



Implementation of ADDIE in Multimedia to Improve Students' Understanding of Extrapolation

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ABSTRACT

Branching becomes one of the materials in basic programming subjects in vocational schools that have not been properly understood by the student. The observation results showed a problem in the learning process of the subject. The proposed solution to solve the identified problem is develop an interactive learning multimedia. Interactive multimedia helps solve problems by making the subject matter more interesting and easier to understand. This study aims to analyze the implementation of ADDIE model in the design and development of learning, improve student extrapolation understanding, and student response to multimedia. Interactive multimedia has been developed and rated "Feasible" by material experts with a score of 3,67 and is rated "Feasible" by multimedia construction experts with a score of 4,03. The use of multimedia, on the other hand, improves the understanding of student extrapolation shown it is emphasized by using the ANOVA test with a value of $0,553 \times 10^{-13} < 0,05$. The student's response to interactive multimedia received a score of 4,53 with the category "Very high".

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1. INTRODUCTION

Basic Programming subject is one of the most difficult subjects to understand. On of that, the basic programming learning process can be monotonous, less interesting, and very difficult to understand. The learning process that uses conventional learning media such as blackboards and modules is unable to achieve the learning goal optimally. Another problem is that the learning process only focuses on the teacher; it only acts as passing down the knowledge possessed by the teacher to their students, while students can only listen without interacting. Student learning outcomes may be low because their interest in learning and exercise is still lacking. Students need to have skills and understanding in this subject, remembering that most vocational graduates go straight into work.

This study is devoted to increasing students' understanding of extrapolation. By understanding extrapolation, the student is expected to understand the context of a problem so that they can estimate the problem, predict the consequences, and broaden their perceptions about the said problem. Therefore, extrapolation skills is needed by students because the learning process does not stop with memorizing the lesson, but also being able to use the concepts that have been learned in existing problems.

One component of learning that has an important role in teaching and learning activities for teachers is learning media. The use of learning media is to convey teaching material, increase student creativity, and increase student attention in the learning process. With learning media, students will be more motivated to learn so that they can make the teaching and learning process more effective and efficient (Tafonao, 2018).

Multimedia is one of the learning media that can be relied upon in the learning process in the 21st century (Astuti et al., 2019). Multimedia can be divided into two categories, namely linear multimedia and interactive multimedia. In this study, researchers focused on interactive multimedia where interactive multimedia can be used to convey messages, and stimulate students' thoughts, feelings, attention, and willingness to encourage the learning process. The media are used to enhance the learning experience, such as by displaying various animations and simulations. Students are expected to be greatly helped by interactive multimedia in understanding abstract concepts.

One method of developing multimedia that is quite effective is the ADDIE model development method. The right choice of multimedia development method will produce an effective and efficient product. One of the characteristics of the accuracy of the product resulting from the development is that the product can be applied properly and provides benefits for its users. The results of good and appropriate product development will increase the motivation and desire of students to gain deeper knowledge of the material presented. One development model that pays attention to the basic stages of media development design that is simple and easy to understand is the ADDIE model (Hadi & Agustina, 2016).

2. METHODS

The research method used in this study is a quantitative research method with a causal-associative design. The research design was chosen because this study aims to measure the effect of multimedia on students' extrapolation comprehension abilities, especially on branching material.

2.1. Research Procedure

In the research procedure section, the stages of research in developing multimedia are described. **Figure 1** below is a research procedure in the form of a flowchart.

