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Development of E-Learning in Web Programming Subjects for Moodle Based Vocational Students

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Abstract

Along with the rapid development of information technology (IT), the need for an IT-based concept and learning mechanism becomes inevitable. Therefore, one form of information technology has emerged, namely facilities for learning systems called e-learning. This research aims to describe the learning system of class XI RPL web in Vocational High School Ibu Kartini Semarang, develop e-learning in class XI RPL web programming in Vocational High School Ibu Kartini Semarang, measure the feasibility of e-development products learning in class XI RPL web programming subjects at Vocational High School Ibu Kartini Semarang, measuring the effectiveness of e-learning development products in web programming subjects in class XI RPL at Vocational High School Ibu Kartini Semarang. This study uses Thiagarajan model, and e-learning was developed through four stages, namely preliminary studies, development planning and validation, product trials, and final product determination. The process of evaluating the feasibility of instructional media by giving questionnaires to media experts, material experts, and respondents of trial use (students). The results showed that the developed e-learning had fulfilled the requirements and fulfilled the requirements to be used as learning media. The results of the pre-test calculation get the value of t_{value} = 0.733 and t_{table} = 1.67 while the post-test results produce a value of t_{value} = 2.986 and t_{table} = 1.67 so that the hypothesis that can be taken is H_0 is rejected if $t_{value} > t_{table}$ that an increase in student learning outcomes. The results of the calculation of students' early and late learning interests in the use of e-learning, with an average percentage increase of 16.38% of the previous learning interest. Based on the above research, the implication in the field of curriculum development science is the use of technology in learning web programming following the development of education 4.0.

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INTRODUCTION

Utilization of information technology and ethics in utilizing information technology has been regulated through Law of the Republic of Indonesia Number 11 of 2008 concerning Information and Electronic Transactions (ITE) in Article 1 paragraph (3) which reads "Information Technology is a technique for collecting, preparing, storing, processing, announcing, analyzing, and/or disseminating information". Information technology cannot be released from electronic systems as regulated in Law of the Republic of Indonesia Number 11 of 2008 concerning Information and Electronic Transactions.

Thus, information technology provides opportunities and opportunities to be utilized in bridging and supporting lectures for departments other than the informatics field. The role of Information Technology in education according to Center for Information and Communication Technology Education and Culture (Pustekkom, 2006) includes the use of information technology as follows skills and competencies, educational infrastructure, sources of teaching materials, educational aids and facilities, and education management. To measure the success of students in learning, an evaluation is needed as a benchmark for the success of students in understanding the material delivered by the teacher. The evaluation given is usually in the form of written, practical, or oral tests. To facilitate the evaluation, a professional teacher is required to create a model or a creative evaluation method, in addition to functioning as a test of the ability of students, they must also be able to provide learning experiences that can help students develop in understanding related subjects.

According to Kusmana (2011) in the implementation of daily learning often encountered is a combination of technology. This technology is also commonly used in distance education so that communication between students and teachers can occur, namely by the use of E-learning. An alternative to the problem is with the help of learning technology, one of which is the use of online learning media, such as social networks, learning management systems, and content management systems. Seeing the conditions in the present, students are more likely to use internet services to communicate between one friend and another friend.

According to Oproiu (2015) states that although it cannot replace traditional education, the internet opens new opportunities for learning. The information obtained in this way, the mobility of its use makes e-learning emerge as the completion and continuation of traditional education. According to Kotzer, and Elran (2012) states that overall, students' perceptions about web-based work testing are very positive. We plan to implement them. Moodle courses in additional subjects such as curricular chemistry and biology to refine and homogenize students' basic knowledge. Meanwhile, according to Sahasrabudhe, and Kanungo (2014) states that using e-learning can attract students' enthusiasm, save money, and create fun learning.

Based on the above quote it can be revealed that to create real learning or provide real experience learning can be created from an abstract or unreal learning model, in this case, learning based on a virtual environment. To create a learning model as explained above, a teacher can use virtual classrooms as one solution, namely by utilizing the Learning Management System. In this case, the researchers chose Moodle LMS for the use of technology as a learning medium because the features contained in Moodle are already feasible for implementing virtual learning and following the development of education 4.0 which must utilize technology as a learning medium.

