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The Development of Massive Open Online Course (MOOC) Based on ADDIE Model for Basic Natural Sciences Course in College

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ABSTRACT

Distance learning is not limited to space and time so that the goal of independent learning can be achieved. Supporting platforms for distance learning in Indonesia are still lacking, especially for basic natural sciences. The aims of this research is to develop interactive learning for basic natural science using massive open online course (MOOC). The sampling method used is the purposive sampling and the instrument used in the form of the questionnaire. Data collection were collected and analyzed descriptively using Statistical Packages for Social Science (SPSS) 26.0 version. Based on the analysis, the reliability value of the instrument is 0.994 and shows that the reliability of the instrument is at a high level. The findings show that the use of MOOC can increase achievement (3.65), interest (3.74) and student learning styles (3.65) and make the learning process more interesting. In addition, the findings show that the use of the MOOC application can help students in improving the performance and achievement of students in learning several courses and thus can be an alternative to diversifying the teaching and learning process in college.

CCS CONCEPTS

• General and reference~Document types~General conference proceedings

KEYWORDS

Development, MOOC, ADDIE, Basic Natural Sciences

1. Introduction

At the beginning of 2020, the world was shocked by the incidence of severe infections with unknown causes, which originated from a report from China to the World Health Organization (WHO). Where 44 severe pneumonia patients were found in an area, namely Wuhan City, Hubei Province, China on the last day of 2019 China [20]. Early March 2020, Indonesia reported the first case of Covid-19 and an epidemic paralyzed the economy and disrupted education. In a short time, many educators are asked to carry out online learning so that students can learn through online and stay away from their school and college.

The biggest obstacle to distance learning experienced is the lack of anticipation from stakeholders when faced with an emergency. In college, lecturers are asked to conduct online learning with social media but the effectiveness of student learning outcomes is still low. The results of the student survey show that 70% of students are not satisfied with only learning materials and assignments, 60% of them want new online learning media that can accommodate learning such as face-to-face learning.

Online learning media currently is developed by the lecturers; which is learning management system (LMS). LMS is categorized as commercial or non commercial platforms, with close, open, or partially open architecture [17]. Menurut Oduntan [23] that the use of a LMS will served as a much more effective and efficient means of learning in the institution. Learning management systems can be used to facilitate online learning [11]. LMSs are of various types and comes with different names: Course Management System (CMS), Learning Content Management System (LCMS), Virtual Learning Environment (VLE), and Virtual Learning System (VLS) [33]. LMS has shortcomings in the implementation of learning, namely limited space and time so that it requires a system that is not limited to space and time. One of the learning media is the massive open online course (MOOC).

Online learning with the valid and structured material is important for students in the achievement of learning objectives [24]. MOOC

is an online learning course whose participants are unlimited and can be accessed openly through the website. According to Aris & Halim [1], Massive Open Online Course (MOOC) is an online course aimed at massive interactive participation and open access through websites. MOOC is an online learning accessible to everyone around the globe for free [14]. It is the new interesting way for the students to keep their leaning.

According to Petra dan Tena [16] MOOC *is recommended, along with more interactive sessions that enhance the learning experience by connecting closer not only participants with tutors but participants with each other*. MOOC is a global online learning capable of accommodating student capacity on a large scale [22]. In fact, the field of skills is an important field especially for developing countries to prepare for the 21st century [3].

Not only that, Abidin [2] states that attitude or interest in teaching and learning process could be embedded in digital literacy practices for all academic institutions to support the concept of e-learning as an effective learning method. Additionally, this is in line with the needs of the country's e-learning policy and 21st century education that highlights student centered learning.

Basic natural science is the study of the physical world and includes fields such as chemistry, biology, and physics, as well as other STEM-related disciplines like technology and mathematics. Natural scientists develop questions and use a specific process of describing, predicting, and observing the natural world [29].

Based on the description above, online learning using the massive open online courses platform on basic natural science will be able to increase achievement learning. The advantage of massive open online courses is there is no limitation of the time that participants can determine their own pace of learning and determine their own time to complete the courses. The absence of face to face means that massive open online courses can be effective and efficient in online learning.

Looking at the facts and thoughts that have been described, online learning problems that are not limited by space and time can be done using MOOC in Basic Natural Science learning. Based on this study, the issues raised in this paper are (1) how to design the learning by using massive open online courses in college, (2) how the validity of the use of massive open online courses to improve the learning outcomes.

