

Developing Mathematics Learning Media for Outdoor Learning Activity for Fourth Grade Elementary School Student

Hanafiah
Yogyakarta State University
Yogyakarta, Indonesia
hanafiah2015@student.uny.ac.id

Marsigit
Yogyakarta State University
Yogyakarta, Indonesia
marsigit@uny.ac.id

Abstract— Education can be defined as an effort that is consciously and deliberately done in order to change human behavior, individual or group, through teaching and training activity. The ability to utilize an appropriate learning method based on the curriculum and the student's characteristic is a very fundamental aspect that is an obligatory for a teacher. One of the methods which can encourage the student to be active on their learning activity is outdoor Mathematics method. This research is a development research that aims to obtain Mathematics learning media for outdoor learning activity for fourth grade elementary student. This research focuses on perimeter and area of plane topic, specifically for square and rectangle. The developed products are some of the learning media, they are lesson plan, student's worksheet book, teaching materials or book, and student's test result. The research instruments are validation sheet, observation sheet on student's character, and observation sheet on teacher's ability to manage the teaching activity based on the lesson plan that support character education. The validation result shows that the developed learning media is appropriate to use since it can be regarded as valid, practical, and effective. According to the research, the developed Mathematics learning media featured on the limited test and field test show the student cognitive improvement on each meeting.

Keywords— learning media; outdoor activity; math learning

I. INTRODUCTION

Education is an effort that is consciously and deliberately done in order to change human behavior, individual or group, through teaching and training activity. The development of a country is heavily influenced by the quality of education on the particular country.

The success rate of Mathematics learning can be measured by examining the success rate of student during learning activity. In other words, it can be seen by the student's level of understanding, student's mastery on the material given, and the student's test result. The higher the student's level of understanding, mastery on material, and the test result, the higher the success rate of the learning process. However, learning Mathematics, in fact, is much more complicated for student, hence resulted on the low success rate [1].

The ability to employ a learning model which fits the curriculum and student's characteristics and potentials is a basic competence which must be possessed by a teacher. This quality cannot be ignored since the choice and the use of certain learning models will affect the process of learning

and the outcomes. If a teacher has the capability to choose and apply the appropriate learning model, it can encourage a good learning process and good outcomes.

The learning model which should be applied must be able to encourage students' enthusiasm and enable them to reach their full potentials by participating in a fun learning activity. One of learning models which can encourage students to participate actively is outdoor activity for learning Math which can help students to develop their potentials. Thus, this outdoor learning activity which facilitates students to learn in a fun environment is different from indoor learning activity (pedagogy indoor learning) since the learning process can be conducted as a game.

The application of this outdoor activity for learning Math will create a more natural learning process and it enables students to experience the learning process holistically compared to a passive learning which is usually conducted in the classroom. Furthermore, it is expected that this learning model will help students to improve their abilities in affective, cognitive, and psychomotoric aspects [2].

The utilization of this learning model also must be supported by learning media which enables students to learn actively and improves the quality of learning process. This learning media will help teachers to prepare and conduct the learning activity with ease. It also provides various strategies to help students with different learning styles and capabilities. Thus, teachers can develop specific lesson plans to provide various learning activities to meet the students' needs. It is really important to develop this kind of learning model and equips teachers with this model to help them to encourage students to learn collectively and develop their logical, systematical, creative, reasonable, and inquisitive thinking. Hence, it is essential to develop this approach which will create innovations in learning models.

The aim of this research is to develop Mathematics learning media for outdoor activity for fourth graders. This media will be used and tested by the fourth graders in Muhammadiyah Elementary School Nitikan Yogyakarta. It focuses on the topic of perimeter and area of plane.

The rest of this paper is organized as follow: Section II describes the related works. Section III presents the data and following by research method. Section IV presents the obtained results and following by discussion. Finally, Section V concludes this work.

