EDUMONDO Data-driven improvement of education

SMART CAMPUS CAMPUS HERNING BRIZE

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AARHUS BSS

Edumondo

Abstract

Our idea is Edumondo, which is a conceptual Learning Analytics System (LAS) assisting students, teachers and institutions in continuous self-improvement. It provides these insights, based on analyzing and visualizing data obtained by tracking individual performance using emerging technologies and the integration of Learning Management Systems (LMS) such as Blackboard.

The scale of such project is immense, but if BTECH wants to be a front-runner, they have the perfect condition for being the testbed for such initiatives on behalf of Aarhus University.

Edumondo is a vision for the future of education, but there are challenges, both technological and ethical, to overcome. Hopefully, this submission will kick-start the crucial discussion on how data should shape the future of education.

This idea is proposed by two students from the master program Technology based Business Development.





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Excellence

Education has always been a black box, in the sense that it is a process, where the inputs and outputs are known, but the inner workings are not very well understood. Edumondo is our idea of how we might utilize emerging technologies to look into this black box, in order to understand and improve how to teach and learn at a modern university campus. Edumondo is a pseudonym for a conceptual Learning Analytics System (LAS), that was proposed as the result of a Technology Specialisation (TS) project on the TBBD master programme. The core idea is for Edumondo to provide students, teachers, and institutions with insights, triggering new reflections resulting in positive continuous self-improvement, these insights are based on data collected from various sources. The system does two things: data integration and learning analytics. Edumondo creates a datadriven understanding of what happens during learning activities, by integrating with various data sources like Blackboard, Mentimeter, Peergrade, and AUs School Information System, and matching these with data from the Internet of Things (IoT) sensors and students filling out confidence-based self-assessment following learning activities.

The possibilities of what can be tracked are comprehensive and expanding with the development of new technologies within fields like speech and facial recognition, environmental sensors, and biometrics. A practical example of how learning analytics will revolutionize education is illustrated by the work of Finnish professor, Sami Suhonen, who could predict exam passing, based on the student's engagement with the digital course content. Suhonen analyzed the correlation between watch time on course videos and exam passing ("Learning analytics in TAMK", YouTube). The potential for learning analytics is much higher. With tools such as artificial intelligence, specifically machine learning, the Edumondo platform could offer predictive capabilities. Imagine being able to predict the effectiveness of lectures based on uploaded course material, or even failure probability of students based on their performance. Edumondo should visualize what the individual, on a practical level, can do to improve their performance. This visibility allows for systematic interventions in either the students approach to learning or the teacher's approach to teaching. The intervention should of cause be driven by the individual's own desire to self-improve, but Edumondo helps them track the effectiveness of these interventions.

As part of the TS project, the two central processes in such a LAS, tracking experiences and triggering reflection, have already been prototyped in the educational setting at BTECH. The project documented a significant willingness from the participating teachers to track and systematically improve upon on several core educational factors such as lecture outcome, student engagement and teacher speech performance.



The Individual

Illustration of the Edumondo feedback loop

Edumondo

Impact

Education is a core pillar of our society and has a significant impact on modern life. 62 % of Danish children, that started in primary school in 2014, are expected to complete higher education. When first joining the workforce, these young individuals have already spent at least 15 to 18 years, of their lives, in the educational system. Edumondo will impact how students, teachers, and institutions in collaboration improve the quality of institutionalized learning. Quality refers to the efficiency of education, meaning how much learning output per input (i.e. hours spend) or as the quality of graduates, meaning the amount and depth of the subject matter learned by the graduating students.

There are many stakeholders in improving this quality. The solution's target groups are students, teachers, and the institute, but with the Aarhus University setting the direction and providing funding. The societal stakeholders would be politicians, regulators, and representatives from the businesses, that are hiring the graduates. The opportunities for big data analytics would likewise have a significant impact on educational researchers.

Impact on Teachers

Edumondo should fundamentally be seen as a tool that helps the teachers be the best version of them self, both before, during and after teaching activities. In preparation for lectures, Edumondo could provide inspiration on best practices from other teachers, for example, suggest curriculum or colleagues to collaborate with.

During lectures, Edumondo could provide teachers with live assistance, highlighting the need for breaks and in similar ways optimize the conditions for learning. Edumondo could provide teachers with insight on verbal communication, using voice analytics to avoid too low volume or unclear speech.

After lectures, Edumondo assists the teachers in investigating what worked and what did not during previous lectures. It provides an overview of the students current understanding of the different subject areas highlighting the need to revisit difficult areas during upcoming lectures or assignments. The teachers should be allowed to scale the use of Edumondo based on their own willingness to get feedback, for example, adjusting the frequency of sampling course satisfaction or whatever the teachers wants the students to provide feedback on.

Impact on Students

Edumondo should be an integral part of the student's experience from the first day at BTECH. Similar to how it is for the teachers, the tracking might not always be voluntary, but the feedback should be. The students could, for example, agree to time tracking on their educational effort - allowing them to compare their time spent on a course or a study programme to their class average or maybe even the average for BTECH.

