Development of web-based and e-learning media for physics learning materials in senior high school: a pilot study

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Abstract. The impressed by the increase of information and technology that causes adjustments in the approach of learning and required teaching and learning activities are no longer restricted to space and time. This study tried to developing the web-based and e-learning media for physics learning material in school. The design on this research used is research and development (R&D) with the Borg and Gall model. Based on the results on this study, we found: 1) learning model of e-learning on subjects of physics has been set up to applied for teaching and learning settings. 2) The researchers are capable to produce the learning medium of web-based e-learning on subjects of physics in senior high school with suitable criteria.

Based on the graphic view, the use of linguistic material, suitability, and sketches of the test material and media experts recover the results that these experts stated 80.8% media created applies to the stable and acceptable to operate by students in school.

1. Introduction
In traditional view, the concept of learning in the schools is always illustrated through face-to-face meetings between teachers and students in the classroom [1]–[4]. Standardized or traditional learning process could be characterized with centralized authority (content selected by the educator) [5]–[7], strong push delivery (instructors push knowledge to students), lack of a personalization (content must satisfy the need of many) and the linear/static learning process (unchanged content) [8], [9].

Current paradigms that occur referred to the learning transform that is no longer simply ended with face to face between instructors and learners in the classroom [2], [5], [10], [11]. Now, learning can also be determined without face to face straight by running the communication media, although the theory of social communication is provided [12], [13]. The internet existence and the rapid evolution of Information Technology (IT)[14] are carrying out adjustments in the approach of learning. Learning and teaching activities are no longer limited to location and time[4], [15], [16].

Based on the observation in SMA 1 Pusaka Jakarta, the teacher showed in front of the class and the students attending in the classroom doing effective less learning. Students were not paying off recognition to what was said by teachers; there were students who chatting and play ed mobile phones. On the reason of this condition, it demands methods and learning media in consonance with learning needs of student. This time methods of learning are using many computer systems and internets. Learning media is a tool to deliver messages from source to recipient. In this case, the teacher plays as the source and students as the recipient [17], [18]. The use of didactic media will indeed support for the performance of the learning process and the delivery of messages and content of the lesson,
because the learning media can move beyond the classroom lines [19]. The presence of learning to applying the internet identified as e-learning can be achieved anywhere and anytime as a support of learning media in facing challenges in the future. Broadly speaking, synchronous learning is crucial to establish if the group of learners is spread over fields and time zones: complex but absolutely not impossible”. Through e-learning, the learning is not in face to face between teachers and learners in the classroom.

The development of e-learning is new relatively and its implementation is highly diverse and no standard eventually. The implementation of e-learning systems ranges from (1) simple collection of learning materials and communication forums via e-mail, separate chats and (2) more complex directly connected to the e-learning portal contained a collection of learning materials, academic information, evaluation, communication and other education tools. The use of e-learning can make the lessons is not consistently done in the classroom and the lessons using multimedia can make fun learning. Multimedia includes various combinations of text, images, graphics, animation and video elements that have been digitally manipulated so as to display a fun projection, having aesthetic value and maintaining visual consistency.” Through this E-learning, teachers can manage learning materials using multimedia, such as: uploading learning materials, giving assignment to students, accepting students' assignment, making tests/quiz, assigning values, monitoring students' active, managing student's values, interacting with students and fellow teachers through discussion forums, chatting, etc. Students can access information and learning materials, interact with fellow students and teachers, make transaction learning assignment, make a tests/ quiz, achievement of learning result, etc. [20]–[22].

One of the learning media that can be made is the web–based Moodle of learning media of e-learning. Moodle has a variety of simple features that can support learning well. In this research, the researchers use the Bitnami Moodle Stack. The Excess of Bitnami Moodle Stack, among others: 1) The Moodle is free available, 2) the application is easy to be installed, 3) available in multiple languages, 4) Can be modified as needed, 5) The technology used is simple, so easy to use, 6) Not serving ads.

Moodle offers students and educators personal dashboards, course lists, and assignments. Educators can make learning by creating tasks and seeing the progress of students. The excess of Moodle in building of Web-based e-learning, among others: 1) Can be modified according to the learning needs, 2) Can include various of learning tools such as; Modules, presentations, videos, and virtual labs. 3) Can set the other teachers not to enter in a learning, 4) Can make tasks, tests, and interactive quizzes, 5) Can view student submissions and monitoring progress of student learning, 6) Can keep interaction between teachers and students through discussion forum [23]–[25].

Based on these descriptions, we intend to conduct research "development of web-based e-learning media on dynamic fluid subject for senior high school students ".

2. Method

2.1. Research Design

This research was conducted at SMA Pusaka 1 Jakarta in March until June 2017. The type of research used is the type of research and development (R & D), to produce a particular product, and test the effectiveness of the product.

