

Daya Matematis : Jurnal Inovasi Pendidikan Matematika

Volume, 8 Nomor 3 December 2020 page. 205-212 p-ISSN: 2541-4232 dan e-ISSN: 2354-7146

Website-Based Teaching Material Development to Improve Student Mathematics Learning Outcomes

Azhar¹, Hendri Raharjo², Alif Ringga Persada³

^{1,2,3} IAIN Syekh Nurjati Cirebon, Indonesia

Email: azharmustafa175@gmail.com, hendri.iainsnj@gmail.com dziqramanagement@gmail.com

(Received: 19-08-2020; Reviewed: 24-08-2020; Revised: 28-09-2020; Accepted: 21-10-2020; Published: 6-12-2020)

© 2020 – Daya matematis: Jurnal inovasi pendidikan matematika. Ini adalah artikel dengan akses terbuka dibawah licenci CC BY-NC-4.0 (<u>https://creativecommons.org/licenses/by-nc/4.0/</u>)

Abstract

The very rapid development of science and technology offers us various conveniences. Teaching materials that are made are the website at the web address belajarmatematics.id. The objectives of this study are: 1) To determine the effectiveness of website-based teaching materials. 2) determine student responses to website-based teaching materials applied in schools. 3) determine the increase in student mathematics learning outcomes using websitebased teaching materials. The research method used in this study is RnD (Research and Development) with the ADDIE model with data collection techniques using questionnaires and tests. The sample used was class VII F SMP Negeri 1 Krangkeng, Indramayu Regency. Based on the results of the independent sample t test (two tailed), it can be seen that the value of $t_{count} > t_{table}$, is 6.331 > 2,000. Because tcount> ttable, it means that there is a difference in students' mathematics learning outcomes between using website-based teaching materials and without web-based teaching materials. Student responses to the application of website-based mathematics teaching materials show strong criteria with an average of 85.08%. The average gain score of students using website-based teaching materials is 0.67 or 67%.

Keywords: Teaching Materials, Website, Mathematics

INTRODUCTION

Improving the quality of education is very important and central in developing countries such as Indonesia. Various efforts have been made by the government in terms of improving the quality of education. Efforts to increase the realization of the ideals of the nation. Human resource is a system in the success of nation building. One of the things that must be immediately improved is the quality of education, to improve the quality of education it can be done with innovations in learning such as using teaching aids or using media that are more attractive to students' learning interest. Many teachers today still use conventional learning models only by lecturing and giving assignments.

The development of media, according to Ashby in Umar (2013: 126) has caused two times out of four revolutions in the world of education. The first revolution occurred several decades ago, namely when parents handed over their children's education to other people who work as teachers, the second revolution occurred with the use of written language as the main means of education, the third revolution arose with the availability of printed media which was the result. the discovery of machines and printing techniques, and the fourth revolution took place with the widespread use of electronic communication media. The times have influenced the educational revolution. This revolution presents a challenge for teachers to be able to teach according to changes that have occurred.

The use of media in the teaching and learning process certainly has a function as a teaching aid to achieve educational goals. The use of appropriate learning media can improve student learning outcomes. The use of instructional media in the teaching and learning process certainly has as a teaching aid for teachers in teaching that can be used by teachers in delivering subject matter to students. An innovation in the development of non-printed teaching materials to improve student learning outcomes, one of which is

website-based learning. This website-based learning is an innovation in the world of education that can be used as a medium in the teaching and learning process.

The use of website-based learning media will gradually replace the delivery of material with the lecture method, this is in line with what Munthoha et al. (2010) stated that technological developments in the world of education have shifted the delivery of material with the lecture method towards the use of learning media. In addition, learning media has undergone changes and developments from media in the form of books to audio-visual forms that are displayed on the internet network that can be accessed online. IT-based teaching materials are one of the ways that can be used to make students active because the teaching materials contain a series of learning experiences that are systematically arranged and can help students achieve learning goals equipped with animations that will increase students' understanding of a concept Roza & Murni, 2018).

