

The Development of E-Assessment with Learning Management System

H. Sahidu, G. Gunawan and L. Herayanti

Physics Education Study Program, Universitas Mataram, Jln. Majapahit No 62 Mataram 83125,
Indonesia

hairunisyahsahidu@gmail.com , gunawan@unram.ac.id , lovyherayanti@ikipmataram.ac.id

I. Indriaturrahmi and F. Austik

Education Technology Study Program, IKIP Mataram, Jln. Pemuda No 59 A Mataram 83125,
Indonesia

indriaturrahmi@gmail.com , fitriastutik@ikipmataram.ac.id

Abdul Talib Bon

Department of Production and Operations, University Tun Hussein Onn Malaysia,
Malaysia

talibon@gmail.com

Abstract

Computer technology can be used for learning assessment activities, commonly called e-assessment. Assessment is an important part of learning. This study aims to develop an e-assessment model using a Moodle-based learning management system. This development research uses the DDD-E model, including define, design, develop, and evaluate. This e-assessment development uses Moodle 3.0 Software. In the e-assessment model generated the questions can be accessed by physics teacher candidates flexibly. This model can help students to evaluate independently to know the level of learning achievement. In addition, this model also encourages motivation and learning to solve the problems given

Keywords

Computer technology, learning assessment, e-assessment, learning management, learning achievement

1. Introduction

The development of computer technology brings a significant impact in life, including in the field of education. Computer technology in the field of education can be utilized for academic information systems, learning media, and assessment. Gunawan & Liliyasi (2012) stated that some forms of interaction, such as practice, practice, tutorial, and problem-solving, could be raised through computer technology. Computer technology that applied to physics learning can improve students' creativity (2017). The interactive display in the computer program helps students recall the material discussed earlier (Gunawan et al. 2017).

Assessment in education is a must and a fundamental aspect of teaching. Therefore, accurate assessment is related to the learning process (Kearns 2012). Both of them are the system that has been built for years in the scope of education and can not be separated. A teacher will succeed in gathering information about the process, the product, or the attitude of the student through an assessment. While students have a role as an object that will get benefit from the test results that is in the form of information about the stage of development that has been achieved

Based on the aspect of meaningfulness in the education process, the assessment serves as: first, the selector, that is obtaining information about whether or not the student is successful in learning, whether or not the student passes the exam, whether or not the student goes to the next level or not, and whether or not the award is given; secondly, as a diagnostic tool, namely the detection of students' mental normality; third, the placement basis, such as the basis of class division, the basis of the award of the scholarship recipient or an award, or the determination of the division of the group; fourth, the success of the teachers. The success of teachers in guiding, success in learning for students, the success of institutional programs, and the success of education in general (Supriyadi 2002).

In general, there are several issues related to the assessment, such as the low quality of the assessment instrument, the inappropriateness of the measured aspect with the purpose of the assessment, the low of the quality of control during the assessment heading, the length time needed for the process of recapitulation and data analysis, the less of transparent assessment process implemented, high subjectivity; and as well as slow and inaccurate feedback. Beebe et al. (2010) revealed that time management affected assessments in the online learning environment. Students expect immediate feedback and quicker feedback on the results of tests they have done

Some of these problems can be solved through improvements in the quality of instruments and assessment tools, while other problems can be solved by using an online-based assessment mechanism known as e-assessment. Through the use of e-assessment, the teacher knows the progress of student learning record completely from time to time. E-assessment makes the assessment process transparent and holistic because several performance factors can be directly measured that impact more efficient time management

Finkelstein et al. (2005) stated that computers could be used to support the implementation of physics learning, namely to collect, present, and process data. Computer programs that applied in physics learning can help student to be more creative, particularly for the aspects of fluency and elaboration (Gunawan et al. 2018). In addition, Santos et al. (2015) revealed that computers offer the opportunity to use simulations, manage large amounts of updated information, improve interaction with information and make students more actively participate in the assessment process. The online mechanism should involve the applicable curricula, e-learning, technologies that are flexible and supportive of high-level thinking, social skills, and teamwork. The application of computer technology has been able to adapt the learning objectives. The forms of application of computer technology have been carried out as interactive e-books to enhance creative thinking skills (Adawiyah et al. 2019), virtual labs to improve mastery of concepts and student creativity (Gunawan et al. 2019; Gunawan et al. 2018; Hermansyah et al. 2019) nor the animation multimedia to improve critical thinking skills (Mashami, 2018). Then, computer technology has a very good opportunity to be applied as an assessment tool. As Clayton et al. (2003) state that the use of an online environment to support learning and assessment opportunities should be in the form of self-assessment, peer assessment, or group/collaborative assessment. According to Romero et al. (2015), the e-assessment system should enable teachers to make diagnostic, summative, and formative assessments, along with self-assessment and joint assessment.

