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Development Massive Open Online Courses (MOOCs) Based on Moodle in High School Physics Static Electricity

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Abstract: This paper discusses the development of e-learning media in the form of MOOCs (Massive Open Online Course) available on the Moodle website. This research was conducted to determine whether the development of interactive multimedia in the form of Moodle-based MOOCs is appropriate for use in teaching and learning activities of static electricity in high school. The method used in this study is the Research and Development (R&D) research method using the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The data collection technique used in this study was a questionnaire on the feasibility of learning media. The questionnaire instrument was given to media experts and material experts. The data analysis technique used in this research is descriptive quantitative and qualitative descriptive data analysis techniques. The aspects discussed are the development of learning media in the form of MOOCs, the level of media feasibility and the level of feasibility of the material presented. The results of this study indicate that e-learning media in the form of Moodle-based MOOCs are suitable for use in learning and are able to increase teacher creativity and can be used for distance learning and can train students to learn independently.

Keywords: Interactive multimedia, MOOCs, e-Learning, Moodle, Learning physics

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INTRODUCTION

Education is the important thing in improving human resources. Education must be designed as well as possible and one of then is in teaching and learning activities in the classroom. Learning physics is not only enough to use printed books, but it is also important to use learning media to support the success of a leason (Darma et al., 2019). Technology products such as multimedia can be used optimally in the learning process (Nuraini & Supriadi, 2018).

The role of science and technology is very important to advance a nation and state, so human resources such as teachers are needed in order to master science and technology (Kurniawti et al., 2019). However, the current situation is that there are still many schools that do not implement learning media for learning support due to the limited ability of educators to develop learning media (Fayanto et al., 2019), because of that researchers developed interactive multimedia in the form of Moodle-based MOOCs to support learning physics in high school.

The education system in various countries has undergone a massive transformation since the development of information technology. The learning environment has shifted from face-to-face learning to web-based education or e-learning (Afrilia et al., 2021). One form of web-based learning is MOOCs.

MOOCs (Massive Open Online Courses) are educational facilities that carry the principle of openness and take advantage of technological sophistication as a result, allowing the involvement of a large number of participants (Setyowati, 2015). Another definition of MOOCs is a model for providing massive education, where theoretically there is no limit to the number of participants; open, because anyone is allowed to participate and is held online, because learning activities generally occur in a virtual environment. This educational model is also designed in such a way that it can achieve the learning objectives set. (Educause Learning Initiative, 2016).

From the article above, it can be concluded that MOOCs are a website-based learning model whose results are in the form of open e-learning with unlimited participant capacity. One of the benefits of the internet for education is as a learning medium. There are three benefits of the internet in learning activities, namely as a complement (complementary), supplement (additional), and substitution (substitute). The internet can support learning activities if it is used as optimally as possible as a learning medium (Herayanti et al., 2017).

There’is not only one MOOCs platforms, the table below is an example of a MOOCs platform provider website.

Table 1. List of websites providing MOOCs platform (Setyowati, 2015).

No.	Website Name	Website Address
1	Udacity	http://www.udacity.com/us
2	edX	https://www.edx.org/
3	CIT: Coursera	https://www.coursera.org/
4	Iversity	https://iversity.org/en/courses
5	Udemy	https://www.udemy.com/
6	Canvas	https://www.canvas.net/
7	Moodle	http://moodle.com
8	Etc	….

Among the many websites providing MOOCs service providers, here the researcher uses the Moodle website which can be accessed online using the website address *gnomio.com.*

Moodle is an interactive multimedia. Interactive multimedia is a combination of various kinds of media that are packaged in the form of learning CDs containing elements of text, sound, images, videos, and animations into one presentation, making it easier for teachers to design relevant media and make the learning process more interesting (Gunawan, 2015). The use of interactive multimedia and the selection of the right learning model is an important part, especially to develop students' reasoning, activeness, and learning motivation (Made Rajendra & Made Sudana, 2018). In global competition, students need to be equipped with: various abilities and skills, one of which is by utilizing information and communication technology (ICT) while studying. ICT facilitates new methods to find and obtain various information available through interactive multimedia (Husein et al., 2019). And interactive multimedia that researchers use here is interactive multimedia based on a website, namely Moodle.