II. RELATED WORKS

“Developing Mathematics Learning Media for Outdoor Learning Activity on Perimeter and Area of Rectangle and Square Topic for Seventh Graders in Junior High School of Integrated Bilingual Krian Sidoarjo”. Based on the relevant research, there are several things can be concluded: 1. The process of the development of Mathematics learning media for outdoor learning activity is based on the development of 4-D model which has been modified through 3 stages: (1) The definition stage which consists of: initial and final analysis, students analysis, concept analysis, assignment analysis and specified purpose learning. (2) Designing stage consists of test preparation, selection of media, selection of format, initial design. (3) Development stage consists of assessment from experts, simulation and limited testing. Mathematics learning media for outdoor learning activity on subtopic of perimeter and area of rectangle and square consists of lesson plans, student’s handbook, student’s worksheet book. (1). This learning media then was assessed by experts and can be employed with several revisions. (2). Teachers’ activities during the outdoor learning process have met the effective criterion. (3). Students’ activities during the outdoor learning process have met the effective criterion. (4). Students’ responses to the outdoor learning activity for learning Math are positive. (7). The seventh graders’ learning outcomes in Junior High School of Integrated Bilingual Krian Sidoarjo for outdoor learning activity for learning Math on subtopic of perimeter and area of rectangle and square have passed its individual and classical minimum requirement thus it can be said that it has met effective criterion.

The suggestions which can be given in accordance with this research are: (1). The users of this learning model are expected to use it as a reference and further development. (2). The Mathematics learning media for outdoor learning activity is expected to be developed for other topics in Mathematics since based on students’ responses they are interested in learning other topics with similar approach. (3). The Mathematics learning media for outdoor learning activity for Junior High School on the topic of perimeter and area of rectangle and square should be tested in other levels and various other schools thus it can be developed further.

The research conducted above is like the writers. It also employs a similar method and develops a similar model. The only difference is about the research and topic level.

III. MATERIAL AND RESEARCH METHOD

This research is a development research. This research aims to develop Mathematics learning media for outdoor learning activity for fourth graders on the topic of perimeter and area of rectangle and square. This developed learning media consists of lesson plans, teacher’s handbook, material book, student’s worksheet book, student’s test result.

Borg and Gall in [3] states that research approach and development is a research that focuses on developing and validating products being used in the research. Nana Syaodih in [4] argues that research and development is a process to develop new products or to improve existing products which can be accounted credible.

This learning model which is employed in this research is adopted from developed model of Borg and Gall in Ghufron [5] as stated in Figures 1 and 2 below:

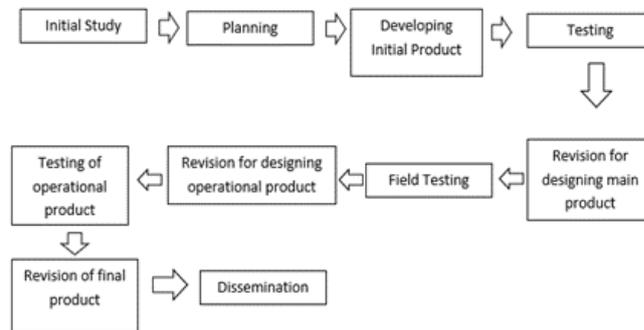


Fig 1. Development model Borg & Gall



Fig 2. Diagram of Learning Media Development

A. Types of Data

Types of data in this research are qualitative and quantitative. The qualitative data are obtained by the response of expert about the product quality which is assessed from the learning aspect, material or content and student’s response about the learning media effectivity. The quantitative data are obtained by validity response score of the learning media, learning management score by teachers, activity score and student’s cooperative ability and the result of the test.

B. Data Collection Instrument

• **Data Analysis of Media Validity Result**

Data in the form of validator response score which are obtained by several categories consist of 5 responses about the quality of the developed learning media i.e. very good (5), good (4), average (3), below average (2) low (1). These data are transformed into interval data. The obtained score then will be converted into qualitative data in 5 scale, with formula which is cited from Sukarjo [6] in this following Table I:

TABLE I. VALIDATION REFERENCE SCORE OF THE LEARNING MEDIA

| Score | Score Interval | Criteria |
|-------|--|---------------|
| A | $X_i + 1,8 SB_i < X$ | Very Good |
| B | $X_i + 0,6 SB_i < X \leq X_i + 1,8 SB_i$ | Good |
| C | $X_i - 0,6 SB_i < X \leq X_i + 0,6 SB_i$ | Average |
| D | $X_i - 1,8 SB_i < X \leq X_i - 0,6 SB_i$ | Below Average |
| E | $X \leq X_i - 1,8 SB_i$ | Low |

Notes:

X_i = the ideal average score $\frac{1}{2}$ (Maximum score + minimum score)
 SB = ideal standard deviation = $\frac{1}{6}$ (maximum score – minimum score)
 X = actual score

In addition to the suggestions from validator learning media can be categorized as effective if the average score of the test has good category. Thus, the result of data analysis which meets good criterion in this research will be used as consideration to revise the media prior to its testing.