The development of web-based mathematics teaching materials has been carried out by Harahap & Fauzi (2017) that web-based teaching materials have a positive impact on student learning outcomes by considering valid and practical criteria for these teaching materials. Research conducted by Zulkarnain, Kadaritna, & Tania (2015) related to the development of web-based e-modules concluded that the average student gave a positive response to the use of electronic modules by 84.5% and had a positive impact of 58% on students' classical learning completeness. Based on relevant research, the application of website-based teaching materials can have a positive impact on student learning outcomes.

Mathematics learning is needed by students as a means of logical thinking, problem solving skills, making relationship patterns and drawing conclusions, and a means of developing student creativity (Nugroho & Riyanto, 2019). Learning mathematics helps students develop process-based knowledge constructs, abstract properties and symbols in mathematics require high concentration and a lot of time to understand it (Masykur, Nofrizal, & Syazali, 2017). In addition, Nur'aini (2017) added that mathematics is a lesson that discusses facts, relationships, space, and forms. Mathematics learning provides skills training for students to be able to think realistically, logically, systematically, and be able to solve problems.

Teaching materials are materials or subject matter that are systematically arranged both written and unwritten which are used by teachers in classroom learning to create an atmosphere / learning environment that allows students to be interested in learning so as to achieve predetermined competency standards (Raharjo, 2014). Gazali (2016) states that there are things that teachers must do related to the availability of teaching materials, namely providing various examples and representations of subject matter to students, encouraging high levels of interaction in the learning process, and connecting subject matter with the real world. Based on this understanding, the teaching materials are arranged systematically, presented attractively in order to increase student interest and encourage student interaction in the teaching material.

Yuhefizar (2011: 1-2) reveals the meaning of a website. A website or called a web blog is all web pages contained in a domain which contains information. A website is usually built on many interconnected web pages. The relationship between one web page and another web page is called a hyperlink. Meanwhile, text that is used as a medium of contact is called hypertext. A website can be accessed through a browser, which is software for accessing web pages, such as internet explorer, mozilla firefox, opera, safari and chrome.

Teachers who organize online learning that must be considered by teachers are students' comfort when learning so that they can learn optimally so that learning objectives can be achieved properly (Suprianto, Hendrayana & Syamsuri, 2020). Comfortable conditions when studying online can affect student understanding. In developing this website-based teaching material, it tries to provide a sense of comfort by providing an assessment / validation of teaching materials before being used by students.

Based on the background above, it is necessary to develop Website-based teaching materials to assist students in learning the material, so that students can easily understand the material presented and

achieve learning objectives. In addition, train students' skills in using the internet and computer technology. Website-based teaching materials make it easy for students in terms of printing costs.

RESEARCH METHODS

This study uses a research model adapted from the ADDIE development model (Analysis, Design, Develop, Implement, and Evaluate) with a research and development (R & D) type approach. The ADDIE model began to exist in the 1990s developed by Dick and Carry which was used to design a learning system (Mulyatiningsih, 2012). In addition, this model can be used for various forms of product development such as models, learning strategies, learning methods, media and teaching materials. This model uses 5 stages, namely the Analysis, Design, Development, Implementation, and Evaluation stages.

Population is the subject of research. This research was conducted at SMP Negeri 1 Krangkeng, Indramayu Regency, semester II in class VII with a total of 214 students. The sample is a part or representative of the population to be studied. While in this study the sample was class VIII-E with 30 students (experimental class) and class VIII-F with 30 students (control class). The technique used to collect samples is purposive sampling, because the samples are taken based on certain objectives or considerations. As for the consideration of researchers is information from the math teacher. So the samples taken were 60 students.

Qualitative data from research and development were obtained from the results of student responses to the developed Android-based mathematics teaching materials. The questionnaire used was a Likert scale questionnaire, with 20 statements and 5 answer criteria, namely strongly agree, agree, doubt, disagree and strongly disagree.

