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# The Development of Ict-Based Mathematics Instructional Media On Linear Program Subject For Students of Grade XI SMA/MA

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## ABSTRACT

This research is constructed based on the lack of instructional media that capable of deliver the information and learning materials of Linear Program. Developing the computer-based instructional media will help students understanding the learning materials easier. This research and development using the model designed by Borg and Gall modified by Sugiyono. This research aimed to improve ICT-based mathematics instructional media which is qualifying the validity and practically to help students in grade XI SMA/MA in order to understanding Linear Program materials. Subjects for this research are 33 students of XI SMA Negeri 1 Pekanbaru. This research is using three types of validation questionnaire, consists of material, media, and students response. The questionnaire was analyzed both in quantitative and qualitative ways. Based on the results of small-group data analysis and discussion can be concluded that ICT-based instructional media is valid and sufficient for practicality with an average value of 0.979.

**Keywords :** *Instructional Media, ICT-based Media, Learning Mathematics.*

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### Introduction

Mathematics is an abstract subject which makes students feel very difficult to understand the material. Therefore, there needs to be variation in deliver the material. One alternative to overcome this issue is using props and learning media in learning process [1].

Curriculum 2013 for national education is designed as an effort to produce the generation of believers, noble, confident and responsible, also to create person who mastered science and technology, cultured, has the insight of humanity and nationality, and care for the environment. Although the structure of the Curriculum 2013 do not include *Information and Communication Technology* (ICT) as a subject in primary and secondary schools, but along with the implementation of Curriculum 2013 then every teacher is obliged to use ICT in teaching any subject. Thus, skills using ICT equipment is required to enhance the learning process.

ICT-based learning is a learning concept based

on computers and multimedia. ICT or multimedia consists of information and technology that serves as an information processing system and communication which used to send information, so ICT becomes the right solution for teachers in delivering educational messages, because in the use of media based on ICT/multimedia is able to clarify every meaning of message conveyed to students [2].

Gagne stated that the media is a mix of different types of components around student that can stimulate them to learn. Meanwhile, Briggs argues that the media are all physical tools that can present messages and stimulate students to learn, such as books, movies, cassettes, and frame films as examples [3].

Based on the interviews with a teacher of SMAN 1 Pekanbaru, in the process of daily learning, teachers are more often use expository, discussion, and assignment method to explain the material. Occasionally, teachers also use demonstration method for certain material. For

Linear Program materials, the use of media in the form of teaching props will take too much time. ICT-based learning media for Linear Program materials is also hard to find. Thus, teachers were basically chose to explain the Linear Program material manually using objects in the form of Linear Program in everyday life. At the time when demonstrating or explaining the Linear Program material concepts, teachers often find it difficult to prepare tools and other media. Thus, ICT-based mathematics learning media is expected to help teachers in transferring Linear Program concepts to students, and also help students to understand Linear Program material easily and practically. Teachers will no longer need to explain material manually because ICT-based learning media through computer devices is available. Linear Program material has the potential to be developed visually to help students understand the concept and find the solution. Another advantage of using ICT-based learning media Linear Program is to save time.

In general, the use of media in learning process is to facilitate the interaction between teachers and students to make it more effective and efficient. But in particular, there are some more detailed advantages of using ICT-based media which proposed by Kemp and Dayton, namely (1) The delivery of learning messages can be more standardized; (2) Learning can be more interesting; (3) Learning becomes more interactive by applying learning theory; (4) The learning time can be shortened; (5) The quality of learning can be improved; (6) The learning process can take place anytime and anywhere; (7) Improving students' positive attitude toward learning materials and learning process; and (8) The teacher's role changes in a positive direction [4].

In developing ICT-based learning media for Linear Program, author was using Microsoft Frontpage and Microsoft Power Point. Frontpage is chose because the program gives students the opportunity to access lessons via website. While the use of Power Point is based on the ability of Microsoft Office Power Point in making an interesting presentation by placing animation, sound, images, video and hyperlinks that can be used as interactive buttons to

facilitate teaching and learning activities in the classroom or individually. This is expected to increase students' understanding of Linear Program material becomes better. In addition, another advantage of using Microsoft Power Point is the ease of operation and can be used on any computer. Author also packed the media in the form of Compact Disk (CD) to make it easier for students to access the lesson material not only at school but also at home.

Based on the explanation above, Author is interested to develop an ICT-based mathematics learning media on the subject of Linear Program for students in grade XI SMA/MA. This study aims to develop ICT-based mathematics learning media that meet the validity and practicality to help students understanding Linear Program materials.

**Research Methods**

The form of this research is research and development proposed by Borg & Gall then has been modified by Sugiyono [5]. The subjects of this research are the students of grade XI SMA Negeri 1 Pekanbaru with the total of 33 students, consist of 5 students in small group trials and 28 students in large group trials. This research is implemented to the students of grade XI. Data collection techniques in this study is based on from literature studies and interviews. Data analysis techniques in this study are generated from:

1. Validity

Validation of the ICT-based learning media product is processed by validators, consisting of material validator and media validator. Assessment by validator using the scale of 1 to 4 presented in table 1 according to Sudaryono [6].

Table 1: Validation Scale

Validation Scale	Criteria
4	Very Good
3	Good
2	Poor
1	Very poor

Source: Sudaryono, et al., 2013.

Validation of the questionnaire sheets are analyzed with following steps:

- a) Calculate the average score of each aspect with the formula:

$$\bar{x} = \frac{\sum x}{\text{Number of validators}} \quad (1)$$

with  $\bar{x}$  = Average score  
 $\sum x$  = Total score of all aspects

- b) Describe the average score of each aspect obtained into qualitative data according to assessment criteria Eko Putro Widoyoko [7].

