



Development of Counting Dakotika Media to Improve Understanding Multiplication Concepts in Class II Elementary School

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ABSTRACT

This research was motivated by the low understanding of student's concepts in multiplication material and the unavailability of mathematics learning media in schools. This study aims to develop arithmetic dakotika media and find out the results of the use (practicality) and effectiveness of arithmetic dakotika media to improve understanding of the concept of multiplication. This study uses research and development methods with the ADDIE development model. Data collection techniques in this study were observations, interviews, questionnaires (validation and responses), tests and documentation. The result of this study is to produce arithmetic dakotika media which has been declared very feasible or valid by experts (media experts, material experts and language experts) with an average overall score of 97%, arithmetic dakotika media is also stated to be very practical with a score the average is 91.95 %. While the level of effectiveness is 93.1 % so that the arithmetic dakotika media is stated to be very effective. The arithmetic dakotika media that has been developed has been declared very feasible/valid, practical and effective for use in the learning process to increase understanding of the concept of multiplication.

Arithmetic Dakotika Media, Concept Understanding, Multiplication

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INTRODUCTION

Mathematics learning is stated in PP RI No.32 of 2013 article 77 I paragraph 1, article 77 J paragraph 1 and article 77 K paragraph 2 concerning amendments to PP No. 19 of 2005 concerning National Education Standards states that mathematics is one of the mandatory fields of study in the curriculum structure (Simbolon et al., 2020). Every student from various levels of education or school, from elementary school to tertiary education, needs to study mathematics.

Mathematics in the school environment is one of the important subjects in learning activities, because of the large number of subjects in schools, mathematics is very necessary in various fields of science, both in the current era and in the era to come

(Yudiana, 2022). According to (Sopiany & Rahayu, 2019) By studying mathematics, students' thinking processes will be trained in solving problems systematically, logically and flexibly, so that mathematics becomes a very important subject to support improving the quality of human resources.

Considering the important role of mathematics, teachers need to present mathematics learning in an easier way so that students are able to understand the mathematical concepts they are studying. This is because understanding concepts is the initial goal or basic skill that students must have from learning mathematics. If students cannot achieve or have the ability to understand mathematical concepts, then other mathematical goals will be difficult to achieve because understanding is a basic skill that students must have in learning more advanced mathematical concepts (Aledya, 2019). According to (Fujiarti & Kurnia, 2021) conceptual understanding refers to a thorough understanding of a design or abstract idea, this means that understanding allows students to understand the material being taught in depth, not just memorize it, so that students can have a deeper understanding regarding the concept of material presented by the teacher.

However, in Indonesia teachers often present mathematics learning by getting used to memorizing without instilling an understanding of the concept, such as in multiplication learning where students learn only by memorizing multiplication without understanding the concept of multiplication so that students often misunderstand the concept of multiplication (Indriani et al., 2022). Understanding mathematical concepts is very important for students to have, therefore, so that elementary school students are able to understand mathematical concepts, teachers must be able to package abstract mathematics learning into more real or concrete learning, namely by presenting a learning tool or media.

According to Tafonao in (Yudiana, 2022) learning media is a means or tool that helps teachers in providing learning material that can attract attention and increase students' creativity in learning activities. At present, the use of various media in the learning process is an important factor very important. The role of media has the ability to fulfill needs in making the learning process more effective, efficient and practical (Fauziah & Fitriyani, 2022) .

In learning mathematics, there are various types of media that can be used , but to stimulate students' interest and motivation to learn so that students can more easily understand the lesson, the use of games as a learning medium can be an effective choice in the learning process in the classroom (Fitriyani et al., 2023) . The selection and use of learning media must of course also be aligned with the student's stage of cognitive development. According to Piaget in (Santrock, 2007) elementary school students are at the concrete operational stage (7-11 years) where at this stage students can think logically replacing intuitive thinking but this thinking is implemented with real

examples or in other words, elementary school students need real objects to help their cognitive development. From this explanation it can be concluded that elementary school students need concrete media that contains game elements to motivate students to learn so that students will understand the lessons more easily.

