Design and Development of E-learning Devices Based on Massive Open Online Course (MOOC) on Static Fluids Material

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Abstract. E-learning devices based on MOOC is a learning device product that is integrated with a Massive Open Online Course system that is available through a web platform/application provider via Moodle. The learning devices consisting of lesson plans, LKPD, and learning assessments are also equipped with various content and other interesting features. The purpose of this study is to produce a valid and feasible e-learning learning device so that it can be used in physics learning, especially on static fluid material. This learning device that is integrated with MOOC is expected to make it easier for teachers and students in teaching and learning activities, so that learning continues to be interesting and effective even though online. This type of research is Research and Development (R&D) using a 4D development model. The research instrument used in this study was a learning device validation sheet consisting of lesson plans, student’s worksheet, and learning assessments that were assessed by the validators to assess the feasibility of the product. The data in this study is quantitative data by showing the results of research on the design and development of e-learning devices based on MOOC on static fluids material which is declared valid with a score of 3.46 (high category). Thus the product of this learning device can be declared worthy of being tested or used in physics learning.

1. Introduction
The COVID-19 pandemic is a tragedy that grieves the entire population of the earth. All segments of human life on earth are disrupted, without exception education. Many countries have decided to close schools, colleges and universities, including Indonesia [1]. On March 24, 2020 the Minister of Education and Culture of the Republic of Indonesia issued Circular Letter Number 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of COVID, in the Circular it was explained that the learning process was carried out at home through online/distance learning to provide a learning experience meaningful to students. Studying at home can be focused on life skills education, including regarding the Covid-19 pandemic. This learning model is an educational innovation to answer the challenge of the availability of varied learning resources [2].
One of the significant advances and changes from the state of the 21st century is the rapid development of internet technology. One of the impacts of the changes felt in this regard is that through the internet today we can get access to education and jobs. Through the internet we can also communicate and socialize without geographical distance restrictions, shop, or entertain ourselves [3]. The development of the world of education with a model as it is today certainly cannot be separated from the development of technological advances. Even the world of education is required to always be able to adjust so that it always moves in line with global technological advances [4]. This is also the forerunner of the birth of e-learning in the current era. The goal is for education to exist and be able to adapt to the conditions of the times. So that the packaging of education is more attractive and transforms into a better direction in terms of quality and quality. According to Munir [5] we can define e-learning as the application of information technology in the world of education in the form of a virtual world which is intended as a form of transformation of the world of education in schools and universities into a digital world which is bridged by internet technology. As the day progresses, the need for internet technology and access to the digital world is increasing. Moreover, the world of education which was originally conventional began to try to change direction and transform towards digital as a form of adapting to the demands and conditions of this century.

In improving the quality of education, information and communication technology is needed. Because developed countries make information and communication technology as a driving force to advance the world of education [6]. E-learning will present a new atmosphere in various learning developments. Utilization of e-learning properly can also increase student’s motivation to learn maximally [7]. E-learning can be said to be much more efficient than traditional learning systems [8]. With its simpler and more efficient nature, this is a great opportunity for the world of education to improve its quality and quality. Especially now that the world of internet technology is very easy to access. Moreover, a significant difference from e-learning compared to traditional learning is the position of the role of teachers and students. In the traditional classroom, the position of the teacher is placed as an all-knowing figure of knowledge sharing. So that indirectly the continuity of the class is very dependent on the presence of the teacher in the class. While e-learning is more student-centered. In this learning, students are required to be more independent and responsible for their learning. So that they will be expected to be more active in exploring and mastering the material and assignments given more independently. This is also corroborated by the statement [9] which states that the media used in e-learning in the world of education has many benefits, including being flexible, interactive, and efficient.

In the world of education, there have actually been many various learning projects that have been initiated and directed to the digital world. One example is MOOC. MOOC, also known as Massive Open Online Course, is a learning system that is carried out online on a large scale with a large number of participants, with far and different scopes and distances. This MOOC can be accessed by using via the web or digital applications and on the internet network. This makes this model system very efficient and easily accessible to anyone globally. Two prominent characteristics of MOOC are the number of participants and the large scale and infrastructure in the distance learning process [10]. Because basically this MOOC system is a very unique program and adds to the learning environment with various advantages [11].