Moodle itself is one of the interactive multimedia developed practically in supporting learning (Pratiwi & Silalahi, 2021). It can also be interpreted, that Moodle is an interactive multimedia prayer built with the principles of e-learning-based educational pedagogy (Hidayati, 2016). Moodle stands for Modular Object Oriented Dynamic Learning Environment. From this description, it strengthens the previous definition that Moodle is a learning media based on online learning or e-learning. In another definition, Moodle is also referred to as a medium or application runner that can change the form of learning media into a website form (Syahriningsih et al., 2018).

In today's world of education, learning multimedia that is recommended to be used to facilitate the learning process itself is web-based interactive multimedia or e-learning (Nugroho & Iqbal Arrosyad, 2020). So that Moodle can be an alternative choice that can be used by educators to create interactive multimedia as a learning support (Azis, 2015). In the field of physics, teachers and students can get many benefits from Moodle where Moodle with virtual space can help teachers share material and students can learn with a combination of types of activities (Putri et al., 2020).

According to William (2006), Moodle is a learning management system that can freely be designed in an attractive, flexible, and attractive way in the online learning experience. It is called an online learning experience because this system is made as a

web page that can be further explored, so that learning is more active and interesting for students and interactions with educators are more interesting (Rice, 2006). In practice, this Moodle-based multimedia is modified according to learning needs so that students get benefits in the form of ease of learning (Herayanti et al., 2015).

Web-based interactive multimedia is flexible enough to be used in any subject, including physics, one of which is static electricity (Mukti et al., 2020). Static electricity is one of the physics materials studied at the high school level at the twelfth or third grade of high school. In this material, students will learn about the laws of physics used in applying static electricity, the relevant formulas, and study its application to phenomena in everyday life.

Based on the description above, the researcher conducted a research entitled Development of Interactive Multimedia in the form of Massive Open Online Courses (MOOCs) based on Moodle on Static Electricity Physics Materials in SMA. The original purpose of this research is to form an interactive multimedia in the form of Moodle-based MOOCs that can be used in static electricity learning activities.

METHOD

In the development of interactive multimedia, researchers use the Research and Development (R&D) method with the ADDIE development model. ADDIE stands for Analysis, Design, Development, Implementation and Evaluation. The stages of developing Moodle-based interactive multimedia MOOCs with static electricity can be seen in the chart below.

