Game-Based Learning Multimedia Design with Aptitude Treatment Interaction (ATI) Model in Basic Programming Lessons

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Abstract:- **This study aims to develop game-based learning multimedia with the Aptitude Treatment Interaction (ATI) learning model as a tool for basic programming subjects and to determine the effect of using multimedia on improving learning outcomes with the research subject being class X (ten) students of SMKN 1 Labuhan Maringgai (Labuhan Maringgai Public Vocational High School 1). The use of multimedia learning lies in the Treatment section of students who are grouped based on ability (upper class students, middle class students, and lower class students). To see the effect of increasing learning outcomes, test instruments in the form of pretest and posttest were used in the class, while to see the feasibility of multimedia, a questionnaire adapted based on the Learning Object Review Instrument (LORI) was used for media experts, material experts and students as respondents. The results of this study are: 1) this multimedia gets an assessment in the very good category and is feasible to use based on the media expert validation test with a percentage of 88.00%, and material expert validation with a percentage of 85.00% and a percentage of 82.14% of students as multimedia users. 2) The increase in student learning outcomes based on the pretest and posttest obtained a gain value of 0.59 in the upper class, the gain value of 0.56 in the middle class, and a gain value of 0.42 in the lower class. 3) Improved cognitive domain learning outcomes, cognitive domain improvement (C1, C2 and C3) in upper grade students increased by 12.22%, in middle grade students by 24.56%, and lower grade by 24.67%.**

Keywords:- *game-based learning multimedia; ATI learning model; learning outcomes.*

I. INTRODUCTION

Vocational High School is one of the educational institutions that are at the secondary level of education. One of the majors related to information and communication technology is the Computer and Network Technology Vocational School which almost all of its subjects are directed at information and communication technology. One of the subjects is basic programming where the material leads to Algorithms and Programming. An algorithm is a certain sequence of logical steps to solve a problem. The emphasis is on a logical sequence of steps, which means the algorithm must follow a certain order, not jump around. One way to find out the difference in student learning outcomes is to use interactive learning media that can help students understand the material presented and can help teachers deliver the

material. Making media must be adjusted to the needs of the learning to be carried out. There are several models that can be used in developing learning media. One model that can be used is the Aptitude Treatment Interaction approach (ATI).

Nurdin (2005: 38) states that statistically and methodologically, ATI is defined as a statistical interaction that is multiplicative (combined) of at least one human variable (independent) and one treatment variable (independent), in influencing one outcome variable. learn (dependent). With this statement, it describes a reciprocal relationship between the learning outcomes obtained by students and the setting of learning conditions. This means that the academic achievement/learning outcomes obtained by students is influenced by the learning conditions developed by the teacher in the classroom. In delivering the material, there are several alternatives that can be used in learning.

One alternative that can be used is to build a game-based learning multimedia where students can experience playing activities while learning or called educational games. According to Wolf (2000) states that educational games are games that are specifically designed to teach about certain subjects, deepen a concept, introduce historical events, or help them learn a skill they have. Based on this background, the title of the research to be carried out is "Design of Game-Based Learning Multimedia with Aptitude Treatment Interaction (ATI) Model in Basic Programming Subjects". So the objectives of this research are:

- To find out the design of game-based learning multimedia with the Aptitude Treatment Interaction (ATI) model in Basic Programming subjects.
- To determine student responses after using game-based learning multimedia with the Aptitude Treatment Interaction (ATI) model in Basic Programming subjects.
- Knowing whether there is an increase in student learning outcomes after using game-based learning multimedia with the Aptitude Treatment Interaction (ATI) model in Basic Programming subjects.

II. METHOD

A. Research Design

The research design used is a pre-experimental design. In this design, there are external variables that also influence the formation of the dependent variable. The form of pre-experimental design used is One-Group Pretest-Posttest Design. The use of this form makes the results of the treatment known to be more accurate, because it can compare

with the initial state before being treated (Sugiyono, 2013: 112).

