Problem Based Learning Media "Learn Web Dev" for Vocational Student

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ABSTRACT
This research aims to design, develop, and test the feasibility of problem-based learning media on web programming material. This research is development research that uses the ADDIE development model. The implementation of this research was carried out through five stages, namely, analyse, design, development, implementation, and evaluation. The results of the feasibility test of learning media from material validators amounted to 97.5%, media validators amounted to 91.07%, small group trials amounted to 86.2%, and large group trials amounted to 89.1%. The average result obtained from all validation data of 91% states that the learning media is very feasible to use in assisting the student learning process.

Keywords: *Learning Media, website, web programming, Problem Based Learning.*

1. INTRODUCTION

Competent workers become a country's main valuable resource to compete with developed countries. Currently, the world of education is closely related to the world of work so that the concept of education in Indonesia is now cantered on preparing workers who have strong knowledge, abilities, skills, character, and personality. SMK is one of several domestic education implementers that provide learning aimed at preparing students to be ready to become workers in their respective expertise and skills [1].

According to the Law on the National Education System, Vocational High Schools have the main achievement of preparing students as qualified workers in the Business World and the Industrial World in line with the majors chosen by the students. One of the expertise competencies owned by SMK is Software Engineering (RPL). SMK preparation to produce graduates as a qualified workforce is one of them by providing a well-implemented learning process [2]. Furthermore, Pane & Dasopang [3] state that the learning process contains the main components including teachers, students, and learning resources (media).

Learning media is an influential factor in improving the quality of the learning process [4]. Learning media are mediators and conveyors of learning messages. The use of learning media as well as the distribution of learning materials can be unified, activities can be more interesting, students are more active with each other, learning duration is more effectively used, and the quality of learning increases. Samhudi [5] states that learning media makes it easier for students to learn and master material. One of the many materials that require learning media to make it easier for students to master is web programming. Learning media is an important factor in improving the quality of the learning process [6].

Web programming is a material in the Fundamentals of Software and Game Development lesson that must be achieved by RPL Expertise Program students in class X. Web programming material is a vocational basis that is needed by the industrial sector so it is very important for students to understand the knowledge in this material and apply these skills into an original product. If this competency is not understood by students, it can make it difficult for SMK RPL graduates to compete in the industrial world, especially in the field of website development. In web programming material, students are expected to be able to understand and create a simple website application with HTML, CSS programming languages.

Based on observations of students at SMK Negeri 4 Malang majoring in RPL, it can be stated that 69.6% of students are still unable to understand Web Programming material. The lack of understanding of the material in students results in not achieving the learning outcomes

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that have been formulated by the teacher. A lack of understanding of web programming material will also make it difficult for graduates to compete in the industrial world. Based on the observation of the learning process of web programming material at SMKN 4 Malang, the learning process is carried out by first explaining the material in the module, then the practicum in the module is done by students. From the acquisition of initial observations made by researchers, it was indicated that the provision of material along with the learning model the students were passive in learning. With this passive attitude, it will affect the lack of understanding of the material.

The lack of understanding of the material in students also raises new problems, namely, based on observations of the learning process students tend to ignore instructions to learn through modules, are lazy to look for material from other learning sources, and many of the students also still do not have editor codes on their personal devices and rely on editor codes on school lab computers. In addition, the implementation of face-to-face learning during the pandemic has the most frequent problem, namely reduced learning time [7]. So that students' time in doing practicum is shorter and students are less able to explore their knowledge in the learning process with limited time. To assist students in understanding skills and knowledge in web programming material, it is necessary to have learning media with technological support that can be accessed even though it is not during class learning hours.

Technology can play a role in education by being applied in the development of learning media. Web-based learning media is one of several media used in learning that utilizes technology. Web-based learning is learning through the internet where students have access to subject matter through their devices via web pages [8]. The use of web-based learning media becomes a place where students can access course materials online from their own devices [9]. With website-based learning media, the media can be accessed anytime, anywhere, and with private or public electronic devices connected to the internet. The ease and convenience offered by web-based learning media has improved education standards and access to education around the world [10].

