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Development of Perdalstic Media on Multiplication Material Class III At Elementary School

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ABSTRACT

The development of this research was motivated by the problems that were obtained by the lack of variety of learning media in the field of mathematics lessons in class III, especially in multiplication, students only did a sketch using paper to find the results of multiplication problems, but students' interest in discussing multiplication in the field of mathematics lessons in class III SD can be said interest, it's just that there hasn't been any learning media creation. This research aims to Develop a mathematics learning media in the form of perdalstik (multiplication in sticks) to enhance students' learning experiences in discussing multiplication for class III SDN Gunung Picung 08 Bogor Regency. In the development of Perdalstic learning media research on multiplication material for class III at SDN Gunung Picung 08, researchers used a development approach or what is known as Research and Development (R&D) with a research model that is obtaining products that are needs analysis, with the ADDIE model but only up to the development stage, it is necessary to study learning media, namely Perdalstik (multiplication in sticks) which aims to foster the learning experience of third-grade elementary school students. The research assessment was conducted with 2 experts, namely the media and material validators. The perdalstic media (multiplication in sticks) gets a score of (1) from media experts getting a score of 100% (2) and material experts getting a score of 100%. So it proves from the two assessments that the learning media is considered to be in the "very relevant" category with an average score of 100% with the result that the learning media is able to be applied in the field without improvement.

Keywords: *learning media, perdalstic, multiplication*

INTRODUCTION

Elementary school or elementary school is a body set up by the government that organizes education for six years officially from grade one to grade six. Elementary school or elementary school as the official educational body for the continuation of the nation is structured based on the nation's behavior and culture, then determined by the syllabus. It is from the syllabus that the educational cycle runs and is carried out. From practice, basic education is delivered to students through various subject areas that need to be understood. The subject areas include religious education, civics education, Indonesian language education, natural sciences, social sciences, arithmetic, physical education and the ability to work on culture, as well as subject areas that contain regional elements adapted to the place where the official education is carried out.

Arithmetic is a science that plays an essential role in the field of biology. The state of the role of arithmetic reinforces all the viewpoints of life that are developing so rapidly in this universe. The pace of financial, technological and industrial is not far from existing arithmetic interventions. Arithmetic is delivered from elementary school to university, given the role of mathematics.

Learning arithmetic must be able to convert students' opinions of arithmetic which are not always limited to counting numbers. Elementary school students think that arithmetic as a field of study in general is quite difficult (Siregar, 2017).

The problem of learning difficulties is a common problem that can arise during learning activities. In this case, learning difficulties can be interpreted as students' difficulties in obtaining or participating in learning activities at school. This difficulty can be influenced by several problems. The existing problems are based on the results of an analysis of the needs of teachers and students by interviewing third-grade teachers and a number of students in class III SDN Gunung Picung 08 which shows that there is a lack of learning media in grade 3 mathematics, especially in multiplication material. Students only do a doodle using paper to find the results of the multiplication problem. Students' interest in mathematics can be said to be very interesting because it can be seen from the level of students' preference for mathematics, but there is no development of learning methods that refer to students and learning media that can support learning activities, especially in multiplication material.

According to Piaget, grade III students enter the concrete operational stage with a vulnerability of 7-11 years old (Lestari et al., 2019; Sali et al., 2022). At this level, children are able to apply logical speculation and practice, but only to physical targets that are directly there. At this level, children experience a loss of tendencies toward trust and imitation. His selfishness decreased and his efforts towards conservation obligations grew better (Ibda, 2015). At this level, visible efforts are efforts in the thought process of reasoning, even though they are bound by real goals. At the age of speed, elementary school students are cognitively still attached to real objects that can be felt through the senses of physiology. In mathematics learning that doesn't exist, students need intermediaries in the form of media and real intermediaries who are able to explain what the teacher can convey and students understand more quickly.

The word media comes from the Latin which is the plural form of medium. Literally means an introduction or intermediary (Hutauruk et al., 2022; Lestari, Siskandar, et al., 2020). Media is anything that can be used to convey information to recipients from senders, then able to develop students' attention, thoughts, interests and feelings so that learning activities take place well (Ramli, 2012).