B. Research Place

The place of implementation of this research is SMK N 1 Labuhan Maringgai (Labuhan Maringgai Public Vocational High School 1) .

C. Research Subjects

As for the research subjects are students of class X (ten).

D. Research Method

The research method used is Mixed Methods Research. Mixed methods combine quantitative and qualitative methods that are used together in research activities, so as to obtain more comprehensive, valid, reliable, and objective data (Sugiyono, 2014: 404).

Creswell (2009) (in Sugiyono, 2014) classifies the combination method as shown in the following figure.
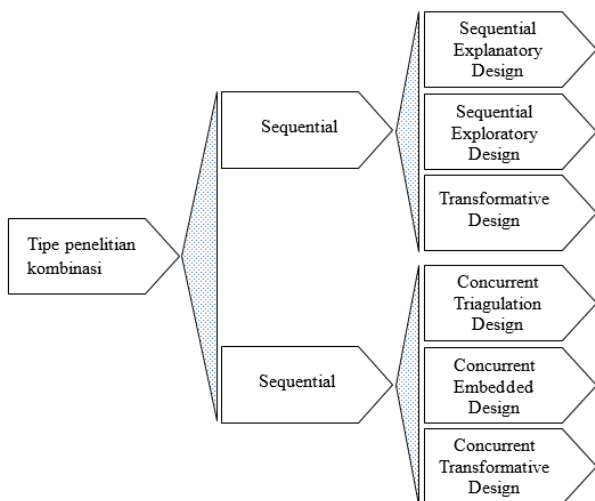

Fig. 1: Combination research type

The combination method in this study uses a sequential exploratory design. The initial stage of this research is to collect and analyze qualitative data. This stage is used in answering the problem formulation about how to design and build a game-based learning multimedia with an aptitude treatment interaction (ATI) model. So to produce a game-based multimedia the author uses the Research and Development (R&D) method. After the multimedia product is produced, then quantitative data collection and analysis is carried out. This stage is in the form of analyzing quantitative data to determine student learning outcomes in basic programming learning and to determine student responses to learning using the developed multimedia.

III. RESULT AND DISCUSSION

A. Multimedia Design

The implementation of multimedia as a tool in the ATI model can be seen from the stages of multimedia development which include making flowcharts, story boards, and the multimedia development stage. The multimedia interface as a tool in the treatment section on the ATI model is as follows:
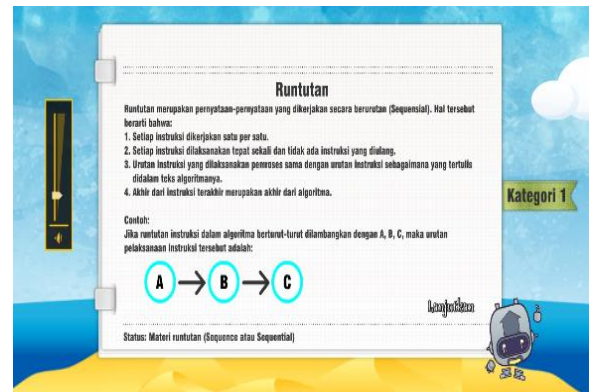

Fig. 2: Material for the upper class group of students

Giving treatment to groups of upper class students who have high abilities in the form of them being guided to choose category 1 on multimedia which contains material that contains a brief discussion and implementation.

Fig 3: Material for the middle class group of students

Giving treatment to groups of middle class students who have moderate abilities in the form of them being guided to choose category 2 on multimedia which contains material that contains a more detailed discussion accompanied by examples.

Fig. 4: Materials for the lower class group of students

Giving treatment to groups of lower grade students who have low abilities in the form of them being guided to choose category 3 on multimedia which contains material that contains detailed discussions accompanied by examples and discussion of the stages of each material.

Fig. 5: Evaluation

After each student uses multimedia with their own treatment, at the end of each material there will be an evaluation that is the same for all students.