The results of observations on students of SMK Negeri 4 Malang majoring in RPL found that all students have devices and applications that can run websites. In addition, students also have an internet network that can access the website.

Based on the problems in the learning process of web programming material that has been described, so that to achieve learning outcomes requires a learning approach that can provide an increase in student motivation to enthusiastically engage in learning that has been formulated by the teacher. One of several learning models that can stimulate students to be more enthusiastic about learning is Problem Based Learning. PBL is a learning model in which in learning activities students are given real problems as a means for students to think at a high level in solving a problem. After students solve the problem, students can get used to implementing their knowledge so that they are better prepared when they have to deal with problems in the future. The PBL learning model was chosen because it actively involves students in learning activities with problem solving. PBL is also an alternative learning model that is suitable for use in vocational schools, especially in the RPL department [11]. In line with this based on research by Kusumawati, et al. [12] the application of PBL in web programming learning makes students more encouraged to learn because they are forced to overcome problems. Problems that interest students encourage students to find solutions in various learning modalities and become more involved in learning.

Based on these problems, researchers are interested in developing website-based learning media with Problem Based Learning content on web programming material. The web-based learning media provides a means for students to learn web programming material. Students can also try to practice writing program code on the HTML coding practice menu according to the material that has been presented. Furthermore, there is a quiz menu with PBL content to measure students' abilities after learning material and practicing writing code on coding practices. Web-based learning media with PBL content developed is expected to help students improve understanding of skills and knowledge on web programming material. Therefore, this research was developed with the title Development of Website-Based Learning Media with Problem Based Learning on Web Programming Materials for Vocational Students.

2. METHOD

The method used in this research is the *research* and development method which aims to find, develop, and validate a product used in education and learning. The model used in this research is the ADDIE development model developed by Dick and Carry in 1996 to design learning systems. The ADDIE development model was chosen because the development concept is simple yet complex and the sequence of development steps is structured and systematic so that it is easy to understand and apply in development. The *ADDIE development model consists of five stages, namely, (1) analyse; (2) design; (3) development; (4) implementation; (5) evaluation, all of which are conti*nuous and connected to each other [13].

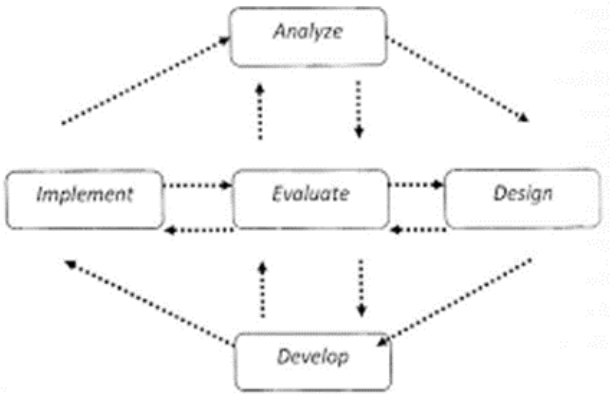

Figure 1. Development Stage of ADDIE Model [13]

2.1. Analyse

At the analysis stage, the activity carried out is to make observations or observations related to the learning process in the classroom. This activity is carried out to find out the obstacles faced during the learning process. Based on initial observations that have been made at SMKN 4 Malang as the place where the research was carried out, the data obtained are (1) students tend to be passive in the learning process; (2) lack of student interaction with the teacher directly related to understanding web programming material; (3) students are still unable to understand web programming material.

Based on the needs analysis results from the analysis stage. The developer conducts the planning stage by designing media in accordance with the needs analysis that has been obtained. Referring to the characteristics of students and analysing the needs obtained, students need learning media that actively involves students in the learning process and can be accessed anytime and anywhere. so that web-based learning media with Problem Based Learning content becomes an alternative. At the competency and curriculum analysis stage, adjustments are made to the competencies and curriculum used at school so that the learning media developed can be in accordance with the materials and competencies used at school.