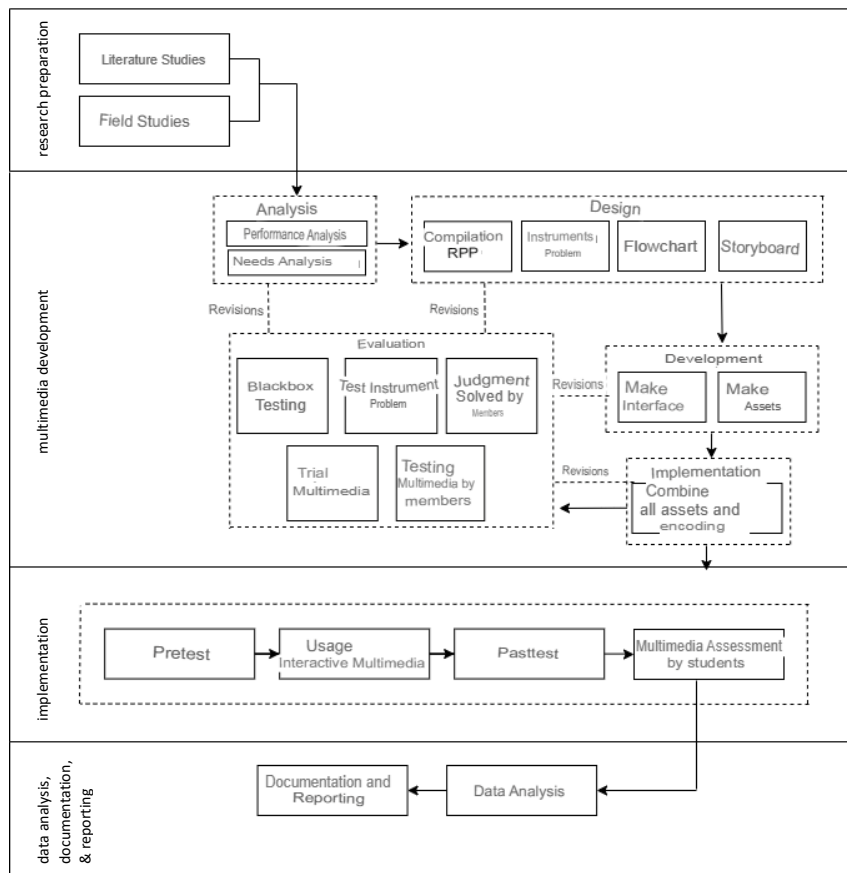


Figure 1. Research procedure.

The description of Figure 1 is as follows:

2.1.1. Stage 1 – Research Preparation

At this stage, a literature study and field study is conducted. The researcher gathers some insights on learning problems in basic programming by doing observation at the school. In the literature study, the researcher collects a theoretical data based on previous research that can assist the study, such as development models, learning methods, learning approaches available from journals and other research.

2.1.1.1. Research Design

The research design used in this study was pre-experimental in the form of a one-group pretest-post-test design. First, the student is given a pretest and the results of this pretest will indicate the ability of students before being given multimedia. After the pretest, the student is given an interactive multimedia as a treatment. Next, the researchers measured the students' scores after the treatment using a post-test. The diagram can be seen in **Figure 2**.

$$O_1 \times O_2$$

Figure 2. One-group pretest-post-test design.

Keterangan:

O1 : pretest score (before treatment)

O2 : post-test score (after treatment)

X : (*treatment*)

2.1.1.2. Population and Sample

The population in this study is one of the schools in Bandung. The sampling technique used in this study was carried out using non-probability sampling of purposive sampling. The sample selection was based on the results of the problems where at that school there were students who still had difficulties in learning programming, especially in Branching materials (based on the results of interviews with teachers at the school).

2.1.1.3. Research Instruments

Instruments are used to help the researchers collect information to ensure the data collected is optimal, complete, and systematic. The data analysis technique used in this research consisted of the following techniques: (1) Field study instrument data analysis was carried out by formulating the results of the data obtained through interviews; (2) Data analysis of the expert validation instrument races based on the Learning Media Assessment Instrument developed by [Sriadhi \(2018\)](#); (3) Analysis of instrument data, consisting of validity tests, reliability tests, difficulty level tests, and distinguishing abilities; (4) Data analysis of student response instruments raced based on the Learning Media Assessment Instrument developed by [Sriadhi \(2018\)](#); (5) Analysis of learning outcomes data in the form of a gain test ([Hake, 2014](#)); (6) analysis of the effect of interactive multimedia on student extrapolation in the form of the ANOVA test.

