

DEVELOPMENT OF FLAT-BASED LEARNING MEDIA
MINIATURE OF THE HOUSE IN MATHEMATICS
AT SD SUKASARI 4

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Abstract

This study aimed to determine the development of miniature house-based learning media for elementary school mathematics, to determine the quality of miniature house media, to determine the effectiveness of the media when applied to learning in 1st grade students of SD Sukasari 4 and to determine the increase in achievement after using miniature house media. In this study, as many as 31 first-year students from SD Sukasari 4 participated, namely 14 from a control class and 17 from an experimental class. This research uses qualitative data gathered through in-depth interviews, as well as quantitative data gleaned from surveys and other similar instruments. T and N-gain tests are used for analysis. The study's findings indicate that this form of educational media has gone through a number of iterations, including the identification of opportunities and challenges, the collection of data, the development of a prototype, the validation of that prototype, the conduct of user tests, the revision of that prototype, and finally the production of mass quantities of the product. The produced medium is fit for purpose, as evidenced by the acquired findings of the assessment from the material expert, who gave it a score of 143 on good criteria. This miniature house-based flat building learning media is effectively used in Grade I students in Mathematics learning based on the results of the t test can be seen the t-statistic value of 6,905 > t table 2,035. Besides, the N-gain analysis showed that in the control class of 0,27 with the criteria low, while in the experimental class it was 0,70 with high criteria. Hence, the increase in achievement is in the high category.

Keywords: Development, House Miniature, Learning Media, Mathematics, Two-dimensional Figure

1. INTRODUCTION

According to Danarjati (2014), education is the process of developing all abilities/skills and human behavior through a teaching and learning process. In this teaching and learning process, of course, there is a series of knowledge that is given to students. A series of knowledge that is also called science.

Mathematics is one of the disciplines that must be used to determine student success in taking exams. Sadiq (2014) emphasized that in the past, many people said that mathematics is a science that studies numbers and shapes. This was the answer of people because it was influenced by their experiences when studying mathematics or arithmetic at school. However, currently, learning mathematics aims to develop students' self-potential through providing experience by accustoming children to thinking and reasoning related to everyday life. Therefore, in the teaching and learning process, especially mathematics, teachers must use appropriate media according to the needs and

stages of child development so that the material being taught can be concrete and become meaningful learning for children.

Hence, learning media is very essential. According to Ariyanti (2015), Learning media is one of the tools as an intermediary so that the messages conveyed in learning can be conveyed, so that the teaching and learning process is effective. Children in elementary school are included in the concrete operational stage, thus it's crucial that they have access to media. For pupils to be successful in solving abstract problems, they must first develop the ability to think methodically about concrete objects and events, as is typical for youngsters at the concrete operational stage.

Based on observations of Grade I elementary school children in the Sukasari area, especially children at SD Sukasari 4, the Mathematics learning activity about "flat shape or two-dimensional figures" is carried out with lectures without media support, because the learning media used is very limited and not varied. In addition, there have been no developments in flat shape learning medium. Thereby, students pay less attention to the mathematics learning process, resulting in low student accomplishment.

As such, it is necessary to have learning media that are in accordance with student development. Therefore, the researcher wants to develop a flat-building learning media based on a miniature house called Bopas Minirum (Disassemble a Miniature House).

2. THEORITICAL REVIEW

2.1. Educational Development

According to Setyosari (2015), educational development is a process in which to develop and validate educational products. Development is a conscious effort to develop educational products such as learning tools, learning methods or learning media.

2.2. Learning Mathematics

According to Sudarwanto & Hadi (2014), learning mathematics is a way of thinking and reasoning that is used to solve various types of problems in everyday life, science, government, and industry. One of the tasks of mathematics is trying to solve problems in real life (Muschla & Muschla, 2009).

2.3. Learning Achievement

Lomu & Widodo (2018) said that learning achievement is an effort of learning activities which are usually expressed in the form of symbols, numbers, letters or sentences that reflect the results achieved by students in a period.

