to students independently on place and time, 2) increasing the productivity of teachers by reducing distributed and fragmented preparation work and sharing the delivery of courses, and 3) improving the quality of courses by jointly created contents. This also gives an option to reallocate the teachers' workload from basic course preparation to advanced course preparation and delivery. The change of practices is expected to lead to partition of teachers' work partly to the preparation of course content and partly to the delivery of course which rises completely new views in future education system.

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1 VIRTUAL ONLINE COURSE PACKAGES

1.1 High Level Objectives

A major concern of an education manager is how the education of Information and Communications Technology (ICT) should be organized and systematically developed in order to lead to an optimal solution. This concerns teaching quality, students' on-time graduation, and the course palette with relevant substance content as well as effective teaching resource utilization. This directs universities focusing on their strengths according to their profile of their expertise and specialisation.

Often it is understood that it is important to create a network and cooperation model to boost collaboration between educators and stakeholders without forgetting the benefits of international collaboration and a chance to influence working life and entire societies [1]. However, the cooperation model should be created as minimized administrative overhead as possible. The model is to be designed so that the demand and supply of the study modules would begin to grow spontaneously.

1.2 Planning Objectives

One of the main objectives of this development project was to agree a consensus of the basic ICT subjects to be offered as virtual courses. The virtual courses are thought to be used by teachers as a course repository or as individually accessible online course offerings used directly by students. It was also planned how jointly provided courses should be organized and offered. The partners defined the basic competences in the field of ICT and got to know the existing course offerings in the other partner institutions.

Planning the online course offerings was executed in small teams. One university was responsible for the content of one course offering of 2 - 10 ects. Each team consisted of at least two partner universities, but often a small team consisted of 4 - 5 universities. It was planned how the structure and implementation of course packages should be done. All course offerings are designed with fine modularity so that it will be possible to implement a final study unit in several different ways. This phase also covered contents, learning outcomes and prerequisites that were set and agreed on. The assessment criteria were agreed to be based on the knowledge-based principle.

1.3 Design Objectives

Learning methods and implementation concerning pedagogical approach, computer implementation, assessment methods and scalability were considered and agreed on in the implementation teams. The partners were interviewed concerning their preference of the technology platform. Potential platform options were considered, e.g. Moodle, edX, and Eliademy [2]. Finally the technical solution was unanimously agreed to be based on the Moodle platform. Access to the Moodle platform is available for all students and it is well-known by the developers. There is a common identity authentication (HAKA) used in many other academic IT systems in Finnish universities [3].

1.4 Pedagogical Objectives

Teachers of the partner universities participate in the online pedagogy training. This ongoing tailor made training includes best practices related to online learning, pedagogical aspects, introduction of different tools and guidance for effective use of

Moodle. More frequent use of video lectures plays an important role in training new teaching methods [4].

2 COURSE CONTENTS

All courses and their syllabuses are described on the project web site. For the time being, there are 14 course offerings as shown in *Table 1*. The course contents were selected to serve a wide diversity of the ICT studies. Their level is to address the basic knowledge of bachelor students both in the fields of engineering and business administration. One of the main objectives is that each institute has a chance to develop and strengthen their profile based on their own expertise and to resort to the expertise of another university whose strengths are different.

Table 1. Available course offerings as of May 2016

		ects
1	Intelligent systems Internet of Things	5
2	Big data basics and Big data in practice	6
3	Cybersecurity	7
4	Foundations of web development	3
5	Web techniques, client side programming	2
6	Dynamic web pages	2
7	Mobile programming	3
8	Introduction to operating systems	5
9	Introduction to game production and game design	10
10	Open source code	2
11	Virtualization	3
12	Data structures and algorithms	5
13	Digitalization	2
14	Basics of programming	3

All partner universities are working on the project and the project is in progress in summer 2016. The first courses are available and ready to be piloted by other universities while usability and accessibility testing is in progress in several places. Many smaller technical items such as code optimization and performance capacity are in a tuning phase.

3 ENSURING QUALITY

One of the key issues for this kind of a co-operation project to succeed is that the quality of the material produced is at a high level. To ensure that the quality meets the expectations, every small group had members from several co-operating universities. In total there were 12 small groups and the average number of teachers per group was 3,5. The mean value of universities per group was 2,8. Using teachers from many universities widens the perspective of the subject and ensures that the content is handled and approved by more than just one university.