2. Method

In the research development, this research was used Richey & Klein [25] development design. This product uses product development design. The model used to design this project is ADDIE Model. According to Richey & Klein [25], there are five (5) phases in this model such as analysis phase, design phase, development phase, implementation phase and evaluation phase. This model was chosen based on the approach to the development of the study by solving the problems arising from the early stages.

3. Results and Discussion

3.1. Analysis Phase

At this stage, the analysis phase in volves several determining processes and identifies the problems that need to be resolved. After a problem can be identified an analytical process will be carried out to find out what causes or factors are related or that cause the problem. The analysis process covers the problems faced, product requirements include the objective of developing the product [10]. In addition, the phase of analysis is the basis of all phases in this instructional design model. To develop the MOOC for basic natural science at the college, researchers have set some research objectives. Based on the objective of the study, researchers need to design an interactive learning through the MOOC, develop it as one of the test the level of flexibility in its use in learning. During this phase, the researcher set user targets for the development of this MOOC. Among the main focus of the target are lecturers in basic natural science and respondents for this study which consists of students of basic natural science.
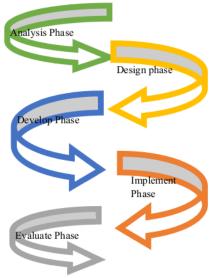

Figure 1. ADDIE Model

3.2. Design Phase

At this stage of the process, it explains the overall view of the design, structure, teaching approaches, types of media and technologies to be used, content and script/storyboard. This phase is crucial for planning strategies in developing teaching and outlining how to achieve teaching goals. The development needs to acquire appropriate learning objectives and it should be based on the use of learning materials in college according to the prescribed syllabus. In addition to learning notes, the design of activities, training and quizzes/tests should also be developed soon. According to Lee, Hsieh, & Hsu [18], the development should be appropriate and check the way or method of delivery of information

in the software to be more user-friendly. Among the things that need to be emphasized in this design phase are content design and script/storyboard design.
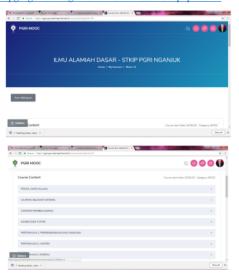
3.3. Development Phase

This stage involves real system implementation by using all appropriate media and technology elements based on requirements. Built based on analysis and design phase. The purpose of this phase is to produce lesson plans and learning materials [8]. During this phase will be developed, the teaching steps as well as the media to be used in teaching and other required documents. Multimedia project development work will be done according to the agreed upon specifications. Each development will be tested to ensure that it is consistent and effective.

3.4. Implement Phase

At this stage, the teaching materials that have been prepared will be used or implemented in real terms. In this phase, testing was also made. Testing will be made on MOOC which will be developed by the researcher. The completed MOOC development project will be tested on users to identify errors during the project development process. In the event of a mistake, the repair will be made before it is fully delivered to the target user for use. All syllabus, activities, discussions, references, and notes will be included in the MOOC platform at https://pgri.gurudaringmilenial.id/course/View.php?id=18

Figure 2. MOOC View

3.5. Evaluate Phase

This phase is an advanced phase of the implementation phase. This phase is evaluated from two aspects of assessment, namely (i) usability assessment, and (ii) conformity assessment [22]. Instead, the main purpose of this phase is to detect weaknesses and failures in the development process and operating system. As such, three experts comprising MOOC specialists, multimedia specialists and basic natural science experts to evaluate and verify MOOC functionality developed through the expert confirmation form to be provided. Additionally, the usability of MOOC development was assessed through a questionnaire given to 20 students.

3.6. Population and Sample

The population in this study involved 20 students taking a basic natural science program at basic natural science. The sampling was the respondents selected to represent a population [9]. The sampling method that used is was purposive sampling .

3.7. Validity and Reliability of Instruments

Validity and reliability are important to ensure that the findings are credible. To ensure that the questionnaire can be used, the validity must be made first. The validity used in the study is the validity of the content and the validity of multimedia. The researcher has obtained three experts to determine the validity of the questionnaire which has been developed. The three experts consisted of a MOOC expert, a multimedia expert, and lecturer basic natural sciences.