2.4. Characteristics of First Grade Elementary School Students

According to Zulvira et al. (2021), explained that the elementary school age period is divided into two phases, namely the low class and the high class. High grade period in elementary school in grades 4-6. High class students have a high desire to learn, and are realistic, focused on practical daily activities, high curiosity so they need to be given direct experience to learn.

2.5. Learning Media

Nurrita (2018) explained Learning media is a tool that can help the teaching and learning process and serves to clarify the message conveyed, so that learning objectives will be achieved effectively and efficiently.

2.6. Two Dimensional Figure

According to Wulandari (2013), two dimensional figure is a flat shape whose entire shape lies in one plane. This flat shape is a two-dimensional figure that only has length and width and is bounded by straight or curved lines. According to Wahyudi (2014), mentions various plane figure, namely triangles, quadrilaterals (squares, rectangles, parallelograms, rhombuses, kites, trapezoids), and circles.

2.7. Miniature House-Based Flat Building Learning Media

This miniature house-based flat construction learning media is a tool or object in the form of an imitation of a house and its contents and is used in learning 2-dimensional shapes that only have a plane figure and are limited by straight and curved lines, in this case what is meant is the area of the plane figure. This miniature house media can also be called Bopas Minirum, because one of its advantages is media that can be disassembled in its use. Bopas Minirum is disassembling miniature houses.

3. RESEARCH METHODS

This study uses a Research And Development (R&D) research approach. Sugiyono (2015) highlight that research and development is a research method used to produce certain products, and test the effectiveness of these products. The product developed in this research is a miniature house media (Bopas Minirum), which is a three-dimensional media in the form of a miniature house and its contents.

3.1. Development Procedure

Sugiyono (2015) states the steps for implementing Research and Development (R&D) method research by carrying out several stages, namely (1) Potential and problems, (2) Data collection, (3) Product design, (4) Design validation, (5) Design revision, (6) Product trials, (7) Product revisions, (8) Usage trials, (9) Product revisions, and (10) Mass products.

3.2. Trial Subjects

The subjects for this Trial were 1st grade students at SD Sukasari 4, totaling 35 students. The test subjects in this development research are as follows:

- 1) The limited trial consisted of 5 students from 1st grade of A class, namely 3 female students and 2 male students.
- 2) Field trials consisting of a control class, with a total of 16 students from 1st grade of B class and an experimental class consisting of 19 students from 1st grade of A class.

3.3. Trial Design

This study employed an experimental design for its trials (pretest-posttest control group design). An experiment is a trial in which subjects are separated into two groups, one of which serves as a control. The experimental group in this field study was given media exposure as a therapy, while the control group received no such treatment and only

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received pre- and post-test questions. The following depicts the experimental design for a research trial:

a Limited Trial

| | |
|---|---|
| X | O |
|---|---|

b Field Trials

| | | | |
|-------------------|----|---|----|
| Experiment | O1 | x | O2 |
| Control | O3 | | O4 |

Information:

X : Treatment in the form of applying home miniature learning media (Bopas Minirum)

O : Observation/results of implementing miniature house learning media (Bopas Minirum)

O1 and O3 : pretest

O2 and O4 : posttest

This study makes use of both qualitative and quantitative information. Data collection techniques used in this study were interviews, questionnaires, and tests. Interviews with teachers yielded qualitative data, while surveys of professionals in the field, journalists, and students provided quantitative information.

The researchers used student questionnaires, teacher replies, and test sheets with material expert validation sheets and media expert validation sheets to compile their findings. Meanwhile, data analysis techniques were carried out as follows:

1) Test Questions Analysis

After the instrument was compiled, it was then tried out to analyze the validity, reliability, level of difficulty and discriminating power of the questions.