To cope with principles, policies and quality as a whole, a small assisting technical group was formed in the beginning of the project. The team's responsibilities were divided between pedagogical, substance and implementation issues. Pedagogical guidance concentrated on general issues including course evaluation and feedback enabling continuous improvement of the courses. Substance supervision focused on the group's scope and deliverables. One important issue was to ensure that similar

course contents are not overlapping. Implementation issues were divided between a platform and an implementation model. After the platform selection and installation, the configuration and development of the eLearning platform started. At the same time, online education concerning the Moodle platform was started. This ensured that all the teachers involved were able to use the newest features of the selected platform.

At the beginning of the project it was made clear that all course material produced was meant to be open and public. Materials were produced under Creative Commons License [5]. Making the material public increases the quality, because teachers tend to sharpen their deliverables when the audience gets wider and more public. As stated by in the Ministry of Education and Culture, making science and research more open will significantly improve the quality and competitiveness of Finland's research and innovation system [6].

After the development of the course material, a pilot implementation phase began. Every course implementation should report experiences about the course to the producer team. This model tests the quality of the course material every time implementation takes place and enables the improvements and development of the content in the long run. At the end of the project and after it, the usage of the courses in this package is market-based, meaning that popular courses will have more implementations than the less popular. Popular courses will then have more feedback data and their quality will improve as the time goes by. This also means that the quality courses will probably live longer.

Gamification can be explained as the use of game elements and game design techniques in non-game contexts. Progression, levels, points, resource collection, quests or avatars may be such game elements. The game should give the player hints to figure out how to play: highlighting, guides, feedback, limited options or even an "impossible-to-fail" approach. All of these can be considered as examples of game design techniques [7].

Gamification of studies is a way to raise motivation and to have more fun during learning. In several reports, the educational value of gamification and serious games is found reasonably high. The research published by Backlund and Hendrix analyzed and summarized 99 scientific articles published in different journals over the years 2002-2012. The result shows that gamification and serious games are efficient teaching methods regardless of the subject [8].

Another empirical study compares the learning experience between a non-gamified and a gamified version of the same course. The performance and satisfaction of students were followed. The result of gamification was found positive; showing considerably better outcomes in lecture attendance and number of downloads of the course material. Also the students participated more eagerly on the course discussion forums [9].

The Moodle platform, used in this project, offers many possible options to implement features of gamification. Two pieces of plug-in software were chosen: Badges and Level up!. Badges work in an efficient way to show the progress of students. They can be earned on the grounds of several reasons. An example would be a successful completion of a quiz after each section of a course. The badges earned so far are displayed on the student's profile [10]. The Level up! -plug-in software lets students earn experience points based on their actions. It displays the current level and progress using a progress bar. There are many options to reward the students, for

example congratulating them when they level up or upload images to customize the appearance of the level [11].

4 CO-OPERATIVE MODEL

All course offering packages are designed with fine modularity so that it will be possible to combine a final study unit in several different ways. Here two of them are explained. The arranging university selects from the bank of master study units on the Moodle platform the components needed by the local course implementation of a study unit. There may also be a need for local components to be added, such as laboratory working. In this case, the course is offered only for local students as in *Fig. 1*.

