Curriculum Development of a Health Informatics Master Course in Understanding Technology

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Abstract. Education in health informatics is an important contribution to the digital transformation in health care services, and there is a need to combine health and technology competencies. Traditional ways with separation of health sciences and computer science have shortcomings, and there is need for individuals with a holistic view and relevant education background for improving the technology-supported clinical work processes. This paper presents how the curriculum was organised in a course in "Understanding Technology", which was a part of a Master's Programme in Health Informatics. The course targeted different aspects of technology for students with a diverse background, and it was organised with the aim to provide the students with theoretical technical insights and apply the knowledge through problem-solving and practical use. The course was decentralised and had a student-centred teaching approach over one semester.

Keywords. Master Education, Curriculum Development, Technology Understanding, Health Informatics

1. Introduction

Master education in health informatics targets the combination of health sciences and computer science [1]. Health and social services are changing rapidly due to digitisation, and there is a need for individuals with combinded competancies for change- and project management. This combination of health, organisational and technical issues is relevant for improving the technology-supported clinical work processes. At the University of Agder in Southern Norway, there has been a Master's Programme in Health Informatics since year 2000, provided by Faculty of Health and Sport sciences. In the Master's Programme, the 10 ECTS course HSI-408 Understanding Technology [2] is given during the first semester by staff from the Department of Information and Communication Technology at the Faculty of Engineering and Science. In 2017 there was a change in the responsible staff for the course and this led to a revision regarding the curriculum, organization and syllabus.

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In this context, this paper aims to share the experiences on how the "Understanding Technology" course organisation and the curriculum was refined and further developed during the fall of 2017. The research question stated was:

How can a health informatics master course in technology understanding be organised supporting student-centred learning?

2. Methodology

The curriculum was developed by studying similar courses at other universities [3][4][5], and by searching after relevant literature on the Internet. The course development was conducted in four phases: 1) definition of learning outcomes and sub-topics, 2) selection of literature, 3) distribution and definition of lectures and 4) digital structuring in a Learning Management System.

The two lecturers of the course had a multi-disciplinary background within health informatics, computer science and health science. One was a postdoctoral research fellow with teaching duties and the other one was an assistant professor at the end of the PhD studies. Both had earlier teaching experience at the University of Agder. The Department of Information and Communication Technology at University of Agder approved and supported this work.

3. Results

3.1. The Learning Outcomes

The students being taught in the course were enrolled at the Faculty of Health and Sports at University of Agder and most had health and nursing related background, but there were also students with technical education. The main learning outcomes were the fundaments of health informatics, laws, regulations and national strategies for use of information and communication technology (ICT) and digital information exchange in health care services, design of user interfaces and evaluation of health information technology (usability, heuristic evaluation and cognitive walkthrough), information security and requirements for storage and exchange of sensitive patient information, modelling of databases and implementation and integration of new ICT solutions for health services. In addition, there was focus on welfare technology and telemedicine implementations and research trends within health informatics.

3.2. The Syllabus

The mandatory literature that was chosen for the course were two English books: Guide to Health Informatics [6] and Biomedical Informatics [7]. In addition, there were two Norwegian books targeting databases and information security [8][9]. Several national strategy documents and plans were mandatory to focus on the implementation strategy and plans of the authorities [10][11][12][13]. About 10 additional book resources and leaflets were complementary literature, to provide different aspects and a historical perspective on health informatics in Norway, but also to focus in-depth on design and evaluation of health information technology.

3.3. The Structure of the Lectures

The course was organised with a decentralised approach, with a total of 25 lectures distributed over two one-week-long seminar blocks. In between the seminar weeks there were eight weeks of student-centred teaching supported by technology. During each seminar week there was one laboratory session to support the learning by practical exercises. The first one targeted design of graphical user interfaces where groups of 4-5 students created paper prototypes for a smartphone application for International Normal Ratio (INR) home-measurements and self-management of anticoagulation therapy. In the second laboratory session, the students could choose one of following tasks: 1) make a cognitive walkthrough of a public health-related web-portal or 2) make a usability evaluation in laboratory of a prototype for a smartphone application for self-management of tick-borne diseases symptoms. In addition, there were group works targeting database modelling and information security.