Subjects in this study is interactive learning media-based Web-Based E-Learning of Web-based Moodle on the subject Fluid SMA Pusaka 1 Jakarta. The materials learning refers to the national curriculum 2013.

2.2. Procedures

The research model used is Borg and Gall with the consideration that this refers to real conditions and needs, develops systematically and is based on the theoretical foundation of learning design. The stages of research consist of 10 steps proposed by Borg and Gall. It means that the stages of research
that researchers use are: conduct literature study, make a plan, develop a product preliminary form with validation conducted on content expert, media expert, revision and outcome/result.

2.3. Instrumentation
The techniques of data collection on this study by testing the product intended to collect data that can be used as a basis to determine the level of effectiveness, efficiency, or attractiveness of the resulting product. The product trial is intended to achieve valid of learning product criteria. The data collection techniques used is questionnaire product evaluation. Questionnaires are used to assess product development by experts.

Instruments used to collect data is questionnaires. The questionnaires used to collect data from trial subjects for good, questionnaire is close and open. Closed questionnaires are provided to reviewers in assessing developed product development that has been developed. While an open questionnaire is provided to reviewers in providing advice that is not provided by the choice in a closed questionnaire. As given the questionnaire grid consists of 30 items of statement that is divided into 5 aspects of graphics, usage, language, material suitability, and illustration.

2.4. Data Analysis
The techniques of analysis data used is to manage data from the results of expert review on the development of Web-based learning that is using descriptive statistical analysis and qualitative descriptive analysis. The quantitative data, in order to be read in the form of structured information, involves the percentage of values. The qualitative descriptive analysis is used to process data from the results of expert reviews, this technique is implemented by grouping information of qualitative data in the form of suggestions of improvements contained in the questionnaire. The Analysis of this data will be as a guide to revise development product of Web-based Media learning.

3. Result and Discussions
The results of the first stage of research is the collection of information for researchers to arrange the concept of learning media for physics subjects which will be developed further. Such an information is the observation in the school about the continuity of physics lessons in class XI, collecting information about media of learning and determine the subject that will be included in the media of learning. From the results of information gathering obtained the subject of dynamic fluid and Web-based e-learning of media of learning for researchers to develop.

The second stage is the planning stage which includes determining the purpose of making Web-based e-learning of media of learning. The development of Media of learning has purpose to make physics learning process is more fun, not monotonous, accessible anywhere and anytime, and Students become more independent. Next, determine the expert to do the validation and determine the target will be subject to field trials limited test and field test expanded.

![Figure 1. The main interface of physics learning materials based on time per weeks](image-url)
The third stage is the compilation of Web-based e-learning of media learning containing physical materials with dynamic fluid subject consisting of; learning modules, power points, video learning, quiz, and assignment. Next, researchers conducting expert tests and revisions. The display of product results can be seen in Figure 1 to 3.

Figure 2. The interface of interactive quiz for students in physics learning materials

Figure 3. The interactive quiz score for students

The fourth stage is a field trials limited test conducted on the students of class XI MIA at SMA 1 Pusaka Jakarta. At this stage, researchers took samples at random from to get the validation results.

The fifth stage, revised from a field trials limited test results. The sixth stage, namely, the field test expanded. At this stage, researchers took data on class XI MIA 2 in SMA 1 Pusaka Jakarta. Furthermore, the last stage is the revision of the test results be extended until the end of the result obtained as follows.

The result of validation of the instrument that has been done from graphic aspect, usage, language, material suitability, and illustration aspect is 80,8% with good category and proper to be used. The input obtained is as follows: According to media experts: the web-based and e-learning media be completed with needs to chat facility on any material. According to material experts: 1) to avoid the word "Sebuah", 2) Write the magnitude with italics font and write the unit with an upright letter, 3) List the video source, 4) Mention the limitations of learning module, 5) Fix writing a bibliography on learning module, 6) Improve the spelling of the learning module. Based on Field Trials Limited Test: Using video with a more attractive and more clearly. Based on Field Test Expanded: 1) Add more exercises 2) Change the background to make it more attractive.
4. Conclusions and Suggestions

Based on the results of research that has been done can be drawn conclusion as follows: (1) the e-learning of model learning on the subject of physics is a new media in the field of teaching and learning, and; (2) researchers are able to develop a web-based e-learning of media learning on high school physics subjects with good qualifications and proper to use.

While the advice to be conveyed is the utilization of e-learning requires an independent learning culture and a habit of learning. Lack of interaction between teachers and learners or even among students themselves can slow the formation of a culture or value on the process of learning and teaching. This e-learning tool is very positive to be developed with other services such as can be accessed via mobile phone and completed with a video learning is more interesting.

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