DEVELOPING VISUAL LEARNING MEDIA BASED ON MACROMEDIA FLASH 8 FOR LINEAR PROGRAM MATERIAL FOR GRADE XI STUDENTS OF SENIOR HIGH SCHOOL

Nita Wulansari[a], Widayati[b]
Universitas Ahmad Dahlan
[a]nitawulansari33sbw@gmail.com, [b]ummunabilah67@gmail.com

ABSTRACT

One use of technology in education is to make mathematics learning media based on computer applications. The media can be equipped with animation so that it is more interesting and helps visualize the concept of the material. Such media can be applied to linear program material related to visual elements such as graphic images. This study aims to develop a visual learning media based on Macromedia Flash 8 for linear program material for grade XI students of senior high school and find out the level of eligibility of the media. This research development using the ADDIE model namely Analysis, Design, Development, Implementation, and Evaluation. The subjects of this study were material experts, media experts, and students of SMA Negeri 2 Bantul and SMA Negeri 3 Bantul. Data collection techniques are observation, interviews and questionnaires. The data analysis technique uses qualitative data which is converted into quantitative data using a Likert scale and ideal evaluation criteria table. The product of this research is the visual learning media based on Macromedia Flash 8 for linear program material. The results of the eligibility of learning media based on the calculation of the average score of each aspect of the material, media, and student responses are 4.11, 4.16, and 4.24. So the average score of the three aspects is 4.17 in the good category. Thus, this learning media is appropriate for students.

Keywords: Macromedia Flash, Mathematics, Visual Learning Media, Linear Program

Introduction

In this era of globalization , technology has developed rapidly . Many brilliant ideas about technology have emerged from / as various fields such as economics , industry , communication , and education . In the world of education , especially in schools , learning activities are the most basic activities in the whole educational process . According to Winkel , learning is actions planned to support student learning processes (quoted in Siregar and Nara , 2015 : 12) . That is , treating educators in the learning process is very important to achieve learning goals . Therefore , educators do various ways to maximize the results of the teaching and learning process especially in the cognitive abilities of students . One way that material or messages from teachers can be absorbed by students is by using learning media . Learning media is all things that can be used to channel messages (learning materials) , So they can stimulate students ' attention , interests , thoughts , and feelings in learning activities to achieve learning goals (Daryanto , 2013 : 6) . It is expected that the use of instructional media can facilitate and accelerate understanding of students, and also increase student interests in learning .

After observing the condition of the class and the environment in SMA Negeri 2 Bantul and SMA Negeri 3 Bantul, several problems were obtained related to students' interests and learning resources. Of the two schools, some students are less interested in learning mathematics. The causes are various factors, such as lack of interest, material that is difficult to understand, and lack of focus due to fatigue or drowsiness when studying mathematics at noon after the midday prayer. In addition, the learning resources used also do not support the explanation of some of the material. For example graphic images that are less clear in the worksheet or a summary of the teacher. The student worksheets and summaries also did not attract the attention of students.

According to James and James in Syafri, Fatrima Santri (2016: 8), "mathematics is the science of logical study of numbers, shape, arrangement, quantity, measure and many related concepts". In some

mathematical material, graphic images are needed as a way to find solutions to mathematical problems and as a visualization of their concepts. When teaching material that contains graphs, the teacher has difficulty in terms of time to draw graphs. This is because drawing a good and clear graph will take time while the duration of learning time is limited. To overcome this, the teacher can use graphic images that have been prepared before learning begins. The picture will be even more interesting if it is equipped with animation. Making animation can be done with the help of computer applications such as Macromedia Flash or the like.

Based on the opinion of Fahmi, S (2018: 91), Macromedia Flash is a flexible program in making animation, games, and presentations. From this application, visual learning media can be made that can help learning activities become more interesting. Such media can also be applied to linear program material. Linear programs related to visual elements such as graphic images. Linear program is a part of Applied Mathematics (operational research) with a mathematical model that consists of equations or linear inequalities, which includes making programs to solve various daily problems (Manulang, 2017: 53). In line with the thinking of two mathematics teachers from the two schools mentioned above, both of them agree that the visual learning media based on Macromedia Flash application on linear program material will attract more attention to students so that students pay more attention when learning takes place. Therefore, schools need these learning media.

Visual learning media has four functions that can support the learning process of students. These four functions are stated by Levie and Lentz (1982) in Arsyad (2016: 20) namely; (1) the attention function to attract and direct the attention of students to concentrate on the content of the lesson that contains visual meaning in the form of pictures and text of the subject matter, (2) the effective function of the visual media is to influence the feelings of students when learning with pictures or symbols in the learning material, (3) cognitive functions to facilitate understanding and remember information contained in images or visual symbols, (4) compensatory functions to make it easy for students who are weak and slow to accept or understand the content of subject matter presented in text or verbal form. These functions are in line with the thought of Arsyad (2016: 89) who argues that visuals can also foster student interest and can provide a relationship between the content of subject matter with the real world. Therefore, visual media will be very useful as learning media for students.

