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DEVELOPMENT OF INTERACTIVE LEARNING MEDIA BASED ON CONSTRUCT 2 IN THE SUBJECT OF TELECOMMUNICATION ACCESS NETWORK TECHNIQUES AT SMKN 1 REJOTANGAN

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***Abstract*— This study aims to develop interactive learning media based on Construct 2 for the subject of Telecommunication Access Network Engineering at SMKN 1 Rejotangan. The development addresses the limitations of conventional media in delivering abstract concepts, especially regarding fiber optic transmission. The research follows the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. Validation results showed scores of 91% from media expert 1 (very good), 82% from media expert 2 (good), and 80% from a material expert (good). Trials on small groups scored 86%, and large groups scored 91% (both very good). The average achievement rate was 89%, classified as very good. These findings indicate the media is feasible and effective to enhance a more engaging, interactive, and efficient learning process.**

Keywords: Construct, Interactive, Learning, Media, Network, SMK, TJKT.

I. PENDAHULUAN

Advances in information and communication technology (ICT) have brought major changes in the world of education [1]. One of the impacts is the presence of more interactive and interesting learning media, which helps students understand the material more easily.

At SMKN 1 Rejotangan, which has been designated as a Center of Excellence by the Ministry of Education and Culture [2], The demand to produce job-ready graduates is very high. However, in practice, learning, especially in the subject of Telecommunication Access Network Engineering (TJAT), still relies on printed books and modules which feel less effective and boring for students.

Seeing this need, an interactive learning media based on Construct 2 was developed. This media is designed to be easy to use and can be accessed through various devices, both Android, IOS, and computers[3]. The hope is that students can learn in a more fun and flexible way.

The development of this media follows the ADDIE model, from analysis to evaluation. The final product is validated by experts to ensure its benefits in improving student understanding and quality of learning in SMKN 1 Rejotangan.

II. RESEARCH METHODS

A. Types of Research

This research uses a Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model [4] to develop software-based learning media in the subject of Telecommunication Access Network Engineering class XI at SMKN 1 Rejotangan. The ADDIE model was chosen because it is systematic and flexible. This model provides room for evaluation and revision at every stage, so that it can improve the quality of development products in a sustainable manner.[5] so that it is suitable for the development of learning media.

This model was chosen because it is considered more complete and relevant than other models such as 4D, and is able to produce innovative learning media that meets the needs of today's vocational education.

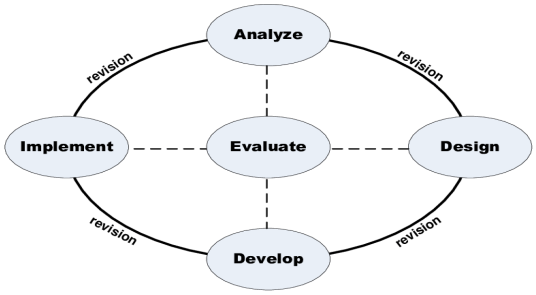

Figure I Model Addie [6]

B. Instrumen

The instruments used include interview guidelines, initial needs questionnaires, validation sheets, and student response questionnaires. Interview

guidelines are carried out with teachers to find out the characteristics of students, subject matter and curriculum used. The initial needs questionnaire is used to obtain information about student characteristics.

The validation sheet consists of validation sheets of subject matter experts and media experts whose purpose is to measure the validity of the learning media developed [7]. Student response questionnaires are used to obtain data related to the practicality of the learning media developed.

C. Procedure

This research procedure is carried out in several stages, namely the analysis stage, this analysis stage is carried out by interviewing TJKT teachers and providing initial needs questionnaires to students. The purpose of this analysis is to collect information related to student characteristics, analyze the material and analyze the curriculum. Furthermore, the design stage is carried out The media development stage which includes the creation of the overall media design (storyboard), preparation of materials, creation of backgrounds, videos, which will be included in the application [8]. Furthermore, there is the development stage, where learning media products are designed using the Construct 2 Program software and then validated by media experts and material experts to assess the validity of the developed product. If the validator states that the media is suitable for use with revision, it will be revised before going to the implementation stage in accordance with the input and suggestions from the validator. The next stage is implementation, this stage is carried out by conducting product trials to students. Furthermore, in the last stage of the evaluation stage, this stage evaluates the learning media obtained from the respondents' questionnaire to analyze the practicality of the product.

D. Analysis

- **Needs Analysis**

[9] Needs analysis is the process of analyzing the needs required to create and execute Construct 2. Table of media development needs analysis and media implementation needs analysis.