E-assessment in this study was developed by using learning management system (LMS). LMS is a software that virtualizes the conventional learning process. LMS can manage the features in the learning process in the form of classes, materials or content, attendance, discussion forums to assessment. This study focuses on developing online assessment or e-assessment using LMS. According to Cavuset al.(2007), LMS became a very active domain among researchers studying online education. LMS is often regarded as a starting point for developing online courses or programs by teachers as it provides the means to manage, deliver and track online learning and student learning outcomes

The LMS system acts as a bridge between teachers and students. The teacher will configure the LMS system by filling in the learning materials; thus, students will easily access the learning. In term of cognitive benefit, the use of the LMS system allows students and teachers to meet in a virtual classroom. Furthermore, the LMS system allows teachers to continuously monitor the learning abilities and success rates of the students. Therefore, a Moodle-shaped LMS is used in the development of this e-assessment model.

E-assessment was built using Moodle 3.3 software that can be accessed through computer network and operated through computer. This research activity is important to obtain empirical evidence about the advantages of the e-assessment model as an alternative evaluation model in the future. The purpose of this research is to produce an e-assessment product that can be applied to support learning for physics teacher candidate. The development of this model is expected to encourage student learning motivation to improve the ability of thinking and ability in problem-solving.

2. Methodology

This research was research and development. E-assessment model with learning management system has been produced in this research. Research and development were used to produce and test the effectiveness of certain products (Sugiyono 2013). This development study began with the needs analysis, as well as testing the effectiveness of the product in order to be widely utilized. This type of development research used the DDD-E model, which consists of 4 stages, namely define, design, develop, and evaluate (Baron and Ivers 2002).

At the deciding stage, the identification and the analysis of content, aspect, and situation of the research site needed for the development of the e-assessment were done. Then proceed with the design stage, which was the stage of designing the detailed content that was prepared to be developed further. The flowchart and storyboard design of e-assessment were made in this stage. The third stage was developed where the development of media was done. It

began with the background design, navigation buttons, the selection of images and text that has been prepared previously. The last of the stage was evaluated, which was a thorough evaluation of the e-assessment product that has been developed by involving the users. In general, the product development model in this study can be modified and controlled in accordance with the established development goals.

3. Results and Discussion

This study aims to develop an e-assessment model and test its effectiveness in an evaluation of physics learning. The development of e-assessment products through four stages of DDD-E that is, decide, design, develop, and evaluate.

At the deciding stage, content analysis has been generated to determine the need for appropriate product development goals. At this stage also the needs of software and hardware that are feasible to use in the process of making and applying e-assessment products were analyzed. At this stage also, the next stage was determined, including the location of the product trial. At the design stage, a flowchart design has been created, which consists of the flowchart of e-assessment login process and flowchart of data process. The storyboard design was also generated at this stage which consists of a preliminary view design of storyboard before the login, the login process, the start display of the exam, the exam quiz exam question, the test scores. The design at this stage was prepared for further development.

At the developing stage, an e-assessment product has been produced appropriate to the design. The expert validates the product that has been developed. Validation was carried out on aspects of its evaluation design, physical content, as well as on selected aspects of technology. At the last stage, the evaluate stage, a thorough evaluation of the initial stage until the model test was conducted. Trials were conducted in several sessions in different subjects. Those subjects were physics learning evaluation, physics learning device development, and waves and optics courses.

The product of e-assessment model is further tested. Trials are divided into three activities, namely trial one which was intended to improve the features, menu, access, and display program. Based on the results, it was found that the respondent easily understood the menu and appearance of the program. However, there were some improvement recommendations, especially the changes in the display image of the program. At this stage, interruption, and error when login program was still found. This happened because of the mistakes in email entry, which was used when registering as a participant of trial.