This research aims to describe the learning system of class XI RPL web in Vocational High School Ibu Kartini Semarang, develop e-learning in class XI RPL web programming in Vocational High School Ibu Kartini Semarang, measure the feasibility of e-development products learning in class XI RPL web programming subjects at Vocational High School Ibu Kartini Semarang, measuring the effectiveness of e-learning development products in web programming subjects in class XI RPL at Vocational High

School Ibu Kartini Semarang. The benefit of this research is to enhance the learning of web programming by the use of technology-based on E-Learning Moodle.

METHODS

This research uses the Research and Development method which is a 4D development model that includes aspects of Define (Preliminary Study), Design (Development), Development (Development), at this stage it does not reach the Desiminant (Dissemination) stage (Thiagarajan, Sammel, D. S., and Semmel, M. I., 1974). The reason researchers use the development model because it has the advantage that is seen from the systematic work procedures, i.e., at every step that will be passed always refers to the previous steps that have been improved so that an effective product is obtained. Data collection using research instruments, quantitative/statistical data analysis to test the hypothesis that has been set. The data analysis technique used is the feasibility test, effectiveness test, practicality test, and gain test.

RESULTS AND DISCUSSION

Web Programming Learning System in Vocational High School Ibu Kartini

Web programming is a productive subject which contains material about web development. Web programming in Vocational High School Kartini is a major productive subject because the focus of the Software Engineering major is as an expert programmer who can create a web-based information system. According to Simarmata (2010) the web is a system with the information presented in the form of text, images, sounds, etc. stored on an Internet Web server that is presented in the form of hypertext. Web client software called a browser can access the web. The browser reads web pages stored on a Web server through a protocol called HTTP (Hypertext Transfer Protocol).

According to Hamid (2015) states that learning using front e-learning media can increase student interest and learning outcomes. Teachers no longer carry out conventional learning, but have utilized technology by using e-learning fronts, so students become more creative. Meanwhile, according to Jati (2013) states that the rapid development of e-learning and the use of LMS (moodle) has triggered several universities and schools in Indonesia to develop e-learning. However, the majority of their e-narrative material or content is still underutilized by the advanced features available at LMS. In designing digital material development, preparation, planning, online development of material consideration, work mapping, designed and written content, development material, final testing and checking and evaluation are important steps to be carried out to produce good educational e-learning.

Based on the above quote the researcher can conclude that the teacher has difficulty in finding relevant media that is applied to student learning, especially for subjects related to the basic theory that students should be able to master the theory before students practice, one of them is on web programming subjects in class XI Software Engineering. So that researchers choose e-learning because it is considered appropriate for web learning because e-learning media can make students able to focus on learning web programming.

Development of E-learning in Web Programming Subjects Analysis Phase

This research and development trial was conducted at Vocational High School Ibu Kartini Semarang, located on Imam Bonjol 199 street, Semarang City. Teachers have difficulty in delivering learning material, especially for theory, because teachers find it difficult to find appropriate tools or media to deliver learning material so that students participate actively in the KBM.

One of them is in the web programming subject wherein this subject emphasizes more students for practical work that is the final project to produce a product. The value that will be obtained by students at the final value is 70% of the practical weight and 30% of the theoretical weight. So the theory is usually delivered at the

beginning of learning, which is two weeks with a total of 8 hours of learning. Besides that, the media to deliver material is only limited to hundreds of pages of student books, so students tend to be lazy to read. This makes it difficult for teachers to find learning media that arouse students' motivation to study at school or home.

Based on the needs analysis conducted by the researcher, it can be concluded that the teacher has difficulty in finding relevant media that is applied to student learning, especially for subjects related to the basic theory that students should be able to master the theory before students practice. One of them is on web programming subjects in class XI of Software Engineering.

Design Stage

Design making is based on the results of preliminary observations in the needs analysis activities which include the selection and collection of material or content in the form of supporting texts and images that can build student interest in learning web technology based on web programming subjects that will be used in learning media. The following is a flowchart display that is used to create learning media in the eyes of web programming. For more details, see figure 1.

