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DEVELOPMENT OF LEARNING MANAGEMENT SYSTEM (LMS) AS AN EFFORT IN INCREASING LEARNING EFFECTIVENESS AND LEARNING ACTIVITIES OF STUDENTS IN SRIWIJAYA UNIVERSITY

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ABSTRACT: The aim of this research was to develop LMS as an effort in increasing learning effectiveness and learning activities of students in Sriwijaya University. The method used in this research was development research method by applying a model proposed by Hanafin and Peck, with specific phases as analysis of necessities, design, development, and implementation. The subjects of this research were students in Physics Education Study Program in Sriwijaya University, Indonesia. Data collection techniques used in this research were questionaire technique and observation. Validation result frommedia experts showed that mean of total validation score was of 4.41 indicating that our LMS used was absolutely valid. The effectiveness which was analyzed from students responses showed mean of total responses of 71.5% in one-to-one experiment phase, 82.32% in limited experiment phase, and 79.88% in class experiment; indicating that all of students responses was positive. Analysis of observational forms in term of active students learning showed that the total scores of observational forms was of 83.51%, which indicated that students were active in learning activities. We succeeded in developing LMS in Sriwijaya University.

Keywords: E-learning, LMS, development research, students activities, effectiveness, Integrate : memadukan

INTRODUCTION

There are two facts about Informations and Communications Technology (ICT) in scientific literature. First, it is important to integrate ICT in science education. Research literature has shown that the use of ICT has a promising positive results in education. ICT supports students collaboration and knowledge building. In the context of science education, it also offers possibilities for interaction with the nature and tools for real-time data logging (Juuti, et. al., 2009). According to Twigg (2001), ICT creates transformative learning environment which provides individual approach and is suitable for students need. It aslo helps students to acquire and even use knowledge, skills, and attitude which are necessary for professional activity (Dwyer, 1999). Second, ICT has low levels of use in classrooms. A case study conducted by Istance and Kools (2013) in "OECD's New Millenium Learners Project" showed that since 2007, the gap between the current use of technologies for teaching and learning in schools and the daily experiences students have with technologies outside schools has been increasing. ICT can be used as an integral tool of laboratory-based practical activities to enhance students learning process, virtual alternative to real practical work, or a pedagogical tool for the teachers but classroom use remains scarce (Beaufils, 2005; Alev, 2003).

E-learning is a new form of learning organizations in the 21st century (Seok, 2008). E-learning is the use of ICT (e.g. internet, computer, mobile phone, Learning Management System (LMS), televisions, radios, and others) to enhance teaching and learning activities (Oye, et. al., 2012). In 1960s and 1970s, schools and universities started to use printed learning materials, television, radio, overhead projector (OHP) and movies in learning process (Nguyen, et. al., 2012). However, the rapid growth of computer (personal computer and notebook) and even smart phone in recent days has increased the use of ICT in classrooms. Thus, the use of ICT will adress e-learning activities.

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Based on our own informal observations, we found that what is stated on OECD's Project was right. All of our students have their own gadgets (e.g. notebook, personal computer, mobile phone, smart phone, ipad, etc.) brought to the class. These gadgets will allow them to get information from world-wide sources so the focus of courses will not only be on textbooks anymore. Besides, Sriwijaya University (UNSRI) campus offers a free internet access (free wi-fi) for students and lecturers. Thus, both students and lecturers can acces internet for teaching and learning purposes. These all factors enabled us to conduct research about e-learning as an effort to increase effectiveness in learning activities.

Introduction to Solid State Physics is one of the courses offered in our study program. According to our students, this course is relative hard to understand as the tree-dimensional structure of solids including lattice and atoms, atomic binding, band gap, boundaries, and other abstract concepts are not easy to visualize. By this difficulties, the learning effectiveness was low and lecturers needed more time to explain the materials. Thus, we assume that we need to make a Learning Management System to help our students learn this course effectively.

As we know, LMS are software systems designed to support students learning activities (Ellis & Calvo, 2007). Usually, they contain a number of presentations, assessment, communication, and management tools. There are many kinds of LMS, such as Blackboard (Blackboard Inc.), Moodle, and Desire2Learn. The focuses of our research were the development of Learning Management System (LMS) by using Moodle (https://elearning.unsri.ac.id) and use of this LMS to increase effectiveness of our students learning activities.