2.2. Design

The design stage (designing) is carried out by researchers to design learning media to be developed in accordance with the analysis stage that has been carried out. The material design stage is carried out by designing the KI/KD to be developed. While the media design stage is carried out by making a storyboard for each page of the learning media.

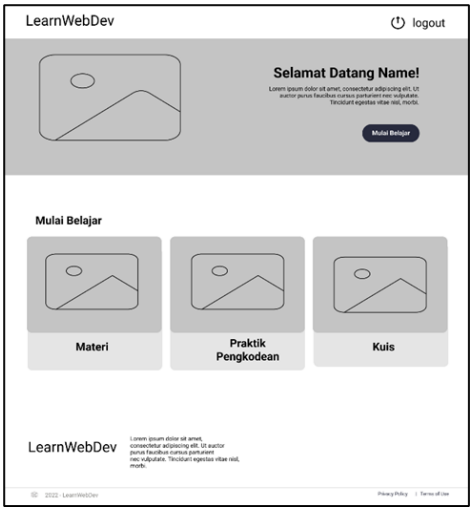

Figure 2. LearnWebDev Storyboard

Table 1. Problem Based Learning Steps

Stages	Activities
Problem orientation	Explaining learning objectives, presenting the issue raised
Learning Organizing	Display material
Investigation	Conduct an investigation based on the material presented
Presentation	Presenting the results of the investigation
Analyze and evaluate	Analyze and evaluate problem solving

The stages of the problem-based learning model in this learning media are applied with the steps in Table 1.

2.3. Development

The development stage is carried out by researchers to develop learning media referring to the design that has been made at the design stage. Learning media developed based on web applications built using PHP 7, HTML5, CSS, and JavaScript programming languages using MySQL database. Features contained in the learning media include a dashboard, material menu, coding practice menu, and quiz menu with Problem Based Learning content.

In developing learning media products with a website base, researchers use the waterfall software development method which includes analysis, design, implementation, and testing.

2.4. Implementation

The implementation stage is carried out to find out the development of media and to find out the student's response to the media that has been developed through product trial activities to users. Before conducting product trials, the learning media that has been developed goes through a product validation test process conducted

by a team of experts to find out the need for a revision process before the field trial is carried out.

2.5. Evaluation

At the evaluation stage, revision procedures are carried out if necessary. Assessment of the media can also be seen from the response of students as users of the media that has been developed. The results of the trial are then used as a reference to measure the feasibility of the learning media products developed. If the learning media products developed have not met the feasibility, improvements are made again.

There are two trials in this study, namely a small group trial conducted on 15 students by class XI students majoring in RPL at SMKN 4 Malang who have taken Web Programming material, and a large group trial conducted on 32 students by class XI students majoring in RPL at SMKN 4 Malang who have taken Web Programming material.

Aspects of material validation include: 1) content quality, 2) learning goal alignment, 3) feedback and adaptation. Media validation aspects include: 1) design, 2) interaction usability, 3) accessibility, 4) reusability. End user validation aspects include software engineering aspects, learning design aspects, and visual communication aspects.

Data were analyzed using the percentage formula in Equation (1):

$$V=TSe/TShx100\% \quad (1)$$

The results of the analysis were then interpreted according to the criteria in Table 2.

3. RESULT AND DISCUSSION

The results of the development in this study are *web-based* learning media with *problem-based learning of* web programming material for class X Software Engineering students. The learning media contains material, coding practices, and quizzes in accordance with web programming material in the basic orientation elements of software and game development and is developed using the ADDIE development model.

Product validation data for the development of problem-based learning media website with web programming material is obtained through the assessment results of validation by media experts and material experts.

