


## Development of multimedia learning educational game based for teachers SMP N 3 Sungai Kakap

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| Article Info                                                                                                                                                     | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Keywords:</b><br>game-based,<br>multimedia,<br>mathematics                                                                                                    | This research aims to determine the feasibility of Educational Game-Based Multimedia Learning at SMP 03 Sungai Kakap. The method used in this research is a Research and Development method with the ADDIE model design (Analysis, Design, Development, Implementation and Evaluation). The product trial subjects in this research were Class VII Students at SMP Negeri 3 Sungai Kakap in the Mathematics subject. The data collection techniques used are observation, direct communication techniques and indirect communication. The conclusion that can be drawn is that the feasibility of Game-Based Learning media using the Construct2 Application in mathematics subjects in class VII of SMP Negeri 3 Sungai Kakap is known in terms of media and material to be classified as "Very Appropriate" with the average score from media experts being 93.2% and The average score from material experts is 83% classified as "Very Decent". Based on the results of responses from users or students, an average score of 92.7% was obtained in the "Very Good" category. |
| This is an open access article under the <a href="#">CC BY-NC</a> license<br> | <b>Corresponding Author:</b><br>Danar Santoso<br>IKIP PGRI Pontianak<br><a href="mailto:danar.santoso21@gmail.com">danar.santoso21@gmail.com</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### INTRODUCTION

Education basically equips students with expertise in their respective fields so that students can develop the potential that exists within themselves and success can be achieved in the learning process. Success in the learning process is certainly supported by the use of appropriate learning media. Currently, many learning media have been developed, so as educators you must be clever in choosing and utilizing existing media. The choice of learning media must also be in accordance with student needs.

Learning media is something that students can use in formal, informal and non-formal education. Education according to Law No. 20 of 2003 explains that the educational route consists of formal education, which is education that is held in the school environment. This formal education route consists of basic education, secondary education and higher education. Informal education is a pathway to family and environmental education in the form of independent learning activities carried out consciously and responsibly. One of them is the non-formal education pathway, which is a family and environmental education pathway in the form of independent learning activities carried out consciously and responsibly. Non-formal education functions to develop students' potential with an emphasis on mastering knowledge and functional skills as well as developing professional

attitudes and personalities. Non-formal education units consist of course institutions, training institutions, study groups, community learning activity centers, and taklim assemblies, as well as similar education units and school is one form of formal education that must be achieved by everyone.

The results of observations made at SMP N 3 Sungai Kakap on mathematics subjects in the use of learning media/multimedia were not optimal, this had an impact on student learning in class, teachers provided learning that was still in the form of lectures and textbooks, which resulted in students focusing only on the teacher. teach in class. Students are less enthusiastic about the learning process carried out by the teacher. Based on the problems faced, researchers intend to develop educational game-based learning media that is appropriate to learning. It is hoped that as a result of this development, students can be motivated and practice independence and make it easier for students to understand the subject matter, so that the impact of using this learning media can help students in their independent learning process.

Based on this description, it is necessary to develop computer learning media, one of which is by creating game applications that can be used via a computer or smartphone. There are various game making applications or what are usually called game engines, one of which is using Construct 2. In the Construct 2 application you can create game-based learning media, where developers can design and use themes in the application to produce game-based media. In this research, development was carried out for mathematics subjects for class VII students at SMP N 3 Sungai Kakap.

## METHODS

This research uses the Research and Development (R&D) method, which means that research and development is a series of processes or steps to develop a new product or complement an existing product so that it can be accounted for. The research design used is the ADDIE development method with research stages involving Research and Development (R&D). Branch (2009:17) develops products as learning designs using the ADDIE method which stands for Analysis, Design, Development, Implementation, and Evaluation. The research steps for developing ADDIE in this study are presented graphically as follows:

### Analysis

Analysis includes the activity of analyzing or identifying problems encountered in a particular environment which becomes a source of ideas or thoughts to determine the product to be developed. The goal is to identify possible causes of performance gaps. The steps in the analysis stage according to Branch (2009:25) are: (1) Identifying learning problems, (2) Developing learning objectives, (3) Determining student personalities, (4) Identifying required resources, (5) Determining learning strategies appropriate, and (6) Develop a learning management plan.

