WHELP: Web-Based Holistic E-Learning Platform

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Abstract: In education, finding the appropriate learning pace that fits to the members of a large group is a challenging task. This becomes especially evident when teaching multidisciplinary subjects such as epidemiology in medicine or computer science in most study programs, since lecturers have to face a very heterogeneous state of previous knowledge. Approaching this issue requires an individual supervision of each and every student, which is obviously bounded by the available resources. Moreover, when referring back to the second example, writing computer programs requires a complex installation and configuration of development tools. Many beginning programmers already become stuck at this entry stage.

This paper introduces WHELP, a Web-based Holistic E-Learning Platform, which provides an integrated environment enabling the learning and teaching of computer science topics without the need to install any software. Moreover, WHELP includes an interactive feedback system for each programming exercise, where lecturers or tutors can supply comments, improvements, code assistance or tips helping the students to accomplish their tasks. Furthermore, WHELP offers a statistical analysis module as well as a real-time classroom polling system both promoting an overview of the state of knowledge of a course. In addition to that, WHELP enables collaborative working including code-sharing and peer-to-peer learning. This feature enables students to work on exercises simultaneously at distinct places. WHELP has been successfully deployed in the winter term 2013 at the Cologne University of Applied Sciences supporting the 120 students and 3 lecturers to learn and teach basic topics of computer science in an engineering study program.

Keywords: E-Learning, Real-time Feedback, Collaborative/Peer-to-Peer Learning

1   Introduction

Multidisciplinary subjects are part of any study program. Computer science is one common example. Nowadays, almost any program includes some aspects of computer science. Observable initial hurdles faced by the students in this context include issues related to the installation, setup, configuration and use of tools needed for the practical exercises. Consequently, the students lose time and perspective, before they can start with the actual work on the course contents. The lecturers and tutors on the other hand have to deal with very different educational backgrounds as well as wrong expectations

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regarding the multidisciplinary subject and its relevance to the primary subject.

Moreover, available e-learning platforms are often enough not specialized or focused in a way required to support the students in their learning process. The deployed and used functionality essentially boils down to the provisioning of lecture and exercise artefacts. This emphasizes the demand for an integrated environment that guides first-year students into the topics of a multidisciplinary subject by offering a comprehensive platform supporting them actively in mastering their challenges. In this paper, such a holistic platform is introduced and evaluated with a specific focus on computer science as multidisciplinary subject and an introduction to computing programming in particular.

2   WHELP

The introduced platform – denoted as WHELP – is an interactive and collaborative e-learning platform. It has been implemented as a web application and can thus be used with any web browser without any prior installation. As being a web application, WHELP supports the increasing students' needs for time- and location-independent learning. Through responsive design, the environment is accessible on any device. WHELP includes specific plugins to teach and study computer sciences topics in a problem-based manner. A common example is computer programming. WHELP contains innovative browser-based source code editors similar to the solutions of Khan Academy [Ac14] and Code Academy [SB15]. These editors execute the code instantly. Thus, the programmer receives immediate feedback on his actions. This renders the effect of the entered code more comprehensible. In addition to the writing of computer programs WHELP also supports code reviewing. Reading and commenting the program code of a fellow student improves the own coding skills. Beyond that, learners do not necessarily individually edit tasks. The most important feature of WHELP lays in the ability to pair course participants in order to support the simultaneous collaborative work on problems. Depending on the given learning context, the pairs can consist of one student and one lecturer or tutor as well as of two students. To invite fellow students a generated link to a certain learning context within WHELP needs to be exchanged, e.g. by using the build-in chat system. The students can arrange groups individually by themselves creating a form of virtual social classroom [Wa15]. Furthermore, WHELP offers a number of interesting new features for lecturers. The statistics module provides detailed real-time feedback related e.g. to the processing state of a particular exercise or the time required to solve a certain problem. By this, lecturers get to know the individual constitution of each course and are hence empowered to set adequate focal points. A further feature is a real-time classroom polling system following the approach of PINGO [Re12]. Moreover, WHELP can be understood as a tool for guided self-organization. Learners must develop knowledge through their own actions, so that knowledge not be transferred from lecturers to learners [Fr12]. In this way students develop content through WHELP before they attend the lecture. Due to this resulting feedback lecturers might be able to prepare their lectures particular to the needs of their students. Finally, WHELP can be used as market-

place where learning content can be provided, so that lecturers are able to search for their own course for matching learning content with solutions. WHELP has been launched at the start of the winter term 2013/2014 at the Cologne University of Applied Sciences and has been used to support a first-year program on computer science.

3   Conclusions

Primarily WHELP aims to assist learners in their effort. For this purpose innovative tools are provided by which learning content can be developed in form of problem-based tasks. Particularly in computer science students are often overwhelmed at the start of their studies due to a complex installation and setup of development tools. In this context WHELP simplified the start into computer science. WHELP was approved with more than 120 students of the lecture "computer science 1" of the bachelor degree course media technology. Additionally, the live realtime feedback was used by several lecturers in other lectures. Consequently, the ability to run of WHELP has been confirmed. Students and lecturers were quite impressed of the offers of WHELP and would like prefer this way of working instead of the conventional way. The potential of whelp has not been fully explored. For instance further features could be the implementation of gamification aspects, whereby WHELP might be get more attractive. Gamification aspects ought to maintain the motivation of students permanently high. An extension of the supported programming languages as well as the production of videolectures for specific topics. In summary, for teaching WHELP offers very much potential and can be used in other areas outside of computer science such physics, mathematics or electrical engineering, too.

References

[Ac14]   Academy, Khan: You only have to know one thing: You can learn anything. Website, 2014. Available online at: https://www.khanacademy.org/.

[Fr12]   Frank, St.: eLearning und Kompetenzentwicklung - Ein unterrichtsorientiertes didakti-sches Modell. Verlag Julius Klinkhardt, 2012.

[Re12]   Reinhardt, Wolfgang; Sievers, Michael; Magenheim, Johannes; Kundisch, Dennis; Herrmann, Philipp; Beutner, Marc; Zoyke, Andrea: PINGO: peer instruction for very large groups. In: 21st Century Learning for 21st Century Skills, pp. 507–512. Springer, 2012.

[SB15]   Sims, Zach; Bubinski, Ryan: Codecademy - Learn to code interactively, for free. Website, 2015. Available online at: http://www.codecademy.com/.

[Wa15]   Walber, Markus: Konstruktionen virtueller Lernräume. Lernräume – Gestaltung von Lernumgebungen für die Weiterbildung, pp. 219–230, 2015.