Currently, this MOOC model has been developed by various universities and corporate agencies around the world. Among them are Cousera, idX, Udacity, Moodle, and so on. These various providers are also very easily accessible via the web and applications. So that it can be accessed anywhere and anytime in the learning process. The features presented are also very promising and helpful in learning effectiveness, such as video features and materials, final assignments, as well as discussion and evaluation forums. So this will not eliminate the essence of learning, but on the contrary will enrich and strengthen the learning process itself.

Static fluid material is material that is closely related to everyday life, but is very difficult for students to understand. So that students are constrained in understanding the concepts that exist in the discussion of this material such as Pascal's law, Archimedes, and other static fluid concepts [12]. This
material is also very often encountered by students in their daily lives, such as several applications of the laws contained in the discussion of this material [13]. In addition, this material requires the discovery of concepts, understanding, and is applicable so that it will be better if it is taught contextually accompanied by experiments or experiments that interest students [14]. Based on the description of the background above, the researcher is interested in researching MOOC-based e-learning learning tools for students in schools with the title "Design and Development of E-learning Devices Based On Massive Open Online Course (MOOC) on Static Fluids Material". With this designed learning tool, it is hoped that it can help teachers and students in the online teaching and learning process to be more effective and interesting.

2. Methodology
Research on the development of e-learning based on Massive Open Online Course (MOOC) was conducted at the Physics Education Laboratory, Department of Mathematics and Natural Sciences, Riau University. The research was conducted in July 2020 to April 2021. The type of research is Research and Development (R&D) research using a 4D development model consisting of 4 stages, namely Define, Design, Development, Disseminates. However, in practice the researchers only reached the development stage.

Data analysis in this research is quantitative data analysis taken from the validation scores by the validators. Validation sheets that will be assessed on learning device products include lesson plans validation sheets, validation sheets of Students worksheet, and validation sheets for learning assessments. Validation sheets were adopted from several reliable sources [15, 16]. Then this data will be analyzed using a Likert scale [17] as shown in Table 1.

| No. | Score | Category       | Validity |
|-----|-------|----------------|----------|
| 1.  | 4     | Very Good      | Valid    |
| 2.  | 3     | Good           |          |
| 3.  | 2     | Not Good       | No Valid |
| 4.  | 1     | Very Not Good  |          |

Learning devices are said to be valid if each validation assessment item is large or equal to 3 and the average validation score is large or equal to 3. Meanwhile, on the contrary, it is said to be invalid if one of the assessment items is smaller than 3. Improvements to be re-validated until it becomes valid and feasible.

3. Results and Discussion
This study uses a 4D model consisting of Define, Design, Development, and Disseminates. However, in this study, the researcher only reached the Development stage, while the results of the analysis (Define) have been discussed and presented in the author's special article entitled "The Need Analysis For E-Learning Based on Massive Open Online Course (MOOC) For High School Students". The following are the results of research on the design and development of e-learning devices based on MOOC in physics learning. It is hoped that MOOC can become a media system that has innovative methods in dealing with new challenges in teaching and learning activities [3].

3.1 Design
This stage serves as the stage of designing a product which in this case is an e-learning devices based on MOOC according to needs. Examples of the resulting learning device designs are (1) lesson plans, (2) students worksheet, and (3) learning assessments. The activity at this stage is the selection of the format and draft design of the learning device. The following is the format and draft of the lesson plans in e-learning devices based on MOOC:
Figure 1. Snippets of Lesson Plans Format Design

In the design of the lesson plans according to the snippet of Figure 2 above, it contains one thing that is interesting and distinguishes it from other lesson plans, namely, the existence of an lesson plans that is directly integrated with the use of the MOOC system. That is, all sequences of learning implementation are carried out in a MOOC system by teachers and students. Starting from opening learning, giving motivation, apperception to core activities carried out by students by logging in, uploading, and downloading all teaching materials and assignments through the system, to closing activities in learning. So that the learning process will be packaged in an attractive and centered on the MOOC media used. Learning will also become more interactive if it is added with integrated video conferencing via Zoom Meeting or Google Meet. This is also supported by the statement [18] which states that the MOOC system can indeed be relied upon as a web-based online learning medium that attracts various people and even globally with the freedom of an open and easily accessible learning environment.