• **Data Analysis of Learning Management Result**

The data of teacher’s competence in managing outdoor activity for learning Math are observed and analyzed through descriptive statistic with average score. The description of average score of the level of teacher’s competence in managing the learning process is cited from Azwar [7] in the following Table II:

TABLE II. TEACHER’S COMPETENCE IN MANAGING LEARNING PROCESS REFERENCE SCORE

| Score | Score Interval | Criteria |
|-------|--------------------------|---------------|
| A | $M+1,5s < X$ | Very Good |
| B | $M+0,5s < X \leq M+0,5s$ | Good |
| C | $M-0,5s < X \leq M+0,5s$ | Average |
| D | $M-1,5s < X \leq M-0,5s$ | Below Average |
| E | $X \leq M - 0,5s$ | Low |

Notes:

M = Mean

S = deviation standard

X = actual score

Teacher’s ability in managing learning process can be categorized as effective if the average score of each aspect of teacher’s competence in managing outdoor learning activity is categorized as average (C). Thus, the result which cannot meet the average (C) category in this research will be used as consideration to revise the tested learning media.

C. Data Analysis of Activity and the Student’s Cooperative Ability

Data analysis of activity and student’s cooperative ability consist of average frequency and percentage of each aspect based on the following factors:

- Measuring the average of each aspect of activity and student’s cooperative ability in each meeting, it is measured by calculating the frequency of each aspect of every observed student which then divided by the total of the observed students.
- Percentage of each aspect of student’s cooperative ability in each meeting, it is calculated by dividing the average aspect which emerges with the maximum frequency of each aspect multiplied by 100%.

To show which aspect that will be observed is effective then limited criteria in each aspect can be seen from the following Table III:

TABLE III. EFFECTIVE LIMITED CRITERIA FOR STUDENT’S ACTIVITY

| Student’s Activity | Effective Criteria (%) |
|---|------------------------|
| Listening/paying attention to teachers | 10-15 |
| Reading student’s handbook and worksheet book | 13-17 |
| Responding peers’ question | 8-14 |
| Asking question for more comprehension | 8-14 |
| Making conclusion for every learned material | 10-15 |
| Doing the quiz | 13-17 |

For effective limited criteria of every aspect of student’s cooperative ability can be seen in the following Table IV.

TABLE IV. EFFECTIVE LIMITED CRITERIA FOR STUDENT’S COOPERATIVE ABILITY

| Cooperative Ability | Effective Limited Criteria (%) |
|--|--------------------------------|
| Focus in the group and assignment | 18-20 |
| Communicating the assignment with the group | 10-15 |
| Encouraging themselves and peers to participate actively | 8-14 |
| Attempting to deeper comprehension | 15-18 |
| Helping peers in learning | 8-14 |

The learning process can be categorized as effective if each aspect in the activity and the student’s cooperative ability for each lesson plan is perceived as effective.

D. Data Analysis of Student’s Response

The questionnaire is analyzed to examine the student’s response to the use of the developed media in the learning process in outdoor activity. The analysis employs Likert scale from 1 up to 5. Each score from the questionnaire will be analyzed then is interpreted into percentage. The interpretation score of student’s responses is cited from Ridwan in [8] the following Table V:

TABLE 5. CRITERIA INTERPRETATION SCORE OF STUDENT’S RESPONSES

| Range of Criteria Percentage | Category |
|------------------------------|---------------|
| 0% - 20% | Low |
| 21% - 40% | Below Average |
| 41% - 60% | Average |
| 61% - 80% | Good |
| 81% - 100% | Very Good |

E. Analysis of Test Result

Analysis of test result is conducted in this research by looking at validity test, reliability test, and lowest required passing grade.

1. Validity Test

Azwar in [7] states that “validity is derived from valid which means correctness and exactness of measuring tool and its correct and exact use”. Jain, *et al.*, in [9] defines that validity reflects the object it measures. An instrument is deemed as valid if it is used to measure object what it should measure [10]. To examine the validity test of the test result in this research it needs to calculate each test by using moment product correlation formula as follows:

$$r_{xy} = \frac{N \sum XY - \sum X \sum Y}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}$$

By: rxy = item score
 Y = total score
 N = the total of students participates in the test
 Rxy = Correlation coefficient of item score and total score

For interpretation to the value of correlation coefficient, price *r*-count is consulted with the price *r*-table with falsity rate 5%. If price *r*-count which is obtained is bigger than *r*-table thus the question is valid, but if the price *r*-count

which is obtained smaller than r -table then the question item will be revised or remove.