Over time Edumondo analyze the students' learning practice and provides suggestions for changing unproductive habits and improving learning outcome. For example, the system could suggest difficult areas in the curriculum, preparing the students.

During the lectures, the current state of the conditions for learning should also be accessible for the students, making it a shared effort between the students and the teachers to improve upon these conditions. Edumondo could identify low concentration or too much noise in the classroom. Edumondo should in this way continuously reinforce the students' notion, that they are themselves ultimately responsible for learning and give them a suggestion for how to improve how they do that.



Edumondo

Impact on the Institute

Edumondo also offers a lot of potential for the institution in managing the quality of their programmes. Traditionally, there has been a large reliance on course evaluation and grades in evaluating courses.

With Edumondo the goal is to offer a more detailed foundation to evaluate and improve upon. This could encompasses the identification of unsatisfactory facilities based on data from environmental sensors, but also unsatisfactory student and teacher performance. The institute can initiate interventions in instances where the system detects unhealthy trends in lecture effectiveness. These interventions are planned based on analysis, accounting for factors like teacher performance but also student performance.

Edumondo is not a performance management system and it is central that the institute avoids alienating the trust in, that the teachers do their best, and have the students best in mind, but should not overlook the emerging opportunities for improvement.



Mockup of Edumondo's teacher dashboard





Break assistant

Environmental sensor

Prototypes

As inspiration for further development of a LAS, there was, as part of the TS project, developed two prototypes and several mockups for the Edumondo platform. These were made in order to validate different key aspects of the proposed Edumondo platform.

The break assistant visualizes the time since the last break, using LEDs, to reinforce healthy break structure during lectures. The environmental sensor tracks different learning conditions in the classroom. The mockup illustrates how a teacher dashboard could look.

Implementation

An initiative like Edumondo aligns perfectly with 2018 to 2023 Educational IT strategy of Aarhus BSS, specifically categorized as a technology that supports both the in-class and out-of-class learning experience.

Implementing Edumondo with all the presented features would be a monumental task for BTECH to do on their own. The idea is therefor for BTECH to become the AU BSS testbed for digitization of learning activities and deployment of learning analytics, in direct compliance with the Educational IT strategy. In terms of technology readiness, the core functionality is already feasible, with parts of the solutions already available as stand-alone solutions. The more advanced technologies for data collection and analysis might be a few years into the future.

As an example, BTECH could already now deploy solutions that could help teachers improve their speaking volume, speed, and clarity, while the paradigm shift occurs when AI is mature enough to understand what is happening in the classroom and the context of the lecture.

There are low hanging fruits to be had now and significant future potential, therefore we propose that Edumondo is developed in incremental steps and with an agile approach, where the focus is continuously on what would create the most value right here and now for BTECH.

Edumondo

In practice, we propose BTECH begin the journey with the following:



Involve stakeholders in exploring data collection opportunities and the ethical, technological and legal limitations

The collection of data and tracking of individuals poses clear ethical concerns, which must be addressed for Edumondo to become a reality. There needs to be a public discussion on what data to collect, and how this data is stored and used, minding GDPR and information security. Driving this inquiry could be research projects on campus. The motivation for implementing Edumondo is the improvement of learning and therefore justifying the collection of data as long as participation is on a voluntary and informed basis, while data is protected and anonymized.



Digitizing learning activities

In order to enable data collection, and analysis, it is a prerequisite that BTECH starts digitizing the learning activities. This could initially include the recording and publishing of all inclass sessions, which would allow for tracking the digital footprint (i.e. views, watch time, playback location) of students. While BTECH already utilizes existing digital learning tools (i.e. Blackboard, Peergrade, and Mentimeter), the use of these needs to be increased and an effort to systematically collect data from these must be established. Further, we suggest that BTECH starts implementing confidence-based self-assessment, where students throughout the semester evaluate their own understanding of the core themes of the course. This could be combined with a per lecture feedback system for both students and teachers. Finally, this digital tracking approaches should be supplemented by the deployment of environmental IoT-sensors in all facilities. All these efforts should be in collaboration with the AU Centre for Teaching and Learning and under the umbrella of the AU BSS IT Strategy.

3

Experiment with visualization and analysis of data

Students, teachers, researchers, and administrative staff should be involved early on in exploring how to extract meaning from the data collected from all these different sensors and services. It is a new frontier, where good ideas can be crowd-sourced.



Establish a Technology Roadmap

BTECH or the forces driving the implementation should develop a roadmap, containing what tracking and analysis capabilities the campus wants in the future, with the proposed technological solutions and a timeline for testing, implementing and scaling these. This is in order to ensure that the right capabilities, mindset, and resources are available going forward. This could include ensuring the right IT infrastructure to handle the data management and integration requirements for implementing and testing different solutions and technologies.