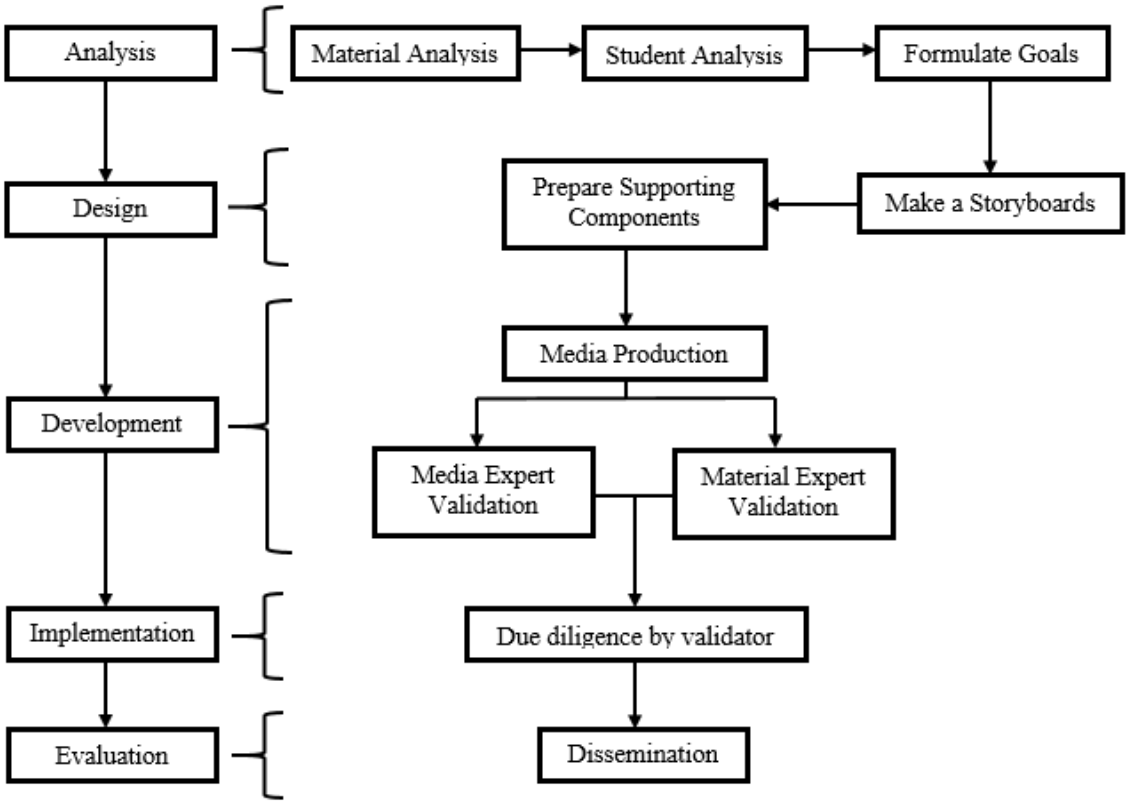


Figure 1. Stages of Development Planning

In this study, the data collection technique used is a feasibility questionnaire which will be filled out by validators, namely material expert validators and media expert validators. The validation questionnaire uses a likert scale with score criteria which can be seen in table 2.

Table 2. Assessment Score Criteria

Evaluation	Score
Very Good	5
Good	4
Pretty Good	3
Good Enough	2
Not Good	1

The data analysis technique used in this research is descriptive analysis. The data collected will be summed and compared with the number of expected scores/scores, after which they are presented. Or it can be written with the following formula.

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

Information :

P : Percentage of Eligibility (%)

$\sum x$: Total score obtained

$\sum x_i$: Expected score

From the results of the percentage of eligibility that has been obtained, the results are analyzed using the criteria of the percentage of eligibility. The assessment criteria developed by Arikunto (2014) are adapted in table 3 below.

Table 3. Eligibility Percentage Criteria

Percentage	Criteria	Information
90% - 100%	Very Good	No need to revise
75% - 89%	Good	No need to revise
65 % - 74 %	Enough	Revised
55 % - 64 %	Not Enough	Revised
0 % - 54 %	Very Less	Revised

RESULT AND DISCUSSION

Moodle is a web-based learning media or in other words, Moodle is a web design is useful for education, especially for learnings.This web design in the form of moodle-based MOOCs is made on the *https://www.gnomio.com/* page, which then results in a moodle page that can be further managed by the developer. MOOCs of static

electricity from the research and development of researchers can be found on the *https://listrikstatis.gnomio.com* page (figure 2). Students can log in with the correct username and password that was created previously, then students will be directed to the home page which contains regarding the introduction to MOOCs and Moodle (picture 3), at the end of the home page there is a static electricity course (picture 4) which can be clicked and will direct students to enter the static electricity course page (picture 5).

The development of MOOCs or static electricity e-learning is expected to help the independent learning process of high school students, especially class XII in the subject of static electricity physics. These static electricity MOOCs can be a source of learning, because in it there are static electricity learning references in the form of PDF, PPT and poster files (picture 6), not only that, in this MOOCs there are also electric charge drag and drop games and puzzle games Gauss's law cross-section (figures 7 and 8) which aims to hone students' memory skills and understanding of the interaction of two electric charges and also Gauss's law which has been presented in ppt materials, videos and experiments on PhEt Colorado, in MOOCs a video is also provided interactive (figures 9 and 10) where students can watch the video that is displayed while being able to answer the questions in the video. The creation of interactive video content and games is made on the h5p.com page (figure 11) wherein the content links and finished content files are inserted into the e-learning page provided by Moodle.

In addition to providing learning resources, these MOOCs also provide online discussion forums where students are expected to be able to discuss with their classmates or to ask questions with the teacher without a certain time limit, because the discussion forum is opened without any time restrictions (figure 9), in addition to students who are shy. Asking questions can send questions to the teacher via private messages (figure 9) so that teaching and learning interactions are evenly distributed in these static electricity MOOCs.

These MOOCs also provide an online collection point for assignments (figure 9) which is expected to help teachers manage student assignments effectively and efficiently. In addition, MOOCs for static electricity also provide quizzes and daily tests (figure 12) which are expected to allow students to review the lessons they have previously learned from studying static electricity in these MOOCs.

