

DEVELOPING INTERACTIVE MEDIA IN LEARNING MATHEMATICS BY USING MACROMEDIA FLASH 8 ON MATERIAL TWO VARIABLES LINEAR EQUATION SYSTEM OF CLASS X SMK

Guntur Prabowo^a, Aris Thobirin^b

Program Studi Pendidikan Matematika Universitas Ahmad Dahlan
Jalan Ring Road Selatan, Tamanan, Banguntapan, Bantul, Yogyakarta

^agunturprabowo@gmail.com, ^baris.thobi@math.uad.ac.id

ABSTRACT

Rapid technological developments, make innovation development of instructional media of mathematics as a tool for learning. Media developed learning because students are still challenging to understand the material system of linear equations, so that the need for renewable innovations in mathematics for students in learning to overcome boredom. The use of laboratory and LCD (Liquid Crystal Display) is still not widely used in learning mathematics. This study aims to develop teaching media in the form of interactive media using Macromedia Flash 8 in the learning of mathematics in SMK on the material of the Two-Variable Linear Equations System and test the feasibility. This study focused on developing mathematics learning media packaged in a Compact Disc (CD). The development of research using (Research and Development). The subject of research is matter experts, media experts, and National Vocational High School Berbah (SMK Nasional Berbah) and Muhammadiyah Vocational High School 3 Yogyakarta (SMK Muhammadiyah 3 Yogyakarta). Learning media is validated by three votes materials experts, three expert media, and the subject of the trial of 10 students on a test smaller classes. All students in the pilot class of high use assessment instruments or sheets instrument quality research materials and instructional media student response. Data analysis techniques use qualitative analysis that is converted into quantitative value. Data collection techniques in the form of interviews, questionnaires, and observations. This research has succeeded in developing a medium of mathematics learning that has quality on every aspect of assessment with an average score of 76,67 material experts with good criteria and an average score of expert media assessment 40,33 with Very Good criteria. While the score of student response 69,74 with the score on the small class test and big class test with good criterion. Based on these assessments, this math learning media is worthy of being used as a learning resource for students.

Keywords: Learning Media, Multimedia.

INTRODUCTION

The development of an increasingly modern era, especially in the age of globalization, demands high-quality human resources. Improving the quality of human resources is an absolute prerequisite for achieving development goals. One vehicle to enhance the quality of human resources in education. It is hoped that this education can foster the potential of human resources through an effective learning activity. The development of technology is now happening rapidly, both information technology and communication technology. This technology will be very useful if, in its ongoing development, balanced with developments in education where education utilizes these technological developments effectively. Did not rule out the possibility of education in Indonesia will be more advanced if it uses advanced technology that already exists; one of them is in mathematics. In improving the quality of education, the government does not turn a blind eye to the rapid development of technology. Because the use of appropriate technology can facilitate the learning process, this was also stated in Minister of Education Regulation number 22 of 2006 concerning one of the principles of curriculum development for Elementary and Secondary Education. Development of teaching materials must pay attention to the demands of the curriculum, but how to achieve them and what teaching materials used are left entirely to the educators as professional staff" (Ministry of National Education, 2010: 3). One of the principles of implementing the Education Unit Curriculum, among others, The curriculum is performed using a multi strategic and multimedia approach, learning resources and technology (Permendiknas, 2006: 6).

Thus the government also encourages the use of technology in learning. To that end, the government also improves facilities and infrastructure to support the learning process that integrates with technological developments. The improvement in facilities and infrastructure is shown by the number of junior high schools and high schools / vocational schools that already have computer and LCD laboratories in each class and even use the latest technology. Thus, learning is expected to be more effective because the learning process is more exciting and innovative. However, this has not become a spark for the teachers' enthusiasm at the SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta to utilize the technology. Some teachers still stick to ordinary learning without using technology. That is because some of the teachers at SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta have not been trained in using the technology provided. Only a handful of teachers have used technology to support learning. The government has also held a lot of training in educational technology use in education, especially in the form of instructional media. Thus the teacher will get used to using technology in learning.