Based on the data obtained from observations and interviews with class II.3 teachers at SDN Mekarmukti 01, some information was obtained including: 1) the mathematics learning that the teacher has been doing so far is by explaining material from thematic books without presenting media in the learning process, so that learning seems less interesting and difficult for students to understand. 2) Students do not fully understand the concept of multiplication material, students are only able to memorize multiplications 1-5, this is because the multiplication learning has been carried out through lectures and getting into the habit of memorizing multiplications 1-5 before learning begins. 3) The student's score is still below the KKM set by the school, namely 65, so it can be said that the student's understanding of the concept of multiplication is still relatively low. This can also be seen when students work on the *pretest questions* and the results of the 29 students who complete it are only 7 students. 4) The unavailability of learning media in schools to support the process of learning mathematics, especially in multiplication material.

Based on these conditions, a solution is needed to help improve understanding of the concept of multiplication, namely by developing a learning media in the form of arithmetic dakotika media. Count Dakotika has another name dakota which stands for math dakon. According to (Andiyani et al., 2019) Dakota or dakotika is a learning media for mathematics material created to make it easier for elementary school students to learn and understand mathematics material which students consider difficult to learn. Meanwhile, according to Kurniati in (Riska et al., 2019) dakota or dakotika is a new innovation in mathematics learning in the form of concrete (visual) media in mathematics learning. Dakotika is a combination of traditional dakon games and learning mathematics which is useful for understanding mathematical material. From this explanation, it can be understood that dakotika calculating media is an innovative learning media originating from the traditional dakon game combined with mathematics learning which was created to make it easier for elementary school students to understand mathematics material which is considered difficult.

According to Legowo in (Savriliana et al., 2020) dakon games can provide double benefits to students, namely making it easier for students to understand the mathematical concept of counting, and at the same time can make students happy, this is because dakon contains elements of play. (Hestyaningsih & Dinar Pratisti, 2021) also revealed that the dakon game can train students to be sportsmanlike, can increase students' attention, increase students' motivation to learn to count and can develop cognitive abilities and stimulate students' motoric development.

Previous research which stated that by using Dakota media students' learning activity and ability to understand the concepts of multiplication and division increased (Jasuli et al., 2021) . In addition, student learning outcomes can also increase after using dakota media in the learning process (Trisnani & Sari, 2021) , and dakota media is stated to be very feasible and effective for use in the mathematics learning process (Komariah, 2020) .

Thus it is hoped that by developing arithmetic media, students will not only memorize multiplication but can understand the concept of mathematical arithmetic, namely multiplication, and can increase motivation and learning can be more effective. Researchers are interested in conducting research and development with the title "Development of Caounting Dakotika Media to Improve Understanding of Multiplication Concepts in Class II Elementary School". The aim of this research is to develop arithmetic dakotika media, determine the feasibility, practicality and effectiveness of arithmetic dakotika media to improve understanding of the concept of multiplication in class II elementary school.

RESEARCH METHOD

Research method used in this research, namely the Research and Development. According to (Sugiyono, 2019) the research and development method is a research approach used to create a product and test the effectiveness of the resulting product. In this research, researchers used the ADDIE development model . The ADDIE model has five stages , namely according to the name ADDIE (Analysis, Design, Development, Implementation, and Evaluation) (Rusmayana, 2021) .

This research was carried out at SDN Mekarmukti 01, North Cikarang, Bekasi, West Java. The subjects in this development research were three expert validators consisting of media experts, material experts and language experts. The target users of this product were 29 students and class II.3 teachers at SDN Mekarmukti 01.

This study used data collection techniques in the form of observation, interviews, questionnaires, tests and documentation. The types of data used and analyzed are quantitative and qualitative data. Qualitative data were obtained from the results of responses, suggestions from experts, teacher and student responses as well as based on observations and interviews and presented in a descriptive form. The quantitative data was obtained from the results of expert validation questionnaires (media experts, material experts and language experts), the results of teacher and student response questionnaires as well as from test results which were converted into scores and interpreted using the guidelines for assessment category criteria for product suitability. In this research, the questionnaire used was

presented in the form of a Likert scale and analyzed using the following calculations:

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

P = Percentage of validity value

f = Total score obtained

n = Maximum number of scores

To determine eligibility or product validation results, you can pay attention to the following validation result criteria:

Table 1.
Criteria for Validation Results

Percentage value	Criteria
$0 \leq P < 25\%$	Not feasible
$26 \leq P < 50\%$	Less Eligible
$51 \leq P < 75\%$	Worthy
$76 \leq P < 100\%$	Very Worth it

Source: (Hayuwari & Rahmawati, 2016)

Based on this table, the calculated dakotika media is declared valid/feasible if it reaches the minimum criteria of 51-75%. As for knowing the practicality of arithmetic dakotika media, it was obtained based on the results of the analysis of the teacher and student response questionnaires. To analyze it, you can use the following formula:

$$K = \frac{R}{SM} \times 100\%$$

P = Practicality percentage

R = Total score obtained

SM = Maximum total score

The following are the criteria that must be considered in determining product practicality.

Table 2.
Practicality Criteria

Practical Value	Criteria
$0 \leq K < 55\%$	Impractical
$55 \leq K < 60\%$	Less Practical
$60 \leq K < 75\%$	Pretty Practical

$75 \leq K < 85\%$	Practical
$85 \leq K < 100\%$	Very Practical

Source: (Yokri & Saltifa, 2020)

Based on the table above, counting dakotika media is declared practical if it reaches the minimum practicality criteria, namely equal to or more than 75%. To find out the effectiveness of the product being developed, it can be obtained from student test results. To analyze it, use the following formula:

$$H = \frac{T}{n} \times 100\%$$

H = Percentage of learning completeness
 T = Many students complete

n = Number of students

The criteria for the effectiveness of this arithmetic media product are as follows:

Table 3.
Effectiveness Criteria

Intervals (%)	Category
$H < 50\%$	Ineffective
$50 \leq H < 60\%$	Less effective
$60 \leq H < 70\%$	Effective enough
$70 \leq H < 80\%$	Effective
$H \geq 80\%$	Very effective

Source: (Norsanty & Chairani, 2016)

Based on the table above, dakotika calculating media is declared effective if it reaches the minimum effectiveness criteria, namely more than or equal to 70%.

RESULTS AND DISCUSSION

In this development research, the product produced is in the form of learning media called arithmetic dakotika media. Counting dakotika media is a concrete media modified from the dakon game which is used as a means of conveying multiplication material with the help of holes and painted stones (dakon seeds) with the aim of helping students understand the concept of multiplication. This learning media was developed for grade II elementary school students in learning multiplication material. In this development research, researchers used the ADDIE model stages which have five stages, namely Analysis, Design, Development, Implementation, Evaluation.

The first step taken by researchers was to carry out analysis. The analysis carried out is performance analysis and needs analysis, namely to find out various problems or constraints, needs and availability of learning media in schools.

Meanwhile, based on interviews and observations conducted by researchers with teachers and students in class II.3 of SDN Mekarmukti 01, the results showed that students experienced difficulties in understanding the concepts in multiplication material, the teacher only used picture media for certain material but for multiplication material the teacher did not use media, and the unavailability of learning media in schools, especially multiplication material. Therefore, researchers provide a solution that is considered effective for this problem, namely by developing learning media in the form of arithmetic dakotika media to increase students' understanding of concepts in multiplication material.

The second stage is to design or create specifications for the product being developed (counting dakotika media) by adapting the material and characteristics of second grade elementary school students. Counting dakotika media has five components, namely (1) a dakotika board made of plywood shaped like a chess box with a size of 43 cm × 24 cm. This dakotika board also provides a place for practicing questions in the form of a pocket, and has 10 small holes and 1 large hole on each side. This number has been adjusted to the multiplication material 1-10; (2) painted stones are used as dakon seeds and are made of stones painted with various pictures and characters using acrylic paint user manuals in the form of printed books with A5 size and arranged to make it easier for teachers to use arithmetic dakotika media. (4) the question and answer cards contain multiplication questions and interesting pictures on the front of the cards so that students are interested and enthusiastic about working on these questions. The answer card is in the form of a number (5) star reward. All of these media components are designed with various colors and images so that arithmetic dakotika media can attract students' attention to learning.

The next stage is development, namely making product specifications into real products according to the design at the design stage. At this stage, validation is also carried out by experts consisting of media experts, material experts and language experts. The following are the steps in the development stage, namely as follows:

Product development stage

At this stage what is done is preparing various tools and materials, followed by the manufacturing process after which printing stickers for media covers, printing instruction books and question cards, answers and reward stars.