The next trial was focused on the display model, time setting, and evaluation activities. Display intended at this stage were quiz display or other assessing models. There were some changes in the display of questions on one screen. It was started with five questions, three questions, and 1 question. Each display with several different questions randomly arranged by the program. At this stage, the information obtained that the number of questions on one screen should not be too many. This was related to the participants' focus on the question. Participants can be more focused to answer the question well with this pattern. Participants can immediately move on to the next question after finishing a particular question. In the model created, the participants can work on the questions randomly. Questions that have or have not been answered will be displayed with different marks in the program so that participants can try again to answer questions that may have missed earlier. Questions can be provided with images, animations, or video that is relevant to the question. This will help for visualization to ease participants in understanding the question. At this stage, the ideal time for each type of test can be determined by considering the degree of material ease, test form, and the number of questions that must be answered in specified time intervals.

The next trial activity is intended to ensure that the e-assessment model that has been developed still provided valid results in accordance with the ability of participants. This trial used a multiple choice test, which was needed to be answered in 100 minutes. Questions vary according to the characteristics of each course tested — the number of problems that appear also adjusted with the given time. The number of questions to be answered, and the estimated time can be arranged in the program.

After logging in for the test, each participant can directly work on the question that appears on the monitors. At the same time, the countdown begins and can be seen by the participants at the top right of the screen. After performing the test, participants can log out of the test, the test results, including a description of the number of questions answered correctly or incorrectly, were displayed on the monitor. Participants can check their answers on any given questions. In the answer, there is already correct or incorrect marker so that they can find out which question that they response incorrectly

The participant's test scores interval and average performance in each of the test subjects are shown in Table 1. The results of this test were used for program evaluation and inputs to improve the quality of learning for lecturers and students.

Table 1. Average Student Test Scores Using E-Assessment Models

No	Courses	Highest Score	Lowest Score	Average Score
1	Physics learning evaluation	95.0	47.5	75.05
2	Physics learning device development	72.0	48.0	59.68
3	Waves and optics	65.0	14.0	32.67

After conducting the exam, students were asked to fill in a questionnaire that can be downloaded on their accounts. The purpose of the questionnaire was to obtain responses to the effectiveness of the functions of the assessment features and to find out their opinions on the tests and assessments using the e-assessment software, as a review material in subsequent e-assessment development.

The results of the questionnaires given to the students in the form of opinions, constraints, impressions, and advantages and the disadvantages they feel when using e-assessment. Students stated that the online exam process run well. The time given to work on the questions was consistent because the system has been given time limits so that students can focus and discipline in working on the test. In addition, on the online exam, students only need computer media and focus on the screen to answer the question. Questions were randomly assigned during the test caused students receiving different sequences of questions. Patterns like this will reduce the chances for participants to discuss or cooperate during the test.

Most respondents stated that e-assessment was a form of effective assessment using the computer system. Garrison & Vaughan (2008) stated that in online learning and assessment there are several advantages, such as reconceptualization and redesign of learning so that it is more fresh (fresh), the ability to manage more content and to make it as an inquiry community. In addition, e-assessment was made to ease students to access every feature in it. The feature displayed on e-assessment was also easy for users to access. Figure 1 shows the display of features in the developed e-assessment.