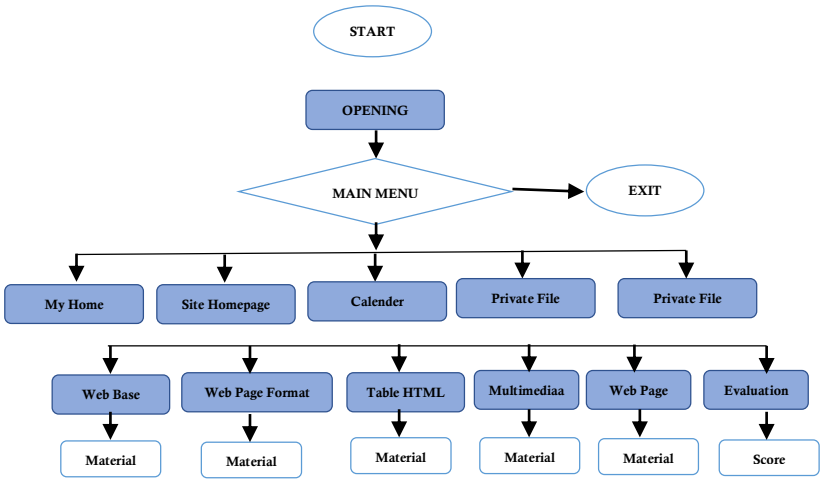

Figure 1. Design E-Learning Flowchart

Development Stage

At this stage, researchers continue to make e-learning products for web programming subjects developed using Moodle LMS. The things that researchers consider to develop e-learning are the availability of material. The teacher's role in the preparation of the media is only as a user, not as a developer at the same time. E-learning is only as a compliment or a means of learning not as a substitute for teachers in the classroom. The e-learning contains the Login view, the main menu/my home, the site's homepage, calendar, personal files, courses are taken, and evaluations (Figure 2).

At this stage, the researchers continued manufacturing the product. E-learning learning media developed using Moodle LMS. The things that researchers consider to develop e-learning are the availability of material. The teacher's role in the preparation of the media is only as a user, not as a developer at the same time. This media is only as a compliment or a means for learning not as a substitute for the class teacher. The following are the results of the evaluation of learning media by media experts and material experts, the validation results obtained (Table 1).

The conclusion of the validation of media experts 1 and 2, namely learning media e-learning web programming subjects said to be very feasible with eligibility criteria 92. So that e-learning web programming subjects have been declared feasible to use without revision in the learning process.

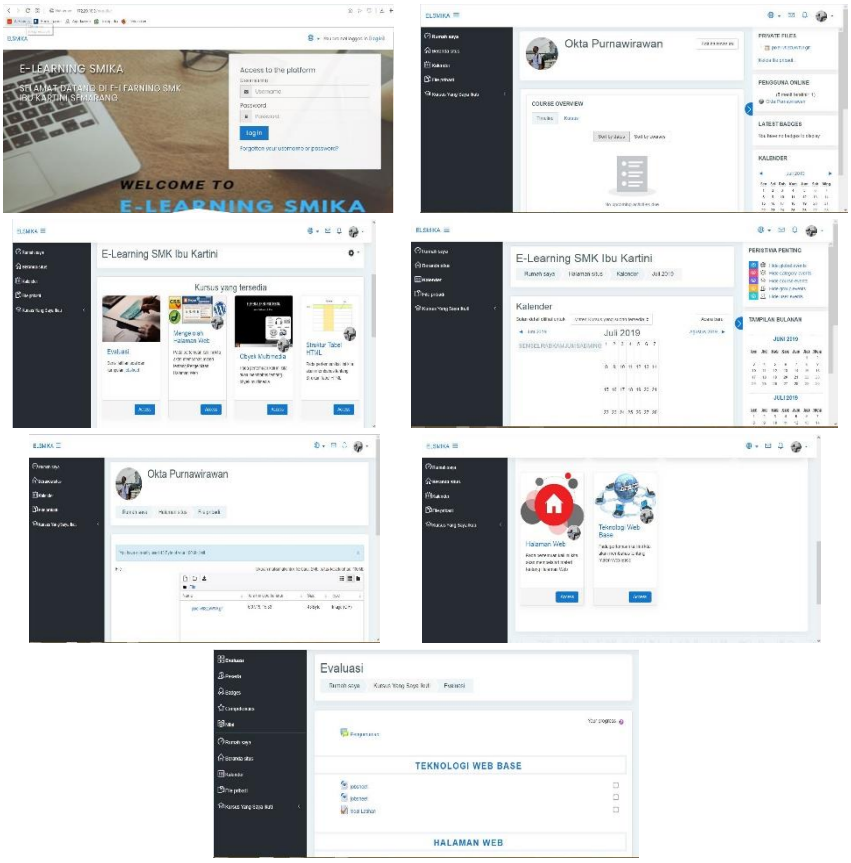

Figure 2. Development Process

Table 1. Conclusion Results of Media Expert Ratings

Validator	Score	Eligibility criteria
Novi Hendriyanto, M.Kom	93	Very decent
Ign. F. Bayu Andoro, S.T, M.Kom	91	Very decent
Average	92	Very decent

