

Developing web-based mathematics learning media for statistical material

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Abstract

This research aimed to describe the validity, practicality and effectiveness of web-based learning media. The subject of this research was the students of 9th grade of MTs 9 in Wetan. Validation result of this research from the media validation was 3,70 included into very valid category and the result of material's validation was 3,67 that mean very valid category. The result of students' response was obtained 3,39 from small group trials and 3,50 for large group trials, that mean that the media got very practical category and the result of the students' test is 88,9% from small group trials and 82,6% from large group trials that showed the percentages of students achieve the minimum completeness criteria score. Therefore, the web-based learning media was stated as valid, practical and effective and could be used in the mathematics learning process.

Keywords: Moodle, WEB, Learning Media, Statistics

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan media pembelajaran berbasis *web* yang valid, praktis dan efektif. Peneliti menjadikan peserta didik kelas IX MTs di Wetan sebagai subjek. Hasil validasi dari ahli media mendapatkan 3,70 dan mendapatkan kriteria sangat valid dan hasil analisis ahli materi mendapatkan skor 3,67 dengan kriteria yang juga sangat valid. Hasil respon angket peserta didik memperoleh skor 3,39 dari ujicoba kelompok kecil dan 3,50 dari ujicoba kelompok besar, hal itu berarti media ini mendapatkan kriteria sangat praktis serta hasil tes peserta didik sebanyak 88,9% ujicoba kelompok kecil dan 82,6% dari ujicoba kelompok besar yang menunjukkan persentase nilai peserta didik mencapai ≥ 75 atau di atas Kriteria Ketuntasan Minimum (KKM). Oleh karena itu, media pembelajaran ini dapat disebut valid, praktis dan efektif dan dapat digunakan pada kegiatan belajar mengajar matematika.

Kata kunci: Moodle, WEB, Media Pembelajaran, Statistika

INTRODUCTION

In the era of adult education, we are currently experiencing the era of the media world, in which learning activities require reducing methods by using a face-to-face lecture approach and then replacing it with the use of lots of media. At this time, learning activities emphasize process skills and active learning, therefore the role of learning media is becoming increasingly important. Information and communication technology is currently something that is very important for society (Husaini, 2014). One information technology that is familiar for us is the internet. One way to keep up with developments of information technology is by using learning media (Purba, Drajad, & Mahardika, 2021). Information technology is a network that can connect many people to send information, news or data to each other (Walidaini & Muhammad Arifin, 2018).

There are weaknesses in the following developments in learning technology, which makes teachers as the main source of learning, so efforts need to be made to overcome these weaknesses (Moto, 2019). One way to keep up with technological developments is by using learning media (Purba et al., 2021). The use of learning media as a link in conveying information and solving problems in a series of learning activities means that it is important for teachers to be able to develop learning media (Pradana, Setyosari, & Sulthoni, 2020).

Nowadays almost everyone has a cell phone and carries it wherever they go. It is no longer a secret that most students bring cell phones to school or any other place of education. This will of course disrupt the learning process to some extent because they will definitely use their cellphones during class hours without the teacher's permission. It will be beneficial if the teachers can use the cellphone as a learning media or method. Hence, teachers must be able to develop learning methods or media in accordance with the current developments and students' interests so that learning can run better, one of which is by using cellphone media. The learning process using cellphones will make the relationship between teachers and students more interactive (Makmuni, 2020).

According to (Muslimahayati, 2017) the development of mathematics learning media is adapted to the use of the chosen approach, how mathematics is studied and taught. According to its development or usage, media that is suitable to use at this time is learning media related to cellphones, which can be in the form of applications or websites. According to (Januarisman & Ghufroon, 2016), a website is defined as a page that displays one or more pieces of information. If an educator uses a website as a learning medium, the advantage is that the media is not limited by space and time and has speed to access (Peprizal & Syah, 2020).

Based on previous research conducted by (Suanah, 2019) which is based on six process stages: conceptualizing, designing, collecting data/materials, manufacturing, testing and publication. The resulting product gets a score that is in the good category, in other words the media created makes it easier for students to understand the material being studied and has an effect on increasing students' achievement.

Rhomdani (2017) has conducted a lot of research on web-based learning media, web-based learning media that are not accompanied by learning videos to make it easier for students to understand the material. Web-based learning media gave product trial results that did not get good marks because the features were not complete and attractive (Setyadi & Qohar, 2017). Students can only read the material, and there are only a few practice questions. Students understand the material being studied and this has an effect on increasing students' achievement (Suanah, 2019). Development of web-based learning media for equations of lines, equations of lines and angles is effective and fun (Novianti, Utomo, & Dintarini, 2019; Wijayanti, Fayeldi, & Pranyata, 2020). Development of web-based learning media for material on quadratic functions for IX SMP using the drill and practice method is effective and able to make students motivated in learning (Purba et al., 2021). The use of web-based media with Google sites can change students' perceptions of statistical material and make the learning process easier (Gumilar & Efendi, 2022).

