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MOOC Development in Basic Natural Sciences as a Distance Learning Solution

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Abstract

The Covid-19 pandemic that occurred massively in Indonesia had an impact on distance / online learning that must be done to reduce physical interaction between lecturers and students. Distance learning that has been done is still one-way communication. Development of the Massive Open Online Course (MOOC) as a learning platform that can support distance learning. The purpose of this research is to develop MOOCs as support for distance learning, to determine the quality of the MOOC, and the level of MOOC satisfaction. The research method used is the ADDIE development model with phase analysis, design, development, implementation, dan evaluation. The results of the research at each stage are: analysis stage needs analysis and problem analysis on the need for distance learning solutions with active two-way communication. The design stage made a MOOC design with RPS, materials, videos, enrichment questions, and quizzes at every meeting. The development stage develops each menu stage in the MOOC from the expected competencies to the quiz. The implementation stage, validation of experts, and validation of small groups of students. The evaluation stage evaluates MOOCs both in language, layout, content, and user satisfaction. The conclusion of the study is that MOOC was developed with the stages of analysis, design, development, implementation, and evaluation (ADDIE). The MOOC quality from the validation results obtained an average of 80,8 in the good category. The results of the user satisfaction level of MOOC Basic Natural Sciences were 78% with a good category.

Keywords: MOOC, Basic Natural Sciences, Distance Learning.

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INTRODUCTION

A new health crisis occurs in society that threatens the world with the spread of the novel coronavirus 2019 (2019-nCoV) or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which cripples human activities (Singhal, 2020, p. 281). The consequences of covid 19 have an impact on various aspects of life, including in the field of education.

The world is changing with the shadow of the disease that has claimed the lives of millions of people in the world. Changes have also occurred in the world of education, namely not being allowed to carry out learning in the classroom to minimize physical contact between teachers and students. This is in accordance with Circular of the Minister of Education and Culture Number 4 of 2020 concerning the Implementation of Education in the Emergency Coronavirus Disease (Covid-19), that all learning in Indonesia is carried out at home at all levels of education.

Colleges carry out distance learning suddenly and without preparation which results in distance learning being carried out using social media. From the problems that arise above, the solution that can be given is to develop a better and more reliable distance learning system, one of which is the MOOC. Based on the results of the study, the effect of the MOOC learning model is effective and feasible to use in the teaching and learning process in terms of a significant increase in student learning outcomes (Pambudi, 2021, 294).

MOOC (Massive Open Online Course) is a massive open online learning program as a form of technology-based learning carried out with online information and to support literacy skills ownership (Johan, 2015, p.203). MOOC can be used globally anywhere, anytime, and by anyone so that this technology can be developed and will become a distance learning solution.

Based on research results, MOOC has had a real impact on Higher Education Institutions on a global scale, with every year new universities include MOOCs in the large number of courses offered continues to increase since the launch of the first MOOC in 2008 (Leon, 2016 , p.1). The development of MOOC and the existence of the Covid-19 pandemic have a good impact on the development of MOOC as a learning platform for the future. Students can take courses at various universities and do assignments according to their speed and ability.

Distance learning or distance education is training given to participants or students who do not regularly gather together in one place to receive lessons directly from the instructor (Anggy et al, 2020, p. 95). Far learning is currently an effective learning system because it is able to provide guidance, supervision and direction to students so that academic activities run according to learning outcomes.

Distance learning has several obstacles and drawbacks. Based on the results of the study, it shows that students' scientific literacy has not been trained optimally, even though the design of this scientific literacy activity sheet can be responded to by students during distance learning (Setiawan, 2020, p. 28). Lack of distance learning is also experienced in basic natural science learning, the problems experienced in basic natural science courses are less than optimal because the ability of students to provide initial perceptions, experiments, and management of calculations gives a lack of experience and less than optimal communication.

Subjects that provide initial perceptions and experiments are basic natural sciences, which are an exact course that connects natural phenomena to be qualitative so that it is proven about a theory or finding a new theory. Based on problem analysis and needs analysis in the implementation of distance learning in IAD courses, students want an effective learning platform capable of accommodating theoretical proof and natural phenomena. Through MOOC students will get learning objectives, learning outcomes, materials, videos, discussions, enrichments, quizzes, virtual lab work, and other literacy that can be learned.