The reliability of the instrument is a measure to determine the consistency of the score against each item found in the questionnaire form. This is to preserve the accuracy of the questionnaire instrument from having any problems and data obtained accurately. To see the reliability of the questionnaire, an internal methodology was used Cronbach Alpha method. Based on the analysis that has been made, Alpha Cronbach's value is 0.994 and is at a high level [15]. All the items in the questionnaire were analyzed by appraising using four point Likert scale scores based on a very disagreeing, disagreeing, agreeing and strongly agreeing. Item analysis refers to the range of mean scores such as Table 1 which determines the level of respondents' stance on items in question.

Tabel 1. Mean Score Analysis

Mean	Level
1.00 – 2.33	Low
2.34 – 3.66	Moderate
3.67 – 5.00	High

3.8. MOOC Literacy Analysis

Table 2. shows the results of MOOC literacy which is the respondents involved in the questionnaire by item and finds the mean result obtained is moderate and it clearly indicates that respondents agree with this item. This shows the respondents' decision to answer the first question is positive and computer literacy among basic natural science is good.

Table 2. Data Analysis of MOOC Literacy

No	Item	Mean	SD
1.	I understand more about learning when using MOOC.	3.63	0.486
2.	I know how to use the MOOC learning platform.	3.68	0.469
3.	I am more likely to find information through MOOC's learning platform.	3.68	0.469
4.	I'm more interested in learning to use MOOC than books.	3.55	0.502
5.	I feel the MOOC application helps me practice SLT (Self Learning Time)	3.65	0.481
6.	The information provided in the MOOC platform is clearly communicated.	3.73	0.446
7.	MOOC can help improve my academic achievement.	3.75	0.437

3.9. Students Interest Analysis

Table 3 shows the results of students interest towards MOOC usage. The results found that the majority respondents strongly agreed on the items given and this clearly showed that students interest in the use of MOOC for learning was high.

Table 3. Data Analysis of Students Interest

No	Item	Mean	SD
1.	I love learning to use the MOOC learning platform.	3.7	0.462
2.	I like it when teachers use MOOC as a teaching aids tool.	3.78	0.415
3.	I love to answer the questions in the MOOC.	3.73	0.446
4.	I am ready to use the MOOC at any time.	3.73	0.446
5.	I always take the opportunity to learn using MOOC.	3.67	0.475
6.	I often use MOOC to get learning materials.	3.68	0.469
7.	I feel the convenience in MOOC stimulates my learning.	3.73	0.446

3.10. Student Learning Style

Table 4 shows the results of the students learning style using MOOC. The results found that the majority respondents strongly agreed on the items given and this clearly showed that students learning styles while using MOOC for learning was high.

Table 4. Data Analysis of Student Learning Style

No	Item	Mean	SD
1.	I often visit MOOC's website to find information.	3.7	0.462
2.	MOOC helped me learn not to think time	3.75	0.437
3.	I use the MOOC learning platform in daily tasks.	3.68	0.469
4.	Information is easier to obtain when using the MOOC app.	3.7	0.462
5.	I love to use MOOC applications in helping the learning process.	3.67	0.475
6.	The MOOC app helped me to understand something learning.	3.67	0.475
7.	I love to learn to use the materials on the MOOC platform	3.72	0.454

The findings of this study show that computer literacy among basic natural science students on MOOC application is at the moderate level for the whole item. This can be seen when some students agree that they know how to use the MOOC platform. MOOCs are the promising and increasingly popular technological innovation in higher [20]. The findings also show that some students feel that MOOC's application helps them to practice self learning time besides the information provided in the MOOC platform is presented clearly. Kemmanat & Gan[19] in their study found that

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Media design for hearing impaired students should include various media options and multimedia presentations.

Besides, findings show that some students agree that they understand more about learning when using this simple platform. In online interaction, students are more interested in learning to use the MOOC platform than scientific books. This is supported by Yassine & Abdellatif [34]. In MOOC platforms, information provided to learners is considered starting points from which they can jump off and pursue an information trajectory in accordance with their concerns. This is because the MOOC app makes it easier and more user-friendly because students and other users can access unlimited limits.