Learning Media is an intermediary or means needed by teachers to convey information or knowledge to students, so that students can understand and master the concept easily (Hutauruk et al., 2022). Learning media is something that acts as an intermediary for knowledge or information conveyed by the teacher to students which aims to stimulate students so that the direction of teaching is conveyed (Lestari et al., 2022; Wandira et al., 2023).

Overall, learning media has a function, including supporting teachers to overcome gaps and shortcomings in teaching, in understanding the material and learning methods. Learning media helps students to further enhance the quality of understanding in learning elements, and is able to further accelerate the quality of learning digestion of the material being studied, and supports the strength of the quality of learning memory. The nature of learning media has a more persistent stimulus quality. Learning media can also improve learning (Lestari, Setiawan, et al., 2020; Yulianti et al., 2022). If the application of learning does not get the coveted value commensurate with the minimum effort, as a result it is the teacher's obligation to repeat the teaching. So the

media is able to support the acquisition of the value obtained, the specified media must be further improved in quality and quantity (Ramli, 2012).

So from the discussion above the researcher wants to foster students' learning experiences in the field of mathematics lessons contained in multiplication material so that students can understand the multiplication concept easily. According to researchers in this problem, the media that is suitable in the learning process is media that is interactive. Interactive media is media that can manifest active action or interaction between students and the media used (Jessica Michaela Mintorogo, 2014).

Researchers want to develop interactive media in the form of multiplication stick boxes, that's why it is called "Perdalstick (Multiplication In Sticks)" to make it easier for students to learn multiplication form material in elementary schools. The concept of perdalstic media is inspired by the multiplication by fence method. In Pekalian Pagar, children are able to calculate multiplication quickly, without having to count cross-sections. This media aims to make multiplication operations more concrete with real media.

Perdalstik is a box-shaped multiplication learning media containing 36 sticks. Each part is solved in 9 sticks on each side. In fact, this perdalstic media is exactly the mathematical intermediary tool that is commonly used by the general public, for example the abacus, but if the abacus requires a coin to operate it, while this perdalstic requires a stick to operate it. The procedure for using perdalstik media is very easy, just shift the stick according to the number that is calculated to get the multiplication value. Compared to the Perdalstik media abacus, its calculations are more effective and simpler to use. If the abacus requires several techniques, this Perdalstik only requires one technique, namely shifting the sticks of the two parts according to the desired amount. Perdalstik media is also very simple and effective because it is formed from cardboard and ice cream sticks which are lightweight so they are easy to use anywhere. Given the usefulness and practicality of this media, the researcher wishes to carry out the development of research on the title "Development of Perdalstic Media on Class III Multiplication Materials at SDN Gunung Picung 08".

In previous studies, this stick-based learning media was called the Multiplication Stick Box. The results of the Multiplication Stick Box study can foster student learning experiences, but in this product the way of making learning media designs explains a lot about the shape and size, but there is no detailed explanation of the manufacturing mechanism. So the development of learning media carried out by researchers is focused on student learning experiences with problem-based questions.

Based on the results of the analysis of the literature on the implementation of learning plans, basic competencies and core competencies. In this study there are differences in basic competence. These differences are due to differences in the use of teaching materials used. In learning at Gunung Picung 08 Elementary School, teaching materials were used, namely thematic books, while in previous studies using teaching materials for mathematics books were separate. The novelty lies in the questions presented, namely in the learning process students are asked to solve problems in a problem (case study) whose results can be operated in the form of multiplication. Curriculum differences are not an inhibiting factor for this Perdalstic medium to be used. So Perdalstik can be used in the 2013 curriculum.