METHOD

This research is a type of research development (research & development). This study uses the ADDIE development model (analysis, design, development, implementation, and evaluation). Implementation time from October 1, 2020 to February 1, 2021. Targets are MOOC Basic Natural Sciences courses and MOOC user satisfaction. The subjects of this study were 58 students of Economics education taking basic natural sciences courses. The stages of the ADDIE development model look like Figure 1 below.

Figure 1. ADDIE Cycle (Molenda, 2008)

The Addie development model has several stages, namely the analysis, design, development, implementation, evaluation stage (Aldoobi, 2015, p.68). The research implementation procedure using the Addie model is the analysis stage, concluding problem analysis and needs analysis from the results of student questionnaires. The design stage, making the MOOC design and research implementation design, the development stage, developing the MOOC according to the design that has been determined in accordance with the RPS and material content. The implementation stage, creating an expert questionnaire to assess the design and development of the MOOC and test it in a small group. The evaluation stage, evaluates the MOOC and evaluates the content.

This research uses test instruments, questionnaires / questionnaires, and observation sheets. The test instrument was used to determine the quality of the material content and student understanding. The questionnaire / questionnaire instrument is used by experts / experts to validate the language, material, and content of the MOOC. The observation sheet instrument was used to assess the implementation of the small group test.

In this study using data collection techniques through observation, filling out questionnaires, and tests. Observation to collect data based on observations. Filling out a questionnaire to collect written information from the object of research to determine feelings and satisfaction in using MOOC. The test is used to collect information about students' ability to understand to achieve learning outcomes.

Data analysis technique is a method for analyzing data from the results of data collection to obtain data interpretation. The data analysis technique used is descriptive statistics.

RESULTS AND DISCUSSION

Development Phase

1. Analysis phase

The analysis stage includes several processes of determining and identifying problems that need to be resolved. After a problem can be identified, an analysis process will be carried out to find out what causes or factors are related to or which cause the problem. The analysis process includes the problems faced, product requirements include product development objectives (Halim et al., 2012, p. 463). In addition, the analysis stage is the basis of all stages in this learning development model. To develop MOOC for basic natural sciences in Higher Education, researchers have set several research objectives. Based on the research objectives, researchers need to design interactive learning through MOOC, developing it as a test of the level of flexibility in its use in learning. During this phase, the researcher set a target user for the development of this MOOC. Among the main focuses of the targets were basic science educators and respondents for this study who consisted of students.

2. Design Phase

At this stage of the process, it explains the overall appearance of the design, structure, teaching approach, types of media and technology to be used, content and script / storyboard. This phase is very important for planning strategies in developing teaching and describing how to achieve teaching goals. Development needs to achieve appropriate learning objectives and must be based on the use of Collage teaching materials according to the specified syllabus. Apart from learning notes, activity designs, training and quizzes / tests should also be developed. According to (Lee, Hsieh, & Hsu, 2011, p.124), development must be appropriate and check the way or method of conveying information in software to make it more user-friendly. Among the things that need attention at this design stage are

content design and script / storyboard design

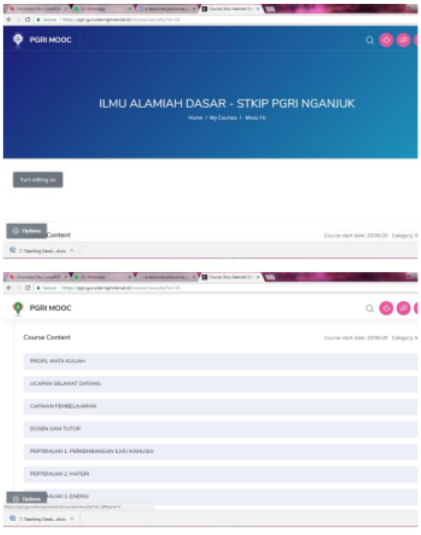
.