The difference in this research is that the Moodle application is used with a more attractive appearance so that students will be more enthusiastic in studying mathematics. This media is equipped with KI (Core Competence) and KD (Basic Competence), learning objectives, materials, learning videos, quizzes and discussion space between teachers and students. By taking advantage of technological developments and also looking at the current situation, in which all countries are experiencing the Covid-19 disaster.

RESEARCH METHODS

Researchers used the ADDIE model in this research, including: (1) analysis stage, both school curriculum, student character and use of learning media; (2) design, which includes creating Moodle web design product designs; (3) development, including the realization of the development of Moodle design web media; (4) implementation, including product trials carried out at MTs in Wetan; (5) evaluation, including assessing the Moodle web design media based on its advantages and disadvantages. Several data collection instruments used are:

Instruments for measuring the validity of Moodle web design development, including the validity of design experts and the validity of material experts. To find out the average score from the validation results, the following formula is used:

$$\bar{x} = \frac{\sum x}{n}$$

Information:

\bar{x} = average value/score for each product assessment point

$\sum x$ = total value for each product assessment point

n = number of assessment items

(Widoyoko, 2014)

These results will be assessed based on the criteria in **Table 1**:

Table 1. Analysis validity score

Skor	Validity Score
$3,25 < \bar{x} \leq 4,00$	Very valid
$2,50 < \bar{x} \leq 3,25$	Valid
$1,75 < \bar{x} \leq 2,50$	Fairly valid
$1,00 < \bar{x} \leq 1,75$	Less valid

Instruments for measuring media practicality are taken based on students' response questionnaires. The results of the questionnaire score will be calculated using the formula used when calculating expert validation. These results will be assessed based on the feasibility criteria for student response questionnaire analysis in **Table 2**.

Table 2. Practicality score

Skor	Practicality Score
$3,25 < \bar{x} \leq 4,00$	Very practical
$2,50 < \bar{x} \leq 3,25$	Practical
$1,75 < \bar{x} \leq 2,50$	Fairly practical
$1,00 < \bar{x} \leq 1,75$	Less practical

Instruments for measuring the effectiveness of the media are taken from students' test results with statistical material. The aim is to measure the effectiveness of using Moodle web design media to determine the level of students' learning success in studying statistics. Here's how to calculate the percentage of completeness (Safitri, Suyanto, & Wahyudi, 2019).

$$\bar{x} = \frac{L}{n} \times 100\%$$

with :

\bar{x} = Percentage of mathematical test completion

L = Completed subject

n = Subjects who took the test

These results will be assessed based on the effectiveness criteria in **Table 3**:

Table 3. Criteria for effectiveness of analysis

Skor	Effectiveness Score
$\bar{x} \geq 80$	Very Effective
$80 < \bar{x} \leq 60$	Effective
$60 < \bar{x} \leq 40$	Effective
$40 < \bar{x} \leq 20$	Effective
$\bar{x} \leq 20$	Effective

RESULTS AND DISCUSSION

Analysis stage

At this stage, information is collected on mathematics learning problems, in this research the material is statistics. Information is obtained by observation, interviews, during teaching and learning activities. Interviews were conducted with the aim of finding out the material to be delivered as well as the supporting tools needed such as students' attendance, list of students' grades, students' learning media and learning resources used by students. Documentation is used to take pictures and videos of the teaching and learning process situations that are taking place in the classroom. The purpose of observation is to determine students' characteristics during the teaching and learning process.

Design Stage

Based on the results of data analysis found during observations, interviews with teachers, and supported by test results, the idea emerged to develop mathematics learning media based on Moodle web design as a learning supplement. Here, teachers can still provide material when they are unable to attend the class by utilizing the internet network. This Moodle web design-based learning media is divided into 2 parts, namely the appearance and content.

Development Stage

This stage produces media that can motivate and add designs that need to be added. This stage was started by pouring out creative and innovative ideas to create Moodle design web-based learning media. The development of Moodle design web-based learning media consists of two stages. The first is the preparation of the design, followed by the creation of text documents, animations, images, videos, etc. The second stage is the completion by correcting deficiencies in Moodle design web-based learning media. Developing web-based learning media for Moodle design begins with creating a domain name and hosting to build a planned web-based learning website. Furthermore, materials such as materials, KI (Core Competencies), KD (Basic Competencies), materials, learning videos, discussion rooms are integrated into the website. The domain address that has been developed is almuslihun.smkpggrisumawe.sch.id. The choice of domain's name is based on the uniqueness of the abbreviated name where the student is located, so that students can easily remember it.