### Design

Design is the stage of designing a product based on needs or analysis carried out previously. At the design stage, the next steps include compiling a storyboard task list,

developing learning objectives, developing learning strategies, and designing the interface. Examples of this design stage are layout diagrams, adding learning equipment, and other design plans.

### Development

Development is the activity of producing and testing products. The steps taken in this development stage are: (1) Content production, (2) Supporting selection or development (3) Developing instructions for students and teachers, (4) revision, (5) Carrying out tests.

### Implementation

Implementation aims to prepare a participatory learning environment for students. At this stage, the product is ready to be applied to students. At this stage, product preparation is carried out and marketing it for the final purpose of learning.

### Evaluation

Evaluation is the activity of assessing each step that has been taken to achieve a product that meets the specified specifications. The aim is to measure the quality of the product being developed. The stages of ADDIE development research in this study are presented graphically as follows:

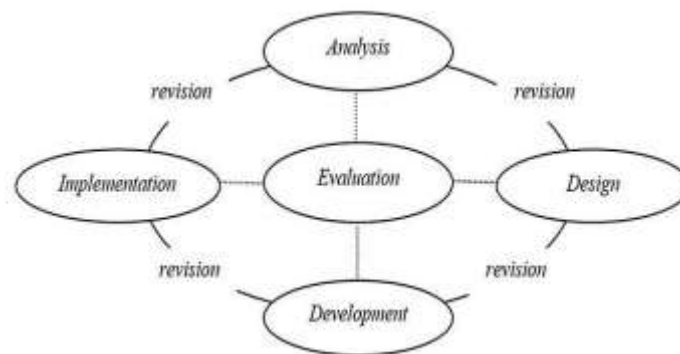


Figure 1. ADDIE Development Model

## RESULTS AND DISCUSSION

The development results are produced through the stages used in the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). Following are the results of these steps:

### Analysis

Analysis is related to the identification of problems found in a particular environment from which ideas or thoughts are generated to determine the product to be developed. The goal of this analysis stage is to identify possible causes of employment gaps. This analysis was carried out by researchers to determine the initial needs for developing Android-based teaching materials which required (1) user needs analysis and (2) content needs analysis (3) software and hardware needs analysis.

The results of the analysis of teachers, especially Mathematics subject teachers, carried out at SMP Negeri 3 Sungai Kakap, researchers conducted direct interviews with the

teachers concerned and students to detect problems, especially students who had difficulty understanding the System of Linear Equations in Two Variables (SPLDV) material because of the material. is still limited to theory and gives the impression of using presentation methods when presenting material and makes students easily feel bored and tired. One factor is the lack of other independent learning multimedia devices and various learning media for students. Therefore, researchers want to develop Android-based learning media so that students have a variety of learning media and can be used as a solution to help students overcome difficulties. Needs are determined based on data from observations and interviews listed in table 1 and table 2. the following.

**Table 1.** Table of Observation and Interview Results

| No. | Observation and Interview Results                                                                                                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Subjects observed are Systems of Linear Equations in Two Variables                                                                                                                                                                                                                  |
| 2.  | Learning Process Providing material verbally and on the whiteboard, assignments                                                                                                                                                                                                     |
| 3.  | Availability of books or learning resources. Packages of learning resources from books, LKS books, and learning resources from the internet                                                                                                                                         |
| 4.  | Quality of learning media. Use is still rare, only limited to power points.                                                                                                                                                                                                         |
| 5.  | Student Condition Students have difficulty understanding the content of the material and the teacher explains it repeatedly.                                                                                                                                                        |
| 6.  | Teachers' obstacles in teaching. Students lack motivation to learn because the lessons are considered difficult.                                                                                                                                                                    |
| 7.  | The technology owned by students as a source of independent learning. Android smartphones owned by students are not utilized optimally in the learning process                                                                                                                      |
| 8.  | Media needed<br>Media that can arouse and help students' interest and attention, there can be materials and simple educational games to measure students' understanding<br>Learning media that can be used other than in class, can be used for studying at home for reinforcement. |