Table I Analysis of media implementation needs

Hardware Requirements		
1.	Prosesor	Intel Core i5 8th
2.	VGA Card	NVIDIA GeForce MX150 1GB
3.	RAM	4 GB DDR4
4.	Hardisk	1 TB
Software Requirements		
1.	*Construct 2*	

Tabel ITable II Hardware requirements analysis

Hardware Requirements		
1.	Prosesor	Mediatec MT 6750 1,5Ghz
2.	RAM	2 GB
3.	Storage	32 GB
Software Requirements		
1.	OS	*Android 5.0 Lolipo or above*
2.	Additional Features	*ZAerchiver, XAPK Installer*
Perangkat Tambahan		
1.	Headset	-
2.	Controller	Universal

- **Curriculum Analysis**

The curriculum analysis was carried out by reviewing the curriculum applied at SMKN 1 Rejotangan. The curriculum analyzed is the Independent Curriculum which is applied to all classes and expertise programs. The material on Access Telecommunication Network Engineering is taught in grade XI of SMK, with reference to the applicable elements as shown in table lII:

Table III Fiber Optic Elements, TP, and Materials

No	Element	Learning Objectives	Material
1	Fiber Optic Cable Transmission	1.1. Applying the concept of fiber optic cable transmission	• History of Fiber Optics • Light Propagation Concept • Fiber Optic Type • Fiber Optic Structure • Types, Color Codes and Usage of Optical Cables • Characteristics of Fiber Optics • Function of Fiber Optic Communication System Elements
2	Fiber Optic Cable Transmission	2.1 Creating design and survey of fiber optic cable main network	• Installation techniques based on fiber optic types • Tools and materials for permanent and non-permanent fiber optic connection

E. Design Stage

At the design stage, the researcher designs learning media based on the results of previous analysis and learning competencies [10]. The app is designed to present the material optimally, is easy for students to understand, and comes with a tutorial on how to use it. Design done using Visio.)

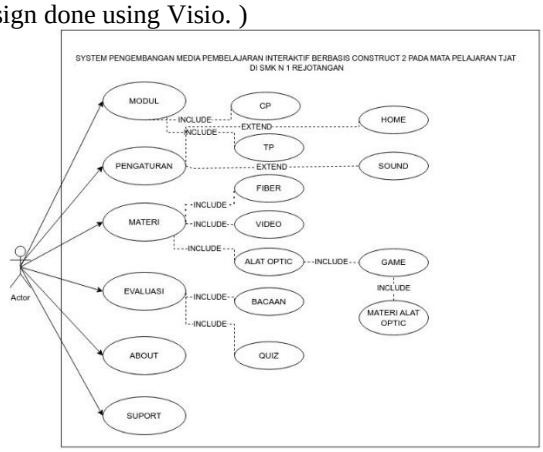

Figure II Application Usecase

F. Development Stage

The development stage is the stage of realizing a design or design that has been made into a complete product in accordance with the guidelines in the design

of flowcharts and storyboards.[11] then turn the design into a learning medium that is ready to be used by students.

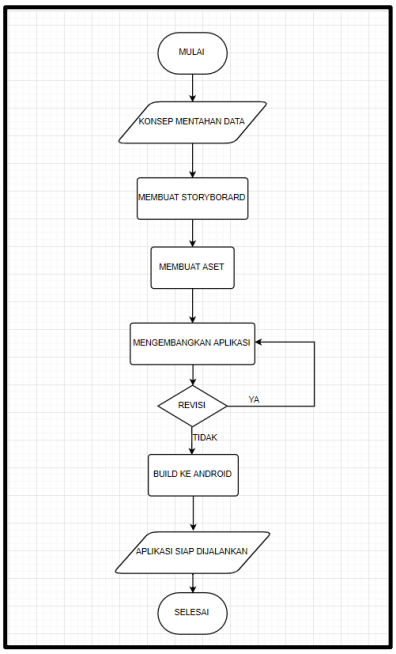

Figure III Application development flowchart

G. Implementation Stage

At the implementation stage, the application of products that have been designed and selected from the previous stage is carried out.[10], learning media was tested on teachers and students of SMKN 1 Rejotangan, and validated by experts.

The assessment is carried out through a questionnaire to evaluate the feasibility, advantages, and disadvantages of the product. In addition, technical testing is also carried out to ensure the functionality of the media. The results of the implementation are the basis for evaluating and improving the product to be more effective and efficient.

H. Evaluate Stage

[12] The evaluation stage aims to assess the achievement of learning media development goals. Revisions are carried out based on the results of expert validation, teacher trials, and technical testing. The end result of this stage is a media product that is ready to use and can be applied in other schools.