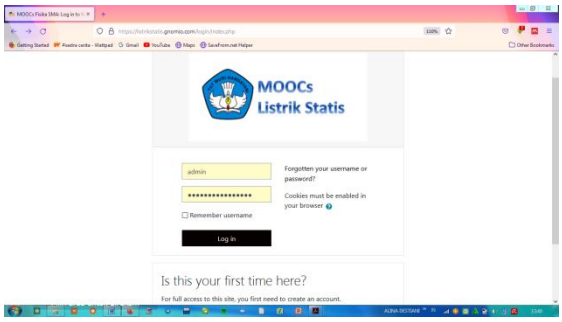


Figure 2. Studen login display

Figure 3. MOOCs start page display

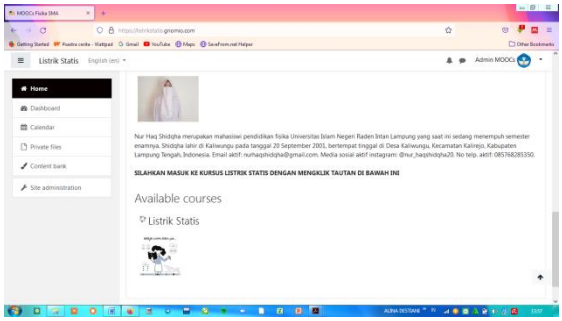


Figure 4.MOOCs home page view for connecting to static electricity course

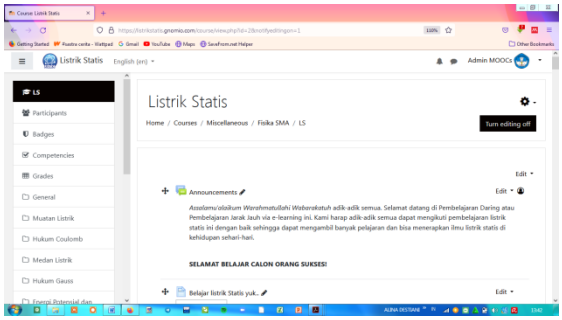


Figure 5. Static electricity course view

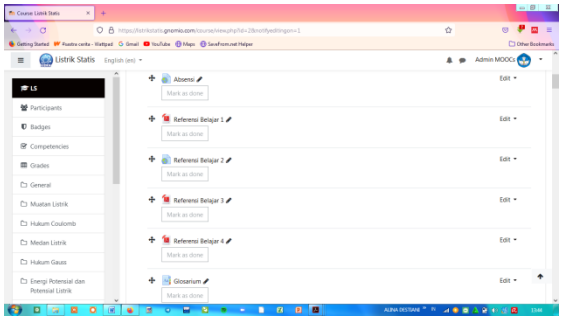


Figure 6. Static electricity study reference display

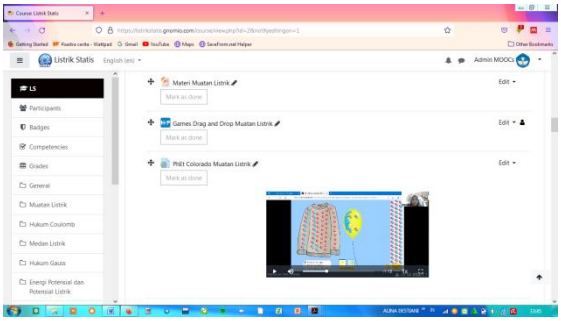
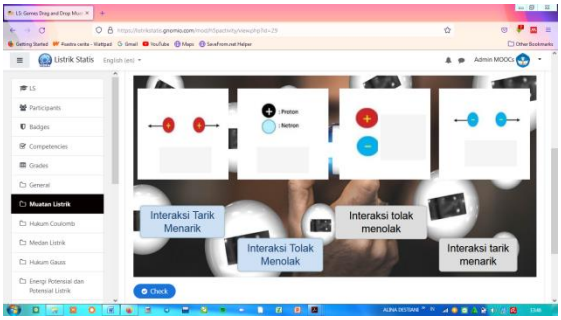


Figure 7. Display buttons to the games page, phet colorado and also the delivery of material via video



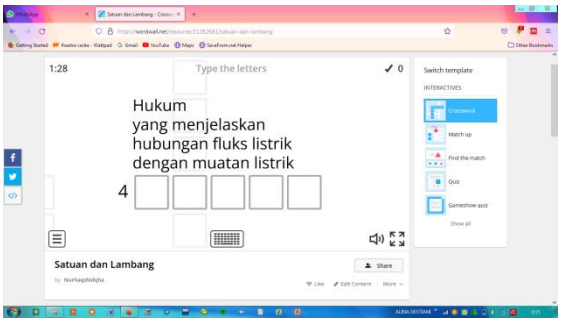


Figure 8. Page display of electric charge drag and drop games and Gauss's law cross word games