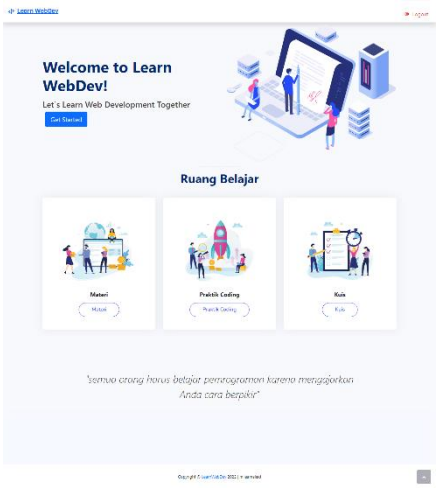

Figure 3. LearnWebDev Dashboard

Based on the overall assessment on four aspects of material validation on website-based learning media by material experts, the average value is 97.5% with very valid qualifications used in learning activities and material in learning media can be used without revision. Instructional media web-based, assessed practical by teachers from the aspects of content, technical, design and students from the aspects of convenience, motivation, and attractiveness, usefulness [14].

Table 2. Validation Criteria

%	Criteria
85.1 - 100	Very valid
70.01 - 85	Valid enough
50.01 - 70	Less valid
00.01 - 50	Invalid

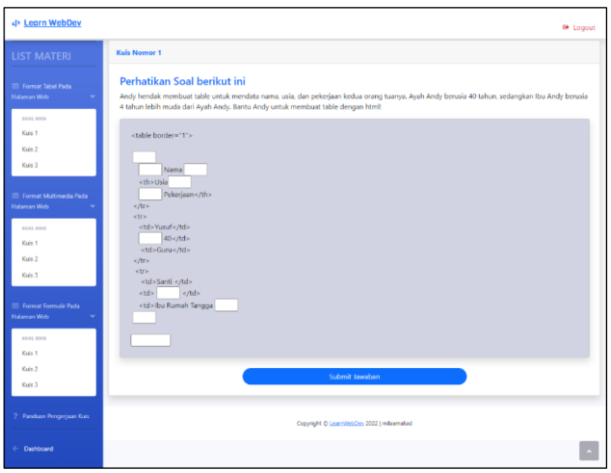

Figure 4. Problem Based Learning Quiz

Based on the overall assessment on four aspects of media validation on website-based learning media by media experts, the average is 91.07% with very valid qualifications and the media can be used without revision.

Based on the overall assessment of small group trials on website-based learning media, an average of 86.2% was obtained with very feasible qualifications.

Based on the overall assessment of the large group trial on website-based learning media, an average of 89.1% was obtained with very feasible qualifications. It can be concluded that the web-based learning media with Problem Based Learning content developed for web programming material is very valid or very feasible to be used to assist the learning process.

Learning media is a tool for presenting interesting and accessible learning material make learning situations active and easy to understand students to improve the quality of learning effectively and efficiently [15]. Problem-based learning-based interactive multimedia learning could significantly increase the learning outcomes [16]. Besides having an effect on learning outcomes, multimedia also can improve situations, make learning more interesting, and motivate students [17]. So, it can be concluded that the developed web-based learning media has interesting features and is suitable for use in vocational school learning.

4. CONCLUSIONS

The product produced in this research and development is a website-based learning media with problem-based learning on web programming material. In this learning media, the materials developed are table format on web pages, multimedia format on web pages, and form format on web pages. The learning media developed has three main menus, namely the material menu, coding practice, and quizzes.

The learning media is developed using PHP programming language and integrated with MySQL database. To implement using the help of the CodeIgniter (CI) framework which is used to implement the code into the form of functions needed by the program. Then for learning media design is designed using Figma application and implemented into user interface design using Bootstrap framework. Learning media development is carried out using the ADDIE development model. This website-based learning media can be run on computer and smartphone devices connected to the internet network.

The learning media developed has gone through a validation process of media experts, material experts, and small and large group feasibility trials by students. The average value obtained from the material expert validation was 97.5%, the average value obtained from the media expert validation was 91.07%, the average value obtained from the small group trial was 86.2%, and the average value obtained from the large group trial was 89.1%.

The average result obtained from the entire validation and trial process is 91%. Based on this, it can be said that the problem-based learning media *website* on web programming material is declared very valid / very feasible and can be used to assist the student learning process.

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