METHODS and PROCEDURES

Method used in this research was Development Research method. Our participants were 46 third year students who enrolled Introduction to Solid State Physics course. In this research, we developed LMS by using Moodle. In developing our LMS, we used Hannafin and Peck design model. The model (Suryana, et al., 2014) has three phases including Needs Assessment Phase (Phase I), Design Phase (Phase II), and Development/Implementation Phase (Phase III). Evaluation and revision were carried out throughout all three phases of this model. In Phase I we identified the objectives and learning materials to produce some learning units and to collect data which are related to the developed LMS which is used and another research publications which support our research. In Phase II we designed the LMS. In this phase, we produced story board documents of the LMS as an illustration for designing the LMS which would be developed. In Phase III we developed the story board documents so it became a complete LMS, and we implemented it on the one-to-one of the students, small group and classrooms.

During the three phases, we also had carried out the evaluation and revision processes. Before we implemented it on the one-to-one of the students, we had some expert validations process, including 2 media validators and 2 content validators. The media validators validated the e-learning media in terms of its simplicity, integration, emphasis, balance, and colors. The content validators validated the e-learning media in terms of its content fidelity and language.

The criteria of media and content validity were based on Kiswanto (2012). Mean score for each term criteria from four validators was gained from this formula:

$$Ki = \frac{\sum_{j=i}^{n} V_{ji}}{n}$$

where K_i was the mean score for i-th criteria, V_{ij} was the score of i-th criteria from j-th validator, and n is the number of validators. After we got the mean score for each criteria, we calculated the mean score for i-th aspect with this formula:

$$Ai = \frac{\sum_{j=i}^{n} K_{ij}}{n}$$

Where $A_i$was the mean score for i-th aspect, K_i was the mean score for the j-th criteria in i-th aspect, and n was the number of criteria in i-th aspect. Then, the mean of total validity scores was calculated with formula:

$$V_{amedia} = \frac{\sum_{i=1}^{n} A_i}{n}$$

Where V_{aMedia} was the mean of total validity scores and *n* was the number of criteria in *i*-th aspect. Based on Khabibah (Kiswanto, 2012), validity criteria was fitted by the following range: if 1 <$V_{a\ Media}$ ≤2the e-learning is not valid, if 2 <$V_{a\ Media}$ ≤3 the e-learning is less valid, if 3 <$V_{a\ Media}$ ≤ 4 the e-learning is valid, and if 4 <$V_{a\ Media}$ ≤ 5 the e-learning is strongly valid.

After the implementation on one-to-one of the students, we had three students who had differences in term of cognitive level to complete the questionnaires in which they gave some suggestion for improving the e-learning media. After the small group implementation, we also had evaluation and revision process by choosing six students who had differences in term of cognitive level to complete questionnaires for improving the LMS. The revision of LMS based on the questionnaires was then used in classrooms.

The analysis of questionnaires was done by rating the statement expressed by students. If students "strongly agreed" with the statement in questionnaires, the score would be 5; if students "agreed" with the statement in questionnaires, the score would be 4; if students "were in doubt" with the statement in questionnaires, the score would be 3; if students "didn't agree" with the statement in questionnaires, the score would be 2; and if the students "strongly didn't agree" with the statement in questionnaires, the score would be 1.

Our developed LMS is considered as an effective e-learning if data collected from students responses were positive. Data from students responses were analyzed by calculating the mean of the number of student response for each statement with this formula:

$$\mathrm{R_{smedia}} = \frac{\sum \text{score for each statement}}{\mathrm{n}}$$

where $R_{smedia}$was the mean of all students responses scores for each statement and *n* is the number of students. The percentage of the number of student response for each statement were calculated with this formula:

$$\%\mathrm{R_{smedia}} = \frac{\sum \mathrm{R_{smedia}} \text{ for each statement}}{5} \times 100\%$$

According to Kiswanto (2012), there are 4 criteria of students responses: if the percentage of R_{smedia} is more than 85%, it means that the responses is strongly positive; if the percentage of R_{smedia} is more than 70% but less than 85%, it means that the responses is positive; percentage of R_{smedia} is more than 50% but less than 70%, it means that the responses is less positive; and if percentage of R_{smedia} is less than 50%, it means that the responses is not positive.

Beside giving the questionnaires to the students in classroom implementation, we also observed students learning activities to measure the learning effectiveness with using e-learning media. The observation was performed with using checklist and indicators. Students activities were scored by using rating scale with three criteria: if the student "completed 3 criteria", the score would be 3; if the student "completed 2 criteria", the score would be 2; and if the student "completed 1 criteria", the score would be 1. In this research, we first calculated maximum score for each aspect according to the following formula proposed by Riduwan (2007):

$$\text{Total of maximum score for each aspect} = \text{maximum score for each aspect} \times \text{students}$$

Then we calculated score of all students for each aspect and students activeness percentage in learning process by using the following formula:

$$\%K_s = \frac{N_{smaks}}{N_{s\,i}} \times 100\%$$

Where $\%K_s$ was the percentage of students activeness, N_{smax} was the maximum score for each aspect, and N_{si} was the total score for all students in each aspect. After finding the percentage of students activeness, we fitted it with these criteria:

0 20% 40% 60% 80% 100%

Very Weak WeakEnough StrongVery Strong

RESULT and DISCUSSION

1. Needs Assessment Phase

In this phase, we identified the objectives and learning matters. Learning units were produced. Data which were related to the developed LMS, including publications of another research were collected to support our research. The analysis of needs assessment produced a prior concept of LMS which would be developed.