**Table 2.** User Needs Analysis Results

| No. | User Needs Analysis Results                                                                                                                                                                                                 |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Target users: Class VII A students at SMP 3 Sungai Kakap                                                                                                                                                                    |
| 2.  | Types of learning media Learning media is an educational game application that can be installed on an Android smartphone, so it can be used for independent learning.                                                       |
| 3.  | Required features<br>1) Displays learning objectives and material on Systems of Linear Equations in Two Variables<br>2) Educational games consist of 4 levels like Mario games<br>3) Instructions for using the application |

### Content Needs Analysis

After determining user needs, a content analysis step will be carried out. Content analysis is related to the content of this learning application, namely material that is

relevant to mathematics learning objectives. Apart from determining the content of the material, other content that will be included in the learning media must also be determined first, especially the material and games that include questions from the multiple choice bonus game.

### **Analysis of Hardware and Software requirements**

In developing Android-based learning media, learning media creation tools are needed. Therefore, hardware and software analysis is needed to support the success of creating Android-based learning media learning materials, because there is a need for a media development tool that meets the specifications of Android-based media, software or learning software using APP Construct 2, then the media learning will be developed in the form of an application that can be installed on a smartphone with an Android operating system, educational game-based learning media is applied to the material on Systems of Linear Equations in Two Variables in class VII SMP 3 Sungai Kakap, the form of online media starts from simple and easy-to-use educational game material , can be used on Android OS, there are several things contained in the application, including: (1) Intro Page, (2) Main Menu Page which has several sub menus, namely: Material, Instructions, simple Mario game.

### **Design**

Design is the second step in developing learning media. The results of the design stage are in the form of a flowchart that describes the sequence and structure of learning media, a storyboard including a design model plan, and also an interface design. The flowchart created is then used as a storyboard design guide to create a design plan that suits the media structure. A storyboard is a rough shape of the learning media that will be developed, including the content of the media, its layout, and most of the elements contained therein. The storyboard created will then be used as a guide in creating the interface design. In designing the interface, a real storyboard depiction is made, including paying attention to the elements and characteristics of the learning media. In the first stage of design, what is needed is a learning media flowchart that can be depicted. The following is a flowchart design for creating learning media:

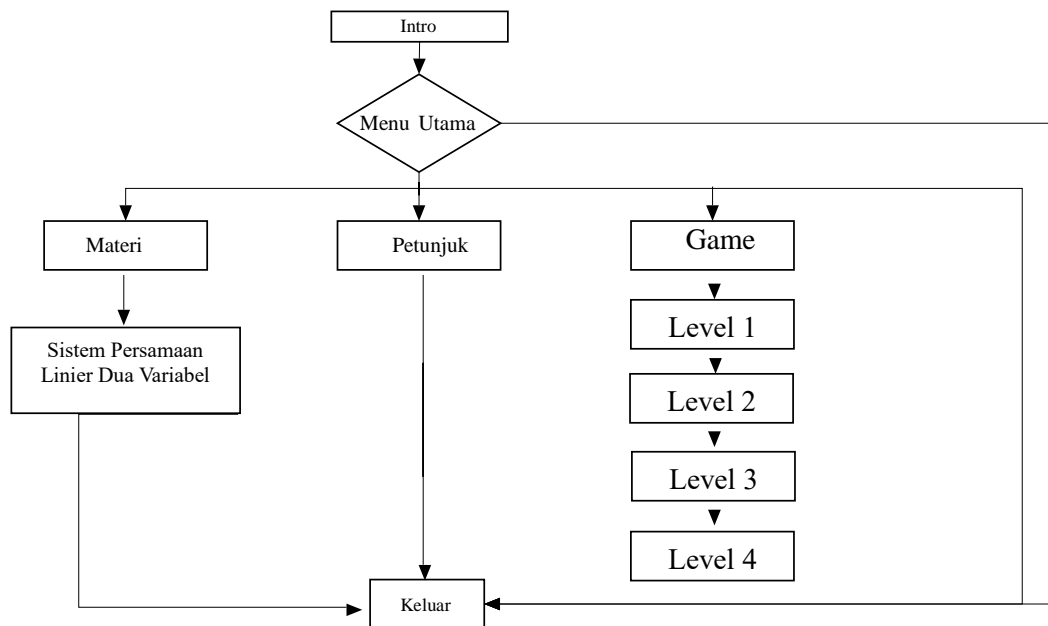


Figure 2. Learning Multimedia Flowchart

### Development

Initial development of the appearance, layout, and determination of content in learning media, such as navigation buttons, page layout, text placement, and elements contained in learning media.