Many learning media in mathematics have been developed, such as teaching aids, worksheets, and modules, including learning CDs, which are new models of learning media. The goal is that learning mathematics can be more attractive to students so that the results achieved can be more leverage. This is in line with what was conveyed in the observation with one of the mathematics teachers at SMK Nasional Berbah, Mrs. Rini Mulyani, S.Pd. This revealed that mathematics needed renewable innovations in the process of learning so that the results achieved were more leverage. Also, computer-based learning media can gain sympathy from students because it is felt more interesting in learning. However, of the many learning media at this time, few interactive learning media are used in the material system of two-variable linear equations. SMK Nasional Berbah has not utilized interactive media in learning, especially on the two-variable direct equation system material. Mrs. Rini Mulyani, S.Pd. Also revealed that from various materials in class X, the material system for two-variable linear equations can be used in learning media. It requires students to understand the problem-solving in the material system for two-variable linear equations.

An interview was also conducted with a mathematics teacher at SMK Muhammadiyah 3 Yogyakarta, Mr. Yulianto, S.Pd., who said that mathematics learning was centered on teachers combined with discussions to anticipate students' boredom in learning mathematics. The teacher also emphasized that learning mathematics is needed interesting education to entice students to learn mathematics so that students can understand clearly and use their imagination to explain the material being taught. One of them is the need for a learning media in mathematics learning packaged with exciting animations, especially in the material system of two-variable linear equations. The animation form can be in the form of a parable for the variables and its solution because students still have difficulty understanding the two-variable linear equation system. Also, based on observations at the SMK Muhammadiyah 3 Yogyakarta, it was found that laboratories in schools were not yet used for learning mathematics, but were only used for ICT lessons. While the use of LCD (Liquid Crystal Display) is also still not used for learning mathematics. Tay Vaughan (2006: 3) argues that multimedia is a combination of text, photos, graphic arts, sound, animation, and video elements that are digitally manipulated. The use of appropriate multimedia is an alternative to overcome students' low learning outcomes, especially in mathematics. By using relevant learning media in teaching, it is expected to be able to improve student learning outcomes. In the selection of media, it must be considered in terms of compatibility with the material being taught and the state of students, which includes their abilities and time.

Teachers in the teaching and learning process must have the ability to manage classes and create a pleasant atmosphere for students to be motivated to study harder. Besides that, the thing that teachers need to pay attention to is the use of appropriate and appropriate media for each subject matter given, because the use of appropriate media can support success in achieving efficient and effective learning goals. The increasing learning outcomes of students show one of the achievements of education. Factors that influence the level of student learning outcomes include the media used in learning. Thus, one of the challenges faced by teachers is to determine the learning media used in teaching so that students can study

harder so that they obtain high learning outcomes. Azhar Arsyad (2013: 15) argues in the teaching and learning process, and two essential elements are the teaching methods and learning media. Teaching methods that fit students' needs and conditions will provide more understanding to students because psychologically, students can follow the learning process. The use of instructional media in the teaching and learning process can arouse new desires and interests, generate motivation and stimulation of learning activities, and bring psychological influence on students.

With advances in technology, the combination of computers and CD pieces can be an effective and efficient learning media in the form of interactive learning CDs. Moreover, in almost every school already has a sufficient number of computers to be used in the learning process and students who have enough skills also to operate machines. The interactive CD is a media that confirms a multimedia format that can be packaged in a CD (Compact Disk) with the aim of interactive applications. CD ROM (Read Only Memory) is the only one of several possibilities that can unite sound, video, text, and programs on a CD. As a product, Interactive CD is the result of solving a problem based on an audiovisual communication approach. The design of an Interactive CD is a visual communication design that is displayed through a monitor that can be present at any given time. The monitor screen serves as a visual communication media that looks no different from the design of a magazine or a newspaper. SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta are schools with complete computer laboratory facilities, but facilities in the form of LCDs are rarely used in the learning process. This is because presenting subject matter in the way of audiovisual takes a bit of time and is difficult to make. Therefore, the presence of an Interactive CD makes it easier to teach the material, especially in mathematics. The content to be shown has been presented in audiovisual form by displaying several animated images that are easily absorbed by students, especially abstract mathematics subjects. From the various sources above, it becomes the background of researchers to integrate the availability of good facilities and infrastructure to be utilized more maximally in the process of learning mathematics as an interactive multimedia-based learning media in creating innovative learning processes in the world of education.