METHOD

The development of Perdalstic learning media research on multiplication material for class III at SDN Gunung Picung 08, the researchers used a development approach, known as Research and Development (R&D). R&D is a process needed to validate and develop products needed in the educational realm. The products created include training capital for teachers, teaching materials, learning media, questions, and management systems in the learning process (Hanafi, 2017). The development of perdalstic media research refers to the ADDIE research model (Analysis, Design, Development, Implementation, and Evaluation) but only up to the development stage. ADDIE is a teaching design system that is based on single learning, has direct stages and long boundaries, is structured, and applies a structured approach to human learning and knowledge (Hidayat Fitria & Nizar, n.d.). This ADDIE model has steps, including: 1) Analysis (Analysis). This level of analysis leads to the introduction of the probabilities of the causes of a learning performance gap. 2). Design (Design). The level of this design is to confirm the desire in learning activities and the right way. 3). Development. The Development level is aimed at creating and validating the selected product. 4). Implementation (Implementation). The Implementation Level is intended for teachers to prepare learning places and students to be involved in learning activities. 5). Evaluation (Evaluation). This evaluation level is aimed at assessing product quality and the process of teaching activities (Soesana et al., 2023).

The development of perdalstic research was carried out in class III at SDN Gunung Picung 08 Pamijahan, Bogor Regency. The student sample ranges from 36 people involving 13 female students and 26 students with a 2-day research period. The development of this research was carried out only at the development stage, where it was hoped that mathematical media should be used in learning activities to enhance the learning experience of the subject matter of multiplication arithmetic.

The method of data accumulation was carried out in the development of this research by: 1) Document study 2) Field study 3) Validation. The method of accumulating data for the development of perdalstic research is to present all the comments and suggestions of the evaluator that appear in the attached notes. In the analysis stage of the development of this research using document studies and field studies. At the document study stage by analyzing dilabus and Learning Implementation Plans (RPP). At the field study stage, data was collected by direct interviews with teachers who held class III and a number of class III students at Gunung Picung 08 Elementary School. Meanwhile, at the development stage, data was collected using validation using 2 validators including media experts and material experts. The accumulated data from the validation has 5 levels of criteria and is then reviewed by scoring the overall percentage of the two validation results. The score parameters applied in this validation to produce an assessment of Perdalstik material and media are: (1) Not relevant, (2) Not relevant, (3) Quite relevant, (4) Relevant, (5) Very relevant.

Meanwhile, to find out the results of the scoring percentage for the assessment, apply the percentage calculation formula, namely:

$$P = \frac{f}{N} \times 100\%$$

Information:
P = Validation percentage
f = Frequency of scores obtained on aspects assessed
N = Number of highest scorers

The results of the percentage of scoring against the assessment then calculated the average score of the entire validation sample subject which was converted into measurement affirmations to ensure the suitability of the material against the quality of the perdalstic developed based on the validation results. The feasibility parameters for multiplication material and perdalstic media are as follows:

Table 1. Perdalstic Media Feasibility Assessment

No	Validity Category	Level of Validity
1	81,0%–100,0%	Very relevant, can be used without revision
2	61,0%–80,9%	Quite relevant, can be used but needs revision
3	41,0%–60,9%	Less relevant, it is recommended not to use it because it needs major revisions
4	21,0%–40,9%	Irrelevant, should not be used

RESULT AND DISCUSSION

Research development was carried out by researchers by applying the Research and Development (R&D) method. The product to be developed is Perdalstik as a tool for arithmetic subjects in grade III elementary schools, especially in multiplication material. Regarding the results of research development seen from the results of the validity of both media validation and material validation. The presentation of the results of this perdalstic product uses the ADDIE model but only for the development level. The presentation stage starts with analysis, design, and development. These stages will be described in the explanation below:

Analysis

At the analysis level, the development of perdalstic research uses needs analysis and document analysis. Needs analysis includes the needs of teachers and student's needs, while the document analysis uses syllabus documents and Learning Implementation Plans (RPP). As for what was obtained from the analysis of teacher and student needs by interviewing teachers who held class III and a number of students in class III SDN Gunung Picung 08 showed that there was a lack of learning media in class III mathematics, especially in multiplication material. Students only do a doodle using paper to find the results of the multiplication problem. Students' interest in mathematics can be said to be very interesting because it can be seen from the level of students' preference for mathematics, but there is no development of learning methods that refer to students

and media that can support learning activities, especially in multiplication material. While the results of the analysis of Syllabus documents, Learning Implementation Plans (RPP), Core Competencies (KI) and Basic Competencies (KD). In the learning process students are asked to solve problems in a problem (case study) whose results can be operated in the form of multiplication. So the results of the needs analysis and document analysis show that Perdalstik media can support the process of learning activities between teachers and students in Multiplication material.