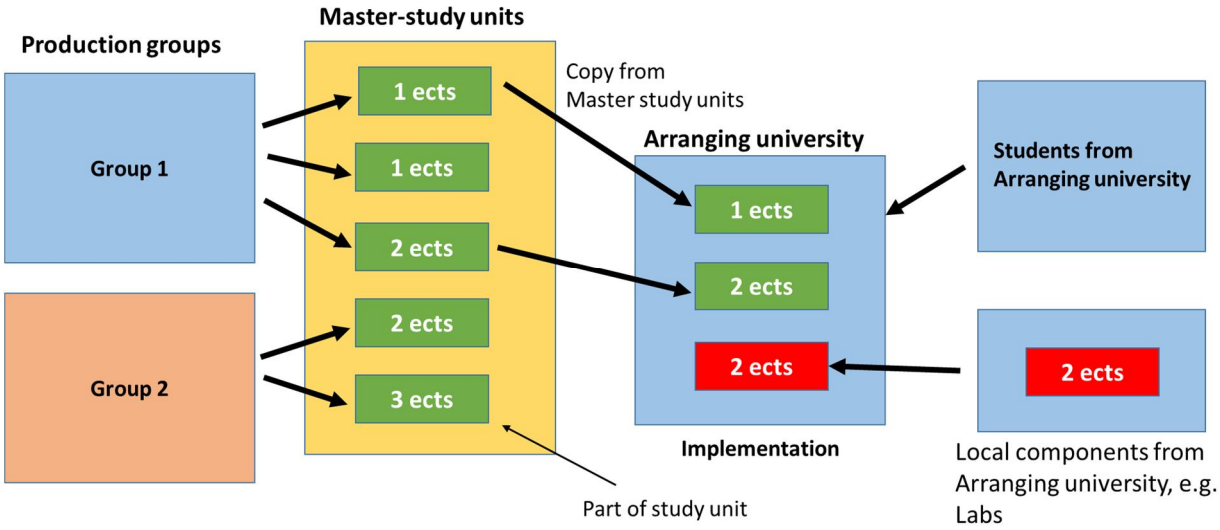


Fig. 1. Local course implementation

Another possibility is to have a MOOC like implementation of a study unit. In this case all the components selected should be able to be executed as remote learning as the students are enrolled from remote universities as illustrated in *Fig. 2*.

