E-mulsi: The digital module for pharmacy physics lab work

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Abstract. Pharmacy Physics is a science that combines the knowledge of physics and pharmacy. The combination of them results in the preparation of an excellent standard pharmacy, significant effect, and it has a superb stabilization as well. Ideally, the practicum of the pharmacy physics has to be able to increase the knowledge from theory material and enhance the impetus to develop a particular understanding. The function of student’s practicum gets real proof from the concept that has studied so that the practicum activity should be able to take a role as a bridge between theory and real-world in daily activities. This research is attempting to create a particular application that is used for a learning tool when practicum's education is happening in the pharmacy physics lab, named e-mulsi. An app that's created web based application, so that it can be accessed by using any device that students have. The pattern that's used to develop the application of e-mulsi is by using the method of the Software Development Life Cycle (SDLC) waterfall model. The effort of this design is hoped to give the alternative learning tool that's suitable for the future development direction and capable of taking the benefits from the technology that's still advancing, especially Industry's revolution 4.0.

1. Introduction

E-module is the modification of the conventional module with the merge of the technology information's utilization so that the said module could be more exciting and interactive. On studying the practice of Pharmacy physics, the module is used as the practicum's guide. Pharmacy physics is a study that combines Physics and Pharmacy [1]. Physics studies about the characteristics of physics that have good substance such as molecule component or about the heredity of a personal matter. Whereas Pharmacy is a study about medicines and how to make them, it also formulates a medicine compound to be a finished preparation that can be circulated in markets. The combination of the two will produce a specific Pharmacy construction that has proper standardization, effect, and stabilization [2]. The study of Pharmacy physics integrates the standard of Pharmacy knowledge and helps a pharmacist for his attempt to predict the connection of solubility, dissolution speed, stability, and mixed ingredients with the quality of a particular medical product [3]. Ideally, Practicum of Pharmacy physics must be able to increase understanding from the theory material and boost the motivation to develop a particular knowledge [4,5]. The function of student’s practicum gets real proof from the concept that has studied so that the practicum activity should be able to take a role as a bridge between theory and real-world in daily activities [6-9]. However, if the relevance between the concepts that's based on a theory with the practicum in the Laboratory is low, the motivation of students will also go down [10-12]. It is because students glance theory subject and practicum's activity as two different things. There is no connection
between the two so that the practicum that's supposed to strengthen the theory, even is hoped to develop the skills of thinking for students; otherwise, it becomes a burden. Based on that problem, this research is attempting to create a particular application that is used for a learning tool when practicum's education is happening in the Pharmacy physics Lab, that is known as e-mulsi. An app that's created based on the web, so that it can be accessed by using any device that students have. The effort of this design is hoped to give the alternative learning tool that's suitable for the future development direction and capable of taking the benefits from the technology that's still advancing, especially Industry's revolution 4.0.

2. Material and method
TE-mulsi is a module of the subject Pharmacy physics that's used as a guide of Lab work. This module contains standard theories, steps of practicum, media to process practicum's data, and a tool to make a practicum report. The explanation of the standard theory has a function as the standard understanding before proceeding the practicum in the Pharmacy physics Lab. The pattern that's used to develop the application of e-mulsi is by using the method of the Software Development Life Cycle (SDLC) waterfall model [13,14] (Figure 1). It consists of system engineering, analysis, design, coding/implementation, testing, and maintenance [15,16]. The process of developing an application is by using framework CodeIgniter (CI). Also, the Database that is used is My-SQL. CodeIgniter is a framework of a web application that has an original open-source that uses to build a dynamic PHP application [17]. The draft of e-mulsi application can be seen in figure 2.

![Diagram of SDLC waterfall model](image)

**Figure 1.** The method of software development life cycle (SDLC) waterfall model.

3. Result and discussion
E-mulsi application has been created based on figure 2. Based on the purpose of creating this application, which is increasing the competence of Pharmacy students, in understanding Physics theories that are proven by executing the practicum in Lab smoothly and pleasantly. E-mulsi consists of the user interface for students and lecturers. Students must have a user account that can be used to log in to the application. To own it, students must register on the registration page.

In this application, it is providing theories that are used as standard understanding before proceeding the practicum in the form of pdf viewer. Next, step by step, the practicum is guided throughout the application, students are told to put in the scores that they received during the practicum so that it could be concluded in the practicum. At the end of the practicum, students would be asked to answer questions that have been given. In e-mulsi application, students can also send their reports. Lecturers can observe the works during the practicum from admin's page.
E-mulsi application has been tested by using the white-box method test and black-box test.

3.1. Whitebox testing
White box trial is a test case that's using the structure of procedural design control to obtain the test case. The test of the white box software is based on conscientious observation towards procedural detail;
because of that, the logical path software is going to be tested by preparing the test case that would do the work of collecting condition or repetition accurately [18]. White box trials have experimented, and there is no error message.

3.2. Blackbox testing

This test can be done for the user interface software. The purpose of this test case is for showing the function of software about how to operate. Whether by inputting data can work correctly and whether saved information can be protected. The black box experiment focuses on the function of regulations software. With that said, the test, as mentioned earlier, enabling software engineering to gain the variety input condition that's entirely using all of the regulation functional for a particular program [18]. The result of the black box test, that e-mulsi application works perfectly on the platform of Android version 4.4, windows 10 and mac0s by using a browser.

4. Conclusion

The develop of e-mulsi application based on the web that's used as a learning tool in studying practicum on Pharmacy physics Lab has been done by using the method of the Software Development Life Cycle (SDLC) Waterfall model. This application gives an alternative learning tool that fits with the development of future direction and taking the benefits of the technology that's still advancing, especially the industry revolution 4.0.

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