

Development of the Dashboard System for Teachers to Perform Effective Indication of the Learning Data Analysis

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Enormous learning history data have been brought by e-Learning teaching materials and Learning Management System (LMS). Through this technical method, teachers can obtain the learning situation of one or more students by the analysis of these data and also encourage them with instruction based on an education model [1]. There are various approaches to utilize the learning history data and processing related to LMS have been researched in many educational institutes for the effective learning of the students. For example, the recommendation of the teaching materials, the improvement of the contents and the instruction method, and the construction of new education technique using Information-Communication Technology (ICT) are representative approaches of the utilizations.

In our group, we have developed a dashboard system on LMS. This system shows the analysis of the learning history data to the teacher effectively and reminds what to do to the teacher. A typical dashboard system in the daily life is the meters which is in front of the driver of a car. By the dashboard, the driver can control the car appropriately while recognizing the drive situation intuitively and instantly such as car speed, remaining amount of gas and gear position. We introduce same idea into LMS for the teachers. The purpose of this system is to promote the improvement for learning materials and education methods by the teachers who check the visualized learning history data. In order to make this system, we have discussed concept and architecture of the information visualization in the e-Learning field from various viewpoints such as technique, education methods and recognition. We describe progress of our works to develop the dashboard system for the teachers to promote effective indication of the learning data analysis.

We have surveyed the academic works related to the information visualization and the dashboard system [2] in advance. There is various software to display the learning data already corresponding to educational methods such as face-to-face class, online class and collaborative learning. Verbert et al. had categorized 24 dashboard systems by the created evaluation method. The data type, data acquisition method, users and devices are used as the evaluation items [3]. Schwendimann et al. had analyzed context and solutions

Table 1. The Basic Learning Activities and The Learning Data

The Learning Activities	The Analyzed Learning Data
The Learning Materials	Text, PowerPoint Slide, Video Data, Caption, Description, Meta Data
The Student's Attributes	Belong to, Age, Gender, Time zone for learning, Place, Comments
The Learning Patterns	System Log, Contents Log
The Student's Abilities	Results of Tests and Reports
Instructional Design	Theory, Methods, Design, Evaluation

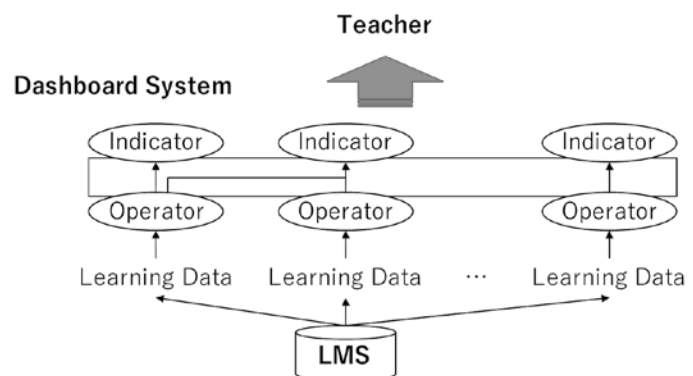
for the dashboard to be used from 55 reviews of the related papers [4]. Aguilar had developed a dashboard system with an early warning function to find dropout students. They had also tried to use the system in actual class [5].

The learning activities of each student can be obtained by the learning using e-Learning system. The basic learning activities and the learning data are shown in Table 1. The visualization based on the analyzed learning data by combining it is performed. The teacher takes educational actions for one or groups of the students based on indicated results. However, when it is not accurate indication, important information to support the students will be overlooked. It is the representative scene where the role of the dashboard becomes important as follows: A scene of a video material which is not watched by a lot of students, A question which is often mistaken for the students, and absent students in a class which is taken by many students.

In order to display the basic learning activities based on the context of the teacher's instruction, the dashboard system requires several operators and indicators to analyze the learning data as input data and to show the appropriate results as output data to the teacher. The teacher can combine operators and indicators to obtain what he/she want to display the learning data analysis on the dashboard screen.

We already have a learning history data of a class that had been carried out in Japanese MOOC as sample data. For the future work, we try to make a prototype of the dashboard system with basic operators and indicators that are available to customize for data analysis and information visualization for corresponding to the teacher demands. And also, we evaluate feasibility and effectiveness of the dashboard system through experiments on actual online classes.

Figure 1. The Concept of the Dashboard System



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