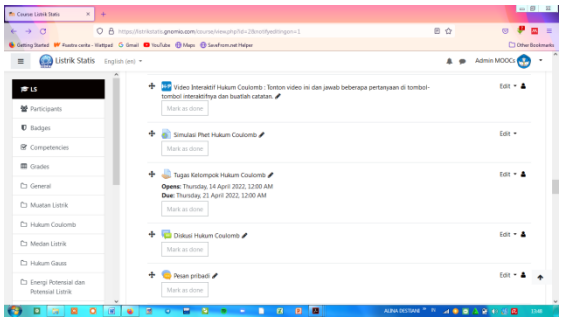


Figure 9. Button display to interactive video pages, phet, assignment collection, discussion and also private messages

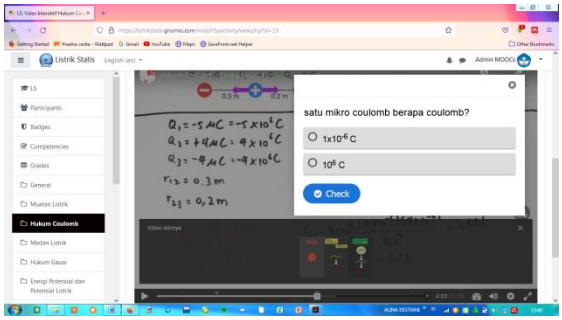


Figure 10. Interactive video display

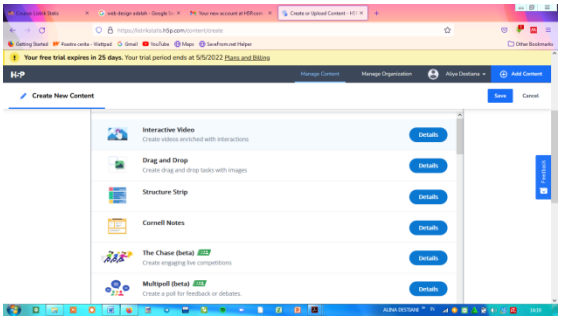


Figure 11. The h5p platform for creating interactive games and video content

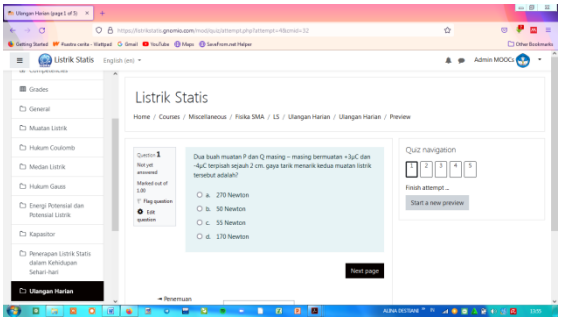


Figure 12. Daily quiz display

From research conducted by Rajendra and Sudana (2017), interactive multimedia can improve cognitive and psychomotor abilities. The development of interactive multimedia in the form of MOOCs based on the Moodle website is the development of learning media that is very much needed in the current era of education, because in reality distance learning is currently being carried out very often, therefore educators and prospective educators should use interactive learning media that can meet education for the better.

The development of static electricity MOOCs requires material expert validation and media expert validation to determine the feasibility level of the static electricity MOOCs learning media that the researchers developed. Based on media development by Agus et al (2019) related to MOOCs, that MOOC has the advantage that a teacher can easily design the learning that will be used and is also able to increase the creativity of teachers in compiling teaching materials. After the development of this learning media has been completed, the next stage is the implementation of material expert validation and media expert validation, carried out by two validators. Aspects of assessment for material expert validation include four aspects, the first is the aspect of content feasibility with points of conformity of the material with KD, material accuracy, material updates, and encouraging curiosity, from the aspect of content feasibility it gets a score of 85%, the second is the aspect of presentation feasibility with items presentation technique, presentation support, coherence and coherence of the flow of thought, from the aspect of presentation feasibility it gets a value of 94%, the third is the

aspect of language feasibility with straightforward, communicative, dialogical and interactive points, conformity to the development of students and conformity to language rules, from the aspect of language feasibility gets a score of 84%, and the fourth is the contextual assessment aspect with contextual essence and contextual components, from the contextual assessment aspect it gets a score of 86%, so that the average of the four aspects of material expert assessment is 87%.

