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Research Article

DEVELOPMENT OF MATHEMATICS LEARNING MEDIA THROUGH THE UTILIZATION OF USED GOODS FOR STUDENTS OF MA'ARIF SUNGEGENENG ISLAMIC ELEMENTARY SCHOOL

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Abstract
This study aims to develop learning media for Mathematics (Spatial Shapes) using used goods for fifth-grade students at Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. This study uses a Research and Development (R&D) method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Samples were taken from fifth-grade students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. The results from material experts showed a feasibility of 91,28% and were rated "very valid", and validation from media experts showed a feasibility of 93,62% and was rated "very valid". Meanwhile, validation by user teachers showed a feasibility of 98,3% without revision, which indicates that the learning media for spatial structures from used goods is very suitable for use. Meanwhile. The results of student responses in small group trials obtained a value of 93,81% and stated "very practical," and large group trials obtained a value of 97,89% and stated "very practical".

Keywords: Learning Media, Mathematics, Used Goods

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INTRODUCTION

Waste is a complex problem in human life, both in cities and villages. Based on field observations, there will be 34,616,950.82 tons of waste generated annually in 319 regencies/cities across Indonesia by 2024 (Kementerian Lingkungan Hidup, 2025). Waste is a byproduct of human life, so a clean residential environment where people live and work, and health, will depend on properly managed waste. processing and transformation. An example of this potential is the processing of used goods such as cardboard, plastic bottles, or used fabric into economically valuable products such as handicrafts, toys, or home decorations. This integration of used goods will help reduce the amount of waste disposed of and create additional income (Herawati et al., 2024).

Besides being economically valuable, used goods can also be used as learning media for students. Recycling used goods is the activity of managing used and unused items to create new products. Recycling used goods helps prevent environmental pollution, reduce waste, and foster creative thinking. Recycling used goods fosters a sense of care in children about waste that is no longer used, which is polluting, filthy, and causes discomfort and disease (Lisa Dwi Afri et al., 2024).

Every teacher is certainly aware of materials that can be used as learning media, and this can make it easier for students to understand these materials to make crafts as materials for P5 learning. Increasing student creativity in P5 classes has a positive impact on their personal growth and prepares them for the complex world of work. The use of used materials as teaching aids fosters student creativity and innovation, helping to strengthen a dynamic learning environment (Mufidah et al., 2025).

The creativity of fifth-grade teachers in science learning is combining ideas and knowledge through the use of used goods as learning media, which can be seen from the students' learning process in science subjects, namely that students find it easier to understand the material presented (Rahman, 2024). A study of used-material-based learning media at Lura 110 Public Elementary School in Pancasila Education using spinner media demonstrated high student enthusiasm and the potential to stimulate and enhance motivation in learning activities. The use of used materials is beneficial for creative and active learning (Syam et al., 2025).

Using learning media made from recycled materials can limit learning time, minimize costs, enhance student creativity, and make learning more engaging and challenging. However, using learning media made from recycled materials requires a long learning period, requires diverse learning styles, and can be difficult to adapt to the desired conditions. Therefore, recycled materials are considered quite effective for use in mathematics learning (Rizko et al., 2023). Mathematics is a subject taught at all levels of education, used in everyday life, and in other disciplines. Mathematics serves to develop the ability to communicate ideas in language through mathematical models (Maftuhah, 2023).

Conceptual and structural development must be ongoing because mathematics is a compulsory subject in elementary school. Children must understand basic mathematical concepts in elementary school so they can understand the mathematics and other sciences they will study at higher levels of education (Yulianti, 2024). Mathematics is a fundamental subject that plays a crucial role in developing logical, analytical, and systematic thinking, starting in elementary school. However, many elementary school students still struggle to understand mathematical concepts deeply, which impacts and influences academic achievement. Motivation for mathematics learning is a crucial aspect and key to success in mathematics learning (Novita Barokah & Umi Mahmudah, 2025).

Research on the Development of Primary Media (Mathematical Snakes and Ladders) in Solving Mathematical Problems on the Area and Perimeter of Flat Shapes for Grade III of Pungangan 1 Public Elementary School produced a mathematical snakes and ladders media that is suitable and valid for use in mathematics learning in mathematical problem solving on the area and perimeter of flat shapes for Grade III of the elementary school (Atmoko et al., 2017).