I. Stages of Data Collection

The instrument used in this study is in the form of a questionnaire, which functions to collect data through written questions to respondents. There are three types of questionnaires: for materialists, media members, and students[13]. Each questionnaire assesses three main aspects, namely the effectiveness, efficiency, and attractiveness of learning media. The assessment uses a scale of 5, from Very Good (5) to Very Poor (1). The calculation of the questionnaire for each question item is with the following formula[14]:

Achievement rate = F/N x 100%
Information:
F = Total score of the Selected Alternative Answer
N = The maximum number of scores of the entire subject

The conclusion and description of the quality of this defense media product uses the conversion of the achievement level with a scale of 5. Conversion rates of achievement and qualification are described in the Table below:

Table IV Conversion Achievement and Qualification Levels [15]

No	Achievement Rate	Qualification
1	85% - 100%	Excellent
2	75% - 84%	Good
3	65% - 74%	Pretty Good
4	55% - 64%	Not Good
5	0% - 54%	Very Less

If the calculation results do not match absolutely with the conversion table, the researcher rounds the value to make the analysis easier to conclude. Values with decimal numbers 0.5–0.9 are rounded up, while 0.1–0.4 are rounded down. The results of this analysis are used for product revision, evaluation, and further development advice.

III. RESULTS AND ANALYSIS

This section contains the results of research and analysis related to the results of the research. The results of the research can be explained with pictures, graphs, tables, or others with the aim that the reader can better understand the results of the research. The Results and Analysis section can consist of several Sub Sections.

A. System Evaluation

This stage is the final step in the prototyping method, which is the evaluation of the system to ensure that the learning media has met quality standards. At this stage, the apps developed with Construct 2 are converted to APK format for use on Android devices, using the Website 2 APK Builder service.

The result of the program has been developed and converted into an APK format, so that it can be run on Android-based devices.

Table V Interactive Learning Media Display Results

Picture	Curiosity
	Learning media home page

Picture	Curiosity
	The menu page consists of: ➢ Material ➢ Suport ➢ Modul ➢ About ➢ Evaluation
	The content page of the menu of Beriri splicing video material, optical tool material, fiber material, fastcon video
	The material guide page, when students scan the barcode that is listed will access the drive containing a more complete and specific version of the doc word file about the study of the material

B. Testing

- **Media Member 1**

Table VI Media Expert Test Table One

Score obtained	Maximum score
91	100
Result	91%
Reach level	Excellent

$$\text{Achievement rate} = \frac{F}{N} \times 100\%$$
$$\text{Achievement rate} = \frac{91}{100} \times 100\%$$
$$= 91\%$$

Media expert test on Monday, February 3, 2025, no suggestions or improvements attached from the teaching lecturer. With a percentage of the eligibility score 91% The test of media experts was conducted by Mr. Bian Dwi Pamungkas, M.Pd. Declared valid and allowed to be used for research.

- **Media Member 2**

Table VII Test table of media experts two

Score obtained	Maximum score
82	100
Result	82%
Reach level	Good

$$\text{Achievement rate} = \frac{F}{N} \times 100\%$$
$$\text{Achievement rate} = \frac{82}{100} \times 100\%$$
$$= 82\%$$

From the results of the score calculation value in the table above, it shows the score 82%,So that it gets a good value category, as well as the calculation of the eligibility value. The lecturer in charge of media experts has validated that the media is suitable for research use without any criticism, suggestions and improvements.

- **Material Expert**

Table VIII Subject Expert Validation Questionnaire

Score obtained	Maximum score
72	90
Result	80%
Reach level	Good

$$\text{Achievement rate} = \frac{F}{N} \times 100\%$$
$$\text{Achievement rate} = \frac{72}{90} \times 100\%$$
$$= 80\%$$

From the results of the score calculation value in the table above, it shows the score 80%,So that it gets a good value category, as well as the calculation of the eligibility value. The lecturer who teaches material experts has provided validation that the media is suitable for research use without any criticism, suggestions and improvements.

- **Hasil Uji Produk**

Table IX Results of Small Group Trial Questionnaire

Score obtained	Maximum score
346	380
Result	91%
Reach level	Excellent

$$\text{Achievement rate} = \frac{F}{N} \times 100\%$$
$$\text{Achievement rate} = \frac{346}{380} \times 100\%$$
$$= 91\%$$

Meanwhile, the results of the media that have been tested in large groups are attached to Table X below:

Table X Results of Large Group Trial Questionnaire

Score obtained	Maximum score
5875	6840
Result	86%
Reach level	Excellent

$$\text{Achievement rate} = \frac{F}{N} \times 100\%$$
$$\text{Achievement rate} = \frac{5875}{6840} \times 100\%$$
$$= 86\%$$

Based on the calculation of the results of the small group and large group trials, the average percentage of assessment was obtained of 89%. With the results of this percentage, the Development of Construct 2-Based Interactive Learning Media in the Telecommunication Access Network Subject, is included in the criteria very well and is suitable for use in the subject learning process TJAT in SMKN 1 REJOTANGAN.

IV. CONCLUSION

The research shows that the Construct 2-based interactive learning media for TJAT subjects of fiber optic transmission material at SMKN 1 Rejotangan obtained

excellent validation results with information on the results of the trial attached:

Media expert 1 (91% – very good) Media expert 2 (82% – good) Material expert (80% – good) Student trial (89% – very good) This proves that the learning media developed valid **and is suitable for use in the learning process.**

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