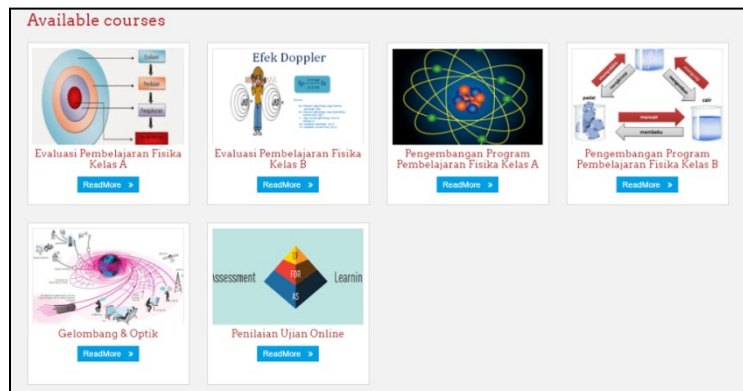


Figure 1. Material Choice and Evaluation Features in E-Assessment Model

The use of e-assessment made the assessment process more transparent and objective. Evaluation becomes more comprehensive because several performance factors can be measured at the same time. In addition, teachers get important information about student participation, such as access to resources, the sequence of activities performed, and so forth. E-assessment also offered a set of assessment tools for creating, managing, and assessing student tasks by using multiple assessment scales. In addition, Arend (2007) stated that the most promising and easy to understand online assessment aspect is e-assessment. This is important because it has a strong impact on learning and the indicator of the quality of learning that occurs in the classroom.

Besides beneficial to the evaluation process, e-assessment was also faced with some obstacles in its use, for example on internet access that is less stable at a certain time, errors on the user's computer, power lines that off during the test. Other obstacles can be a disruption of opportunities to open a new tab for accessing other sites that can interfere with the exams. These constraints must be anticipated so established plan was not as not interfered. This suggests that teachers should be more prepared and thorough during the online exam process taking into account any unforeseen possibilities. According to Romero et al. (2015), in the field of e-assessment, two issues must be addressed. First, e-assessment should be accepted by teachers and students. In addition, tools to support, design, and make valid and reliable judgments, from a pedagogical perspective, are indispensable.

Overall, the e-assessment model has been successfully applied in the evaluation of several physics courses. Students were also excited about the tests in this model. Online exam models in e-assessment can improve concentration and train students' thinking processes. The use of e-assessment in assessment is excellent and relevant to create an effective and efficient learning environment. The results of e-assessment were also clear, fair, and encourage students to keep learning better.

4. Conclusion

This research has successfully developed the e-assessment model using learning management system (LMS). LMS uses Moodle 3.3 software. The developed e-assessment has been validated by the expert and declared eligible to be used for the evaluation of physics learning. Questions in the e-assessment model can be made in a variety of forms such as multiple choice, essay, and another form. At the testing stage, the number of questions on each display influenced the participant's focus in answering.

The random and different question between the students made them more focused on answering independently than conventional tests with almost identical order and type questions. The time limit in working on the question made the student more disciplined and used the time wisely. Quick feedback and follow-up recommendations help the student to know the weakness during the test so they will prepare for the next test.

During the study, there were no significant obstacles due to adequate internet access, an easy feature for students. However, this should be maintained in subsequent research. Another thing that should be controlled during the test is that students do not open a new tab for internet access on other sites.

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Biographies

Hairunnisya Sahidu, associate professor in Physics Education, the Faculty of Education, Universitas Mataram, Indonesia

Gunawan, Senior Lecturer in Physics Education, the Faculty of Teacher Training and Education, Universitas Mataram, Indonesia. He completed his doctoral program in a physics education study program at the Indonesian Education University in January 2011. Currently, he is the Director of the research center for physics and technology education, Universitas Mataram

Lovy Herayanti, Lecturer in Physics Education, the Faculty of Mathematic and Science Education, IKIP Mataram, Indonesia. She completed her doctoral program in a science education study program at Surabaya State University in February 2018. Currently, she is actively researching several issues related to information technology applications in science learning

I. Indriaturrahmi, Lecturer in Technology Education, the Faculty of Education, IKIP Mataram, Indonesia

F. Astutik, Lecturer in Technology Education, the Faculty of Education, IKIP Mataram, Indonesia

Abdul Talib Bon, professor of Production and Operations Management in the Faculty of Technology Management and Business at the Universiti Tun Hussein Onn Malaysia since 1999. He has a PhD in Computer Science, which he obtained from the Universite de La Rochelle, France in the year 2008. His doctoral thesis was on topic Process Quality Improvement on Beltline Moulding Manufacturing. He studied Business Administration in the Universiti Kebangsaan Malaysia for which he was awarded the MBA in the year 1998. He's bachelor degree and diploma in Mechanical Engineering which he obtained from the Universiti Teknologi Malaysia. He received his postgraduate certificate in Mechatronics and Robotics from Carlisle, United Kingdom in 1997. He had published more 150 International Proceedings and International Journals and 8 books. He is a member of MSORSM, IIF, IEOM, IIE, INFORMS, TAM and MIM