
Visualizing online (social) learning processes – Designing a Dashboard to support reflection

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Abstract. Learning analytics, as a means to visualize learning, has been repeatedly suggested to enhance learners' and teachers' self-reflection in online learning processes. Departing from this notion, we propose a combination of this visual approach to learning analytics with the concept of social presence, thereby acknowledging social aspects of online learning processes that are often overlooked. More specifically, we present the considerations and design of a dedicated dashboard that supports self-reflection by visualizing (social) online learning processes. The approach is based on our belief that visualizing learning by itself does not automatically lead to self-reflection and awareness among students and teachers. Instead, organizers and instructors of learning activities need to be conscious about the social aspects of learning.

Keywords: Dashboard, reflection, social learning, online learning, awareness, visualization, learning analytics, social presence

1 Types of Learning Analytics – A German Perspective

The current discussion on learning analytics is based on two main approaches: The first approach focuses on the possibility of using learning analytics as a means to visualize learning, create awareness and stimulate self-reflection [1, 2]. The second approach centres around the idea of stimulating learning through programmed instruction (e.g. adaptive systems) by guiding learners through the learning process [3, 4]. Hence, it can be stated that the role of technology within these two approaches is different. While the latter approach assigns technology a more active role – intervening and guiding the learning process – the prior approach focuses more on technology as a formative tool – visualizing the learning activities in order to stimulate reflection and awareness of the underlying learning processes [5].

When considering the German discussion about this topic, the technology-driven approach is widely criticised and often even rejected as a methodological approach to inform students and teachers. Among the most commonly mentioned reasons for this position are concerns about privacy issues and, more importantly, doubts about employing an automated system to influence and intervene into the learning process of individuals. Consequently, the visual approach to learning analytics appears to be a more promising point of departure

when considering the implementation of such systems in a German context.

Dashboards are a frequently used and investigated tool in learning management systems to visualize learning activities. They consist of dedicated pages or areas within the system mirroring the personal learning process and thereby contributing to the perception and reflection of underlying learning processes. [6] Moreover, departing from the community of inquiry framework (CoI), it is possible to make other participants in a learning environment visible at all three levels: cognitive presence, social presence and teaching presence [7].

However, we believe that visualizing learning by itself does not automatically lead to self-reflection and awareness among students and teachers. Instead, drawing on recent concepts of online learning, like the CoI or the 3C model, the social dimension of learning might need to be emphasized more strongly. Accordingly, we argue that organizers and instructors of learning activities need to be conscious about the social aspects of learning. Many systems seem to focus on the interaction between the learner and the technology (e.g. often the Learning Management System wherein the learning activity is hosted and provided). We propose to extend this approach and to also incorporate the social aspects and interactions between learners in the visualization of learning, thereby providing a more complete representation of the underlying learning processes. It is the aim to contribute to the personalization of a learning environment [8].

Both concepts, the CoI as well as the 3C model, distinguish between three aspects of learning. While the CoI model focuses on three kinds of presence, namely teaching presence (e.g. direct instructions), social presence (e.g. emotional expressions, group cohesion, open communication) and cognitive presence (e.g. triggering events and exploration) [7], the 3C model has a somewhat different focus. Following this model, an online course consists of content (e.g. various kinds of presenting information), construction (e.g. learning tasks) and communication (e.g. video conferences, chats and/or forum discussions) [9]. To some extent, those models share the same perspective on online learning: beside emphasizing the social dimension of learning they mention its cognitive component, as well as the need for instruction. Accordingly, dashboards to mirror a social learning processes consists of three components containing visualizations of those dimensions.

Previous research explored a link between social interaction in learning management systems (LMS) and learners' social presence. Among others, Hölterhof and Rehm (2016) combined the results of social network analysis and social presence, in order to determine learners' position within a communication network and relating this to their (social) experiences within the LMS in question. More specifically, the authors were able to unveil different dimensions of social presence, especially pointing towards positive as well as negative social emotions. While research often focuses on positive emotions, both sides of socio-emotional awareness of other learners are important for a technology enhanced social learning process, especially if learning is considered as an inquiry process. [10]

Following this approach of not assessing learners experience of social presence but to visualize the social heterogeneity of learning as a group inquiry process, the advances of learning analytics turns towards transparency in providing these type of results to all relevant actors in the learning process (e.g. learners and teachers).

In order to take into consideration both the course structure on the one hand and social processes within the structures on the other hand, we develop a dashboard based on the aforementioned 3C-model.