2. Reliability Test

Instrument reliability test aims to examine the rate of questionnaire reliability and it can be valid to be used as data collection instrument. Reliability refers to consistency or reliability of measuring result. An evaluation tool is categorized as reliable if the result of measurement is relatively consistent if it is used for similar subject.

To determine the reliability test, the writer cites Sugiyono in [10]. who states that reliability test using Alfa Cronbach technique is conducted for two types of data: interval or essay? Coefficient formula of Alfa Cronbach reliability is.

$$r_i = \frac{k}{(k-1)} \left(1 - \frac{\sum st^2}{st^2} \right)$$

where k = the total of students participates in the test
 $\sum st^2$ = falsity square mean
 st^2 = total variant

To interpret reliability coefficient (r) it employs criteria guidance made by Guilford in [11] as follows:

| | |
|------------------------|--|
| $F11 < 0.20$ | the degree of reliability is low |
| $0.20 \leq F11 < 0.40$ | the degree of reliability is below average |
| $0.40 \leq F11 < 0.60$ | the degree of reliability is average |
| $0.60 \leq F11 < 0.80$ | the degree of reliability is good |
| $0.80 \leq F11 \leq 1$ | the degree of reliability is very good |

Based on that interpretation, in this research the test item is categorized as good if the reliability coefficient reach average at minimum. Thus, all the other test items which are only categorized below average will be revised.

3. Lowest Required Passing Grade

The students' learning outcomes are determined by two aspects. Scores which are taken from daiy assessment will be used as consideration to assess students ability individually and classically based on the determined learning purpose. The passing grade of student will be determined by this formula:

$$KB = \frac{T}{T1} \times 100\%$$

where:

KB = Percentage of passing grade per student (student proportion)
 T = The total score achieved by a student in all question items
 T1 = The total score of the overall test

As the standard of passing grade developed by Depdikbud in Curriculum 2006, a student can pass minimum learning requirement if the proportion of the correct answer or learning completion percentage $\leq 65\%$. A class can be said has passed the minimu requirement if there are 85% of their students reach individual completion. The result of individual and classical completion then will be used to describe the quality of the learning outcome on the

topic of fraction with the help from learning model and cooperative strategy multilevel in this research.

IV. RESULTS AND DISCUSSION

The validity of lesson plan in this developed model mostly reach 4.0 score. Thus, the indicator, steps of learning, time and media of learning and the language of the lesson plan is categorized as appropriated based on validator. While the aspect of service method the average score is 3.83. It is because the students' comprehension needs to be assessed. Thus, the writer needs to revise the learning model that suits the students' abilities and needs.

The validity of student's handbook developed in this research is above 3,0. Hence, the content, language, and presentation are deemed as good by the validator. It is mainly because the student's handbook mostly takes the materials from the student's worksheet book and takes the answer from it too. Hence, the writer then revised the media and removed the materials taken from the student's worksheet book.

The validity of the student's worksheet book which is developed in this research reaches above 4.0 in average. Thus, several aspects such as guidance, content quality, procedure and questions are seen appropriate by validators.

The result of the analysis on teacher's competence in managing outdoor activity for learning Math with focus on perimeter and area of rectangle and square shows that students can participate actively in learning process. This result is determined by the aspects of teacher's competence in fulfilling effective criteria. Based on the field test, the attitude of teachers who should give more chances to students to solve their own problem must be emphasized. It is essential since the teachers should encourage the students to be more independent and reach their full potentials.

The analysis of students' activity during the outdoor activity for learning Math shows that they can participate actively in the learning process. It can be seen from each aspect in which the percentage of students' activity has reached effective criteria. In the learning process, there are several students who cannot fully follow the learning activity appropriately and tend to disturb their peers. Teachers guidance is essentially needed to make the students stay focus on the learning activity and pay attention to the learning process. This can happen because several students still cannot adapt to the newly developed learning model.

V. CONCLUSION

This research has presented the development of mathematics learning media for outdoor learning activity for fourth grade elementary school student. Based on the analysis which has been stated, the result of this research shows that 32 students have passed individually, it means they can follow the determined learning purpose. In addition, students also have reached the criteria to pass classically, the number of students who have passed the minimum requirement of 86% thus they can reach the determined learning purpose.

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