This research aimed to develop a web-based Moodle design media that will be tested for validity, practicality, and effectiveness. The initial stage was the analysis stage. The media design can be seen in the following images:



Figure 1. Full screen of main menu display

The main menu page in **Figure 1** is the main/first page when entering the application. The section for admin and student log in is also found on the main menu.

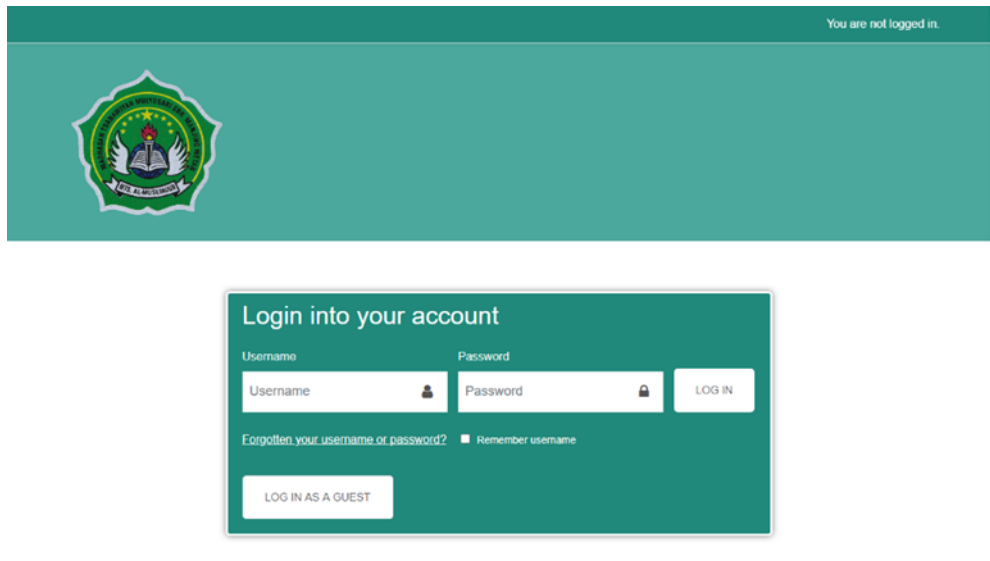


Figure 2. Login menu display

Figure 2 shows the login menu display. The login menu is a menu where admins and students can enter the Moodle design website by entering their username and password so they can access the material, exercises and all the features on the Moodle design website.

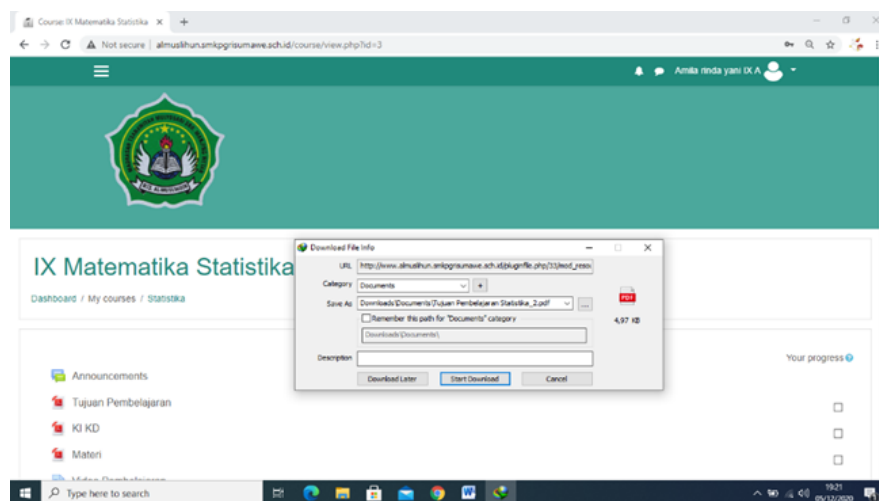


Figure 3. Main page display

The main page according to **Figure 3** contains several items that can be selected according to user's wishes or planned activities, including learning objectives, KI (Core Competencies), KD (Basic Competencies), materials, learning videos, and discussion space.