Design

The design stage is the stage of clarifying the material to be developed in the form of learning media. Based on the analysis of product needs that are applied in learning activities the multiplication material is less varied, therefore the development of this research takes multiplication material. The clarity of the specified material to be developed is multiplication material on commutative properties. Multiplication on the commutative properties of class III Elementary School based on KD (Basic Competence) 3.1 Explaining the properties of arithmetic operations on whole numbers. 4. 1 Solving problems that involve using the properties of arithmetic operations on whole numbers.

The researcher wants to foster students' learning experiences on multiplication material that applies an interactive three-dimensional media. This statement is intended so that students can easily apply their understanding of multiplication techniques with crosses. Therefore, in developing this research, designing multiplication-based media with cross lines. The product in question is a product whose application represents a multiplication method. In this product, the picture is like multiplying with the cross line, namely applying a line that divides the 4 sides and crosses each other. From this statement the development of this research developed a product in the form of a beam design which was doubled by sticks in each part, then it could be shifted. Regarding the product design in question are:

Figure 1. Perdalstik Media

Development

At the development level, it is done by creating multiplication with crosses as a three-dimensional learning medium. This level of development is carried out after the level of analysis (Analysis) and the level of design (Design) is carried out. At the level of analysis, problems have been found in the field that there is a lack of learning tools in grade 3 mathematics, especially in multiplication material. Students only do a doodle using paper to find the results of the multiplication problem. Students' interest in mathematics can be said to be very interesting because it can be seen from the level of students' preference for mathematics, but there is no development of learning methods that refer to students and learning media that can support learning activities, especially in multiplication material. Then at the design level, the researcher determines the multiplication material on the commutative property.

This development stage begins with making the multiplication method with crosses which is transformed into a three-dimensional learning media that will be used in multiplication discussions in class III SD. At the perdalstic development level, there are two stages of developing learning products in the form of perdalstic in the discussion of multiplication. The first is the creation of a perdalstic learning media design. Second, the results of the design are developed in actual form with predetermined materials and sizes. The specifications and steps for making the resulting perdalstic learning media products are as follows: (1) Make blocks of cardboard with a length of 25 cm x 25 cm with a height of 5 cm and then cover them with white HVS paper (2) Cover the cardboard blocks with sticks ice cream wood using glue (3) The block is perforated with a hole up and down. Butlah the top holes on the 2 beams. And in the lower hole on 2 beams. (4) Join the four blocks using glue so that they are square (5) Prepare wooden sticks with a height of 20 cm each (6) Join the two wooden sticks with a height of 25 cm using glue. Do the same way to make up to 36 sticks. (7) Coat using blue and yellow HVS. 16 sticks of yellow and 16 sticks of blue. Yellow for tens and blue for units. (8) Put the stick in the hole in the beam. Each hole contains 9 sticks, both blue and yellow sticks. The upper hole consists of 9 yellow sticks and 9 blue sticks, as well as the bottom hole consisting of 9 yellow sticks and 9 blue sticks.

Figure 2 . Beam Design

Figure 3. Inner Hole Beam

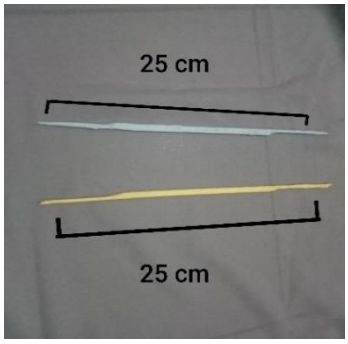


Figure 4. Stick **Figure 5. Perdalstic Media**

The way to use perdalstic learning media in multiplication material is as follows:
1. Students choose a stick equal to the number to be multiplied.
2. Aim the stick that will be found either vertically or horizontally multiplied.
3. So you want to see the crossing of the stick. This cross will be generated as the value of the multiplication number.