Table 1. Likert scale for student response questionnaires	
Statement	Score
Strongly Agree	5
Agree	4
Doubt	3
Disagree	2
Strongly Disagree	1

Quantitative data processing uses test instruments, so it is necessary to test the instruments that include: validity, reliability, difference power test, difficulty level test and n-gain test. The n-gain test is used to find out how much the increase in student learning outcomes in the control class and the experimental class. Researchers used the normal n-gain formula according to (Baharuddin, 2014):

 $\langle g \rangle = \frac{postest - pretest}{Score max - pretest}$ The results of the calculation are interpreted using the gain index $\langle g \rangle$ as follows:

Table 2. N-Gain Criteria	
Indeks gain	Criteria
$g \le 0,30$	Poor
$0.30 \le g \le 0.70$	Medium
/ _8_ /	
$g \ge 0,70$	High

RESULT AND DISCUSSION

Result

The research was conducted from January to March at SMP N 1 Krangkeng, Indramayu Regency. The teaching material product produced in this study is a website, namely the web address www.belajarmatematics.id which has been through a validation process by a team of media experts and material experts, and has been tested on students of SMP N 1 Krangkeng, Indramayu Regency, especially class VIII-E as an experimental class. In this application, there are competency standards, basic competencies, indicators, a collection of material about rectangles and triangles and quizzes as a test medium, as well as several other features such as interactive videos, and this website can also be updated as needed. This application is only run online.

The development of this Android-based teaching material is an adaptation and modification of the ADDIE model research and development steps, namely the stages: Analysis, Design, Development, Implementation, Evaluation. At the stage of making the system, the author uses the prototype method in web engineering for the System Development Live Cycle (SDLC). This method is carried out in five stages, namely.



Prototype method in SDLC

1) Communication needs

At this stage the writer identifies the existing problem, then communicates with stakeholders in this case the "School Name" to obtain information in the form of a specification of what kind of needs are desired to be applied to the system to be built along with the expected output. In this sense, effective communication is actually the most challenging activity we have always had to face. Based on the context of the effectiveness of the results obtained, the best communication is communication that is carried out directly or face to face.

2) Planning

Planning activities are a number of management and technical practices that allow the author to define a road map. The author must find goals that are strategic and tactical, excessive planning will waste time and do not allow for changes in the project, but lack of planning can also lead to chaos, so at this stage you should be able to make the best use of your time.

3) Modeling

The model is made to get a better understanding of the real entity to be created. When the entity is something physical (eg a building, an airplane, a machine) we can create a model that is identical in size and shape but on a much smaller scale. However, when the entity to be created is a software, our model must take a different form. The model must be able to represent the information that will be transformed by the software, the features desired by the user and present the system's behavior when the transformation actually occurs.

4) Construction (Prototype)

At this stage the author creates a code to build a system based on the information that has been obtained at the communication needs stage, then tests the system designed to be submitted to stakeholders, in this case the "School Name".

5) Submission

The activity of submitting software to customers has 3 important actions, namely delivery, support and feedback. Software will be submitted several times before finally the complete software is produced.

The software that is delivered will benefit the user, but the user will also provide feedback from the experience of using the software which will be very useful for the programmer.

In this system design process includes use case diagrams and activity diagrams to make it easier to understand the design so that the results obtained are good systems, this is part of the modeling stage. The system designed is described into several parts that can form the system into a single component Pretest data in the experimental class is the initial data taken to determine students' initial abilities before being given treatment. The data was collected by giving a test in the form of 20 multiple choice questions to the students. From the pretest in the experimental class, the highest score was 50, the lowest score was 15, and the average data was 29.16 with poor criteria, while the variance was 88.074 and the standard deviation was 9.384.