### Intro page display

The intro page is the second page of the application, useful in providing information about the title of this application.



Figure 3. Intro Page Display

### Main menu page design

The menu page contains the main learning media menu which shows several menu buttons, material menu, instructions menu and game menu. On the bottom layer there is a button to exit the application.



Figure 4. Main Menu

### Material

The submenu page contains material, at the bottom there is a continue material button, after the material is finished and if you want to return to the main menu, press the Home button.



Figure 5. Material Page

### How-to page

On the instructions page there is a Back button at the top right which contains the instructions text. This page tells about the use of a media.



Figure 6. How to Page

### Game Page

This page contains the Mario game which will be completed with instructions in the application, there are left and right buttons for going forward and backward and an up button for jumping at the bottom right. After completing the game, students will get information about the question. If they answer the question incorrectly, the student will repeat playing at level 1 again, and if the question is correct, the solution to the question that has been answered will appear. The next step can be to level 2, level 3, and level 4.



Figure 7. Game Page



Figure 8 Question Page

Before this learning media is used in teaching and learning activities, product validation is first carried out by two media experts and one material expert, the results of the validation of the media are as follows

**Table 3** Media Expert Assessment Results

| No. | Assessment Aspects         | Indicators            | Validator |   | Total Score |
|-----|----------------------------|-----------------------|-----------|---|-------------|
|     |                            |                       | 1         | 2 |             |
| 1.  | Ease of use and navigation | Accuracy of media use | 5         | 5 | 10          |
|     |                            |                       | 4         | 4 | 8           |
|     |                            | Navigation accuracy   | 5         | 5 | 10          |
|     |                            |                       | 5         | 5 | 10          |



|    |                   |                                                                                               |   |   |     |
|----|-------------------|-----------------------------------------------------------------------------------------------|---|---|-----|
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   | Media operations                                                                              | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
| 2. | Aesthetic         | Attractive appearance                                                                         | 5 | 4 | 9   |
|    |                   |                                                                                               | 4 | 4 | 8   |
|    |                   |                                                                                               | 4 | 4 | 8   |
|    |                   | Neatness                                                                                      | 5 | 5 | 10  |
|    |                   |                                                                                               | 4 | 4 | 8   |
|    |                   |                                                                                               | 5 | 4 | 9   |
|    |                   | Graphic display of the interface                                                              | 4 | 4 | 8   |
|    |                   |                                                                                               | 4 | 4 | 8   |
| 3. | Technical Quality | Legibility                                                                                    | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   | Quality of handling of answers or feedback                                                    | 5 | 5 | 10  |
|    |                   |                                                                                               | 4 | 4 | 8   |
| 4. | Media Integration | Application of a combination of multimedia elements (Text, Graphics, Sound, Animation / Video | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 5 | 10  |
|    |                   |                                                                                               | 5 | 4 | 9   |
|    |                   | Total                                                                                         |   |   | 233 |

$$\begin{aligned}
 \text{Eligibility Percentage (\%)} &= \frac{\text{Score obtained}}{\text{highest score}} \times 100\% \\
 &= \frac{233}{250} \times 100\% \\
 &= 93,2 \%
 \end{aligned}$$

From the total media expert validation results, which were calculated based on the feasibility percentage formula, the total percentage was 93.2%, including in the category based on the table of criteria for assessing the quality of the products produced, which was included in the Very Eligible category.