Based on the above considerations, the researcher intends to develop a mathematics learning media that is more attractive to students and able to instill concepts to support the process of learning mathematics. Besides being easy to use, Macromedia Flash 8 also has advantages including image animation, text animation, graphic animation, sound and video that have their charm. The learning media that will be developed are visual media using Macromedia Flash 8. With this kind of media, it is expected to increase the variety of learning media in schools.

Based on the description above, the researcher is interested in researching with the title: "Developing Visual Learning Media Based on Macromedia Flash 8 For Linear Program Material For Grade XI Students of Senior High School" The formulation of the problems that will be discussed in this study are; (1) How is the development of visual learning media based on macromedia flash 8 for linear program material for grade xi students of senior high school? (2) How is the feasibility of visual learning media based on macromedia flash 8 for linear program material for grade xi students of senior high school?

The purpose of this study are; (1) developing visual learning media based on Macromedia Flash 8 for linear program material for grade XI students of senior high school, (2) knowing the feasibility of a visual learning media developed in supporting the learning of linear program material for high school students in class XI.

In this research , the product produced is a visual learning media in the form of software created using the Macromedia Flash 8 program . This media is packaged in the form of a CD (Compact Disc). This media can be used on computers or laptops equipped with CD rooms and flash file reader programs with " .swf " extensions such as Free Flash Player, Swiff Player, SWF Player, or Flash Movie Player.

Research Methods

This type of research used in this study is a research and development method (Research and Development) using the ADDIE model. The ADDIE model consists of 5 steps namely Analysis, Design, Development, Implementation, and Evaluation. The first step is analysis. Analysis is carried out to find out whether the performance problems faced require solutions in the form of learning media procurement and determine the abilities or competencies that students need to learn. The next step is design. At this stage, learning media design is carried out in the form of flowcharts, storyboards, and learning media assessment instruments. The design is used as a reference at the learning media or development stage. After original product completion of learning media, the media will be validated by subject matter experts and media experts before being tested to students. After learning media is considered feasible by experts, the next step is to test learning media for students to get responses from students. This stage is also called implementation. The last stage is the evaluation that is the assessment of learning media by experts and student responses. The aim is to find out how the feasibility of developed media. At this stage, the media are evaluated based on the results of the questionnaire material experts, media experts, and student responses.

The data obtained is qualitative data in the form of input from material experts and media experts obtained from the validation results. Also, there are data from the material feasibility test questionnaire, media experts and student responses to the learning media developed. Data from the questionnaire was converted into quantitative data using the likert scale to produce a score of the results of the feasibility test of learning media.

Table 1. Rules for Scaling Using a Likert Scale

Keterangan	Skala Nilai
Sangat Setuju (SS)	5
Setuju (S)	4
Ragu-Ragu (RG)	3
Kurang Setuju (KS)	2
Tidak Setuju (TS)	1

Sugiyono (2016: 135-136)

Next, an average score was calculated from each aspect, namely material aspects, media display aspects, and student responses. This average score determines the criteria for the feasibility of instructional media based on an ideal assessment category table of instructional media. The developed learning media product is declared **decent** to use in learning if the quality of the media in all aspects is included in mininal good category. below is the table of ideal learning media assesment category according to Widoyoko, Eko (2012: 238)

Table 2 . Ideal Learning Media Assessment Category

Qualitative Score Range	Qualitative Category
$\overline{X} > 4,2$	Very Good
$3,4 < \overline{X} \leq 4,2$	Good
$2,6 < \overline{X} \leq 3,4$	Enough
$1,8 < \overline{X} \leq 2,6$	Less
$\overline{X} \leq 1,8$	Very Less

Results and Discussion

The process of developing Macromedia Flash-based visual learning media uses the ADDIE model which is carried out in five steps as follows.

1. Analysis

The analysis consisted of two stages, namely performance analysis and needs analysis. The first stage is performance analysis. Performance analysis was carried out by observing schools and teaching and learning activities in the classroom as well as interviews with teachers and students. From the observations of the conditions of teaching and learning in class, students' interest in learning in both schools was still not good as a result some of them did not absorb maximum learning. To overcome this, learning media are needed that can attract students' attention and arouse their learning interest. The condition of the two schools both in SMA N 2 Bantul and SMA N 3 Bantul is also good in terms of facilities. Both schools have computer labs and provide LCD projectors in each class. Because schools need attractive learning media and facilities at school to support the use of computer-based learning media, the learning media that will be developed are software in the form of learning CDs. While the software chosen to make this media is Macromedia Flash 8.