Posttest data in the experimental class is data obtained from students after being given treatment. From the posttest in the experimental class, the highest score was 90, the lowest score was 55, and the average score was 77 with good criteria. Meanwhile, the variance was 44.137 and the standard deviation was 6.643.Based on the calculation of the results of the pre-test and post-test above, it can be concluded that there are differences in student learning outcomes after using the website as teaching material in the learning process.

The normality test was performed using the Kolmogorov-Smirnova and Saphiro-Wilk tests. The basis for decision making is in testing the normality of pre-test and post-test data for the control class and experimental class using the Kolmogorov-Smirnov test. The results of the calculation of the normality test using SPSS indicate that the research data is normally distributed with a significance output of 0.200 fault. The results of the homogeneity test based on the n-gain data obtained a scatter significance of 0.118, which means that the research data has homogeneous characteristics. From the normality and homogeneous. Meanwhile, the hypothesis test is carried out by using the parameteric test using the independent sample t-2 test or the Independent Sample T-test. With the help of SPSS, it was obtained a tcount of 6.331 using a singnification level of 5%, a t-table value of 2,000 was obtained. The t table value is obtained from the excel program by = tinv (0.05; 60) then enter. So that the value of t count> t table which means that Ho is rejected.

Based on the results of the calculation that Ho is rejected, it means that the increase in student learning outcomes using website-based teaching materials is higher than students who use printed teaching materials. From the descriptive table it can also be seen that the average gain score of students using website-based teaching materials is 0.67. and the average gain score of students using printed teaching materials is 0.52. This shows that the increase in learning outcomes using website-based teaching materials is higher than students who do not use website-based teaching materials.

Researchers obtained data from distributing questionnaires given to the experimental class whose learning used the website. The distribution of this questionnaire aims to determine the response to the teaching material. The student response is seen from three aspects, namely aspects of understanding, aspects of appearance and quality of interaction and aspects of student interest and media kemenarika. From the results of the analysis, it was obtained that the students' response in understanding aspects was 86%, appearance aspects and interaction quality were 82% and aspects of student interest and media attractiveness were 87%. So it can be seen that the average percentage of student responses to website-based teaching materials is 85.08% with Strong criteria.



Discussion

From the results of the research that has been carried out, the researcher finally gets the results of the discovery of the problems that have been formulated previously. Website-based teaching materials that have been validated by two media experts and two learning material experts. Media experts who evaluate teaching materials based on this website are lecturers of IAIN Syekh Nurjati Cirebon, namely Mr. Saluky as media expert 1 and Mr. Ayatullah Kumaeni SE, I from the computer teacher at SMPN 1 Krangkeng school as media expert 2. As for material experts who conduct material assessment This website-based teaching is a lecturer at IAIN Syekh Nurjati Cirebon, Mr. Arif Abdul Hagq as a material expert 1 and Mr. Atma Negara S.Pd, a mathematics teacher at SMPN 1 Krangkeng school as a material expert 2. Based on the results of validation of the media obtained from two media experts and two experts the material obtained by a percentage of 79% (Good) for the quality of learning and 76% (Good) for the quality of the material. Meanwhile, in terms of media, the percentage is 78% (Good) for display quality, the percentage is 92% (Very Good) for content quality, the percentage is 77.5% (Good) for language quality, the percentage is 90% (Very Good) for interactivity quality. So that the overall result of the material expert shows a percentage of 77% with good criteria while the results of the media expert show a percentage of 85.5% with very good criteria. This shows that website-based media / teaching materials are suitable for use even though there are a few revisions, comments and suggestions from supervisors, material experts and instructional media experts.

From the results of research conducted at SMPN 1 Krangkeng, researchers can find out that the average learning outcomes using website-based teaching materials are 77, while the average learning outcomes of students who don't use website-based materials alone are 67.33. - The average student learning outcomes using website-based teaching materials have met the set KKM (Minimum Completeness Criteria) is 75. In testing the effectiveness of the product using calculations from the results of the analysis of the Independent T-test, it was obtained a t-count value of 6.331 Using a significance level of 5% obtained t table value of 2,000. The t table value is obtained from the excel program by = tinv (0.05: 60) then enter. So that the value of ttable> tcount, which means that H0 is rejected. This means that the increase in student learning outcomes using website-based teaching materials.