Table 2: Qualitative Score Conversion Formula

Range	Criteria
$\bar{x} > Mi + 1,8 Sbi$	Very good
$Mi + 0,6 Sbi < \bar{x} \leq Mi + 1,8 Sbi$	Good
$Mi - 0,6 Sbi < \bar{x} \leq Mi + 0,6 Sbi$	Poor
$\bar{x} \leq Mi - 0,6 Sbi$	Very poor

Source: Eko Putro Widoyoko, 2009.

with:

Mi = Ideal average score

$Mi = \frac{1}{2} \times (\text{maximum ideal score} + \text{minimum ideal score})$

Sbi = standard deviation

$$= \frac{1}{6} (\text{maximum ideal score} + \text{minimum ideal score})$$

Maximum ideal score =  $\sum$ criteria items  $\times$  highest score

Minimum ideal score =  $\sum$ criteria items  $\times$  lowest score

Maximum ideal score on validation questionnaire is 4 (four), sedangkan skor minimal ideal adalah 1 (satu). In this research, learning media will be valid if the result meets the minimum criteria of "Good".

2. Practicality

At the stage of analyzing the questionnaire of students' responses, the questionnaire consists of two options, yess and no. The calculation of students' response is done by giving a score of 1 if the student answers yess and 0 if the student answers no to each given statement. After analyzing the student's answers, the practicality can be calculated in the same way as the data analysis for validity. In this research, the learning media is considered practical if it meets the minimum criteria of "Good".

**Result and Discussion**

For product design stage, design is done by using paper-based design, where Linear Program material is designed on paper both in the form of text and drawings. This stage aims to get a picture of what will be displayed on the computer. Product design that has been created in paper-based then transferred into the form of computer based. The program used for the design of computer-based products is Microsoft Frontpage and Microsoft Power Point.

After completing the making of the media, the next process is done by the material validator and the program validator, then continued with the implementation of ICT-based learning media trial.

1. Material Validation

Validation by material validators is used to assess materials that have been compiled in ICT-based learning media of Linear Program materials for grade XI SMA/MA. There are two aspects of the assessment, consist of learning and curriculum aspects.

Table 3: Result of Material Validation

Aspect	Items	$\sum$ Score	$\sum x$	$\bar{x}$
Learning	1	7	89	3,179
	2	8		
	3	7		
	4	7		
	5	7		
	6	6		
	7	6		
	8	6		
	9	6		
	10	6		
	11	6		
	12	6		
	13	6		
	14	5		
Curriculum	1	6	44	3,143
	2	6		
	3	6		
	4	7		
	5	6		
	6	6		
	7	7		
<b>Total</b>		133	133	6,322

<b>Average score</b>	3,161
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Based on the average score on the table 3 above,  $\bar{x} = 3.161$  then the result of the assessment of the material validator is “Good” and valid.

2. Media Validation

Media validation used to assess the product of ICT-based learning media for Program Linear material, specified for students in grade XI SMA/MA. This stage of validation is done by mathematics lecturer. There are two aspects included in the assesment, consist of display and program.

Table 4: Result of Media Validation

Aspect	Items	$\Sigma$ Score	$\Sigma x$	$\bar{x}$
Display	1	4	20	2,857
	2	3		
	3	3		
	4	2		
	5	3		
	6	2		
	7	3		
Program	1	3	17	2,833
	2	3		
	3	3		
	4	3		
	5	2		
	6	3		
<b>Total</b>		37	37	5,69
<b>Average score</b>				2,845

Based on the table 4 above, the average score is  $\bar{x} = 2,845$ , then the result of the assessment of the material validator is “Good” and valid.

1. Small Group Evaluation

Level of the implementation of learning media is generated from the results of student questionnaire with total of 5 students.

Table 5: Result of Small Group Evaluation

Aspect	Items	$\Sigma$ Skor	$\Sigma x$	$\bar{x}$
A	1	5	34	0,971
	2	5		
	3	5		
	4	5		
	5	5		
	6	4		
	7	5		
B	1	5	35	1
	2	5		

	3	5		
	4	5		
	5	5		
	6	5		
	7	5		
C	1	5	29	0,967
	2	4		
	3	5		
	4	5		
	5	5		
	6	5		
<b>Total</b>			98	2,938
<b>Average score</b>				0,979

Based on the small group questionnaire evaluation, it can be concluded that ICT-based mathematics learning media on the subject of Linear Program for grade XI SMA/MA has a very good level of implementation with an average of 0.979.

Respondents stated that students can operate this learning media very well. Explanation of Linear Program material on the learning media is easy to learn, the display of button hints on media and material is very clear and interesting, and also the use of language is very easy to understand. Students also feel motivated to study with this learning media. Respondents also stated that using animation to visualize Linear Program material is very helpful to them in understanding the material easier. The availability of ICT-based mathematics learning media makes learning activities more exciting. Similar research has also been carried out by Yoshe Larisa Ulfa [8], where the research measured the validity, practicality, and effectiveness of ICT-based learning media while on this research, author only measure the validity and practicality because of time constraints.

4. Conclusions and Recommendations

Through this research and development, author has created a product in the form of ICT-based mathematics learning media on the subject Linear Program for students in SMA/MA level. This media is considered valid and practical after going through the process of validation by experts and two test stages to see the level of media implementation.

After carrying out this research, Author would

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like to provide some recommendations related to this research and development. This advice is addressed to the next researcher who wishes to carry out the same research. The suggestions are as follows:

1. In this research and development, author chose Linear Program as the material. There are a lot of subjects and materials in mathematics that also needs to be developed, especially their learning media.

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*Pembelajaran Matematika Berbasis ICT yang berkualitas. Dalam Seminar Nasional Pascasarjana X. Surabaya, 4 Agustus.*