METHODS

This developmental research refers to the procedure of the Research and Development (R&D) model. Sugiyono (2014: 409) suggested the steps of research and development consisted of several stages, including Potentials and problems, gathering information, product design, design validation, design improvement, product trials, product revisions, product trials, product revisions, product revisions, the final result. Subjects of validation are media expert lecturers and material expert lecturers at Ahmad Dahlan University Mathematics Education. The test subjects were grade X students of SMK Nasional Berbah and class X students of SMK Muhammadiyah 3 Yogyakarta. The sample selection technique in this study is to use random techniques. Based on the design of the trial that was carried out for the subject of this study were small class trials respondents were ten vocational students representing groups in one class. At the same time, respondents of large-scale trials are vocational students in one class. Data analysis techniques using qualitative analysis, which is converted into quantitative values. Data collection techniques in the form of interviews, questionnaires, and observations.

RESULTS AND DISCUSSION

Media Assessment Results from Media Experts

Table 10. Media Rating Scores from Media Experts

No	Validator Name	Score	Qualitative Data Criteria
1	Validator I	43	Very good
2	Validator II	42	Very good
3	Validator III	36	Well
	Average	40.33	Very good

Based on the table it can be seen that the average score of the assessment results is 40.33. This shows that the developed interactive learning media viewed aspects of the media, including very good categories.

Media Assessment Results from Material Experts

Table 11. Score Calculation Questionnaire Feasibility of Expert Material

No	Validator Name	Score	Qualitative Data Criteria
1	Validator I	76	Very good
2	Validator II	82	Very good
3	Validator III	72	Good
	Average	76.67	Very good

Based on these tables, it can be seen that the average score of the assessment results is 76.67. This shows that interactive learning multimedia developed viewed aspects of the material included in the excellent category.

Media Research Results from Student Responses

Table 12. Trial Assessment Score for Small Media classes from Student Responses

No.	School	Score	Qualitative Data criteria
1	SMK Nasional Berbah	69,7	Good
2	SMK Muhammadiyah 3 Yogyakarta	67,7	Good
	Rata-rata	68,7	Good

Based on the table, the average score of the results of the assessment of student responses in small class trials is 68.7. Based on the guideline table criteria for learning interactive media assessment of aspects of student responses included in either category.

Table 13. Trial Assessment Score for Large Media classes from Student Responses

No.	School	Score	Qualitative Data criteria
1	SMK Nasional Berbah	72	Good
2	SMK Muhammadiyah 3 Yogyakarta	69,56	Good
	Rata-rata	70,78	Good

Based on the table it can be seen that the average score of the results of the assessment of student responses in large class trials is 70.78. Based on the guideline table criteria for learning interactive media assessment of aspects of student responses included in either category.

1. Potential and Problems. At this stage, the observations and interviews with the mathematics teachers of SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta were carried out. Also, researchers conducted interviews with several students at the SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta. Data obtained from these observations and interviews are as follows:
 - a. Some teachers in SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta have not used many interactive media in implementing learning in the classroom.
 - b. Educational technology in the form of computer and LCD laboratories has not been utilized to the maximum as a medium of learning, including mathematics learning.
 - c. The absence of interactive media used in the material system of two-variable linear equations in SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta.
 - d. Computer laboratories have not been used for learning mathematics, but are only used for ICT lessons.
2. Information Collection. After identifying the potential and problems, the researcher collected information about the subject of the two-variable linear equation system for grade X students of SMK. In this activity, the researcher examines the procedures for making interactive learning media and learns the subject presented in learning media based on discussions with supervisors and mathematics teachers at SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta.

