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PROCEDURAL MODEL OF USING PROBLEM-BASED LEARNING TO TEACH SOFTWARE MODELING COURSE

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Research Highlights

The characteristics of the direct education system that depends on the ability of instructors reflection, only provide little opportunity for students to be actively involved in the learning process. This contrasts with the characteristics of the Software Modeling course which emphasizes student-centered learning. The application of direct learning models in the Modeling Software course causes learning to be ineffective, and students cannot reach the minimum competency standards planned in the learning design.

This paper proposes a Problem-Based Learning (PBL) model that is integrated in the Learning Modeling Software design on three elements of the teaching system, namely: Curriculum elements, emphasizing the use of problems as the starting point of student learning; Group elements, highlighting the collaboration system; and student elements, emphasizing the Student-Directed-Learning (SDL) system.

The application of the PBL model to the three elements in the learning system is effective in increasing the level of student mastery of a particular topic. However, further discussion regarding: 1) how many guidelines are needed in PBL; 2) potential students experience confusion if there is not enough initial learning framework; 3) students who do not have relevant and adequate initial knowledge, tend to experience underdevelopment are still needed to find PBL models that are truly effective in learning the field of Software Engineering.

Research Objectives

This paper proposes PBL conceptual models implemented in the life cycle phase of Software Engineering (analysis phase and design phase), which Pressman (2002) calls "the System Modeling phase." The PBL model is integrated into the learning design of Software Modeling on three elements, namely: Curriculum elements that emphasize the use of problems as the starting point of student learning; Group elements that emphasize collaboration systems (group discussion based learning); and Student elements that accentuate the SDL system. The overall application of 3 main aspects of PBL (problem orientation, independent learning, group collaboration) on each learning topic, is intended to perfect the Shim (2009) model that does not implement 3 PBL main elements on each learning topic, Richardson & Delaney (2009) and the Fakhriah model (2014) which only places individual independent learning in very small portions, or even none at all on PBL systems.

Methodology

This study uses the Research and Development Method (R & D), adapting the stages of Research and Development proposed by Gall at al. (2015). The steps of the study consist of First, Analysis of system requirements involving learning designers, institutional management, and college graduates or the business world as graduate users. They are included in the formulation of competencies in the field of software modeling needed in learning design.

Second: Development of learning design, following the procedure for developing learning designs proposed by Dick, Carey, and Carey (2015). The development stage consists of two main steps, namely identifying learning needs and developing learning designs. The advanced PBL concept is implemented at the scene of preparing the learning strategy.

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Third: Formative Evaluation to test the effectiveness of the model. The effectiveness of the PBL model is tested on one of the learning content modeling software (need assessment). Before being tested, learning content was validated by Software Engineering content experts and Instructional Design experts. Trials are carried out at the formative evaluation stage (field trial). Different forms of test questions (as an instrument to measure the effectiveness of the PBL model in the Software Modeling learning design) were tested on a group of students who programmed Software Engineering courses or Systems Analysis and Design courses in the 3rd year of their lectures. At the end of each trial phase, data analysis and product revisions are carried out based on input obtained from the results of the trial.

Results

PBL integration into learning Software Modeling is carried out on three elements: 1) Curriculum elements, emphasizing the use of problems as the starting point of student learning. Face-to-face models in class (direct education) with Presentation and Brainstorming methods are used to convey conceptual, structured things at each learning session; 2) Learner Elements, emphasizes independent learning (Student-Directed Learning). This activity highlights the activeness of students independently reviewing things that are not structural, are real in the field, about the concept of software requirements model developed. 3) Element Group, emphasizes the existence of collaboration. This activity highlights the active participation of students (small groups) in formulating and synthesizing the results of studies conducted independently. This activity is identical to the stages of the Software Modeling Preparation which are presented in groups in the General Discussion Forum in the class, as a media reflection on the whole concept of the problem being studied, both individually and in small groups.

The proposed PBL syntax is tailored to the learning characteristics of Software Modeling, namely:

1. PBL Orientation
2. Describe the problem & clarify the term
3. Organizing study groups
4. Learn independently
5. Formulate and present challenges
6. Designing field investigations
7. Carry out field investigations
8. Small group discussions
9. Making final project documents
10. General discussion forum

The learning process for one topic course consists of five sessions of activities held for one week. Three activity sessions were held in the classroom involving teacher and student interactions, namely the first session (problem orientation), the third session (formulating problems in groups), and the fifth session (general discussion). Two meetings are held outside the class that involves students independently or in groups, namely the second session (formulating individual problems), and the fourth session (field assignments).

Findings

The model effectiveness test results show that the application of the PBL model on the three elements of the learning system (curriculum, individuals, groups) in the design of the Learning Modeling Software system, is effective in increasing the level of student mastery of

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a particular topic. However, the results of the trials raise several fundamental questions: 1) how many modules are prepared as guidelines for students, so students can quickly attend all PBL-based learning sessions; 2) how long it takes for PBL orientation to students so that students really understand and follow PBL-based learning processes correctly. These questions are in line with the results of Schneider (2014) research which also raises open debate about these two things. Another finding was that some students were bored following the PBL length procedure, and others felt troubled and burdened when they were asked to fill out the forms of orderly learning guides, where this was new to them. This finding is in line with the statement of Harun et al. (2012) that student motivation is the key to success in implementing problem-based learning. The results of Su (2007) regarding the lack of students' skills in collaborating in small groups due to the impact of the background skills of different students, the study in this study did not find the phenomenon. In contrast, trials show students in small groups find it easier to understand a particular concept if studied together.

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