Development and Usability Evaluation of Web-based Self-Monitoring Tool

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Abstract: The transition from individual and dependent learning style into collaborative and self-regulated learning is a challenge for new students in higher education. Self-monitoring process is one of the methods that can be used to answer the challenge. In addition, lecturers also need to monitor students' understanding about certain topics. A web-based self-monitoring tool was developed using prototyping paradigm and user-centered design process. The features of the tool include create prompts, view the students' answers by the prompt or student's name, and give feedback to the students based on keywords appeared on their answers. Usability testing was conducted to measure how usable is the system. We then revised the system from the users' recommendations.

Keywords: self-monitoring, software development, usability testing, scaffolding, prototyping

1. Introduction

The most common setting classroom for K-12 education in Indonesia is a teacher-centered learning environment where students are not guided to monitor their own cognition. This spoon-feeding process makes students become dependent on the role of instructor while constructing their knowledge. In addition, students will acquire the knowledge with less analysis, interpretation, and synthesis (Venezia & Jaeger, 2013). In contrast, when the students attend higher education, they will face a new learning environment where instructors play a role as facilitator. In the college, students have to be more active on constructing their knowledge to prepare them to be a problem solver for real-world application. The students should be more aware of their own cognition to be a self-regulated learner. Therefore, the first year is a transition period from a dependent and individual learner into a self-regulated learner.

The transition phase is a challenge for both lecturers and students. To answer the challenge, self-monitoring is suggested as one of the supporting methods for students to assist them on monitoring and regulating cognition (Junus, Santoso, & Sadita, 2014). The self-monitoring process will help to make the learning progress is visible for the learner during taking a course. It will also help lecturers to monitor students' learning progress and provide assistance as necessary through scaffolding.

At the Faculty of Computer Science, Universitas Indonesia, the self-monitoring process is conducted by the lecturers in the blended classroom (online and face-to-face) by giving prompts to the students (Junus, Santoso, & Sadita, 2014). The prompts are a sequence of open-ended questions that should be answered by the students in periodical order for several weeks. In the previous years, the lecturers collected students' answers in a piece of paper, online forum discussion, or by the use of journal module in the Moodle based Learning Management System named Student Centered e-Learning Environment (Hasibuan & Santoso, 2005). However, those media were not effective for instructors in terms of data collection and providing personalized and necessary feedbacks to the students in a timely manner. In the side of students, their previous answers would be presented only if they were guided to do so. Hence, the students' might not monitor their pre-existing knowledge. Finally, to support self-monitoring process an effective tool was needed to show the development of students understanding and to assist the lecturers for scaffolding.

The purposes of this study are: (1) producing a web-based tool supporting self-monitoring process that can be used by both lecturers and students; and (2) evaluating the usability tool to gather recommendations from lecturers and students.

2. Methodology

The self-monitoring tool was developed using prototyping paradigm (Pressman, 2010) and usability design process (Yan & Guo, 2010). Based on both methods, this research were conducted in four process.

1. **User-Research**, in order to know the prospective users' needs and their expectation regarding the tool. A lecturer and five students were interviewed during this process.
2. **Web design**, based on the user-research results, we created mock-ups using Balsamiq mock-up tool.
3. **Implementation**, the tool was implemented using PHP programming language with Model-View-Controller Paradigm. It is also supported by CodeIgniter framework and MySQL database management system.
4. **Evaluation**, usability testing was conducted by students and lecturers to evaluate the usability of the tool. The usability testing is used to measure how usable a product is in a controlled laboratory setting. Performing usability testing in a laboratory enables evaluators to control what users do and control social influences that might impact the users' performance.

3. Results

The result of this research is a web-based self-monitoring tool. The Figure 1 shows the flow of the tool. Lecturer create prompts to be answered by students. The sequence of prompts and students' answer are shown in students dashboard as shown in Figure 2. Lecturer can see the student's answers and keywords appeared on the answers. Both students and lecturer can see how students develop their knowledge given several prompts subsequently. Lecturer is also able to scaffold students' answer based on the keywords. Before scaffolding, it is important to determine whether students have sufficient background ability to learn a new cognitive strategy (Rosenshine & Meister, 1992). Those features are not available in the previous tools (paper-based, forum discussion, or journal module).
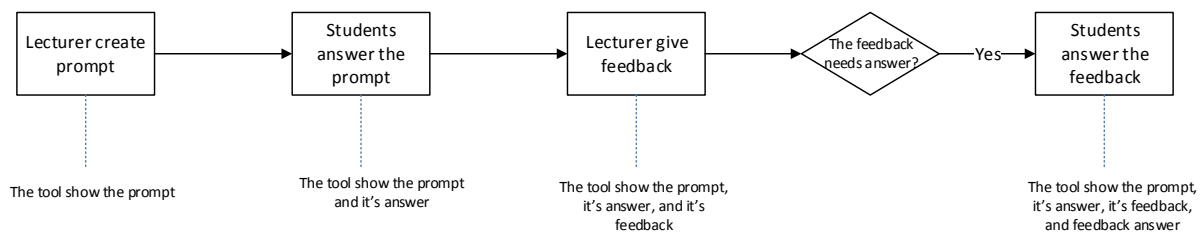

Figure 1. The activity flow

Figure 2. Sample of sequence of prompts seen by students at their Home

The tool was evaluated by usability testing with three lecturers and five students. Four students had experienced using other type of self-monitoring tools. Tasks given to the students were log in, view prompts list and their answers, response to a prompt, view feedback from lecturer, and

log out. Lecturer performed the following tasks during usability testing: log in, create a prompt, create feedback based on expected keywords appeared in students' answers, view prompts, view students' answers grouped by prompt or by their name, view list of feedbacks, give similar feedback to multiple students with similar keywords, and log out. During usability testing, we identified user errors and collected recommendations to revise the tool. There were few minor suggestions such as to choose more familiar terms in students' menu, differentiate answered and unanswered prompts in students' view, and modify lecturer's menu structure. In regards with self-monitoring process, lecturers need features to create a new feedback after viewing students' response and to see both answered and unanswered keywords in each prompt.

4. Conclusion and future work

This research proposed a web-based self-monitoring tool that was improved from standard journaling tool. This tool provides a comprehensive view of lecturer's prompts and students' answers in sequential order so the users can see the development of students' understanding. There are three main components of the tool, i.e., prompt, answer, and feedback. The tool was evaluated using usability testing by students and lecturers to determine how usable it is in a controlled-lab setting. For the future work, we need to evaluate the tool in natural class settings to measure its effectiveness. We also need to add statistic features (chart, graphic, etc) of students' answers to investigate the common patterns.

5. References

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