3. Development Phase

This stage involves implementing a real system using all appropriate media and technology elements based on needs. Built on the analysis and design stages. The purpose of this stage is to produce lesson plans and learning materials (Davis, 2013, p.205). At this stage, teaching steps will be developed and the media that will be used in teaching and other required documents. Multimedia project development work will be carried out according to agreed specifications. Every development will be tested to ensure that it is consistent and effective.

4. Implementation Phase

At this stage the teaching materials that have been prepared will be used or implemented in real terms. In this phase, testing is also carried out. Testing will be carried out on the 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. If an error occurs, a fix will be made before it is fully sent 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



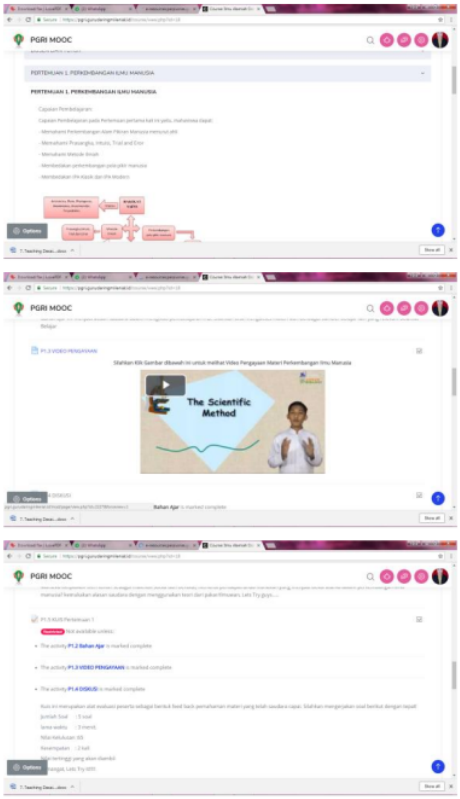


Figure 2. MOOC display

5. Evaluastion Phase

This phase is an advanced phase of the implementation phase. This stage is evaluated from two aspects of the assessment, namely (i) utility assessment, and (ii) conformity assessment (Nordin et al., 2016, p.1). Instead, the main purpose of this phase is to detect weaknesses and failures in the development process and operating system. Thus, three experts consisting of MOOC specialists, multimedia specialists and basic natural scientists to evaluate and verify the function of MOOC developed through an expert confirmation form will be provided. In addition, the usefulness of the MOOC development was assessed through a questionnaire given to 20 students.

Instrument Validity and Reliability

Validity and reliability are important to ensure that the findings are credible. To ensure that the questionnaire can be used, the validity must be done first. The validity used in the study was content validity and multimedia validity.

Researchers have obtained three experts to determine the validity of the questionnaire that has been developed. The three experts consist of MOOC experts, language experts, and science lecturers.

The reliability of the instrument is a measure to determine the consistency of the score for each item contained in the questionnaire form. This is to maintain the accuracy of the questionnaire instrument so as not to experience problems and the data obtained accurately. To see the reliability of the questionnaire, an internal Cronbach Alpha methodology was used. Based on the analysis that has been done, the Cronbach Alpha value is 0.994 and is at a high level (Keith, 2018,1273). All items in the questionnaire were analyzed by means of an assessment using a four-point Likert scale score based on strongly disagree, disagree, agree and strongly agree. Item analysis refers to the range of average scores as shown in Table 1, which determines the level of respondents' attitudes towards the item in question.

Table 1. Average Analysis Score

saNo.	s	Average	ategory	C
.	1	0-50	ess	L
.	2	51-85	ood	G
.	3	86-100	igh	H

Based on the results of validation carried out by experts, the following results were obtained:

Table 2. Expert Validation

o.	pert	Ex	dation		Vali	verage	A
.	OOC	M	78	75	80	7,6	7
.	hasa	Ba	80	85	80	1,6	8
		D	85	80	85		7
.	osen IPA					3,3	
	erage	Av				0,8	8

Based on the results of table 2, it is obtained that the MOOC quality average from the expert validation results obtained 80.8 with a good category.

Student satisfaction in using MOOC can be seen in table 3 below.