Figure 6. Example 4x4 =8

Figure 7. Example 21x21=400+40+1=441

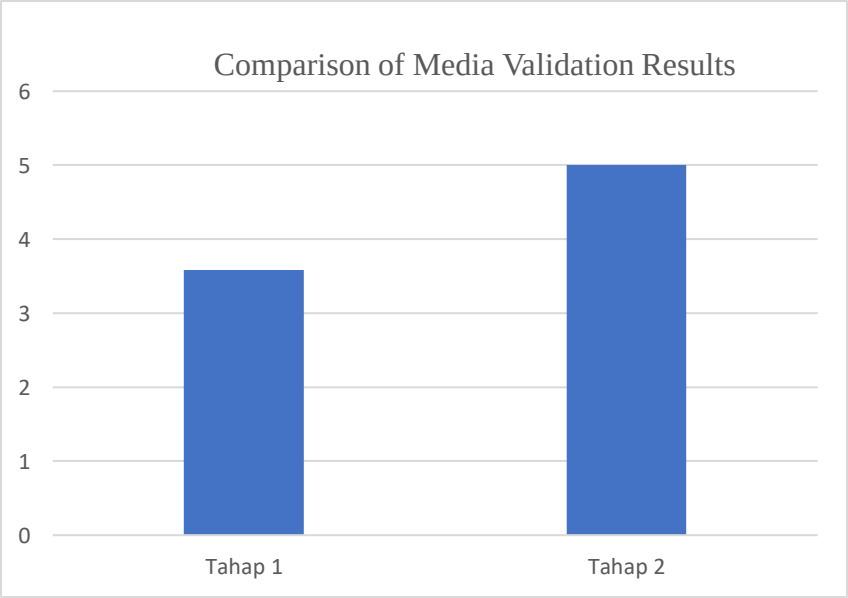
While the Standard Operating Procedures (SOP) used in the class are as follows:

1. The teacher explains the learning material regarding the nature of multiplication exchange
2. Students listen to the teacher's explanation regarding the discussion of multiplication in exchange.
3. The teacher explains the problems regarding the discussion of multiplication in exchange by applying perdalstic learning media.
4. The teacher invites students to ask about the use of mathematical media if something is not understood.
5. The teacher responds to the questions asked.
6. Students apply mathematical media by practicing problem-solving regarding multiplication discussions in groups.
7. The teacher observes students on the use of machine learning media while at the same time helping students who do not understand the use of machine learning media.
8. Students submit the results of their answers.

This perdalstic learning media refers to grade 3 SD in multiplication material with specified material details, namely the discussion of commutative multiplication. In contrast to the first researcher, namely the practice of counting times which is worth three digits. This difference is due to using a different curriculum. In material about the nature of exchange in multiplication in class III Semester, 1 Elementary School based on KD (Basic Competence) 3. 1 Explain the properties of arithmetic operations on whole numbers. 4. 1 Solving problems that involve using the properties of arithmetic operations on whole numbers. The discussion material used in the thematic books with the 2013 curriculum is on pages 59-62. The teaching materials contained in the thematic only include examples, so the addition of material about the concept of multiplication sources uses from Google. While the questions presented are different from previous researchers. In the previous researchers presented questions with questions directly. Whereas in this development the material presented is that students are asked to solve problems in a problem (case study) whose results can be operated in the form of multiplication. This is because when talking with the homeroom teacher he does not only use thematic books but from other sources, such as from Google.

At this development stage, there are differences with previous researchers both in terms of design and in terms of material. In terms of the design of this learning media, there are differences in size, the previous researcher used a size of 35 cm x 35 cm with a height of 5 cm while in this design used a size of 25 cm x 25 cm with a height of 5 cm. Judging from the different manufacturing methods, previous researchers explained many shapes and sizes and there was no detailed explanation of the manufacturing mechanism. Even though there are many differences, this multiplication stick box has the same function, namely to facilitate learning activities on multiplication material.