2.1.2. Stage 2 – Multimedia Development

In this phase, learning materials, research instruments and learning media were developed. The materials prepared for the contents in the multimedia are taken from several sources about Basic Programming subject. The materials itself consists of text-based information about basic programming and some exercise.

After the materials are finished, the development for multimedia began. The model used in the development is ADDIE, which consist of 5 stages namely 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation.

2.1.2.1. Analysis

In the analysis phase, the researcher conducted a needs analysis based on the results of the literature study and field studies that had been carried out.

2.1.2.2. Design

At the design stage, all data that has been collected at the analysis stage will be used to design the media. There are four elements in this stage, as listed below:

1) Preparation of Teaching Plans (RPP)

RPP is used to describe the implementation of learning plans at the time of research and contains the planned materials to be given to the student. This material will be arranged according to the existing syllabus and adapted to learning objectives.

2) Question Instrument

The question instrument contains the list of questions that will be used for the pretest and post-test, where the instrument has previously been validated and declared fit for use.

a) Flowcharts

In this stage, a flowchart is created to help with the flow of the multimedia.

b) Storyboards

Storyboards are used to describe the planned interface and various components that will be in the multimedia.

3) Development

At the development stage, the researcher realizes the design by creating the interactive multimedia based on a predetermined development design.

4) Implementation

At the implementation stage, the assets that have been made are combined. The coding process is also carried out as needed and according to the previous design.

5). Evaluation

At the evaluation stage, a black box test was carried out, after which an interactive multimedia instrument judgment was carried out which was carried out by two experts from Higher Education Lecturers in the Department of Computer Science Education with the aim of assessing the interactive multimedia product.

2.1.3. Stage 3 – Implementation

At this stage, the researcher brings the multimedia that has passed the validation stage to the student. The students will be asked to work on pretest questions. After that, the students will conduct learning activities using the learning media that has been made, and finally students will be asked to work on post-test questions and questionnaires on google form regarding the media the student just used.

2.1.4. Stage 4 – Data analysis

At this stage the data that has been obtained before will be processed. The results of data processing will then be documented and then written down or described as the final report

3. RESULTS AND DISCUSSION

3.1 The Multimedia

The interface of the media the researcher has completed can be seen in the following list:

1) Start Page



Figure 3. Home page.

When it is opened for the first time, the initial page that will appear is the start page as shown in **figure 3**.

2) Multimedia Usage Guide Page



Figure 4. Multimedia user guide page.

The user manual page in **Figure 4** is a guide for users to make it easier to use the learning media they have created.

3) Login Page

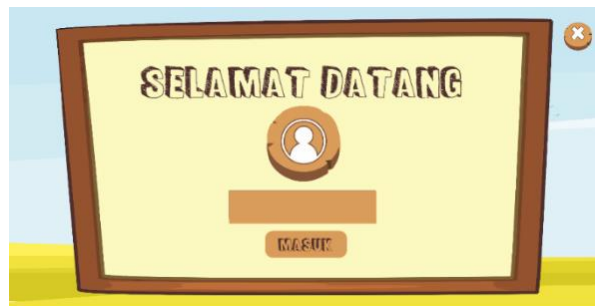


Figure 5. Login page.

The login page in **Figure 5** is made to give a name that uses the media, so that at the time of evaluation a user name appears.

4) Home page



Figure 6. Home page.

The home page in **Figure 6** is the first menu encountered when students have logged in. The page consists of several menus such as learning objectives (KI/KD), material menu, evaluation menu to see the score gained by the student, and at the rightmost is the menu about the creator's information.