The teaching materials used in this learning device are Students worksheet. Students worksheet is also designed in such a way that it can become a unified whole that is integrated with the MOOC system. This means that Students worksheet can be accessed easily on the provided system. Besides being packaged online, Students worksheet is also designed according to the needs of students referring to the theory of Constructivism. A snippet of the Students worksheet design can be seen in Figure 2 below:
Figure 2. Snippets of students worksheet Format Design

The students worksheet that is designed contains several interesting sessions and activities as shown in Figure 3 above, including the "Yuk Kepoin" rubric which functions as a perceptual stimulation as well as student motivation in learning. The second rubric is, "Yuk Eksperimen", even though it is designed and used online, students worksheet can still allow students to experiment in cyberspace. So the rubric "Yuk Eksperimen" aims to train students' psychomotorics in experiments that are presented and accessed through the system. While the rubric "Yuk Temukan" is a rubric that assigns students to find concepts or formulas from the experimental results in the "Yuk Eksperimen" rubric earlier. In addition to the 3 excerpts of the rubric above, there are several other interesting activities in the presentation and design of this Students worksheet.

In the presentation, Moodle as a MOOC provider is also equipped with many interesting features that can be accessed by teachers and students. So that online learning is more interesting and not monotonous. With the help of this MOOC system, we can maximize learning to be student-centered and the teacher can simply become a facilitator. Because in physics learning in particular learning methods that are too teacher-centered are no longer enough to understand the basic principles of physics for students and also cannot improve the quality of their learning. Therefore from now on to improve these qualities, learning methods must be able to make students play an active role and interact with their surroundings [19]. For more details, a snippet of these features can be seen in Figure 4 below:
Some of the interesting features in the Moodle web/application above include:
- Assignment functions as access to upload and download assignments.
- File serves as a link to access and download a work file.
- Glossary functions as a term dictionary feature.
- Quiz serves as a link to access and take quizzes.
- URL is a feature to link to a file, site, or application link outside the system. In its use, this feature serves as the integration of Moodle with the Virtual Laboratory.
- And other features so on.

3.2 Development
The purpose of the stages is to test the validity or feasibility of the resulting valid learning device products. In this development there are several steps, namely expert validation, validation data analysis, revision, until the product is declared valid. Product validation will be carried out by expert validators with certain mechanisms. Validation can be done 1-2 times depending on and as needed. For example, during the first validation, if there are still deficiencies, the validator will check and make suggestions for improvement. After that, a revision of the suggested improvements will be made to be re-tested and assessed on the second validation. The goal is until all validators give a score of at least 3 on each assessment item on the validation sheet provided. After completing the validation, the results of the assessment will be processed and analyzed to measure and see the validity index and category of the resulting device. If it shows the appropriate validity index results, then this e-learning devices based on MOOC is declared valid. The following are the results of the validation of each learning device, which can be seen in Figure 2 below:
The e-learning devices based on Massive Open Online Course (MOOC) on static fluids material which consists of lesson plans, student’s worksheet, and learning assessments has been declared valid and feasible with a validation score index of 3.46 in the high category. This is also supported by the results of journal research related to the validity category [20] which states that a score of 3.46 belongs to the high category and is declared valid. Thus, this device can be inputted and integrated with the MOOC web system via the Moodle platform which has many interesting features in it such as assignments, quizzes, chat, collaboration, as well as the main feature that can upload various formats of learning materials and is easier to learn. understood because the information presented is not only in the form of writing but also images and videos [21] This e-learning device is expected to be able to maintain the effectiveness and quality of learning even though it is online.

4. Conclusion
The e-learning devices based on MOOC on static fluids material which was developed consisting of lesson plans, Students worksheet, and learning assessments has been successfully developed and validated by experts. The e-learning devices has been developed and has been validated has the final validation result that the overall learning device is 3.46 with a high category. This e-learning devices is declared valid and worthy to be tested and used to teach on Static Fluids material.

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