Development of Online Simulator Supports Web-Based Computer Programming Training Media in Information Technology and Computer Education

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Abstrac. The problem of lack of understanding of student competence in basic programming concepts is due to lack of time in the learning process where theory and practice are integrated in only 2 credits per week, limited ability to access tools that support practicum. One of the efforts to overcome this gap in the mastery of basic programming competencies is by conducting training in the field of computer programming. This training is designed to be carried out outside of class time and is not related to the tasks that must be completed by students in lectures. The training process carried out outside of class time provides broad opportunities for students as training participants. This computer programming training is also designed to be done interactively via the internet (online). The interactive training process as described above requires media by utilizing e-learning technology in the field of training known as web-based training technology. Web-based training media have succeeded in facilitating the process of delivering training materials and also demonstrating computer programming practice activities.

Keywords: Online Simulator, Web-Based Training, Computer Programming

1 Introduction

Information Technology and Computer Education, Faculty of Engineering, UNIMED is an undergraduate program in information and computer technology (S1). One of the goals of Information Technology and Computer Education is to produce graduates who are competent in computer programming, computer networks, multimedia, and entrepreneurship. The achievement of this goal is charged to several courses, such as Basic Programming, Data Structures, Object Oriented Programming, Mobile Programming, Web Programming, and so on. The achievement of competencies possessed by students after taking these courses is basically the ability to use various computer programming. Graduates of the Information Technology and Computer Education study program are expected to be able to fulfill competencies in the field of computer programming. As a result, students in this study program at the elementary level are always equipped with basic programming skills. Understanding and mastery of various computer programming languages is a required skill for students studying information technology and computers.

Training in the field of computer programming is one effort to close the gap in mastery of basic programming competencies. According to [1,] training is a learning process focused on a discourse of knowledge and skills with the goal of implementing learning outcomes that meet specific demands. [2] defines training as "the techniques and arrangements for fostering

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and experiencing learning. The emphasis is on learning". [3] defines training as a systematic effort to master skills, rules, concepts, or ways of behaving that impact competence. Furthermore, [4] defines training as the process of teaching and learning as well as exercises aimed at achieving a certain level of competence. In the world of education, training can be used as a supplement to improve students' knowledge and skills in order to meet competency requirements. [5].

This computer programming training is intended to be completed outside of lecture time and is unrelated to the tasks that students must complete in lectures. Outside of class, the training process provides students with numerous opportunities as training participants. The computer programming training procedure is also intended to be conducted interactively via the internet. The interactive training process described above necessitates the use of e-learning technology, also known as web-based training technology, in the field of training. Web-based training is an innovative approach to remote training in which the training material is transformed by internet or intranet technologies and philosophies. The presentation of live content in a structure that allows for independent and self-directed instruction in any topic is the web-based training specification [6].

Web-based training is a type of training that can be created through the use of the internet network [7]. Web-based training allows for real-time and interactive training information delivery. Regular training is provided through training activities in a web-based training system [8]. Thus, web-based training can simply be defined as a training activity that uses networks as a method of delivery, interaction, and facilities, as well as support for various other types of learning services [9]. According to [10], the implementation of web-based training includes four components. Administrative component, assessment component, content delivery component, and community component are the four components. [11] added that the learning content in web-based training is primarily composed of text-based and multimedia-based content.

2 Method

The Waterfall product development model was used in this study, and it consists of (1) Requirements Definition, (2) System and Software Design, (3) Implementation and Unit Testing, (4) Integration and System Testing, and (5) Operation and Maintenance [12]. Communication is required during the Requirement Definition stage of system development in order to understand the software expected by the user as well as the software's limitations. The data is analyzed to obtain the information required by the user. The previous stage's requirements specification will be studied in the System and Software Design phase. System design aids in the determination of hardware and system requirements, as well as the definition of overall system architecture. The system is first developed in small programs called units during the Implementation and Unit Testing stage, and then integrated in the following stage. Unit testing is the process of developing and testing each unit for functionality. After testing each unit, all units developed in the implementation stage are integrated into the system during the Integration & System Testing stage. Following integration, the entire system is tested to ensure that there are no failures or errors. The finished software is run and maintenance is performed during the Operation & Maintenance stage. Maintenance entails correcting errors that were not discovered in the previous step. As new requirements emerge, improve system unit implementation and system services.