3.4. The Organisation of the Learning Management System

Canvas was used as a Learning Management System [14] and it was implemented at the University of Agder during the fall 2017. The "Understanding Technology" course was one of the pilots for using the system. As the system was new for the lecturers, support and supervision on digital course organisation and structuring was provided by advisers in the Department of ICT. In addition, technical advices were given regarding creation of video lectures.

All the course material such as lectures and exercises were published in Canvas. Each student had an individual username and password to access the system through a web portal or a smartphone application. For the eight weeks of student-centred distance teaching, each week had a specific topic where recommended reading was published together with 5-10 contextual learning tasks to be solved as an assignment. The assignments were not mandatory but recommended to deepen the students' learning progress. There were eight days to solve each assignment, and as a motivation factor the students submitting on time received individual feedback within a few days.

3.5. The Exam

At the end of the course there was a graded digital home exam for three hours. The exam consisted of four tasks with 18 associated sub-tasks addressing a problem-based application of the learning outcomes of the course.

4. Discussion

This paper has presented how the master course in "Understanding Technology" was organised and carried out in the Master's Programme in Health Informatics at the University of Agder, Norway. Regarding the research question on curriculum organization and student-centred learning, the structure with two seminar weeks and eight weeks of teaching supported by technology was evaluated as functional and provided satisfactory learning outcomes by the students, even though there was room for improvements. One of the main benefits regarding the course organisation, was the fact

that most of the students were working besides the studies and the decentralised approach took that into consideration with limited in-house classes and extended technology-supported distance learning.

Regarding the student-centred distance teaching, the opportunity for individual feedback in the weekly assignments was used by an average of 50% of the students during the semester. The rate of submitted assignments increased during the semester and was highest for the last assignments close to the exam. A constraint in the course organisation was the compact schedule of lectures during the seminar weeks, and to compensate this, the practical laboratory sessions made up a different character of the teaching process.

The main parts of the mandatory syllabus were in English, which had traditionally been in Norwegian language during the earlier years. That might have created a barrier for the learning progress of some students, as some assignments reflected use of Internet sources such as Wikipedia instead of the recommended syllabus. The reading list consisted of 20 different resources, which was quite extensive, and for next class it will be reduced.

Both lecturers were active researchers in the health informatics field, and in the lectures ongoing research projects and results were reflected and presented. The topics for the laboratory sessions and group tasks were related to on-going research projects [15][16][17], and the aim was to provide the students with the hands-on and insights on "real" problems to solve within health informatics. Regarding the exam, the main discrepancy between the learning outcomes and the results were regarding problem-based database construction, which might be a topic to exercise more in the next class. The overall aim of the course was to provide both theoretical knowledge in health informatics technology and apply the knowledge in practice through problem-solving.

As the course was targeting students at the Faculty of Health and Sports with main learning interests in technology support for healthcare and nursing, the focus of the course was to provide a technology understanding to users of technology, devices and services. The competence requirements for students looking at health informatics with the perspective to work on the development of eHealth systems, healthcare services and other support solutions would be different. Such students would require more focus on teaching of computer science, multimedia design and ICT, which would be a different type of health informatics course. Still, the transformation and digitisation of the health systems requires close cooperation of health informatics professionals with different competencies, both healthcare and technology related. Therefore, also joint teaching and cooperation in common study projects should be offered for students following the different master programs of health informatics.

This paper has some limitations, such as describing the curriculum of one single course. Also, evaluation made by the students was not included due to ethical considerations and privacy. However, the paper shares the lecturers' experiences and lessons learned from curriculum development of a highly relevant course as the health informatics area is an important contribution for improving technology-supported clinical logistics and work processes, where basic understanding of technology has a fundamental role.

Future work would include study visits to international teaching institutions providing similar courses, to learn from the experiences of other lecturers and to share own course outcomes. In addition, the International Medical Informatics Association (IMIA) recommendations and accreditation for education in biomedical and health informatics will be considered for further curriculum refinements [18][19].

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