

The Lea's Box Project

Lea's Box stands for a Learning Analytics Toolbox. The fundamental idea of Learning Analytics is to gather data about student characteristics and student performance and to reason over the data in order to gain deeper insight into learning processes, to better understand students' needs or to enable a forecast of learning outcomes. There is a number of Learning Analytics solutions available, however, many of them are tailored to online learning scenarios where rich data is available. In the very heart of Lea's Box is the goal of supporting classroom teachers who are operating in situations which are less suitable for data analytics. Formal classroom education is still a data-lean, analogue process and digital data are collected rather sparsely. If they are collected, oftentimes this happens unsystematically and with a multitude of unconnected data sources. Solutions to support teachers and educators in their daily routines must allow for an easy linking of scattered, incomplete, and messy data with the goal of providing a more holistic insight into learning processes, individual strengths and weaknesses, possible competence gaps, and needs. Lea's Box offers a modular and service oriented solution in form of a central system that allows connecting all sorts of external data sources via a simple open interface as well as the current quasi standard xAPI. The diverse information are linked to competency models and interpreted on a theory-driven basis.

Lea's Box provides analytics services on the basis of Competence-based Knowledge Space Theory (CbKST) and Formal Concept Analysis (FCA). These frameworks have a long psycho-pedagogical tradition and offer non-numerical, combinatorics approaches to modelling competencies (viewed as atomic units of aptitude), the relationships between them, and their characteristics. On such theoretical foundations Lea's Box provides structural interpretations of a learning domain (the so-called learning spaces) that identify individual learning states, paths, and prospects. Available data sources, no matter if this is a Moodle course, a learning game, or a teacher's personal assessment, can easily be linked to the central competence model and serve as evidences for learning progress. The frameworks operate on a stochastic level so that evidences influence the results of analyses and assertions only cautiously. The possibilities of incorrect data interpretations, accidental errors, or lucky guesses by the learners are always considered with certain likelihood.

The results are not only displayed in form of typical dashboard-style charts, but also in form of structural, directed graphs. These visualizations are innovative approaches to visualizing learning analytics that – although being complex to read – hold a multitude of relevant information. Most importantly, Lea's Box offers Open Learner Modelling (OLM); the results of analyses are not only displayed in multiple and adaptable forms, the method opens the procedures with which the results have been aggregated and calculated to teachers and learners. By this means the transparency and credibility of analyses can be increase substantially.

To provide a surface for the underlying analytics and visualization services, Lea's Box deploys a web portal that features not only the core functionalities but also a set of handy internal tools for teachers and a comprehensive configuration and administration tool. The functionalities and the design have been elaborated in close cooperation with teachers from European countries. In the course of the 3 year project, the system has been piloted and re-designed iteratively. Pilot and evaluation studies have been organized in the partnering countries Austria, the Czech Republic, Germany, Turkey, and the United Kingdom. The results emphasize the strengths and added values of the innovative approach to Learning Analytics developed by Lea's Box.