The use of used goods as learning media makes the classroom situation lively, because this media attracts students' interest and attention, especially if they are directly involved in creating and making their own learning media, and forms an understanding of spatial geometry material and making their own learning media (Ratna Dewi Purwati et al., 2023).

Research on the use of used materials as media in mathematics learning on spatial geometry material can increase the creative thinking and creative attitudes of third-grade students at Sibreh Elementary School (Hudia & Suryawati, 2024). The development of Mathematics learning media for fraction material carried out at SDN II 1 Pucanganak, Trenggalek Regency, was assessed as valid, effective, and practical to use, and helped students understand the material and increased their motivation to learn it (Rahmadyanti et al., 2025).

The results of research on the Development of Counting Box Media in Mathematics Learning on Addition and Subtraction Materials show that Counting Box Media helps students understand basic mathematical concepts, especially addition and subtraction operations. This media also has the ability to increase student interest in the lesson through a visual approach and direct practice, which makes learning more interactive and enjoyable. Thus, this media not only improves students' understanding of the subject but also encourages them to participate more actively in the learning process (Astuti & Aryani, 2025).

Based on the description above, the researcher focuses on three variables, namely the development of learning media, learning Mathematics on the subject of Spatial Buildings, and the utilization of used goods. In this study, researchers want to develop learning media for Mathematics on the subject of Spatial Buildings by utilizing the use of used goods, especially for grade 1 students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. So researchers try to research "Development of Learning Media for Mathematics (Spatial Building Materials) through the Utilization of Used Goods for Students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School".

RESEARCH METHOD

The research was conducted using research and development methods (Research and Development) using the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The academic world currently utilizes extensive Research and Development (R&D) to design and test product effectiveness. This method aims to produce products through the process of identifying potential problems, creating designs, and developing the best products (Waruwu, 2024).

Research and Development (R&D) Method is the process or steps involved in creating new products or improving existing ones. R&D serves as a bridge between basic and applied research (Okpatrioka, 2023). Research and Development (R&D) is an effective strategy for improving practice through systematic research. R&D involves processes aimed at developing new products or improving existing ones, which can be applied to both hardware and software. R&D can encompass a variety of devices, including books, modules, media, and classroom or laboratory aids. In the case of software, R&D includes data processing programs, classroom instruction, library or laboratory systems, educational models, teaching methodologies, guides, evaluation, and management (Novianti & Wulansuci, 2024).

R&D research conducted using the ADDIE model is a simple and easy-to-understand research and development method. This model consists of five interrelated components, where each stage, from the first to the fifth, must be implemented systematically and not randomly. The ADDIE approach is simpler than other design models, and its structured and systematic nature makes it easy to understand and apply, making it highly relevant in the development of learning media (Firda, 2023).

The following is the concept of the ADDIE stages found in Figure 1.

Figure 1. ADDIE Model R&D Research Flow

The development stages of the ADDIE model are explained as follows.

1. Analysis

During the analysis phase, the environmental conditions in the fourth grade of MI Ma'arif Sungegeneng Sekaran Lamongan were assessed through observation and interviews. The purpose of this analysis was to identify the needs of teachers and students in the learning process. Additionally, students were encouraged to collect used items such as plastic bottles, cardboard, straws, cups, and other cardboard.

2. Design

Based on the analysis results from the previous stage, the design phase was used to design the product (a spatial model of the media). In this study, the core competencies, core competencies, and frameworks, in accordance with the Merdeka curriculum, were used to develop learning media through the use of used materials.

3. Development

In the development stage, the spatial media design is transformed into a tool ready for trial and testing by students. After the design has been validated by experts, the instrument development and validation process begins. Lecturers from the PGMI study program, who are experts in media, will validate the instruments in this study.

4. Implementation

Researchers conducted a limited trial of spatial media on fifth-grade students to determine student responses and learning activities in the form of pretests and posttests, and conducted observations using learning activity observation sheets.

5. Evaluation

The results of the limited trial were used to assess the feasibility of the spatial media. The assessment was conducted by examining the quality of the product instrument before and after the trial. If any issues with the spatial media were identified, the researchers made improvements based on the suggestions and input from the validator.

This research aims to develop a product for developing learning media using materials on the subject of spatial geometry for fifth-grade students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School to support teaching and learning activities. Every student certainly has different abilities. Students who have a high curiosity will be facilitated by the existence of this learning media, and the students will become more proficient in the learning process. However, if students have low curiosity, they will always find it difficult to learn anything, including the material on spatial geometry. So this learning media will help these students learn in an easier way.