This is in line with Mustikasari's opinion in Yohana (2011) which states that some of the benefits of using media in learning include the learning process that can be clearer and more interesting, improve the quality of student learning outcomes, and the media can foster positive attitudes towards the material and learning process. With a clearer and more interesting learning process, it will foster a sense of joy for students in the mathematics learning process. So that indirectly it will foster positive attitudes towards mathematics, especially in the material being studied. A positive attitude is needed in the learning process because a positive attitude will move students to be more active in learning. Thus, the learning process can be increased which also has an impact on improving the quality of learning. So that with the increase in the quality of learning, there will be an indirect increase in learning outcomes.

In addition to learning outcomes, this study obtained student responses to mathematics learning using the website. The average percentage of student response results is 85.08% with very strong criteria. In

detail, these criteria were obtained from the aspect of understanding by 86% with very strong criteria, in terms of appearance and quality of interaction, the percentage was 82% with very strong criteria, and from the aspect of student interest and media attractiveness the percentage was 87% with very strong criteria. This means that students give a positive response to learning mathematics using website-based teaching material.

CONCLUSION AND RECOMMENDATION

Conclusion

- 1. The development of this teaching material uses the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. At the Analysis stage, a needs analysis is carried out and the resulting curriculum needs analysis and academic and non-academic needs analysis are produced. At the Design stage, a media script (storyboard) is made and collects all the necessary materials according to the storyboard and prepares all the software needed to create a website. The Development stage begins with building the media that will be developed in accordance with the storyboard that has been made then evaluating the media being developed by material experts and media experts, after getting input and suggestions from media experts and material experts then revising the media. Implementation stage, namely by implementing the media that has been made. At this stage, tests were also carried out in the form of pretest and posttest to the experimental class and to the control class. In addition, questionnaires were also distributed to the experimental class to determine the response to the media being developed. The last stage of ADDIE is Evaluation, at this stage data analysis is carried out from the results of student learning tests and the results of questionnaires that have been distributed.
- 2. Test the effectiveness of the product using the results of the analysis of the Independent T-test obtained a value of t_(count) of 6.331. By using a significance level of 5%, the t_value (table) is 2,000. The value of t table is obtained from the excel program by = tinv (0.05; 60) then enter. Because 6.331> 2,000 then H0 is rejected. This means that the increase in student learning outcomes using website-based teaching materials is more effective than students who do not use website-based teaching materials.
- 3. The average student response to the media made got a score of 86% with very strong criteria for the aspect of understanding, 82% with strong criteria for aspects of appearance and quality of interaction, and 87% with strong criteria for aspects of student interest and media attractiveness. So that from the student's response to the media based on the overall criteria, the average score is 86.08% with very strong criteria.

Recomendations

Further researchers must be able to design more systematic website-based teaching materials based on competency and subject matter indicators, provide contextual illustrations that are understood by students, and speed up website loading so that students don't wait long.

REFERENCES

- Baharuddin, I. (2014). Efektivitas Penggunaan Media Video Tutorial Sebagai Pendukung Pembelajaran Matematika Terhadap Minat dan Hasil Belajar Peserta Ddidik Sma Negeri 1 Bajo Kabupaten Luwu Sulawesi Selatan. Volume 2. Nomer 2. ISSN: 2339-0794.
- Dimyati & Mudjiono. (2006). Belajar dan Pembelajaran. Jakarta: Rineka Cipta..
- Gazali, R. Y. (2016). Pengembangan bahan ajar matematika untuk siswa SMP berdasarkan teori belajar ausubel. Pythagoras: Jurnal Pendidikan Matematika, 11(2), 183-184.
- Hamalik, Oemar. (2008). Perencanaan Pengajaran Berdasarkan Pendekatan Sistem. Jakarta: Bumi Aksara.
- Harahap, M. S., & Fauzi, R. (2017). Pengembangan Modul Pembelajaran Matematika Berbasis Web. Jurnal Education and development, 4(5), 13-13.

https://kominfo.go.id/content/detail/4286/pengguna-internet-indonesia-nomor-enam-

<u>dunia/0/sorotan_media</u> diakses pada tanggal 01 - 12 - 2016.