5) Material Page

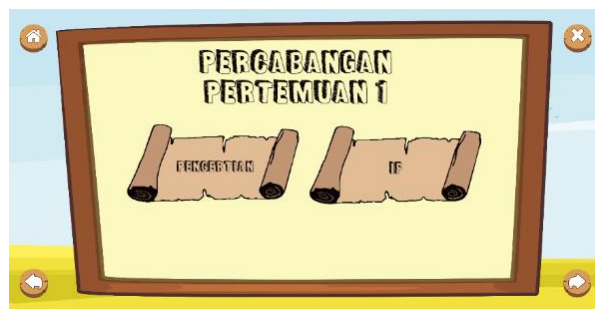


Figure 7. Material page.

The material page in **Figure 7** is a menu on branching material. The student can choose to click on “Pengertian” menu to learn about the definition of Branching, and click “If” should the student want to learn about If condition material.

6) Question Practice Page

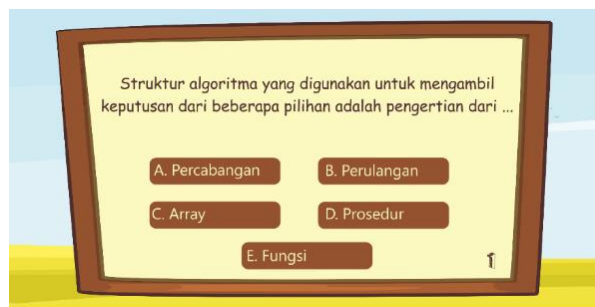


Figure 8. Question practice page

The exercise page in **Figure 8** is a page that is made so that students know how far their abilities have been in the material previously studied.

7) Animation Page

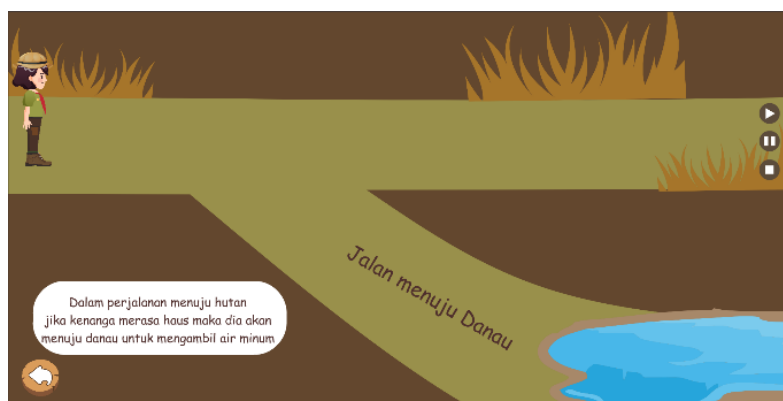


Figure 9. Animation on the if material.

If the student clicked on “If” icon, an animation will play as seen in page in **Figure 9**. The animation contained the first If branch.

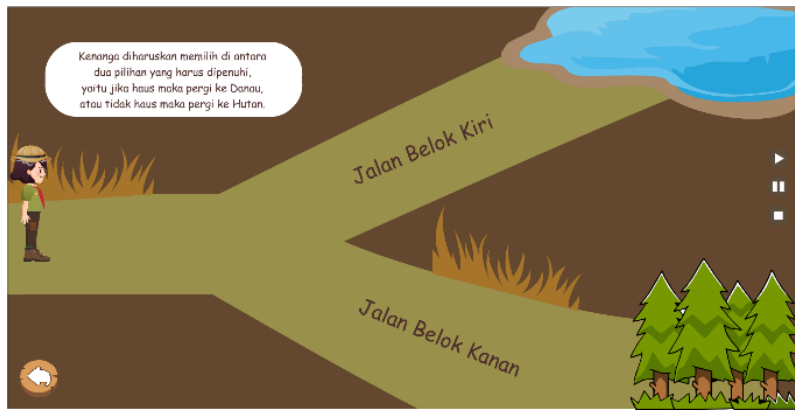


Figure 10. Animation on the if else material.

The animation page in **Figure 10** is the animation contained in the “if-else” material.



