Developing E-Scaffolding Integrated with E-Assessment to Improve Student's Mastery of Concep

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Abstract-**This study was to develop e-scaffolding integrated with e-assessment to improve students' mastery of concept and quality of learning. The development e-scaffolding uses development research 4D conceptual model. The e-scaffolding that is integrated with e-assessment provides a number of scaffolding options needed by higher education to master the physics concepts, especially in mathematic-physics subject. The data analysed in this study are obtained from questionnaires, interviews and cognitive competency test. This study of shows that the e-scaffolding model can improve students' mastery of the concepts. The e-scaffolding model can improve learning quality in the classroom to become more effective and efficient.**

Keyword-E-scaffolding Integrated, E-Assessment, Student' mastery of concept

I. INTRODUCTION

Physics is considered as a difficult subject that many students have minimal to zero interest in. This is due to the view that this subject deals with abstract topics, non-conducive learning situation and lack of sufficient materials and media to support learning, students' low mathematic skill, and limited variety of learning methods adopted by teachers [1]. Scaffolding activities can enhance students independence in learning[2]. The scaffolding activities in this case are given in the form of guidance in doing exercise questions either in groups or individually and giving students exercise questions that can be done individually and are suitable to students' skill level, which in turn will improve their learning achievement[3].Online learning can increase university students' participation in classroom activities[4]. Multimedia technology has a significant benefit for the learning of physics, where learning activities can be supported by the interactive use of images, texts, animation, simulation and video clips that promotes better improvement in learning achievement than conventional method [5]. Hence, the development e-scaffolding which is integrated with e-assessment to improve the mastery of concept and learning quality is highly significant.

Generally, this study aims to develop e-scaffolding which is already integrated with e-assessment to improve the mastery of concept and learning quality. The benefits of this study include: 1) the availability of e-scaffolding that is integrated with e-assessment which university teachers can easily use in learning activities[6][7], 2) the availability of automated feedback by the online system immediately after students submitted their assignments[8]. This will help university teachers in providing practice for students individually without spending a lot of time with each students[9], 3) University teachers can provide room for student discussion and even participate in the discussion while outside of the classroom[10], 4) University students will gain experience working with online based teaching environment[4], 5) the production of an e-scaffolding model that is integrated with e-assessment to improve students' learning achievement in physics for a more effective learning of the physic concepts[11][12], 6) University students can receive feedback on their learning progress[13][14], 7) Students will receive online notes in the form of topics track record and oral or visual explanation of problems[8], 8) Students can obtain guidance to achieve the expected competency, 9) Students get an experience of online learning environment[15], 10) The effect of e-scaffolding that is integrated with e-assessment towards learning quality will be achieved[16], and 11) The effect of e-scaffolding that is integrated with e-assessment towards university students' mastery of concepts will be achieved.

II. METHOD

The research and development approach that is adopted in this study is a modification of the 4D conceptual model developed. This development model consists of 4 stages as follows: The first stage is defining, which comprises of front-end analysis, learner analysis, concept analysis, task analysis, and specifying instructional objectives. In front-end analysis the researcher conducts a background review

for the idea of e-scaffolding that is integrated with e-assessment to come up as an innovation in e-learning. The learner analysis is conducted to find out the general characteristics of the students, which include: intellectual competence or development, individual or social skills which can be developed to achieve the expected learning objectives. Concept analysis is carried on to identify the main concepts to be taught. While in task analysis the competencies in the physics subject are described as learning indicators. The specifying instructional activities are conducted to summarise the results of the concept and task analysis to later determine the behaviour of the study objects. The collective objects will then become the basis for designing the test and learning materials to be integrated with the product. The second stage is designing, in which a number of activities are conducted as follows: constructing criterion referenced test, media selection, format selection, and initial design. The construction of criterion-referenced test links the defining stage to the second stage. The test is designed to fit with students cognitive competence. Media selection is conducted to identify and developed learning media that are relevant with the characteristics of the materials. The selection of the format is aimed to design the content, strategy, approach, method and sources of the learning. While in the initial design activity, the researcher designs the complete plan before being tested. The third stage, developing, includes material and media expert appraisal followed by developmental testing. Overall, this stage is conducted to produce consistent and effecting learning materials. The fourth and last stage is dissemination, which aims to find out the effectivity of the product and to socialise the product before it is launched to the public. The data used in this study are the results of the product validation, questionnaire and interviews, and the cognitive test. The product validation result is achieved from media and material experts assessment. Questionnaires and interviews are conducted on students and teachers[17]. While the cognitive test which describes students' mastery of the concepts is obtained from students' use of e-scaffolding and e-assessment. Framework that use in e-scaffoldingis Code Ingniter (CI) dan Bootstrap, it's deferent with [18] that use OWL-S and XML. The making of this e-scaffoldingused PHP programming language[19], HTML documents, CSS, Javascript and system SQL[19].The software that used in e-Scaffolding is Notepad++, XAMPP, Adobe Flash CC and Adobe Photoshop CS 6.