Maskur, Ruhban, Nofrizal Nofrizal, and Muhamad Syazali. "Pengembangan Media Pembelajaran Matematika dengan Macromedia Flash." Al-Jabar: Jurnal Pendidikan Matematika 8.2 (2017): 177-186.

Mulyatiningsih, E. (2013). Metode Penelitian Terapan Bidang Pendidikan. Bandung: Alfabeta.

- Muntoha, dkk. (2010). Pengembangan sistem evaluasi pembelajaran berbasis web (web based learning assessment system). Jurnal Ilmiah Jurusan Fisika Kampus Unnes Sekaran Gunungpati Gd D7 Lt 2. 195-199.
- Nugroho, G. N., & Riyanto, O. R. (2019). Mathematical Critical Thinking Ability Reviewed From Self-Efficacy in Discovery Learning. Eduma: Mathematics Education Learning and Teaching, 8(1), 25-32.
- Nur'aini, I. L., Harahap, E., Badruzzaman, F. H., & Darmawan, D. (2017). Pembelajaran Matematika Geometri Secara Realistis Dengan GeoGebra. Matematika, 16(2).
- Raharjo, H. (2014). Pengembangan bahan ajar berbasis komputer dalam pembelajaran matematika pada pokok bahasan kubus dan balok. EDUMA: Mathematics Education Learning and Teaching, 3(2)
- Rahmadani, H., Roza, Y., & Murni, A. (2018). Analisis Kebutuhan Bahan Ajar Matematika Berbasis Teknologi Informasi di SMA IT Albayyinah Pekanbaru. JURING (Journal for Research in Mathematics Learning), 1(1), 91-98.
- Sanjaya, W. (2011). Strategi Pembelajaran Berorientasi Standar Proses Pendidikan.Jakarta : Kencana Prenada Media.
- Sardiman. (2011). Interaksi dan Motivasi Belajar Mengajar. Yogyakarta: Raja Grafindo Persada
- Suprianto, U., Hendrayana, A., & Syamsuri, S. (2020). Description of Mathematical Connection Ability From Student Learning Styles In Online LearningUsing Discovery-Based Worksheets. Daya Matematis: Jurnal Inovasi Pendidikan Matematika, 8(2), 119-130.
- Suprijono, A. (2012). Cooperative Learning Teori dan Aplikasi PAIKEM. Yogyakarta: Pustaka Belajar Syaodih, N. (2006). Landasan Psikologi Proses Pendidikan. Bandung: Rosdakarya
- Umar. (2013). Media Pendidikan: Peran dan Fungsinya dalam Pembelajaran. Jurnal Tarbawiyah, 10(2)
- Yohana, A. (2011) . Studi Tentang Media Pembelajaran yang Digunakan Pada Mata Pelajaran Seni Budaya Bidang Seni Rupa Di SMP Negeri 1 Probolinggo. Skripsi Malang : Universitas Negeri Malang
- Yuhefizar. (2011). Cara Mudah Membangun Website Berbasis CMS Joomla.Jakarta: PT. Elex Media Komputindo
- Zulkarnain, A., Kadaritna, N., & Tania, L. (2015). Pengembangan e-modul teori atom mekanika kuantum berbasis web dengan pendekatan saintifik. Jurnal Pendidikan dan Pembelajaran Kimia, 4(1), 222-235.