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Individualize learning through gamification and real-time dashboards

Lecturers can track the development of a course in real-time, while students have access to their progress with an individualized dashboard. The bonus system honours student activity by providing additional services and material.

Over the past 10 years, we have created engaging self-learning materials and a motivating didactical model to teach our first semester natural science students in computer science, which opens the possibility to discover important basic digital literacy competences on a scientific level. The aim of this project is to investigate how we can provide our learning materials and services for different student groups (e.g. novices, advanced, repeaters, etc.) on the basis of data from learning analytics. In order to achieve this goal, we have planned three complementary activities: Firstly, a gamification concept in the form of a bonus system is to be implemented for our courses. The idea is, that active learners are provided with attractive materials and services (e.g. repetition questions, mock exams, possibility for a preliminary grade, personal feedback on current performance, etc.) depending on their learning activity. In a second step, a student learning dashboard will be developed which is based on data from their learning analytics. It allows the visualization of the individual learning progress in small steps, so that even short activities lead to visible progress and put them into the context of the courses' learning goals. Thirdly, another dashboard helps the lecturers to monitor learning progress of large distributed cohorts in real-time. As a basis for the above-mentioned developments, a framework for learning analytics has to be created, which allows the collection and aggregation of student data from different data sources. This new structure could be of broad interest for many lecturers and learning professionals at ETH.

Success factors

Interesting and motivating high-quality self-learning units and an appropriate, effective didactic concept awarded with the KITE award 2018, already exist. They are proven and tested in practice in large scale first semester classes. The corresponding exam questions are reliable and valid. Evaluation instruments and the baseline of the key indicators are well known (long-term measurement). We are able detecting changes and responding appropriately if necessary. The project team has in-depth knowledge in learning analytics, data mining, data science, software development, teaching at large scale and project management. Together with the project partners, we are able to implement the project at a highly professional level. This project is broadly supported by lecturers and learning professionals from different departments.

Innovative elements

- *Real-time learning analytics*: Use of aggregated student data to develop and optimize learning materials in big distributed learning systems. Real-time analytics allows immediate feedback and interventions if necessary.
- *Implementation of a bonus system at large scale in first semester computer science-service courses*: This increases self-responsibility in the transition from high school to university. The bonus system should also help us to keep the dropout rate at a low level.
- *Pursue a gamification concept in three undergraduate courses*: reward active learners with additional learning materials and services as soon as they reach