III.   RESULT AND DISCUSSION

The e-scaffolding that is integrated with e-assessment provides a number of e-scaffolding options needed by university students to master the physics concepts, especially in mathematic-physics subject. Being able to run

on iOS or Apple, this product is rather flexible for university students and teachers to use anywhere and anytime[20][21][5]. On this application, members can see their progress in mastering the physics concepts. E-assessment is also provided on this application in the form of a timed cognitive test. Hence, users can measure their accuracy and speed in completing the test. They can also find out their result immediately after they finish the test, as the application can directly provide feedback to the users on their learning[21].
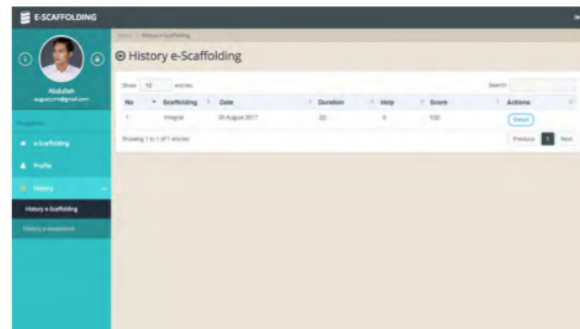

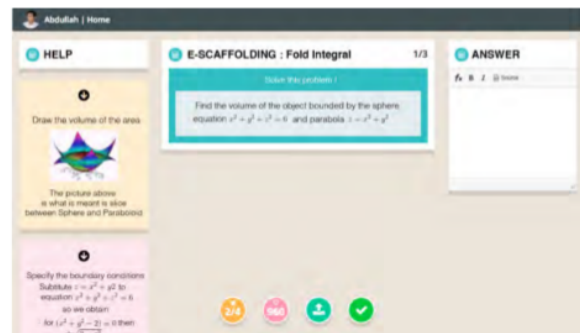Figure 1. Example of a dashboard member

Figure 2. Example solve problem use E-Scaffolding

The questionnaire and interview data analysis as well as the result from media and material expert assessment shows that the e-scaffolding is quite an excellent product. The tests used here are propriety, effectivity, and attractiveness tests from the questionnaire data analysis shows that overall there is an improvement in the quality of the learning process[22]. To find out the increase in students' mastery of the mathematic physics materials, the researcher conducts a cognitive test by utilising the e-assessment. From the result, it is found that among the 35 students who participated in the study their mastery of the concepts experienced an rather significant increase from an average score of 65.7 to 83.2. In addition to the advantages

of the e-scaffolding model, it appears that this model also has several disadvantages, namely the application fails to enhance students' ability in understanding the implementation of the concepts in real life and to increase students' critical thinking skills. It is also unable to provide insights into the students' thinking process.

IV. CONCLUSION

The result of this study is a model of e-scaffolding that is integrated with e-assessment. The topic chosen as the main focus of this study is the mathematic physics. The expert assessment shows excellent result (86.75%), which means the product is highly appropriate for use. The average effectivity score obtained from the questionnaire response is 88% (highly effective). While the effectivity score from the test shows there is an increase in the average score of the 35 students up to as much as 83.2. The applicability test test result comes up with a score of 88% (excellent), and the attractiveness test result is 82.3%, which means the product is highly attractive. The improvement of the learning quality is evident from the increase of the learning quality questionnaire score, as follows: motivation 8.84%, 21.86%, and process effectivity 32.17%. Overall, it can be concluded that the use of the e-scaffolding model can improve learning quality in the classroom to become more effective and efficient. This study of shows that the e-scaffolding model can improve students' mastery of the concept

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