Table 2. Conclusion Results of Expert Material Assessment

Validator	Score	Eligibility criteria
Abu Salam, M.Kom	84	Very decent
Okta Purnawirawan, S.Pd	93.4	Very decent
Average	88.7	Very decent

Based on the results of the material expert validation questionnaire, it can be concluded that the content of e-learning materials is very feasible with the eligibility criteria 88.7. It can be concluded that e-learning material in web programming subjects is very feasible to be used as learning media.

Trial Stage

This trial was conducted on five students. Trial participants respond to products that are developed. At this stage, students assess two aspects, namely aspects of motivation and attractiveness. In this trial, 15 students gave responses and ratings of the products developed. At this stage, students assess three components, namely the component content or material, appearance, and presentation. An operational test (Operational Field Test) is carried out by involving larger students. Students who were included in this trial were students of class XI RPL, namely 35 students. The results of assessments by students are displayed in table 3.

Table 3. Results of eligibility by students

Assessment aspects	Average	Category
Motivational aspects	4.60	Very good
Attractive aspect	4.69	Very good
Ease aspect	4.57	Very good
Aspects of expediency	4.57	Very good

Based on table 3, the four aspects, it can be concluded that based on the aspect of motivation get an average of 4.6 in the excellent category. The attractiveness aspect with 4.69 with the category is very good. The aspect of ease of

obtaining an average of 4.57 and aspects of the average utilization of 4.57 each get a very good category.

Validation by Students of Product Trials. Product trials are conducted to find out whether the products developed can be beneficial for improving the quality of learning or not. There are three types of product trials conducted in this study, namely preliminary field tests, main field tests, and operational field tests (Borg, and Gall, 2007).

The development of E-learning that will be carried out is from E-learning that is already possessed by supporting teachers, where the E-learning has not functioned as a learning medium. E-learning possessed by supporting teachers is still not interesting and represents learning media. The development of E-learning includes the appearance/layouts and menus in E-learning that contain web programming. Besides having advantages, E-learning is also one form of E-learning learning and as a form of integrating technology into learning in vocational schools (Hämäläinen, and Cattaneo, 2015) as well as responding to changes in learning methods from teacher-centered to student-centered on creating students who have innovation, creativity, and high motivation.

The results obtained from the assessment of media experts on the development of e-learning as a learning medium. Web programming explains that e-learning developed as a media is very feasible to use. While the results of the feasibility test, the material experts explained that it is very feasible to be used as a learning medium. With the acquisition of very decent results from media experts and material experts, the development of e-learning as a learning media web programming can be used as a learning medium. The statement is following research Dahiya, Jaggi, Chaturvedi, Bhardwaj, Goyal, and Varghese (2012) states that e-learning is information and communication technology to enable students to learn whenever and wherever. According to Rohmah (2016) states that learning, it can shorten learning time and study costs more economically. Meanwhile, according to Sibyan, and Sumbawati (2016) stated that the use of online-based learning media could improve student learning outcomes and make students more active in lessons. Based on the results of the statement above, eating e-learning media based on Moodle is very feasible to be used as a learning media for web programming.

The Feasibility of Learning Media E-learning Web Programming Subjects Effectiveness Test

The results of the effectiveness test using the paired t-test obtained results that H_0 was accepted if $< t_{1-\alpha}$ (both groups had the same learning outcomes) and H_0 was rejected if $> t_{1-\alpha}$ (both groups had different learning outcomes) with a significance level of $\alpha = 0.05$ or 0.05. The results of the post-test score showed the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_1) was accepted then stated: "there are differences in student learning outcomes after using e-learning as web programming teaching material." Significantly accepted. The experimental class had an average of 79.50, while the control class had an average of 73.70. Based on these data it can be concluded that the use of E-learning in web programming subjects can improve student achievement because it is known that students who use E-learning in web programming subjects are better than students who only use student handbooks packages.