2 Designing a Dashboard to Visualize (Social) Learning Processes

Departing from the aforementioned considerations and stipulations, we identified a high potential for a technology based solution to support and raise awareness in the context of enabling social presence (experiences). Consequently, we are in the process of designing a learning analytics dashboard, which is envisioned to become a feedback instrument, supporting learners in self-reflecting their learning progresses. The dashboard is integrated in a social learning management system based on the content management system (CMS) Drupal®, which is enriched by numerous features to enable communication and collaboration between learners and teachers [11, 12]. The system is further extended by a range of customized modules that visualize the underlying social and cognitive learning processes. Drawing on the 3C-model of online learning, digital learning contains of three different types of structural elements: content, construction and communication. The dashboard depicts all three elements of the model and is based on a selection of different applicable variables. The selected variables per category arise from the various affordances that the LMS offers. The content component visualizes the usage of learning materials available to learners, like text documents, interactive trainings or videos. Especially clicks on learning materials are considered to represent its usage. The constructive component mirrors learners' behavior in relation to the learning assignments. Visualizations within this component present the number of learning tasks per course unit, the number of submissions per task and the number of tries per person in order to solve a learning tasks. The communication component can be considered as rudimentary perspectives on social structures similar to what social network analysis investigates. They offer interpersonal communication, including number of posts in a discussion forum, comments per post and a distribution of posts per role (teacher and learner). Table 1 gives an overview of other variables, which will be presented within the dashboard.

In order to enable a possible transfer of the dashboard into other CMS and LMS (e.g. Moodle), the chosen variables and database structure have been constructed to enable this interoperability.

“Content” variables	“Construction” variables	“Communication” variables
Number of learning materials	Number of learning tasks	Number of discussions/ posts
Usage of learning materials	Number of submissions per learning task and person	Number of comments per post (in average)
Proportion of usage	Table: Number of tries per person in order to solve a learning task	Distribution of posts per role (teacher / learner)
	Number of persons per number of completed learning tasks	Percentage of posts and comments per role (teacher/ learner)
	Number of persons who only needs one try to pass the task	Wordcloud with frequent words

Table 1. Dashboard variables

The dashboard will be piloted in the context of two online master study programs at a German University, which are designed as in a blended learning course format. The programs focus on online-learning- periods, which last at least nine weeks and up to twelve weeks in which three weeks form a unity. During this time, participants communicate with each other and engage into learning activities within the applicable LMS. Ultimately, the goal of this instrument is to stimulate course (activity) by enhancing transparency of (social) learning activities at different points in time. After each three-week course unit, students and teachers will be able to voluntarily access the current visualization of what activities took place. This in turn creates an opportunity for all participating actors (e.g. learners and teachers) to self-reflect about their learning behavior. It also relates effective data to previous points in time as well as previous courses. A visual representation of an initial wireframe is provided in Figure 1 below.

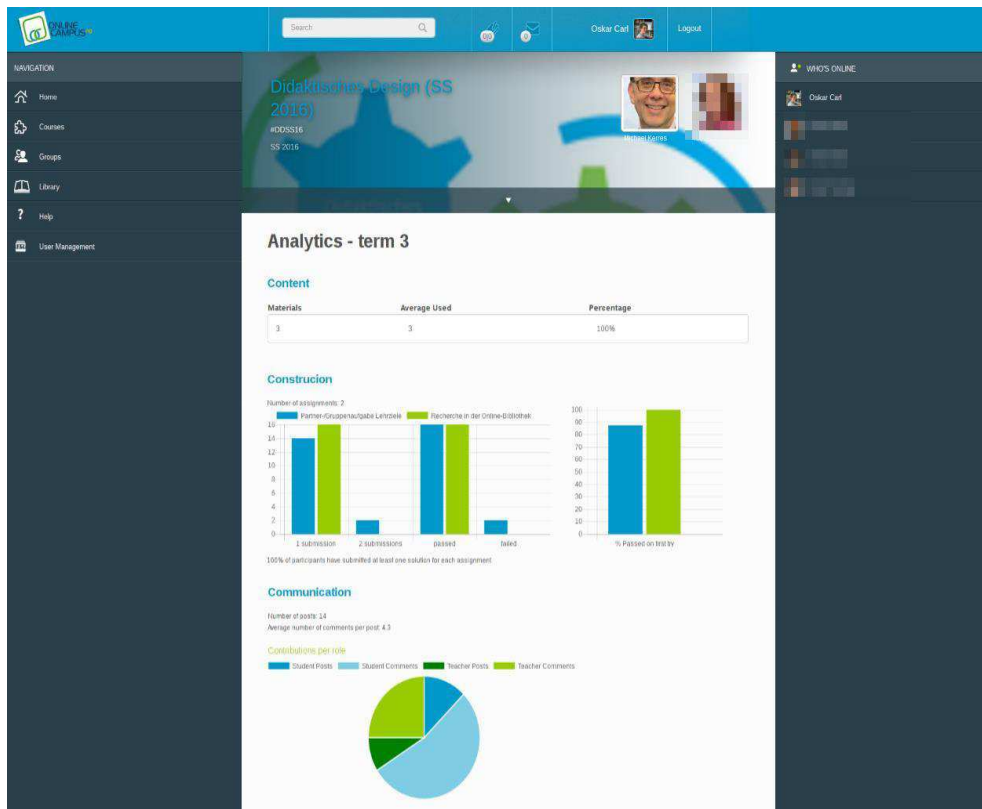


Fig. 1. Initial Wireframe of Dashboard

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