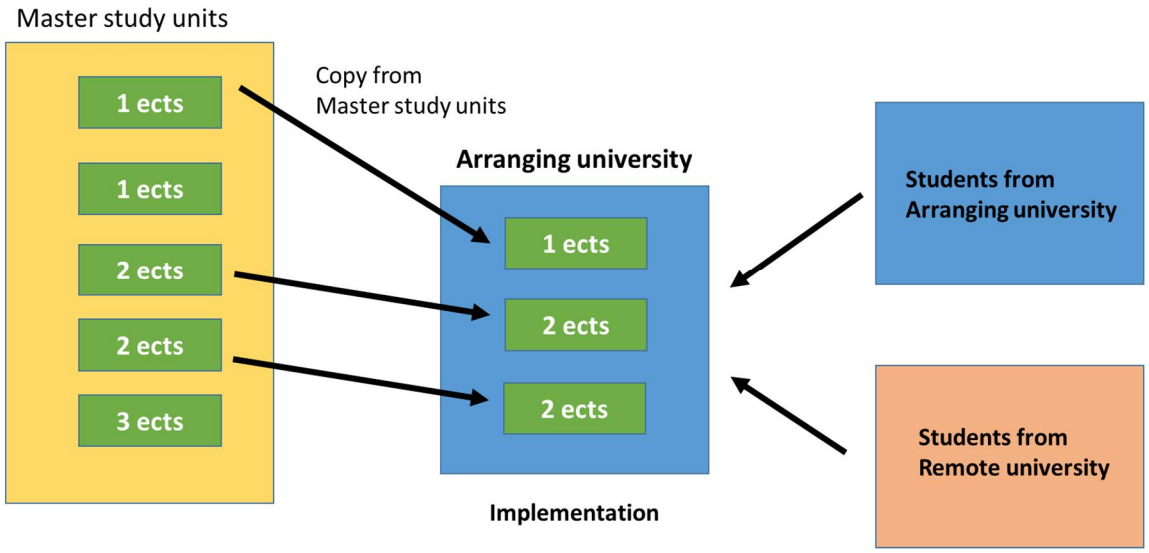


Fig. 2. MOOC implementation

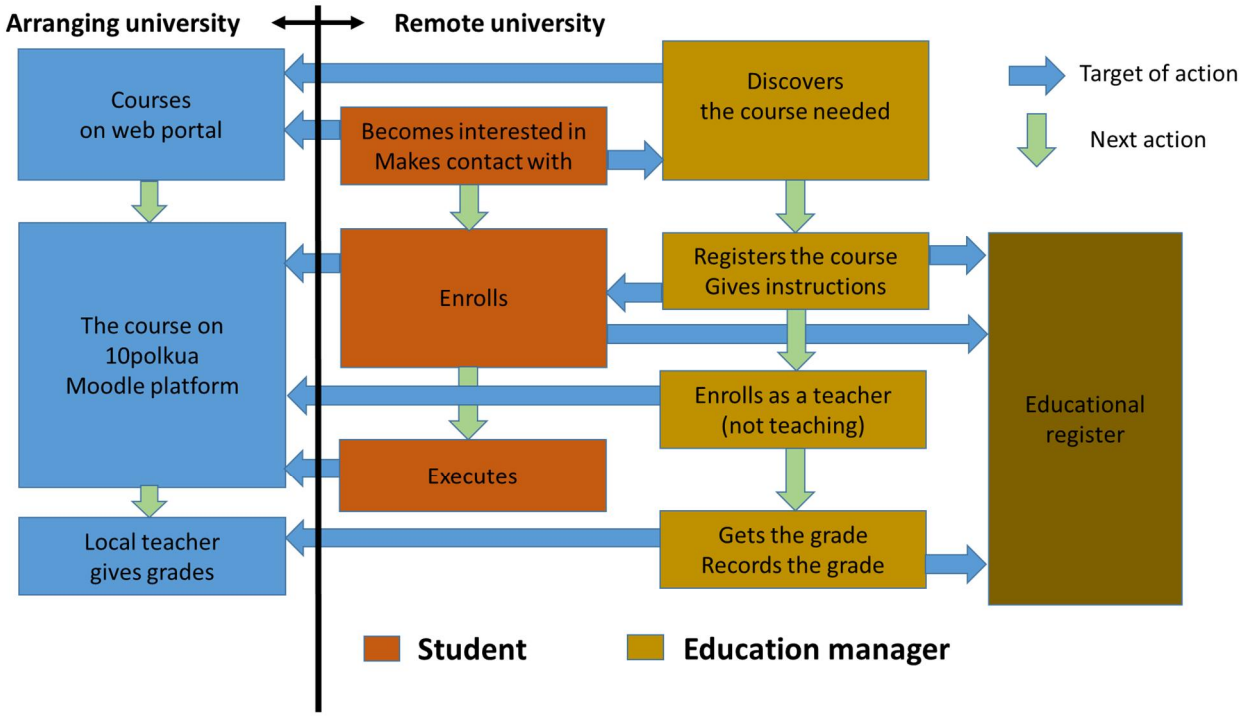


Fig. 3. The cooperation process

In the diagram in *Fig. 3* the phases are described for the co-operation process. The education manager is in charge of joint course operations in a remote university. The MOOC like study units are to be advertised on the web portal of the joint course project. These courses can be discovered by individual students or by an educational manager from a remote university. A student may be looking for additional studies or substitution for some failed course.

The process starts when the student contacts the education manager. Another possibility is that the education manager discovers a suitable course for the whole group of students as remote learning. Next the education manager registers the course to the local educational register and guides the students to enroll both to the local register and to the joint course pool of the Moodle course of the arranging university. The education manager also enrolls to the Moodle course as a teacher, not for teaching but to get the grade and record it in the local register after the students have completed the course.