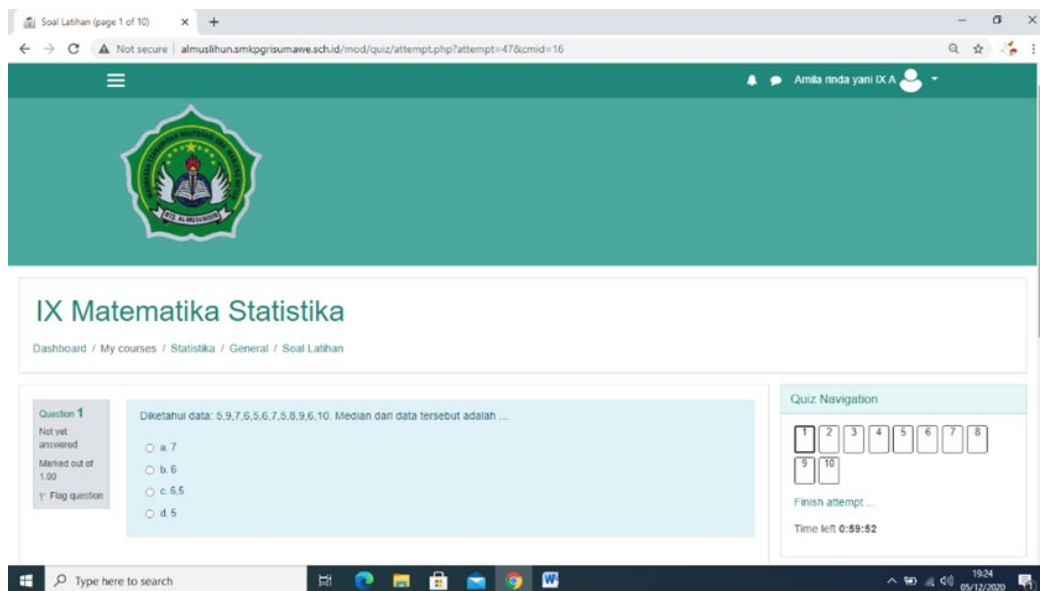


Figure 4. Practice question page

There are several exercises that have been provided by the admin on the page in **Figure 4** above. These exercises can also be adjusted to the type and model of questions according to the wishes of the students. Teachers can use this page as a requirement to fulfill grades for ongoing learning.

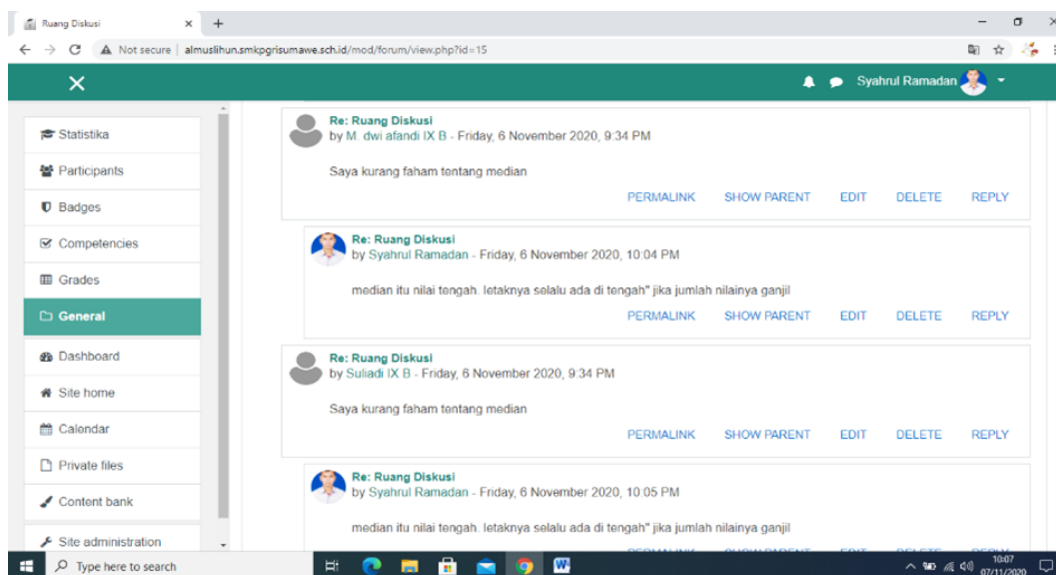


Figure 5. Display of the discussion room

Figure 5 shows the appearance of the discussion room. This page is a page where admins and clients can communicate with each other about the learning material that has been undertaken. This can be done directly from the client to the admin or held discussions together with several other clients.