The web-based training media validation instrument used in this study included three assessment aspects: usability, functionality, and visual communication. The validity of the research product was assessed by processing data in the form of a questionnaire (instrument)

provided by the experts. The obtained data was then analyzed using Aiken's V formula to determine the content validity coefficient (V) value. This data was calculated using the formula [13]:

$$V = \frac{\sum s}{[n\,(c-1)]} \tag{1}$$

where:
S = total score of validator = r – lo
c = The highest validity score
lo = lowest validity score
r = Number given by validator

3 Result and Discussion

Web-based training designed and developed as a training medium focuses on supporting practical activities in programming fundamentals training. Competency-based training objectives are incorporated into the development of web-based training materials for basic programming instruction. Coding, also known as the process of writing program code, can be practiced on the online compiler found in the web-based training that was developed. The interface of the training activities on the developed media is as follows:

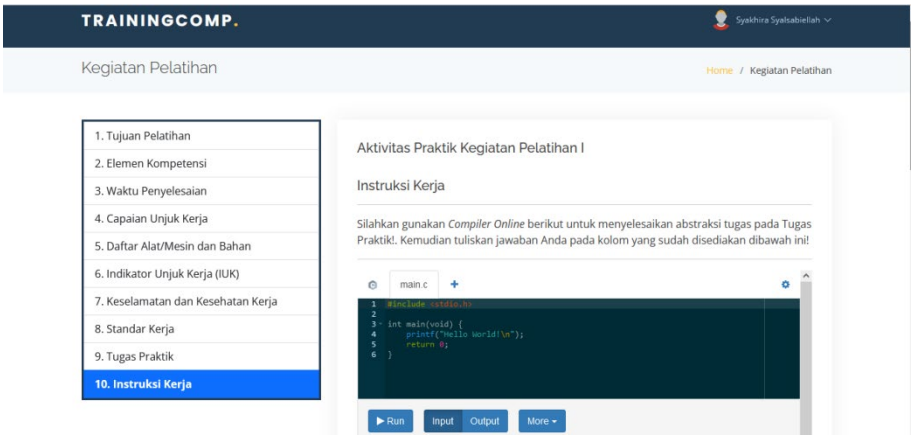

Figure 1. Online Compiler Display on Web-Based Training

In this study, web-based training content development is not focused on accommodating the implementation of a learning management system as e-learning, but rather on web-based online training activities.

Media validation in the development of Web-Based Training training media is a web-based feasibility test used in the process of teaching basic programming. A questionnaire is administered to validators who are experts in the fields of media, information technology, and information technology to conduct the feasibility test. The validation questionnaire is evaluated by experts using quantitative techniques and a Likert scale with response options such as strongly agree, agree, quite agree, disagree, and disagree. Table 1 displays the results of the web-based learning media validity test as well as the Aiken's V value.

Table 1. Results of Web-Based Training Media Validity Test

No	Assessment Aspect	Aiken's V
1	Usability Aspect	0,833
2	Functionallity Aspect	0,800
3	Visual Communication Aspect	0,813
Average		**0,815**

The value of validity (V) for web-based training media is 0.815. This value is greater than 0.677 indicating that the web-based training media is valid to use.

4 Conclusion

The validation of the web-based training media that has been developed is carried out using an instrument that has been prepared to determine the validity value. Experts provide an assessment of the media that has been developed based on the feasibility aspect and provide suggestions and comments regarding the content of the media that is used as a reference for revision and improvement of the media. Validation has been completed and declared feasible for use in training activities. The development of this media can provide additional resources for students of information technology and computer education, in particular, in order to increase their proficiency in computer programming.

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