

# The HiGHmed Didactical Framework for Online Learning Modules on Medical Informatics: First Experiences

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**Abstract.** Within the HiGHmededucation consortium various online learning modules shall be developed by members of the consortium to address the increasing need for skilled professionals in a networked and digitalized healthcare system. Transferability of these modules to other locations is one main objective for the design of online learning modules. Thus, a didactical framework for online learning modules was developed. To ensure feasibility of the framework, the participating universities were analyzed concerning availability of e-learning support structures and infrastructures including learning management systems (LMS). The analysis especially focuses on the various LMS learning tools and their suitability for the framework. The framework is the basis for 12 HiGHmededucation online learning modules of which a part has firstly been conducted in winter 2019/20 and leads to a comparable structure of the modules.

**Keywords.** Medical Informatics, Online Learning, Education, Health Care

## 1. Introduction

As part of the Medical Informatics Initiative (MI-I), the German Federal Ministry of Education and Research (BMBF) supports four consortia to develop structures and technology which meet the requirements for exchanging and analyzing data from clinical research and health care across different sites. One objective of the MI-I is the training of specialists to address the risk of an increasing shortage of skilled professionals in medical informatics (MI). In addition, health care professionals and patients need training to gain digital skills needed to face the digital transformation in health care. HiGHmed is one of the funded consortia [1]. The HiGHmededucation program aims at

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developing online learning modules at currently 14 universities to address the MI training needs of an increasingly networked and digitalized healthcare system. To enable the combination of these modules in a HiGHmeducation certification program and their use at different universities a common and transparent didactical framework is needed. That must consider state of the art online teaching requirements which promote communication and cooperation between learners as well as the construction of new knowledge through work tasks as the main factors for successful e-learning [2][3]. This paper presents the didactical framework that has been developed for the HiGHmeducation online modules and discusses its use for the conduction of 8 modules in the winter term 2019/2020. But besides a suitable didactical framework, creating online courses requires technological support. In order to define online tools suitable for implementing the didactical framework and to ensure feasibility of the online modules, the availability of learning management systems (LMS) and e-learning support structures at the participating universities was evaluated and an overview of available digital learning tools in current LMS was created.

## **2. Methods**

### *2.1. Evaluating of available e-learning software and support structures*

In a survey to gather information about utilized e-learning software at each participating university information was captured on the available LMS, the department responsible for operating the LMS as well as information on the local integration of the authentication mechanism by the German DFN AAI infrastructure [4] allowing students to use LMS at other universities.

### *2.2. Development of a didactical concept for online learning modules*

Starting point of the development of the didactical framework is the HiGHmeducation module catalogue. This catalogue is a competence-based description of the set of modules offered by HiGHmeducation. For the development of the didactical framework, a group of experts experienced in online based teaching exchanged information with other e-learning experts, organized workshops and took part in e-learning training courses. Based on these experiences and in consideration of the already existing module catalogue, a didactical framework for the online learning modules was developed.

## **3. Results**

### *3.1. Available e-learning software and support structures*

When the survey was started, 11 universities were part of the consortium. Each of them has at least one and a maximum of three e-learning related service facilities. The facilities have 7.4 employees on average, while this number ranges from 3 to 15. The services of all facilities focus on the counselling and training of lecturers for the production and utilization of e-learning content and the operation of the LMS, which includes hosting and administration as well as first level support. Rare offerings are in-house development

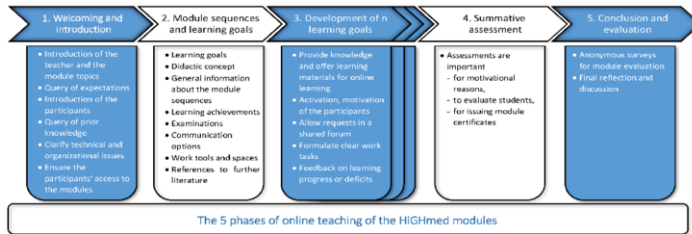
projects and dedicated services for e-assessments. The main LMS utilized at the universities were ILIAS, Moodle and Stud.IP. Some universities utilize more than one LMS. In order to enable comparability of the different LMS, a list of available digital learning tools like wikis, blogs, forums as well as assessment tools like portfolios, tests and surveys has been created. In total, 29 different digital tools were identified. Each tool was mapped to the corresponding tool of the three LMS, if one exists. Additionally, a description of the functionality of the tools was added. The mapping shows that not all LMS offer all 29 digital learning tools. The system with the highest coverage features 97 % of the digital learning tools (see table 1).

**Table 1.** Coverage of the 29 digital learning tools in different learning management systems

Learning management system	Number of digital learning tools	Coverage
ILIAS 5.3.7	28	97 %
Moodle 3.5	27	96 %
Stud.IP	11	41 %

### 3.2. Didactical framework for design and implementation of online learning modules

The framework describes a basic didactical procedure in which each module consists of five phases (see Figure 1). These phases aim at activation of the learners, knowledge transfer, self-directed processing of learning tasks, learning success control and feedback. In each phase digital learning tools can be used to promote a sustainable learning success by motivating learners to interact with the subject matter and by enabling communication and collaboration between learners. A significant approach incorporated in phase three is the use of so called e-tivities, a concept developed by Salmon [5]. E-tivities are a special kind of exercises used in the context of online learning and collaboration.



**Figure 1.** Phases 1 – 5 of the common didactical framework for HiGHmeducation modules

The framework was the basis for the development of 12 HiGHmeducation online modules which were conducted initially as part of a study program at one of the universities. Beginning with the next term the modules are open for interested learners in the healthcare domain of all universities of the HiGHmeducation consortium. The ECTS offered for the courses range from 1 to 6, target groups are students and scientists in the fields of medical informatics, medical information management and medicine as well as healthcare professionals [6].

## 4. Discussion and Conclusions

At all participating universities, LMS and support structures for the implementation of digital learning offerings are available. This corresponds to the results of Back et al. In 2013, they asked 48 medical faculties in Germany, Austria and Switzerland about their e-learning activities [7]. 34 faculties participated in the survey, 97% use at least one LMS

and each of them had support structures. The surveyed universities named the LMS Moodle, ILIAS and Stud.IP. These systems are among the most frequently used LMS in Germany, according to a survey of 204 universities in 2015 [8]. Our comparison of these LMS also shows that many different digital learning tools - in minimum 11 - are available (cf. table 1). Not all digital learning tools are available in each LMS, it is often possible to add them through plugins. Thus, the implementation of digital learning opportunities seems not to be a technical problem at any of the participating universities. In order to enable competence acquisition at a higher level not only the technical side of online learning must be taken into account. Rather, digital learning offers are necessary which enable social interaction and a constructive examination of the learning material. For Kerres and Schulmeister, communication and collaboration in digital learning processes play an important role [2][3] and Ammenwerth and Hackl [9] have shown that the use of e-tivities [5] can stimulate these communication processes. Our didactical framework, including a matrix of available digital learning tools, provides a tool to design online learning modules. Through this framework lecturers and students have a similar didactical approach to the modules, even if using different LMS. Despite the standardization, the framework offers lecturers sufficient opportunities to design their courses individually. The first conduction of online modules in 2019/2020 demonstrates the usability of the framework, but further steps are necessary to evaluate its effectiveness, to ensure inter-institutional transferability and to clarify regulatory issues. Online learning offers a variety of possibilities to support learning. A common didactical framework aims at designing online courses that follow a comparable structure. Such a framework is an important step towards the cross-location use of online learning offers.

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