Rating chart by material expert validators:

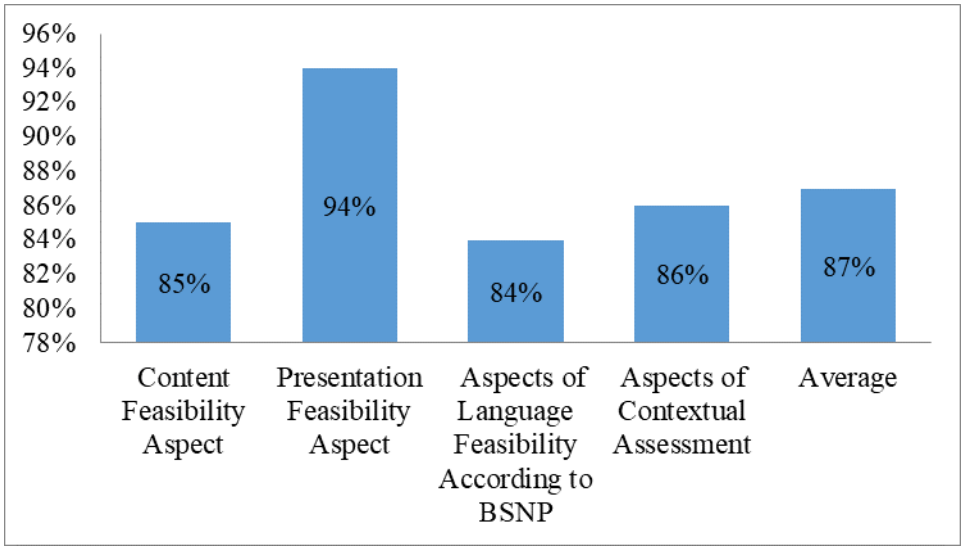


Figure 13. Assessment Results by Material Validators

From the evaluation graph by the material expert validator above, the percentage of eligibility can be calculated using the formula below:

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

$$P = \frac{87\%}{100\ \%} \times 100\%$$

$$P = 87\ \%$$

In accordance with the feasibility presentation table, this 87% value indicates good criteria and does not need to be revised, so the material contained in Static Electric MOOCs is fairly feasible to use.

Then, the development of static electricity MOOCs also requires validation from media experts in assessing the feasibility of static electricity MOOCs themselves. Several points of assessment by media experts include: layout, the font used is attractive and easy to read, consistency of layout, harmony and completeness of layout elements, layout that speeds up understanding, typography of media content and easy to read, and

visual appearance of media. Of the several points of the assessment, there are two main indicators of assessment, namely the indicators for the assessment of Front Page Design and Media Content Design. By following the guidelines and the assessment criteria based on the Likert scale, the total score for the Home Design assessment is 33 points. While the Media Content Design obtained 79 points.

The following is a table of assessment results by media validators:

Table 4. Assessment Results by Media Validator

Rating Indicator	Score Obtained	Expected Value
Homepage Design	33	35
Media Content Design	79	85
Total Score	112	120

From the results of validation by media experts, the overall total score obtained by following the likert scale that has been explained previously is 112 points, while the overall expected value is 120 points. So we can calculate the percentage of eligibility as follows:

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

$$P = \frac{112}{120} \times 100\%$$

$$P = 93\%$$

Based on Table 3. Regarding the criteria for the percentage of eligibility with a percentage of 93% validation results, it shows MOOCs for Static Electricity have very good criteria without the need for revision. So it can be concluded from the results of the expert validation of the Static Electricity MOOCs media it is said to be suitable for use.

CONCLUSION

This research is research and development that produces distance learning media in the form of MOOCs (massive open online course) based on the Moodle website for high school static electricity physics material. MOOC Static Electricity was developed using the ADDIE model and was validated by two validators, namely the material expert validator and the media expert validator. Of the two, the validation results show the feasibility of the developed media to be used as teaching materials in the learning process. The results of this multimedia research and development are able to increase the creativity of teachers in designing physics lessons and facilitate distance learning and can train students to learn independently.

SUGGESTION

The researcher suggests that the further development of Moodle MOOCs use materials other than static electricity and that it be further developed into e-learning for the needs of all lessons at school. This e-learning still has shortcomings, one of which is that the attendance section still uses the google form, so the researcher also suggests that the attendance menu can use the features in the e-learning directly. Then, the researcher suggested to do further research on the effectiveness and efficiency of learning using MOOCs based on the Moodle website and student responses after using the developed media.

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