2) Media Quality

Qualitative data were obtained from teacher response interviews, while quantitative data validated material expert scores, media expert validation, student responses, data analysis with reference to value conversion tables adapted from Sunarti (2014). According to Sunarti (2014), Assessment of Benchmark Reference is an assessment that is carried out by comparing the score of a student's test results with a predetermined benchmark. Convert scores into grades with Benchmark Reference Assessment, by calculating the formula \bar{x} and SD as follows:

\bar{x} ideal = 60% x highest possible score

ideal school = $\frac{1}{4}$ of \bar{x} ideal

In this study using a scale of 5 with an A value and the lowest value is E. The following is the calculation in the following table.

Table 1. Guidelines for Evaluating Media Expert Validation Results

| Formula | Calculation | Results | Intervals | Mark |
|-----------|-------------------|---------|--------------|------|
| +1.50SD | 51+1.50 (12.75) | 70,125 | >70,13 | A |
| + 0.50SD | 51+ 0.50 (12.75) | 57,375 | 57.38- 70.12 | B |
| - 0.50 SD | 51 - 0.50 (12.75) | 44,625 | 44.63- 57.37 | C |
| - 1.50 SD | 51 - 1.50 (12.75) | 31,875 | 31.88- 44.62 | D |
| | | | <31.87 | E |

Table 2. Guidelines for Evaluating the Results of Material Expert Validation

| Formula | Calculation | Results | Intervals | Mark |
|-----------|-----------------|---------|--------------|------|
| +1.50SD | 108+1.50 (27) | 148.5 | >148.5 | A |
| + 0.50SD | 108+ 0.50 (27) | 121.5 | 121.5- 148.4 | B |
| - 0.50 SD | 108 - 0.50 (27) | 94.5 | 94.5- 121.4 | C |
| - 1.50 SD | 108 - 1.50 (27) | 67.5 | 67.5- 94.4 | D |
| | | | <67.4 | E |

Table 3. Assessment Guidelines According to Student Responses

| Formula | Calculation | Results | intervals | Mark |
|-----------|-----------------|---------|--------------|------|
| +1.50SD | 30+1.50 (7.5) | 41.25 | >41.25 | A |
| + 0.50SD | 30+ 0.50 (7.5) | 33.75 | 33.75- 41.24 | B |
| - 0.50 SD | 30 - 0.50 (7.5) | 26,25 | 26.25- 33.74 | C |
| - 1.50 SD | 30 - 1.50 (7.5) | 18.75 | 18.75- 26.24 | D |
| | | | <18.74 | E |

3) Media Effectiveness

The analysis prerequisite tests carried out in this study were normality and homogeneity tests. Furthermore, to determine the effectiveness of the media using the t test for independent samples. This t-test was conducted to find out whether there were differences in results between the experimental class and the control class after learning activities were carried out (Sunarti, 2014).

4) Achievement Development

To find out the increase in achievement, the N-gain test was carried out according to Hake in Lukman & Ishartiwi (2014) with the following formula:

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$$g = \frac{S_{pos} - S_{pre}}{S_{maks} - S_{pre}}$$

Information:

S post : Average Posttest Score

S pre : Average Pretest Score

S max : Maximum Score

Interpretation into the following Gain value classification table: (Hake, (1998) in(Lukman & Ishartiwi, 2014))

Table 4. Gain Value Interpretation

| Value (g) | Classification |
|----------------------------------|----------------|
| $(N\text{-gain}) \geq 0.7$ | High |
| $0.7 > (N\text{-gain}) \geq 0.3$ | Moderate |
| $(N\text{-gain}) < 0.3$ | Low |

4. RESULTS AND DISCUSSION

4.1. Media Development

Sugiyono (2017) provides a detailed outline of the R&D process from identifying opportunities and obstacles to designing, validating, and iterating on a product before putting it into mass production. These stages were followed to conduct this study. After going through these steps, a miniature home learning media product is produced. This learning media contains math material for 1st grade students in 1st semester, namely Area of plane figure.