3. Product Design. The next step is designing the product to be developed. In designing the product to be developed, researchers go through several stages, namely: Determination of Competency Standards and Basic Competencies, create a Story Board, and make an interface design.
4. Making Interactive Learning Multimedia. Creating interactive learning multimedia is translating the design of interactive learning multimedia on the actual display by using the Macromedia Flash 8 application.
5. Design Validation. After interactive learning multimedia is packaged in the form of learning CDs and questionnaires instrument, the feasibility of interactive learning multimedia has been completed. The next step is the validation of interactive learning media to media experts and material experts to determine the feasibility of interactive learning media before being tested on students.
6. Design Revision. Based on the interactive learning media validation process, several suggestions for improving interactive learning media are obtained. These improvement recommendations consist of advice from media experts and advice from material experts. Suggestions for improvement from media experts and material experts can be seen in the appendix.
7. Product Testing. The product trials were conducted at two schools, namely the SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta, and performed in a class of 10 students. Product trials are conducted to determine the level of student response and input from students before being used in trial use. The product trial is carried out after the interactive learning media is improved in the previous stage. The purpose of product trials is to get responses and input provided so that they can represent all input in the class. So the results achieved can improve the quality of learning media developed. Product trials are carried out by providing interactive learning media products that are designed then students are asked to fill out assessment questionnaires and provide comments and input or suggestions. The product trial was conducted on 23 October 2017 involving ten students of SMK Muhammadiyah 3 Yogyakarta and on 27 October 2017 involving ten students of SMK Nasional Berbah. The selection of student product trials is carried out by the teacher concerned because they better understand the character of students. At this stage, there is no input from students on interactive learning media to implement the next step.
8. Product Revision. Based on product trials conducted in the previous stage, no improvement suggestions were given by students. Therefore the researcher did not make a product revision stage.
9. Trial Usage. The usage test was attended by 25 students from SMK Muhammadiyah 3 Yogyakarta on 26 October 2017, and 30 students from the SMK Nasional Berbah on 31 October 2017. In the trial use, students run the media in the available computer laboratories. After students operate the interactive learning media, the researchers distribute questionnaires to students to determine student responses to the learning process using the interactive learning media. At this stage, there was no revision because the learning media were considered reasonable in terms of the material and media appearance.
10. Product Revision. Based on the usage tests conducted in the previous stage, no suggestions for improvement were given by students. Therefore the researcher did not make a product revision stage.
11. Final Results After being revised according to suggestions from media experts, material experts, and student responses obtained the final result product in the form of a learning CD.

CONCLUSION

The conclusions obtained from the study of interactive media development for learning mathematics using Macromedia flash eight on the system of linear equations for two variables of class X SMK are:

1. Develop a medium for learning mathematics with a development model (Research and Development). The explanation is as follows:
 - a. Potential and Problems. At this stage, the observations and interviews with the mathematics teachers of SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta were carried out. Also, researchers conducted interviews with several students at the SMK Nasional Berbah and

- SMK Muhammadiyah 3 Yogyakarta. This aims to determine the learning process carried out by the teacher.
- b. Data collection. After identifying the potential and problems, the researcher collected information about the subject of the two-variable linear equation system for grade X students of SMK. In this activity, the researcher examines the procedures for making interactive learning media and learns the subject that will be presented in learning media based on discussions with supervisors and mathematics teachers at SMK Nasional Berbah and SMK Muhammadiyah 3 Yogyakarta.
 - c. Product Design. The final results of research and development activities are in the form of new product designs, complete with specifications. Product designs must be embodied in drawings or charts to be used as a guide to assessing and treating them.
 - d. Design Validation. Design validation is carried out by referred material experts, media experts, and education practitioners. Design validation aims to determine the feasibility of interactive media as a learning resource. In the validation process, material experts, media experts, and education practitioners will provide input to improve learning media. The input is intended to make the media developed better.
 - e. Design Revision. After experts and known weaknesses and weaknesses have validated the design, then the researchers who developed the product will correct the shortcomings and weaknesses of the product design that has been approved.
 - f. Product Trial. Product trials are conducted to find out whether the product being developed runs as expected or not. Through this activity, the researcher also collects information for product improvement. Product trials are conducted twice, namely in small classes and large classes.
 - g. Product Revision. Product revision aims to overcome the shortcomings and weaknesses in interactive media that have been tested in the first trial with limited samples and to improve the product to be more productive.
2. Interactive media mathematics learning material system of two-variable linear equations for vocational students is declared feasible based on the assessment of media experts, material experts, and students.

REFERENCES

- Arsyad, Azhar. 2013. *Media Pembelajaran*. Jakarta: PT Raja Grafindo Persada.
- Kemendiknas. 2010. *Panduan Pengembangan Bahan Ajar Berbasis TIK*. Jakarta: Direktorat Jendral Manajemen Pendidikan Dasar dan Menengah, Direktorat Pembinaan Sekolah Menengah Atas.
- Permendiknas. 2006. *Standar Isi Untuk Satuan Pendidikan Dasar Dan Menengah*. Jakarta: Menteri Pendidikan Nasional.
- Sugiyono. 2016. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R & D*. Bandung: Alfabeta.
- Vaughan, Tay. 2006. *Multimedia: Making it Work*, Edisi 6. Yogyakarta: ANDI.