**Table 4** Material Expert Assessment

| No. | Assessment Aspects | Indicators                                            | Validator | Total Score |
|-----|--------------------|-------------------------------------------------------|-----------|-------------|
| 1.  | Suitability        | Clarity of basic competencies and learning objectives | 4         | 4           |
|     |                    |                                                       | 4         | 4           |
|     |                    |                                                       | 4         | 4           |
|     |                    |                                                       | 4         | 4           |
|     |                    |                                                       | 4         | 4           |

| No. | Assessment Aspects             | Indicators                                              | Validator | Total Score |
|-----|--------------------------------|---------------------------------------------------------|-----------|-------------|
|     |                                | Relevance of Material                                   | 4<br>4    | 4<br>4      |
| 2.  | Quality of Content and Purpose | Material Accuracy                                       | 4<br>4    | 4<br>4      |
|     |                                | Completeness                                            | 4<br>4    | 4<br>4      |
|     |                                |                                                         | 5<br>5    | 5<br>5      |
|     |                                | Suitability to the student's situation                  | 4<br>4    | 4<br>4      |
|     |                                |                                                         | 4         | 4           |
| 3.  | Instructional Quality          | Quality of tests and assessments                        | 4<br>4    | 4<br>4      |
|     |                                |                                                         | 4         | 4           |
|     |                                | Motivating qualities                                    | 5<br>5    | 5<br>5      |
|     |                                | Media can provide assistance and learning opportunities | 4<br>4    | 4<br>4      |
|     |                                |                                                         | 4         | 4           |
|     |                                | Total                                                   |           | 108         |

$$\begin{aligned}
 \text{Eligibility Percentage (\%)} &= \frac{\text{Score obtained}}{\text{highest score}} \times 100\% \\
 &= \frac{108}{130} \times 100\% \\
 &= 83 \%
 \end{aligned}$$

The results of material expert validation were also calculated based on the feasibility percentage formula and obtained a total percentage of 83.0%, then categorized according to the product quality assessment criteria table, the resulting product was in the Very Feasible category.

### Implementation

At this stage the program has been developed and through a validation process by media experts and material experts, revisions will be carried out to produce the final product, then user feedback is needed, this process will be carried out with students.

Student response data is students' responses or opinions regarding the learning media that has been created. The results of student responses can be seen in the following results

Total Score = Number of Respondents x Number of Questions x 5

Total Score = 47 x 20 x 5 = 4700

Total Score Percentage = 4356/4700 x 100% = 92.7%

Based on the calculation results above obtained from 47 respondents, the total result is 92.7%. The product or learning media created is classified as Very Good..

### Evaluation

This step assesses each step taken so that learning media can be produced according to the specified specifications. The purpose of this evaluation is to improve the product produced before determining the final product. One way is to improve learning media that has gone through the development stage, namely after being validated by media experts and material experts.

## CONCLUSIONS

Based on the results of research and discussion, the development of Android-based learning media using modeling tools or the ADDIE development approach contained in the materials on Systems of Linear Equations in Two Variables for class VII SMP Negeri 3 Sungai Kakap will improve the learning process to make it more diverse and effective. The problems obtained are concluded as follows. Development of Android-based learning media using the ADDIE development approach. Analysis (Analysis Stage) was carried out by observing and interviewing Mathematics subject teachers and class VII students to understand the learning situation in class VII SMP Negeri 3 Sungai Kakap. Design (design stage), which is carried out is developing Android-based learning media in the form of storyboard interfaces and flowcharts. Development (development stage) the learning media being developed consists of introductory pages, instructions, materials, videos, evaluations and profiles. Implementation (implementation stage) will be carried out to ensure that learning media needs are met through implementation for class VII students at SMP Negeri 3 Sungai Kakap. Evaluation (evaluation stage) is the process of determining whether a product being developed can be used. The evaluation will be carried out by two media experts and one material expert from the mathematics teacher at SMP Negeri 3 Sungai Kakap. Based on the research results, the feasibility of Android-based learning media using the Construct2 Application in mathematics subjects in class VII SMP Negeri 3 Sungai Kakap is known in terms of media and material to be classified as "Very Feasible" with an average score from media experts of 93.2% and the average score from material experts is 83% classified as "Very Decent". Based on the results of responses from users or students, an average score of 92.7% was obtained in the "Very Good" category.

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