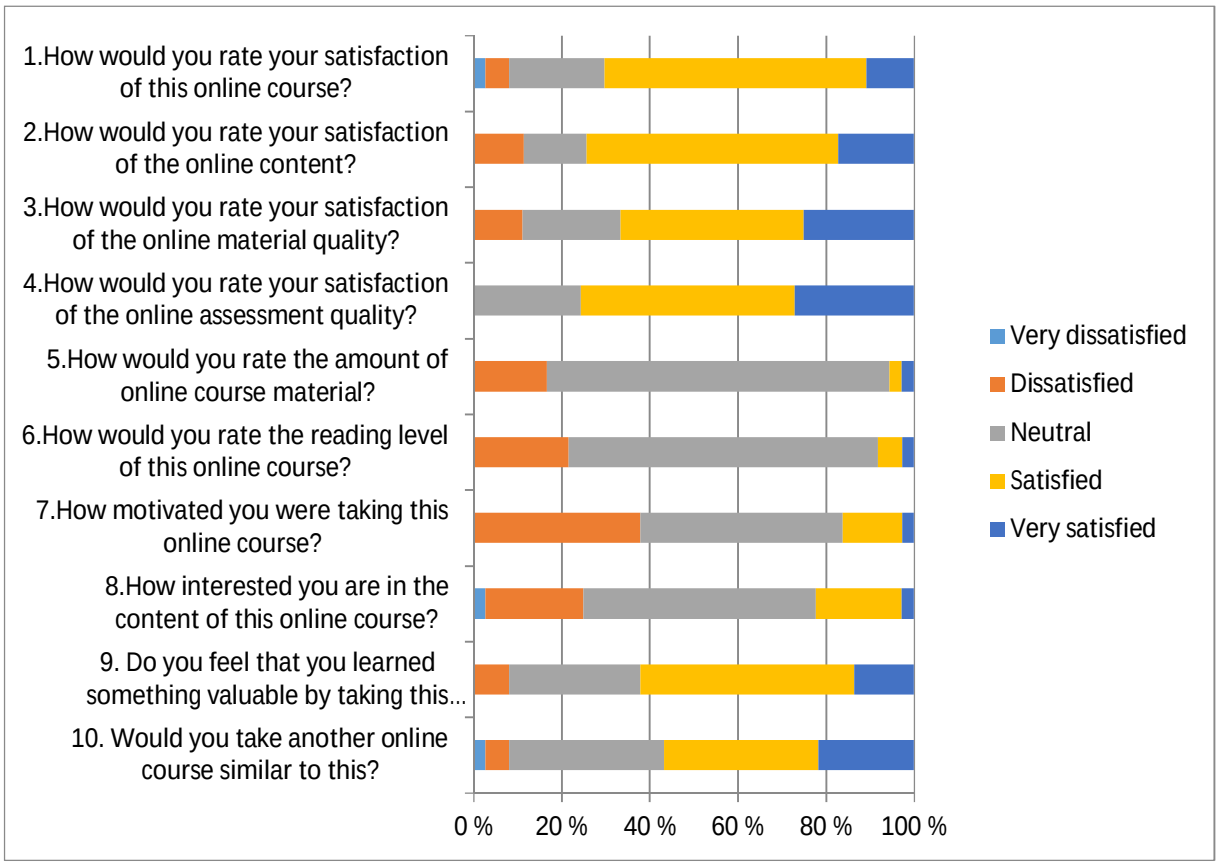
This kind of a co-operative model is carried out with as little administrative load as possible. The motivation of a remote university is to offer courses with very low costs. The motivation for the arranging university should be guaranteed by the financial model proposed for the universities by the Ministry of Education in Finland [12]. In this proposal credit points are counted according to the agreements of the co-operation between universities. The additional costs of extra students could be covered with this financial model.

5 FEEDBACK AND USER EXPERIENCES

The first instances of the feedback and user experience were collected from the pilot course of Cybersecurity. Students' behavior in answering the final exam was observed; data was collected and analyzed in detail. The students were also asked to answer anonymously to a QA questionnaire. The questions are shown in *Table 2*.

The answers were expressed in the scale of 1 - 5 where 1 means very dissatisfied and 5 means very satisfied. Open written feedback was collected as well. The results in *Table 2* are based on 36 answers.

Table 2. Feedback questionnaire of Cybersecurity online course



As *Table 2* shows the students were more satisfied with the online course content and its quality as well as with the assessment. They were less satisfied with their own motivation, amount of material, and readability of the material. They were also annoyed by grammar and spelling errors noticed by the students.

6 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER WORK

All 14 course offerings will be piloted by the partner universities in fall 2016. All feedback and use experiences will be collected and analyzed for improvements of the course contents and organization. In the next phases enhancement issues such as gamification, automated examination and increased usage of video clips and increase of interactive session should be of concern.

This kind of consortium of educators is valuable in many respects: collaboration and cooperation of teachers is always a necessity, profiling of the universities freeing them resources to focus on their own fields of expertise, and thus increasing the productivity of education as a whole. It must be guaranteed that students receive good and effective education despite the declining resources. The students deserve it.

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