The second stage is the needs analysis. This analysis is carried out by consulting the teacher about the material to be used in learning media. From the results of discussions with the teacher, the material that will be used in instructional media is the Linear Program because it requires the visualization of concepts, especially in graphic images of completion. Material compiled based on *Kompetensi Inti* (Core Competencies) and *Kompetensi Dasar* (Basic Competencies) used in learning media developed is according to the *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia nomor 24 tahun 2016*. The basic competencies chosen as a reference for making material are basic competencies numbers 3.2 and 4.2 relating to linear programming. Thus, the material that will be discussed in the learning media developed is the basic concept of linear programming, mathematical models, determining the optimum value with the corner point test method, and determining the optimum value with the inquired line method. This media is also equipped with practice questions to hone students' abilities.

2. Design

In the Design stage, researchers need to prepare learning media designs and develop media assessment instruments. The design is in the form of a flowchart and storyboard. The flowchart of learning media that researchers develop starts from the initial process of entering learning media until the process of ending the use of learning media. Then the researcher arranged the design of learning media display. The design of learning media display is used as a core description of the learning media display that will be developed. The design is presented in the form of a storyboard.

In addition to the design of instructional media, instructional media assessment instruments are also designed to assess the feasibility of developed learning media. The assessment instruments used in this study were questionnaires consisting of assessment questionnaires for media experts, assessment questionnaires for material experts, and assessment questionnaires for student responses. Before being used to assess learning media, learning media assessment instruments are reviewed by competent lecturers to produce instruments that are suitable for use as learning media assessment tools.

3. Development

Development is the stage of developing or making learning media based on designs that have been made previously in the form of flowcharts and storyboards. From this design, the learning media was made using the Macromedia Flash 8 application to produce the original product. This initial product is then validated by material experts and media experts. During the validation process, experts provide advice and input as a reference to improve the initial product of learning media so that it becomes a product worth testing. Material experts consisted of three experts namely Dra. Sumargiyani, M.Pd. as a Lecturer in Mathematics Education, Ahmad Dahlan University, Dra. Y. Rini Prastuti as a Mathematics Teacher at SMA Negeri 2 Bantul, and Dyah Oktariana, S.Pd as a Mathematics Teacher at SMA Negeri

3 Bantul. While the media experts consisted of three experts namely Dra. Sumargiyani, M.Pd. as a Lecturer in Mathematics Education, Ahmad Dahlan University, Dra. Y. Rini Prastuti as a Mathematics Teacher at SMA Negeri 2 Bantul, and Dyah Oktariana, S.Pd as a Mathematics Teacher at SMA Negeri 3 Bantul.

After being judged feasible by experts, the learning media developed were tested in a small class involving 10 students of class XI of SMA Negeri 2 Bantul and 10 students of class XI at SMA Negeri 3 Bantul. Small class trials are conducted to determine student responses and input before being used in large classes. This trial was conducted by showing the developed learning media. Then students were asked to fill out an assessment instrument sheet for student responses. If there are still deficiencies in the learning media, the learning media is revised before being tested in a large class. below is the main menu display of this learning media.

Picture 1. Main Menu Display of This Learning Media

4.   *Implementation*

Implementation is the stage after the learning media development is complete. The application of instructional media is carried out by testing products in large classes in both schools. Trials large classes at SMAN 2 Bantul involving 21 students were k 's in SMA Negeri 3 Bantul involving 31 students. The end of this trial is the assessment of learning media by students with assessment instruments for student responses.

5. *Evaluation*

At this stage, an assessment of the learning media developed is carried out. The assessment consists of 3 aspects that are material aspects, media aspects, and student responses. The assessment is done by filling out a questionnaire that has been validated by an expert. After the assessment by experts and students, the data from the assessment is processed and used as a reference to determine whether the learning media developed is feasible or not to be used in learning.

Table 3 . Results of Questionnaire Calculation for Material Feasibility

No.	Respondents	Position	Average Score	Qualitative Category
1	Dra. Sumargiyani, M.Pd	Mathematics education Lecturer in UAD	4,28	Very Good
2	Dra. Y. Rini Prastuti	Mathematics teacher in SMA Negeri 2 Bantul	4,11	Good
3	Dyah Oktariana, S.Pd	Mathematics teacher in SMA Negeri 3 Bantul	3,94	Good
Jumlah			12,33	
Rata-Rata			4,11	Good