B. Multimedia Validation

Validation is carried out aiming to determine the feasibility of multimedia before it is implemented. The measurement uses a rating scale. The validation stage of this multimedia is divided into two, namely the validation process on the media aspect and the validation process on the material aspect. The results of the validation are as follows:

No	Indicator	Value Gain (%)
1	Presentation design	80,00
2	Interaction Usability	100,00
3	Accesibility	90,00
4	Reusability	80,00
5	Standar Accompliance	80,00
	Average	**88,00**

Table 1: Validation results by multimedia experts

Based on the following table, the average value obtained for the validation of the media aspect is 88.00% so that it is included in the very good category.

No	Indicator	Value Gain (%)
1	Content Quality	80,00
2	Learning Goal Alignment	80,00
3	Feedback and adaptation	80,00
4	Motivation	100,00
	Average	**85,00**

Table 2: Validation results by material experts

Based on the following table, the average value obtained for the validation of the media aspect is 85.00% so that it is included in the very good category.

C. Student Response

Student responses are obtained by providing an assessment questionnaire that must be filled out by students.

No	Indicator	Value Gain (%)
1	Learning Goal Alignment	82,31
2	Feedback and Adaptation	84,33
3	Motivation	83,11
4	Presentation Design	80,73
5	Interaction Usability	81,73
6	Accessbility	82,33
	Average	**82,33**

Table 3: Student response results

Based on the table above, the average value percentage is 82.14% which is included in the Very Good category.

D. Improving Student Learning Outcomes

To analyze the increase in learning outcomes, the data tested by the author is in the form of data from the pretest, posttest, and gain values obtained. The gain value is used to see the significant difference in the increase in student learning outcomes that occur in the upper, middle and lower groups. The results of the pretest, posttest, and gain can be seen in the table below.

Group	Average Pretest	Average Posttest	Gain
On	80,67	92,00	0,59
Middle	59,37	82,11	0,56
Lower	37,60	64,00	0,42

Table 4: The results of pretest, posttest, and gain

Based on the following table, the average gain values obtained for the upper, middle and lower groups are included in the medium category. This shows that each group experienced an increase in learning outcomes after using multimedia.

E. Improving Learning Outcomes in the Cognitive Area

In this section, the writer compares the pretest and posttest data which contains the results of the achievements of C1, C2, and C3 for students in the upper, middle, and lower groups. The results of the comparison of achievement results can be seen in the table below.

Group	Percentage of Improvement in Posttest and Pretest (%)			Average Increase
	C1	C2	C3	
On	13,33	3,33	20,00	12,22
Middle	31,58	8,42	33,68	24,56
Lower	48,00	10,00	16,00	24,67

Table 5: Cognitive domain enhancement

Based on the table, there was an increase for all students in different categories. this shows that the multimedia used can increase the percentage of success in the cognitive domains of C1, C2, and C3 for students with different abilities.

IV. CONCLUSSION

Based on the results of research that has been carried out in the form of using game-based learning multimedia in the Aptitude Treatment Interaction (ATI) learning model in basic programming subjects, the following conclusions are obtained:

- The implementation of the ATI learning model assisted by interactive game learning multimedia in basic programming subjects has been successfully implemented, this is based on the results of the observer's assessment with a percentage of 100% for the implementation of the learning phase in the classroom.
- Multimedia game learning received an assessment in the very good category and suitable for use based on the media

expert validation test with a final score of 88.00%, and material expert validation with a final score of 85.00%. In addition, this multimedia gets an average value percentage of 82.14% from students as multimedia users.

- Student learning outcomes in each category increased after using the ATI learning model assisted by multimedia game learning in basic programming, this is based on the gain value of 0.59 in the upper class, 0.56 in the middle class, 0.42 in the lower class. This value is obtained from the calculation of the pre-test and post-test scores.

- There was an increase in the cognitive domains of C1, C2 and C3 in each class in the form of an average percentage increase of 12.22% in upper grade students, a percentage increase of 24.56% in middle grade students, and a percentage increase of 24 ,67% in lower grade students after using the ATI learning model assisted by multimedia game learning in basic programming.

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