Gain Test

Analysis of the results of the pre-test and post-test showed a gain of 0.54 in the experimental group with moderate criteria and a gain of 0.43 in the control group with moderate criteria (Table 4).

Table 4. Gain Test Results

Group	Pre-test average value	Post-test average scores	Improvement (N-Gain)	Criteria
Experiment	55.24	79.50	0.54	Moderate
Control	53.54	73.70	0.43	Moderate

Based on the gain test results obtained an increase in learning outcomes after using e-learning as web programming teaching materials with moderate criteria. This medium criterion is obtained because students still need to adapt to the e-learning learning process and changes in learning methods that were initially teacher-centered to student-centered. E-learning, as a learning media filled with teaching materials, serves as an intermediary in the learning process to facilitate and improve student learning outcomes. Following the definition of instructional media proposed by Hamalik (1983) that learning media are tools, methods, and techniques used to make communication and interaction between teachers and students more effective in the learning process. This means that e-learning has the ability to facilitate the delivery of more interesting information and is designed to improve the ability of independent learning (self directed learning) of Vocational High School students in the Software Engineering study program, because in e-learning Web Base Technology includes competency requirements students must have after going through web programming learning, namely the examples and ways of programming that are equipped with video.

Pinya, and Rosselló (2014) writes that e-learning can provide information to students about learning in new forms and formats as well as being a tool that offers unique learning opportunities. Meanwhile, according to Işık, and Yılmaz (2010) states that e-learning makes it easy to use, and students have satisfaction in learning. Learning with e-learning is very helpful and time passes very quickly when learning with a computer, and makes it easy for students to learn. This provides evidence that students feel comfortable and confident while learning through e-learning.

E-learning Effectiveness in Web Programming Learning

The use of E-learning for learning can function as a guide in the development and achievement of professional competencies among students so that it will make a powerful means to enhance student learning and be accompanied by feedback from teaching staff to improve students' self-assessment and meta-cognitive abilities (Pinya, and Rosselló, 2014).

Student responses to e-learning as web programming teaching material has a percentage of 76.67 with good criteria so that the development of e-learning as web programming teaching material is responded well by class XI students of Vocational High School Ibu Kartini Semarang Software Engineering. The teacher's response to e-learning web programming learning has a percentage of 85 with very good criteria so that the development of e-learning as a web programming teaching material is well received by supporting teachers and can be used as web programming teaching material.

The results of the questionnaire analysis of early and late learning interest in students obtained that the initial questionnaire distributed before starting teaching and learning activities using E-learning media contained one student or 3.33% of students in the uninterested category, five students or 16.67% students in the less interested category, fifteen students or 50% of students in the quite interested category, nine students or 30% in the interested category, and no students in the very interested category. As for the final learning interest questionnaire distributed after teaching and learning activities during several meetings with E-learning media it was found that there were no students in the uninterested category, two students or 6.67% in the less interesting category, five students or 16.67% in quite interesting category, seventeen students or 56.67% students in the interesting category, six students or 20.00% in the very interesting category. Increased interest in learning can be seen from the amount or percentage in each category of early and late learning interest.

The above statement is following research Ahmadi, and Wang (2014) writes that the use of learning media based on "JariMatik" can increase student motivation. Learning with learning media is very helpful in memorizing students about counts. Nurhasanah, and Sobandi (2016) write that student learning outcomes can be improved through increasing student interest in

learning, meaning that the better the interest in student learning will have an impact on better student learning outcomes. While Siagian, Mursid, and Wau (2014) stated that almost all students gave positive responses regarding learning using interactive multimedia in instructional design, in that context multimedia can bring benefits, be interesting, and can increase students' motivation to learn.

CONCLUSION

Based on the results of data analysis and discussion, the conclusions that can be drawn from this research are, with e-learning media on web programming subjects proven to help teachers as a tool in clarifying the presentation of subject matter so as to increase student interest and improve student learning outcomes, evident from the results of validation by media experts and material experts as well as the results of the trial of the use of students, and e-learning media can increase the effectiveness of student learning outcomes, student interests, and create direct interactions between teachers and students, so that learning is more effective, efficient and interesting.

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