

Development of a Research-Based Teaching Course as Blended-Learning Format in a Medical Informatics Program

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Abstract

We consider Medical Informatics programs at universities as one of the main education resources for young scientists in our field and thus present a new design for a course teaching scientific skills at the University of Heidelberg as blended-learning format. We utilize common E-learning methods and created the whole course with respect to the concept of research-based teaching. Finally, we present our lessons learned from the current conduction of the course.

Keywords:

Education, Distance [I02.195]; Teaching [I02.903]; Medical Informatics [L01.313.500]

Introduction

Medical Informatics is a scientific discipline with a variety and evolving research topics [1]. Therefore, it is an important aim of academic Medical Informatics programs to educate students to participate in scientific work. In the Medical Informatics bachelor program at Heidelberg/Heilbronn (Germany) the students have an obligational practical course where all participating students work as a research team together on an up-to-date scientific question of Medical Informatics.

Academic teaching in Germany is mostly organized on the basis of weekly classroom instruction. This format is not so adequate for a larger group of students who are working together on a project. There are times in the course of the project where intensive instruction and feedback in short intervals is necessary and there are phases in which the learners can work independently for longer periods of time. Therefore, we developed a blended-learning concept for a practical training that implements research-based learning.

Blended-learning formats are used rarely (18 % of German university teachers used such formats regularly in 2017 [2]). Therefore, a process model how to establish such a course was not available.

Methods

We used existing work from Salmon [3,4] to implement an active and social virtual learning environment (VLE). The overall design of the VLE was created following the concepts of research-based learning by Healey and Jenkins [5] and the guidelines for research-based courses from Sonntag et al. [6]. For the implementation of the VLE an existing instance of the open-source learning management system *Ilias* (version 5.3.7) was used. To measure the students learning success and the general satisfaction with the course, an evaluation will be conducted at the end of the winter term 2018 / 2019. For this evaluation a German questionnaire was created, which utilizes the F-Komp-model from Böttcher and Thiel [7], who specifically address the

evaluation of research-oriented courses. The items from the F-Komp-model were combined with the standard evaluation form of the universities quality management department.

Results

The blended-learning concept covers a 15-week term and is suited for a course which grants 6 ECTS credit points. The course is organised in weeks which include classroom teaching and exclusive E-learning weeks. The sequence of these types of weeks has to be flexible to a certain extent to allow adjustments throughout the term (see Table 1).

Structure of the VLE

During all weeks of the course the VLE is used to offer different resources, like literature, tutorials or formative tests, to the course members. The course is structured at two levels: On the first level the phases of research-based learning from Huber (see *Figure 1*) are represented as blocks in the VLE, which clearly distinguish different phases of the course from each other.

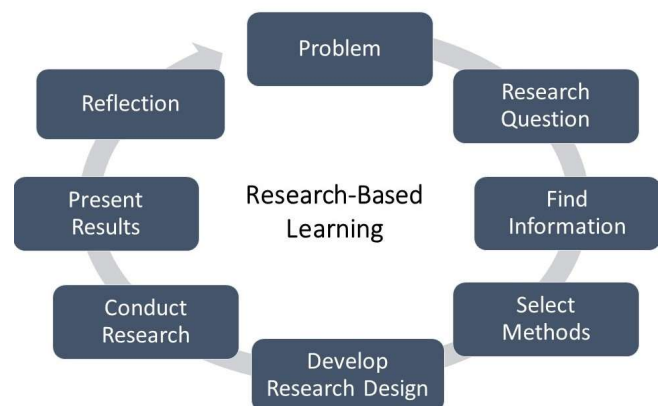


Figure 1 - Research Cycle (cf. [7])

On the second level each block uses expandable container objects for each course week. Each week consists of an overview and the actual content. The overview summarizes textually if classroom teaching takes place, which tasks should be completed and which resources are needed to complete them. The content consists on the one hand of the aforementioned resources and on the other hand of interactive online-forums. The forums are used for multiple purposes: For each classroom teaching there is a forum, which shall be used to discuss organizational and content-related matters like the absence of participants or summaries of classroom discussions. Other forums represent the so called E-tivities. They are an activating way of assigning tasks to learners, which not just motivates them to work on the task, but also fosters collaboration in a VLE [4]. This collaboration is supported by a teacher all time. According to Salmon's principles of moderating, the teacher takes the role

of an E-moderator, which is an important differentiation from the known role of university teachers [3].

The described structuring results in a course layout that is shown in Table 1.

Table 1 – General course layout

Week	Teaching Type	Content
1	E-learning	Problem: overall subject
2	Classroom	Problem: specific problems
3	Classroom	Research Question
4	Classroom	Find Information; Select Methods
5	Classroom	Develop Research Design
6-12	Flexible	Conduct Research
13	Flexible	Present Results: preparation
14	Classroom	Present Results: trial presentation
15	Classroom	Present Results; Reflection

Course Layout

The first week is used to assign the learners with reading fundamental literature to get to know to the subject of matter. To make sure everyone arrived at the VLE and worked on the assignment, each learner has to write a short message introducing himself and a short formative test about the literature has to be passed. This introduction to the VLE results in an online brainstorming for problems in the defined research field. In week two the preparations from the first week are used in the classroom to define the problems the learners want to work on. Week three is dedicated to the definition of the research question. To enable the learners to select the aims of their research, methodical skills are conveyed in the classroom, before the learners are divided into groups of 4-6 persons. These groups are supported individually afterwards. The next two weeks (4 and 5) cover a deeper enquiry in the field and the selection of research methods, which are used to create the research design for the coming weeks. These last preparing parts of the research cycle take place in the classroom, as well. Now the learners should be ready to conduct their own research project. In this extensive part of the research cycle most teaching can be done in the E-learning setting, as the learners are expected to work independently. Classroom teaching is recommended in cases where the E-moderator finds a need for face to face motivation or discussion. The last three weeks take care of the preparation and presentation of the results. First, the preparation consists of the definition of requirements for the presentation, which can be done either in classroom or in the VLE. The trial presentation and the final presentation should be done in the classroom, to create a setting, which is comparable to presentations at scientific events like conferences. Finally, the learners should be supported with reflecting their collaboration within the course.

Implementation

We implemented the course according to the introduced concept and 18 advanced students in our Medical Informatics bachelor program participate currently. They work in the field of patient participation and consider especially application components supporting this paradigm. Selected research questions are: “Which requirements exist for application components that support patient participation?” and “Which software solutions and frameworks are currently available, to support patient participation?”.

Conclusions

Generally, we found a higher workload for teachers of a blended-learning course, because the contact time with learners

is not limited to fixed appointments in a work week but open for contact whenever it is needed. Furthermore, the configuration and preparation of the E-learning environment is more demanding than the preparation of materials for classroom teaching. In return, it is possible to achieve a much closer mentoring of the learners while they go through the research cycle. As this is the first time the course takes place, we expect a reduced workload for future terms, because it was implemented as a general concept, which can be instantiated by each year’s individual Medical Informatics research question.

With a focus on optimized results of the research projects the time constraint of a university term limited to 15 weeks is challenging, because especially the first phases of defining a research question and creating a research design have a varying demand of time. The VLE helped us to closely accompany the students in this crucial phase of the project.

When term’s lecture period ends in January we will evaluate the course with the tools mentioned. The evaluation results will be presented on the poster and we will use them to revise the concept for the next group of students.

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