After the design stage is complete, the media will be assessed for validity by several experts which can be seen in **Table 4**:

Table 4. Expert validation results

Validator	Validation Result	Criteria
Design Expert	3,70	Very Valid
Material Expert	3,67	Very Valid

The validation scores obtained from design experts and material experts were 3.70 and 3.60 with the criteria "very valid". This is in line with (Aditya, 2018). in which the web-based mathematics learning media studied obtained an average validation score of 3.5 which was declared valid. Apart from the assessment according to the validation sheet, there are several suggestions from design experts and material experts; in layout of images and making logos according to the meaning of the learning media as well as increasing the number of examples of questions for each KD and clarifying sentences in the material. This evaluation and suggestions will be used to revise the product so that the learning media can be used for research.

Next, the Moodle web design media was tested on students to assess the feasibility and effectiveness of the media in learning mathematics. The feasibility assessment uses a questionnaire distributed to students, while the effectiveness assessment uses tests with statistical material. Practicality test assessment, Moodle web design media got 89% in the range $3,25 < \bar{x} \leq 4,00$ and 11% in the range $2,50 < \bar{x} \leq 3,25$ used in mathematics learning. Website-based learning media in the form of e-comics is practically used in mathematics learning (Adeliyanti, Suharto, & Hobri, 2018). Web-based teaching materials can make it easier for students to access various learning materials and can facilitate mathematical problem solving abilities (Fitriana, Murni, & Maimunah, 2022; Purmadi & Surjono, 2016).

The results of the media effectiveness test in the small group test showed that 88.9% of research subjects got good grades. The test results showed that the media developed achieved the criteria of "very effective". E-learning using website-based mathematics learning media is effective for use in mathematics lessons as evidenced by

the increase in students' level of completion which reached 84% after using the e-learning website-based media (Lutfiyah & Sulisawati, 2019). Development of learning media had the most important position in achieving effectiveness and practicality in mathematics learning (Istiandaru, Istihapsari, & Fitriyani, 2017). Mastery of e-learning website-based media statistics material can still run well. This is also in accordance with the opinion of (Nusantara, Zulkardi, & Putri, 2021). in which students continued to learn with the help of online learning platforms and persist in learning to live in the midst of COVID-19 while mastering mathematics. Based on this description, Moodle web design media used in mathematics learning is very feasible and very effective.

Implementation Stage

Trial development of Web-based learning media using Moodle was carried out by providing the URL (almuslihun.smkpgrisumawe.sch.id) to students. The trial activity ended with students filling out a response questionnaire. Filling out the student response questionnaire aims to determine the level of practicality of the learning media that has been developed and accommodate suggestions and input from students as direct users. The results of the assessment of the practicality of the Moodle web design media obtained a score of 91.3%, a score between $3.25 < x$ Moodle design gets the "very practical" category. Mean while, in the effectiveness test, Moodle web design media got 82.6% of students who got a score of ≥ 75 , which means Moodle media is very effective.

The validity assessment is seen from the validation scores by design experts and material experts of 3.70 and 3.67 in the "very valid" category. The response questionnaire score received an average score of 3.39 and 3.5, which was categorized into "very practical". Meanwhile, the level of effectiveness of the media is shown from the results of student tests, in each trial, more than 80% of the subjects obtained good grades at MTs in Wetan.

Evaluation Stage

This stage is the final stage of developing web-based learning media using Moodle. At the evaluation stage, the media that has been produced and implemented is evaluated for several shortcomings. This aimed to make it easier for students to use the web-based learning media using Moodle. As a result, students suggested that the video's sound on the learning media was less clear. From the students' input regarding the video's sound was not clear, the researcher made improvements by increasing the volume. Students found input in the form of background and writing colors that lacked contrast, so students had difficulty to read it. Improvements were made to check the background and the color of the writing that was less contrast by making it more contrasty.

CONCLUSION

Moodle media received validation from design experts and material experts with scores of 3.70 and 3.67, both of which received "very valid" criteria. In the practicality test, Moodle media got score of 3.39 in the small group and 3.50 in the large group. The criteria obtained were "very practical". The level of media effectiveness in the small group obtained a mean of 86.67, while in the large group with average score was 87.4. The criteria obtained were "very effective". This media succeeded in obtaining valid, practicality and effective criteria. Web media development using Moodle is suitable for online classes, learning outcomes and student activity become more effective after using Moodle. The media is not boring for students, using Moodle media will save time and money, and guarantee the security of the learning process. This media can support in increasing students' interest in studying mathematics so that students' learning outcomes will also increase.

Suggestions for future researchers was developing another web-based mathematics learning media that is more interactive by providing discussion space for other applications. The discussion room can be connected to other communication media such as WhatsApp, Telegram, etc. This communication media will speed up the discussion space because there will be notifications if there are questions and comments when students use the cellphones.

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