Figure 11. Animation on multilevel if else material.

The animation page in **Figure 11** is an animation contained in multilevel “if-else” material.



Figure 12. Animation on nested if items.

The animation page in **Figure 12** is the animation contained in the “nested-if” material.

3.2. Research Discussion

The collection of pretest, post-test, and student responses was carried out using the Google form, the gain calculation comes from the pretest to post-test scores. The following is a table of pretest, post-test, and student responses to learning media.

Table 1. Pretest-post-test gain results.

No Respondents	Pretest Score	Post-test Score	Nilai Gain	Average Gain	Class
1	72.00	88.00	0.57	0.56	Top
2	60.00	100.00	1.00		
3	60.00	76.00	0.40		
4	52.00	80.00	0.58		
5	48.00	80.00	0.62		
6	44.00	80.00	0.64		
7	44.00	68.00	0.43		
8	44.00	64.00	0.36		
9	44.00	76.00	0.57	0.51	Middle
10	44.00	56.00	0.21		
11	40.00	64.00	0.40		
12	40.00	84.00	0.73		
13	36.00	68.00	0.50		
14	36.00	48.00	0.19		
15	36.00	56.00	0.31		
16	36.00	80.00	0.69		
17	36.00	76.00	0.63		
18	32.00	76.00	0.65		
19	32.00	56.00	0.35		
20	32.00	68.00	0.53		
21	32.00	80.00	0.71		
22	32.00	76.00	0.65		
23	28.00	56.00	0.39	0.54	Bottom
24	28.00	84.00	0.78		
25	28.00	68.00	0.56		
26	24.00	60.00	0.47		
27	20.00	56.00	0.45		
28	20.00	68.00	0.60		
29	20.00	64.00	0.55		
30	16.00	60.00	0.52		
Average Gain				0.54	

Based on **table 1** pretest-post-test results, the highest gain value was obtained by the upper class, which was 0.56 which was categorized as a “Moderate” increase in gain. The increase that occurred in the middle and lower classes was also categorized as “Medium”, namely the middle class was 0.51 and the lower class was 0.54. For responses to learning media responses from students can be seen from **Table 2**.

Table 2. The results of responses to learning media responses.

Group	Average Pretest	Average Posttest	Gain	Rating Media
Top	53,00	79,50	0,56	4,53
Middle	36,29	68,86	0,51	4,39
Bottom	23,00	64,50	0,54	4,51

Based on table 2, the average student who experienced a large increase in gain got a good response to the media. Based on table 2, the average student who experienced a large increase in gain got a good response to the media. The top group that has the largest gain value is 0.56 and the quite effective category has the largest media rating average value,

namely 4.53. The lower group experienced a significant increase in gain, namely 0.54, had the second largest media rating average value, namely 4.51, and the middle group experienced the lowest gain increase among the three classes, namely 0.51, had the lowest media rating average value. among the three classes, namely 4.39. So it can be concluded that the higher the gain obtained, the better the assessment given by students to multimedia, so that students who experience a high increase in gain tend to give good media assessment results.

4. CONCLUSION

Interactive multimedia on branching material has been completed using the five stages of the ADDIE method development. Interactive multimedia is considered "proper" by material experts with a score of 3.67 and is considered "appropriate" by multimedia construction experts with a score of 4.03. ADDIE-based multimedia can improve understanding of extrapolation on branching material. This can be seen from the increase in scores where the average pretest score was 37.20 and the post-test was 72.32 with an average n-gain of 0.54 students with the "moderate" criterion. This was confirmed by using the ANOVA test with a value of $0.553 \times 10^{-13} < 0.05$. Thus it can be concluded that there is an influence on the use of interactive multimedia developed with ADDIE. Student responses to interactive multimedia get a value of 4.53 in the "Very High Acceptance" category.

Recommendations for the development of interactive multimedia can be further developed in the form of web or android so that students can use it on various platforms and devices.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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