Table 4 . Results of the Eligibility Questionnaire Calculation by Media Experts

No.	Respondents	Position	Average Score	Qualitative Category
1	Dra. Sumargiyani, M.Pd	Mathematics education Lecturer in UAD	4,33	Very Good
2	Dra. Y. Rini Prastuti	Mathematics teacher in SMA Negeri 2 Bantul	4,20	Good
3	Dyah Oktariana, S.Pd	Mathematics teacher in SMA Negeri 3 Bantul	3,93	Good
Jumlah			12,47	
Rata-Rata			4,16	Baik

Table 5 . Results of Calculation of Student Response Questionnaire

No.	Respondents	Average Score	Qualitative Category
1	SMA Negeri 2 Bantul	4,18	Good
2	SMA Negeri 3 Bantul	4,30	Very Good
Jumlah		8,48	
Rata-Rata		4,24	Very Good

From the above table, the average assessment scores from material aspects, media aspects, and student responses are 4.11, 4.16, and 4.24, respectively. The average of all aspects of the assessment then compared with the table of Ideal Learning Media Assessment Category to determine the level of feasibility of the developed learning media. The following are the results of the calculation of the assessment of these three aspects.

No.	Aspects	Average Score	Qualitative Category
1	Materi	4,11	Good
2	Media	4,16	Good
3	Respon Siswa	4,24	Very Good
Jumlah		12,51	
Rata-Rata		4,17	Good / decent

The product of developed learning media is declared decent to use in learning if the quality of the media in all aspects is included in the minimal good category. Based on the table above, it can be seen that the average final score calculated by all aspects obtained is 4.17. So overall, the developed product is in the good category. Thus the Visual Learning Media Based On Macromedia Flash 8 For Linear Program Material For Grade XI Students Of Senior High School is appropr

Conclusion

The process of developing visual learning media based on Macromedia Flash 8 on the subject of this linear program uses the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The analysis process is done by observation and interview. From this analysis, the results obtained are that schools need visual learning media that can attract students' attention such as computer-based learning media. This learning media is created using the Macromedia Flash 8 application so the result is software that is packaged in the form of a learning CD. The material used in learning media is a linear program. The design of learning media are flowcharts and storyboards is used as a reference to create learning media. The original product of learning media was validated in advance by 3 material experts and 3 media experts before being tested. Furthermore, the learning media was tested in a small class involving 10 students of class XI from each school where the study was conducted. Then a large class trial was conducted involving 21 students of class XI of SMA Negeri 2 Bantul and 31 students of class XI at SMA Negeri 3 Bantul. Learning media assessment is taken from the results of filling out the questionnaire by material experts, media experts, and class XI students. Data from the questionnaire is processed and used as a reference to assess the feasibility of learning media.

The results of the feasibility of a developed visual learning media product were viewed from the aspects of the material, the media, and student responses and all three aspects (combined). Product viability in terms of material aspects obtained an average score of 4.11 with good criteria. Product viability in terms of media aspects obtained an average score of 4.16 with good criteria. The feasibility of the product in terms of aspects of student responses obtained an average score of 4.24 with a very good category. While the product feasibility in terms of all aspects obtained an average score of 4.17 with good or decent criteria. Thus, the visual learning media based on Macromedia Flash 8 for linear program material for students grade XI of senior high school is suitable for use in the process of learning mathematics in the classroom. iate to be used in the learning process when it has gone through the final revision process.

References

Arsyad, Azhar. 2016. *Media Pembelajaran*. (Cetakan ke-19). Jakarta: Rajawali Pers.

Daryanto. 2016. *Media Pembelajaran: Penerapannya Sangat Penting Dalam Mencapai Tujuan Pembelajaran*. (Edisi ke-2 Revisi Cetakan ke-I) Yogyakarta: Gava Media.

Fahmi, Syariful. 2018. *Membangun Multimedia Interaktif*. Yogyakarta: Bildung Pustaka Utama.

Manulang, Sudiyanto, dkk. 2017. *Matematika SMA/MA/SMK/MAK Kelas XI*. Jakarta: Kementrian Pendidikan dan Kebudayaan.

Setyosari, P. 2013. *Metode Penelitian Pendidikan & Pengembangan*. Jakarta: Kencana Prenadamedia Group.

Siregar, Eveline dan Nara Hartini. 2015. *Teori Belajar dan Pembelajaran. (Cetakan ke-4)*. Bogor: Ghalia Indonesia.

Sugiyono. 2016. *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)*. Bandung: Alfabeta.

Sundayana, Rostina. 2015. *Media dan Alat Peraga dalam Pembelajaran Matematika*. Bandung: Alfabeta.

Syaftri, Fatrima Santri. 2016. *Pembelajaran Matematika; Pendidikan Guru SD/MI*. Yogyakarta: Matematika

Widoyoko,Eko, P. 2012. *Evaluasi Program Pembelajaran Panduan Praktis Bagi Pendidik dan Calon Pendidik*. Yogyakarta: Pustaka Pelajar.