Figure 1. Miniature House (Bopas Minirum)

In miniature house media (Bopas Minirum) it is divided into 4 rooms, namely:



Figure 2. Living Room with Pink Color Code



Figure 3. Main Room with Purple Color Code



Figure 4. Rooms with Blue Color Code



Figure 5. Kitchen Room with Yellow Color Code

4.2. Quality of Media Development

The overall score given by the subject matter expert to the instructor who mastered the content was 143. Based on the interviews with teachers of the 1st grade, it was revealed that the miniature house media developed was beneficial to student learning, sparked greater interest and curiosity in the subject matter, allowed for more student-driven exploration of the material, was simple for students to implement, and ultimately led to higher achievement. In order to maximize the educational potential of the miniature house scale model.

Based on the results of material expert validation data, media expert validation, student responses, teacher responses indicate that this miniature house media has good criteria so that it is suitable for use in learning with flat build material for 1st grade students.

4.2.1. Media Effectiveness

Based on the t test on the posttest value, t-statistic (6.905) is greater than t-table (2.305), indicating that there is a difference between the control class and the experimental class. It can be concluded that the miniature house media (Bopas Minirum) is effectively used in learning.

4.2.2. Achievement Development

Based on the N-gain analysis in the control class of 0.27 with low criteria, while in the experimental class an N-gain value of 0.70 with high criteria was obtained. It can be concluded that the class that was given treatment in the form of using miniature house media (Bopas Minirum) experienced a high increase in achievement compared to the class that did not use media.

5. CONCLUSION

Conclusions that can be drawn from the results of the research and discussion described above are:

- 1) The development of this Miniature House is in accordance with development research steps according to Sugiyono (2015) including 1) potential and problems, 2) data collection, 3) product design, 4) design validation, 5) design revision, 6) product trials, 7) product revisions, 8) usage trials, 9) product revisions and 10) mass production.
- 2) Based on the validation of material experts, media experts, student responses and teacher responses to the quality of the media is good to use. From the validation of the material experts, the total score is 143 with an average of 4.05 and good criteria, and based on the validation of media experts, the total score gets a score of 67 because the media expert's score is in the range of 57.38-70.12, which is good criteria. Based on filling out the student questionnaire in the limited trial by 5 students, they received an overall score of 225 with an average of 45, because the media expert's score was in the range > 41.25 , which is very good criteria. Meanwhile, the total score for completing the student questionnaire in the field trial by 19 students received an overall score of 830 with an average of 43.68, because the media expert's score was in the range > 41.25 , which is very good. Based on student responses during the limited trial held in 1st grade of A class in SD Sukasari 4, the total response score obtained was 225, with an average of 45 and very good criteria, and based on student responses during the field trial conducted in 1st grade of A class in SD Sukasari 4 with all students, the total response score obtained was 830 with an average of 43.68 and very good criteria. Meanwhile, the results of the limited test and field test, as reported by teachers, indicate that the miniature house media (Bopas Minirum) developed aids students in learning, boosts student motivation and curiosity, gives students opportunities for independent learning, is simple to use, and has a positive impact on students by increasing their academic success. In order that this dollhouse-sized medium of education be put to good use. Given these findings, it seems reasonable to conclude that the miniature house learning media (Bopas Minirum) developed to be used in 1st grade students in the Elementary School, especially in Mathematics learning is both acceptable and appropriate.
- 3) The use of miniature house media in learning mathematics has proven to be effective. The effectiveness of the media based on the results of the t test, t count (6.905) is greater than t table (2.305), indicating that there is a difference between the control class and the experimental class. Hence, it can be said that miniature house learning media (Bopas Minirum) is effectively used in learning Mathematics

in 1st grade students on the area of flat shapes because it can improve student achievement.

- 4) This miniature house media (Bopas Minirum) can improve student achievement. Based on the N-gain analysis, the N-gain value in the control class was 0.27 with low criteria, while in the experimental class it was obtained an N-gain value of 0.70 with high criteria. It can be concluded that the class that was given the treatment in the form of using miniature house media experienced a high increase in achievement compared to the class that did not use the media.

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