So in this research was conducted using the R&D method, with the research subjects being 24 fifth-grade students, 1 fifth-grade teacher, and the Principal of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. A preliminary study was conducted at Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School to collect initial data on the use of media from fifth-grade students and teachers. Student and teacher needs analysis questionnaires, media and material validation sheets, and evaluation test sheets were used as

data collection methods. Qualitative and quantitative descriptive analysis are two data analysis methods used in this development research.

RESULTS AND DISCUSSION

In the ADDIE model, data analysis techniques consist of five stages, including analysis, design, development, implementation, and evaluation. In the analysis stage, needs analysis is carried out, which is obtained through observations of field conditions (fifth-grade Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School), where several aspects are analyzed, namely the school environment, teachers, students, and the education system. Researchers conducted interviews with Mathematics teachers at Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School to determine environmental conditions. The results of the interviews showed that students had difficulty understanding Mathematics material. This was due to several reasons, one of which was the minimal use of appropriate learning media.

Therefore, in this case, learning media are needed that are appropriate to student characteristics, engaging, and support a more enjoyable learning process. As explained by (Maftuhah & Al Sana, 2024) learning media are resources that can be used to achieve learning objectives and assist teachers in delivering material, enhancing student creativity, and increasing student attention.

Learning media can not only increase students' desire to learn but also improve their learning outcomes. Learning media will facilitate teacher-student interaction and enhance the learning process by aligning learning with children's learning habits. Therefore, this type of learning functions gradually and aligns modern progress with the needs of today's millennial students (Sihombing et al., 2024). Furthermore, according to (Fitri, 2023)Mathematics learning media using images, puzzles, games, videos, and teaching aids are very effective in mathematics learning, preventing students from getting bored and making the material easier to understand.

In the design stage, researchers began creating geometric structures from used materials. These structures can be assembled and disassembled, labeled (ribs, sides, corners), and colored to attract attention. The geometric structures created include:

1. Cubes from snack boxes.
2. Blocks from toothpaste boxes.
3. Tubes from used plastic bottles.
4. Cones made from used cardboard and glass lids.
5. Triangular prism made from cardboard.

The use of used goods is also carried out by (Mumpuni et al., 2022), who stated that used media are learning tools derived from making something left over or no longer used. Items such as cardboard, drink bottles, bicycle tires, milk cans, and other materials can be transformed into learning media according to the required materials. According to (Agustina et al., 2019) the use of used goods as learning media can improve children's fine motor skills, including the skills of closing, holding, and arranging eyes and hands.

The next stage is the development stage, which must involve the creation of a real product based on the design that has been designed. In addition, the researcher must also prepare evaluation instruments. The product is then validated by material experts, media experts, and users. Validation by material experts and media experts was carried out by PGMI lecturers, and user validation was carried out by a Grade V Teacher of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. Validation carried out by material experts showed a feasibility of 91.28% and was declared "very valid" with suggestions for improving the definition and explanation of the edge labels on the cube. Validation by media experts showed a feasibility of 93.62% and was declared "very valid" with input on the display of each

geometric shape to be colored so that it looks more attractive. Meanwhile, validation by user teachers showed a feasibility of 98.3% without any revisions, which indicates that the learning media for geometric shapes from used goods is very suitable for use.

In the development stage, researchers create learning media according to a previously established plan (Andi Rustandi & Rismayanti, 2021). Furthermore, this is supported by research (Firda, 2023), which states that the development stage is the stage of realizing the assessment instrument design that has been designed and is ready to be tested on students. Instrument development and validation are carried out once the design has been validated by the validator and is ready for testing.

The implementation stage was carried out to test the learning media product of spatial geometry from used materials on all fifth-grade students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School. According to (Arikunto, 2014)Small group trials involve 4–14 students, while field trials or large groups involve 15–50 students. So in this implementation stage, small group trials were carried out by 5 students, and field trials were carried out by all fifth-grade students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elementary School, totaling 24 students. The results of student learning tests were obtained through pretests and posttests. The pretest was carried out to determine students' initial abilities before being given learning media of spatial geometry from the used materials. While the posttest was carried out using learning media of spatial geometry from the used materials. The results of student responses in the small group and large group trials are shown in Table 1 below.