An interaction between students and the interface is very important because the online and easy to use interface of learning can attract students to actively participate in online learning [21]. Students are delighted and comfortable using computers and therefore they are more likely to seek information through the MOOC learning platform. MOOCs are a significant milestone on the road that online teaching and learning is following, open, distance and online learning started long before MOOCs and will continue to grow in importance when MOOCs are just an interesting footnote in its development [26]

Massive Open Online Courses (MOOCs) are merely online courses for the purpose of education they are characterized by being accessible and scalable in the sense that anyone can access to them [32]. In conclusion, student acceptance of MOOC literacy is at a moderate level but needs to be improved to ensure the smooth implementation of the course using the MOOC application. The results of the analysis obtained from questions 1 to 7 have answered this question.

Moreover, this research found that the students intereted when the teacher used MOOC as teaching aids. Participants that continue the MOOC until the end (a decreasing number over time of course) are more motivated to watch larger pieces or entire videos as they progress in the MOOC [16]. Not only that, students also love to use this platform for learning. MOOC researchers will be able to provide faculty and instructional designers with guidance for designing effective environments for online professional learning [12]

Furthermore, students are ready to use the MOOC platform at any time. A MOOC is considered as a game changer in the online educational system. MOOCs have the abilities to support vast learners in a specific matter [13]. From the perspective of students, internet usage and websites like the use of MOOC can encourage students to take advantage of learning using MOOC.

According to [16], his MOOC will consist of online, ongoing subjects in both English and Kiswahili. The KCS subjects offer self-testing and peer assessment to maximize scalability, and digital badges to show progress and completion to recognize and validate non-formal learning. The KCS uses the Moodle LMS with responsive web design to increase ubiquitous access from any device. Chen [6] argued that MOOC had advantages. There were accessibility, users' comfort, and lifelong learning experience. It offered open and free learning which made it easy for people from different backgrounds to access it. Its classes were open entry and open exit so that users felt more comfortable knowing that there were no consequences if they could not finish the courses. Moreover, as MOOCs were open to everybody with no restrictions in age or educational background, it promoted lifelong learning experience which could increase the quality of human resources. For example, drilling strategies where some attempts have to be made by the students. Learning using MOOC can provide immediate feedback to students. This will indirectly give a very positive reinforcement to the students' interest.

The results of the analysis obtained from questions 1 to 7 have answered the question of this study. In this regard, the researchers can conclude and argue that the student's interest in using MOOC is at a high level. Researchers argue that most items of student interest questions on MOOC use among basic natural science students have shown that students are aware of the MOOC application facility in the learning process. This is in line with Colin [5] MOOCs represents online courses aimed at unlimited participation and open access via the internet. In particular, they represent a dramatic stage in web-based education systems that has been enabled by the rapid growth of Internet access and increase in bandwidths over the past decade.

The findings show that basic natural science student' styles in MOOC use are at high levels for the whole item. This can be seen when some students agree that they visit the MOOC's website to find information materials. MOOCs offers the opportunities to opening up learning and presenting a wide range of choice in various areas and specialties, for a massive number of contributors [28] Moreover, MOOCs support the movement toward the lifelong and on demand learning, for the ones who are work fulltime or those who take a break from their formal education [14].

This can be seen when some students agree that the MOOC helps them learn not to spend time. This statement is supported by Vaibhav & Gupta [30], where MOOC users can access without any time and place gaps. In addition, the findings show that students use the MOOC platform on daily basis. Massive Open Online Course (MOOC) which combines technology and modern teaching methods together can be used for this purpose. MOOC allows people all over the world to access education online anytime. Videos, still and motion images, and audios can be provided in MOOC. A variety of courses and self-assessments can be created. It supports online collaboration and knowledge sharing of open educational sources in the form of text that makes student understand the content quickly. Streaming media that includes both videos and audios, making the content more concrete is also available [19].

The content can be related to everyday life. There are example situations that make students think how to solve the problem. There is a sign language interpreter for those who are unable to fully communicate by writing or speaking, allowing hearing impaired people to communicate clearly according to their needs.

In conclusion, student learning styles in MOOC use are high but need to be improved to ensure MOOC implementation among basic natural science students. Results of the analysis obtained from questions 1 through 7 have answered the question of this study.

4. Conclusions

The findings provide information to researchers on the importance of using MOOC in the teaching and learning process, especially for Basic Natural Science Course in college. Besides, the MOOC literacy, student interest and learning style towards MOOC usage can enhance by using effective methods which can ensure the maximum level of learning of the students in addition to ensuring that the knowledge delivered by the lecturer can be received effectively although it is in online system. Therefore, by using this MOOC platform can help students in improving performance and achievement in learning.

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