No.	Category	Satisfaction Percentage
1	Clarity of work instructions	75
2	Ease of operating the MOOC	74
3	Tools according to their function	80
4	Sequence Tool	80
5	Ease of Language	80
6	Typing	80
7	The material is easy to understand	75
8	Suitability of material content with RPS	80
	Average	78

The results showed that the computer literacy of IAD students in the MOOC application was at a moderate level for all items. This can be seen when some students agree that they know how to use the MOOC platform. The findings also show that some students felt the MOOC application helped them in practicing independent study time besides that the information provided on the MOOC platform was presented clearly. In addition, the findings show that some students agree that they understand better about learning using this application. In online interaction, students are more interested in learning using the MOOC platform than scientific books. Students are happy and comfortable using computers and therefore they are more likely to seek information through the MOOC learning platform. Student acceptance of the MOOC is at a moderate level but needs to be improved to ensure the smooth implementation of courses using the MOOC application. The analysis results obtained from questions 1 to 7 have answered these questions.

Not only that, students also enjoy using this platform for learning. Furthermore, students are ready to use the MOOC platform at any time. MOOC is considered to be a game changer in the online education system. From a student perspective, the use of the internet and websites such as the use of MOOCs can encourage students to take advantage of learning using MOOC.

(Chen, 2013, p.25) argues that MOOC has advantages. There's accessibility, user convenience, and a lifelong learning experience. It offers open and free learning which makes it easy for people of all backgrounds to access it. The classes are open entry and open exit so users feel more comfortable knowing that there are no consequences if they cannot complete the course. In addition, because MOOC is open to everyone regardless of age or educational background, MOOC promotes lifelong learning experiences that can improve the quality of human resources. For example, a drilling strategy where some effort has to be made by students. Learning using MOOC can provide direct feedback to students. This will indirectly provide positive reinforcement for student interest.

The analysis results obtained from questions 1 to 7 have answered this research question. In this regard, researchers can conclude and argue that students' interest in using MOOC is at a high level. The researcher argues that most of the questions of student interest in the use of MOOC among basic science students have shown that students know the facilities of the MOOC application in the learning process. This is in line with (Colin, 2012, p. 3812) MOOCs are online courses aimed at unlimited participation and open access via the Internet. In particular, they represent a dramatic stage in the web-based education system that has been made possible by the rapid growth of Internet access and increased bandwidth over the last decade.

The findings indicated that natural science students' basic styles of use of MOOCs were at a high level for the whole item. This can be seen when some students agreed that they visited the MOOC website to find information materials. MOOCs offer opportunities to open up learning and present a variety of options in various fields and specializations, to a large number of contributors (Liyanagunawardena et al., 2013, p. 202). In addition, MOOCs support the movement towards lifelong and on demand learning, for those who are working full time or those who are taking a break from their formal education (Kop & Fournier, 2011, p. 74).

This can be seen when some students agree that MOOC helps them learn not to waste time. This statement is supported by (Vaibhav, 2014, p. 290), where MOOC users can access without any gap in time and place. In addition, the findings show that students use the MOOC platform on a daily basis. The Massive Open Online Course (MOOC) which combines technology and modern teaching methods together can be used for this purpose. MOOC allows people around the world to access education online at any time. Video, still and moving images, and audio can be provided on MOOC. Various courses and self-assessments can be created. It supports online collaboration and knowledge sharing from open source education in text form which makes students grasp the content quickly.

This content can be related to everyday life. There are examples of situations that make students think about how to solve a problem. Sign language translators are available for those who are unable to communicate fully by writing or speaking, allowing people with hearing impairments to communicate clearly as needed. In conclusion, the student's learning style in using MOOC is high but needs to be improved to ensure the application of MOOC among IAD students.

CONCLUSIONS

Based on the above results, it can be concluded that MOOC has been successfully developed according to the analysis, design, development, implementation, and evaluation (ADDIE) stages. The quality of the MOOC from the validation results obtained an average of 80.8 with a good category. The results of the user satisfaction level of MOOC Basic Natural Sciences were 78% with a good category. Recommendations for the next stage are to develop MOOC in various courses and conduct socialization to students to be able to attend MOOC both at MOOC in courses held by lecturers or from other universities both domestically and abroad.

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