The data validation stage generated in the development of perdalstic media research in the discussion of multiplication for class III SD includes media validation and material validation. This perdalstic learning media was validated with lecturers as media experts from the Islamic Education Management (MPI) study program. The media validator for the perdalstic learning media in this multiplication material is Dr. H. Joko Trimulyo, S.H, M.Pd. The income score obtained from the results of media validation is 60 out of a total score of 60. From this score, a percentage of results is obtained at 100% with a very relevant category with suggestions and comments from media experts. There are 3 prospects that are validated against the media assessment sheet instrument, including general appearance, special form and media presentation.



Graph 1. Comparison of Media Validation Scores

It can be seen in graph 1 that the score obtained from the first stage of the media expert's assessment proves that the perdalstic media is considered to be in the "quite valid" category with an average score of 3.6 seen in diagram 1. The score obtained from stage 1 is 47 out of a total score of 65. The percentage results obtained in stage 1 are 72.3% with the result that the perdalstic learning media can be applied in field experiments with improvements. Suggestions and input from the assessors include giving color and adding stickers to the perdalstic learning media. In graph 1, the second stage of the media expert's assessment scores proves that the mathematical learning media is in the "very relevant" category with an average score of 5 and a score of 100% with the result that the mathematical learning media can be applied in the field without improvement.

The validation of the material on perdalstic learning media was carried out by material expert lecturers majoring in Madrasah Ibtidaiyah Teacher Education (PGMI). The existence of a material validator in perdalstic learning media is Mr. Ir. Rusdiono, M.Pd. In graph 2, the income score obtained from the assessment is 85 out of a total score of 85. From this score, the percentage of results is 100% with a very relevant category with suggestions and comments from experts. There are 3 prospects that are validated against the material assessment sheet instrument, including the significant prospect, the prospect of accuracy, the prospect of the completeness of the discussion, the prospect of the asaa material scheme, and the prospect of the appropriateness of the discussion on learning demands referring to students.

Design Revision

At the media assessment level, there is a revised appearance. The assessor suggested the perdalstic learning media for class III multiplication material at SDN Gunung Picung 08, namely the provision of colors and the addition of stickers to the perdalstic learning media. The researcher carried out design improvements in order to fix errors and weaknesses in perdalstic media.

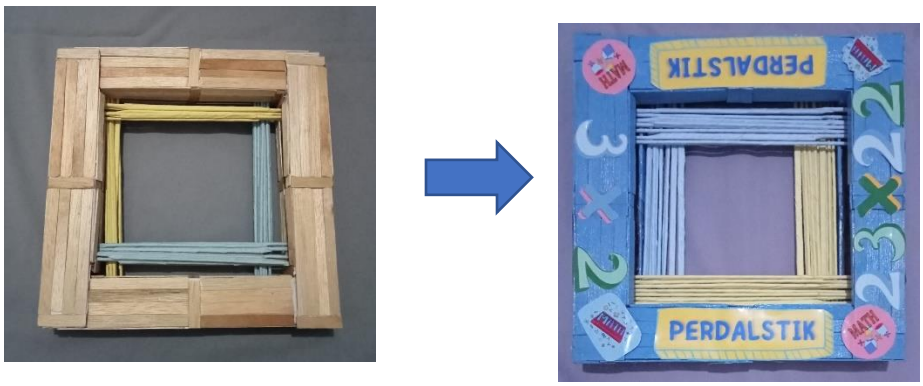


Figure 8. Revision of Perdalstic Learning Media

CONCLUSION

Based on the results and discussion, the statement can be obtained:

1. The implementation of Perdalstik media development is carried out with three levels including analysis (analysis). The level of analysis shows that there is a lack of learning media in class III mathematics, especially in multiplication material. Design (design). At this design level, researchers design multiplication-based media with cross lines in real form. Development (Development) at the development level researchers develop the actual design at the design stage (design).
2. The development of scientific media research goes beyond 2 stages of assessment, namely the validity of the media and the validity of the material. The media validity level gets a score of 100% and material validity gets a score of 100%, both of which are relevant and feasible to apply.

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