Firstly, we examined what courses are too difficult for students to understand. We found that Introduction to Solid State Physics was the most difficult course according to our students. It was quite reasonable as many concepts of this course (crystal structures, atomic binding, band gap, energy levels, lattice, etc.) were not easy to visualize. It needed more time for lecturers to explain the concepts more detail. Some lecturers had difficulties in drawing the crystal structures and explain the electron transfer. Students also needed more time to understand the explanations because the visualization was not good enough. They also needed some flash animations to recognize some learning materials.

In choosing the software for our LMS, we found that there are many industries offered software for LMS development. Some of these softwares were Blackboard, Desire2Learn, and Moodle. By some considerations, we finally chose Moodle as the software for our LMS. We found that many universities in and outside our country also used this software for developing LMS.

2. Design Phase

In this phase, we designed the LMS based on story board documents which had been developed before. In designing the LMS, we used Moddle application. Thus, our LMS have to be used in online. After the LMS created, we validated it to the validators, so there were improvements in terms of content and media features. Validation mean scores in term of media features from two media validators were of 4.41. It revealed that our developed LMS was valid in term of media features according to Kiswanto (2012). We also validated the LMS to the content validators. Validation mean scores in term of content fidelity and language from two content validators were of 3.14. It revealed that our developed e-learning was also valid in terms of content fidelity and language (Kiswanto, 2012).

3. Development/Implementation Phase

The designed LMS were then implemented on one-to-one students. Here we have chosen three students who were cognitively different to try our LMS out. After trying out, these three students were asked to complete questionnaires. The questionnaires were then used to measure students responses in e-learning process. Based on the analysis of completed questionnaires, we had mean score of students responses of 3.5 or 70%. It showed that the students had positive responses to the e-learning process. Because of this positive responses, our LMS were then continued to be implemented on small group. In small group implementation, we had choosen six students who were cognitively different to try our LMS out. After trying out, these students were asked to complete questionnaires. The questionnaires were then used to measure students responses in e-learning process. According to the analysis of completed questionnaires, we had mean score of students responses of 4.01 or 78%. It showed that the students had positive responses to the e-learning process. This positive responses showed that our LMS was effective and valid. This phase were also the final revision before the LMS was implemented to classroom.

In classroom implementation, we used the LMS for students learning activities in classroom. In this implementation stage, we used blended learning, which was a systematic mix of e-learning and learning in face-to-face context. However, using LMS in classrooms is not about teaching students only how to use the LMS or only teach students in traditional way. It is the combination of them. Thus, we used Technology Pedagogoy Content Knowledge (TPCK) Model (Mishra & Koehler, 2006), which describes the inter-relationships between content, pedagogy, and technology. This model is a valuable theoretical conceptual framework as there is a balance between content, pedagogy, and technology. Thus, lecturers should not only be a passive facilitators, but also play an important role in engaging students in classroom activities.

To observe student activeness, we used such a checklist observation form. An accompanying teacher (observer) was asked to observe students and completed the checklist observation form. Data collected from observation forms showed that the mean percentages of students activeness was of 83.52%. It showed that the students were strongly active in e-learning. Thus, our developed e-learning had increased learning effectiveness and students activities in Physics Education study program in UNSRI.

CONCLUSION

We developed LMS for Introduction to Solid State Physics course. The design followed the research development method proposed by Hannafin & Peck. In Phase I, we identified the objectives and learning materials to produce some learning units and to collect data which are related to the developed LMS which is used and another research publications which support our research. In Phase II we designed the LMS. In this phase, we produced story board documents of the LMS as an illustration for designing the LMS which would be developed. In Phase III we developed the story board documents so it became a complete LMS, and we implemented it on the one-to-one of the students, small group and classrooms. During the three phases, we also had carried out the evaluation and revision processes. Validation mean scores in term of media features from two media validators were of 4.41. It revealed that our developed LMS was valid in term of media features. Based on the analysis of completed questionnaires, we had mean score of students responses of 3.5 or 70%. It showed that the students had positive responses to the e-learning process.Validation mean scores in term of content fidelity and language from two content validators were of 3.14.Data collected from observation forms showed that the mean percentages of students activeness was of 83.52%. It showed that the students were strongly active in e-learning. Thus, our developed e-learning had increased learning effectiveness and students activities in Physics Education study program in UNSRI.

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