Table 1. Student Response Results

Stage	Percentage	Criteria
Small group trials	93,81%	Very practical
Field trials	97,89%	Very practical

Based on the table above, the percentage of student responses in the small group trial of learning media on spatial shapes made from used materials was 93.81% with the criteria of "very practical". This result is directly proportional to the student response in the field trial of learning media on spatial shapes made from used materials, namely 97.89% with the criteria of "very practical".

These results are supported by research (Andi Rustandi & Rismayanti, 2021) which stated that the feasibility assessment by media experts was 90% "very feasible." Meanwhile, the material experts, covering aspects of material relevance, evaluation, effects on learning strategies, and language, were declared "very feasible" with a feasibility percentage of 91%.

The results of the student learning test for the effectiveness test before and after using learning media for spatial shapes from the used materials were obtained based on the average pretest and posttest scores. The comparison of the average pretest and posttest scores is presented in graphical form and is shown in Figure 1.

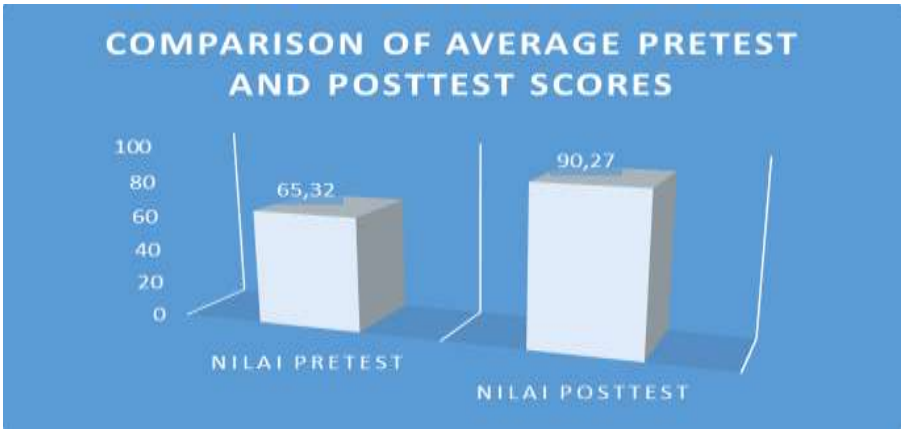

Figure 1. Comparison of Average Pretest and Posttest Scores

Based on the figure above, the average pretest score was 65.32% and the average posttest score was 90.27%. The posttest scores were obtained after learning using spatial learning media made from used materials.

The final stage of this research is evaluation. The evaluation stage is obtained from the results of student responses after being tested using learning media for spatial shapes made from used goods. At this stage, students also received a formative test of 10 multiple-choice questions as an evaluation of the guidance using learning media for spatial shapes made from used goods. The test was given with the aim of determining student learning outcomes and to determine the effectiveness of the media being developed. So that at the evaluation stage, the results of small group trials of learning media for spatial shapes made from used goods were 93.81% and field trials of learning media for spatial shapes made from used goods were 97.89%. In addition, the results of achieving the effectiveness of learning media for spatial shapes made from used goods were obtained from the students' pretest and posttest scores. The average percentage of students' pretest scores was 65.32% and the average percentage of students' posttest scores for learning media for spatial shapes made from used goods was 90.27%.

In a study (Rosmiati, 2019), it was explained that the evaluation stage of Interactive Animation as an English Language Learning Medium was conducted through calculating data from questionnaires. Based on the questionnaire results, it can be said that children can use the animation easily, and children are more interested in learning English, and it can be used as a learning aid for boring learning.

CONCLUSION

Development of Mathematics learning media with the material of Spatial Building through the utilization of used goods for fifth grade students of Ma'arif Sungegeneng Sekaran Lamongan Islamic Elemantary School using the ADDIE model R&D method. The validation results from material experts showed a feasibility of 91.28% and were declared "very valid" and the validation of media experts showed a feasibility of 93.62% and were declared "very valid". Meanwhile, validation by user teachers showed a feasibility of 98.3% without any revisions, which indicates that the learning media for spatial building from used goods is very suitable for use.

Meanwhile, the results of student responses in the small group trial obtained a score of 93.81% and were declared "very practical" and the large group trial obtained a score of 97.89% and were declared "very practical". However, there were several inputs and several revisions including suggestions for improving the definition and explanation of the edge labels on the cube geometric shape and the appearance of each geometric shape to be given color so that it looks more attractive.

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