The calculating dakotika media product was developed with several components, namely as follows:

a. Counting dakotika board.



Picture 1



Picture 2



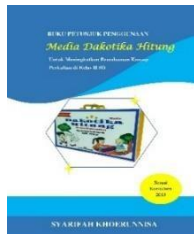
Picture

b. Painting stone



Picture 4

c. User manual



Picture 5



Picture 6

d. Question and answer cards



Picture 7



Picture 8



Picture 9

e. Reward stars



Picture 10

Product validation process

After the counting dakotika media has been created, the next step is to validate the counting dakotika media. Product validation is carried out by distributing questionnaires to validators or experts, namely media experts, material experts and language experts. The aim is to obtain an assessment of the suitability of the computing

dakotika media from experts. Next, after validation is carried out, it is continued by analyzing the questionnaire sheet resulting from the expert validation.

Counting dakotika media is declared valid if the counting dakotika media reaches the eligibility criteria with a predetermined level of suitability, namely reaching the minimum criteria of 51-75%. The following are the results of the validation of the counting dakotika media from three validators, namely as follows:

Table 4.
Expert Validation Results

No.	Validators	Validation Results
1.	Media Expert	95%
2.	Material Expert	96.1%
3.	Linguist	100%
Average		97%

Based on the validation results table, the counting dakotika media got an average score from media experts of 95%, while from material experts it was 96.1% and from language experts it was 100% so that the counting dakotika media got an overall average of 97% and was able to The conclusion was drawn that the arithmetic dakotika media was declared very valid or suitable to be applied in the multiplication learning process in class II elementary schools.

The fourth stage is implementing arithmetic dakotika media in the learning process. This implementation was carried out in two trials, namely a small group trial (10 students) and a large group trial (19 students). At the implementation stage, researchers gave pretest questions to measure students' understanding of concepts before using the arithmetic dakotika media. Next, the researcher tested the product by providing multiplication learning using arithmetic dakotika media, then afterwards the researcher collected data on the effectiveness of the media by giving posttest questions to measure students' understanding after using arithmetic dakotika media. Then the researcher continued with the process of collecting data on the results of use or practicality by distributing response questionnaires to teachers and students to assess the practicality of the computing dakotika media. The following are the results of the practicality test and effectiveness test of the counting dakotika media at the implementation stage.

Practicality test

The practicality of counting dakotika media is obtained by distributing response questionnaires to teachers and students as users of the media being developed. Counting dakotika media is declared practical if it reaches the minimum practicality criteria, namely equal to or more than 75%. The results of the analysis of the

questionnaire responses from teachers and students to the computing media are as follows:

Table 5.
Practicality of Calculated Dakotika Media

No.	Respondent	Mark (%)
1.	Teacher	92
2.	Student	91.9
Average		91.95%

Based on the table, the arithmetic dakotika media obtains an average percentage of the teacher's assessment or response of 92% and from student responses it is 91.9% so that the arithmetic dakotika media obtains an overall average percentage of 91.95% and it can be concluded that the arithmetic dakotika media is stated to be very practical to apply in the multiplication learning process.

Test effectiveness

The effectiveness of the arithmetic dakotika media was obtained by giving a pretest and posttest to students with the aim of finding out the differences before and after using the arithmetic dakotika media to improve understanding of the concept of multiplication. Counting dakotika media is declared effective if it reaches the minimum effectiveness criteria, namely more than or equal to 70%. The results of the analysis of student test scores in small group and large group trials are as follows:

Table 6.
The Effectiveness of Dakotika Calculated Media

No.	Trials	Pretest		Posttest	
		complete	Not Completed	complete	Not Completed
1	Small group trial	1 student	9 students	9 students	1 student
2.	Large group trials	6 students	13 students	18 students	1 student
Overall Complete Students		7 students		27 students	
All Students Have Not Completed		22 students		2 students	

Information: H = Percentage of learning completeness T = Many students complete $n = \text{Number of students (29 students)}$ $H = \frac{T}{n} \times 100\%$ $H = \frac{27}{29} \times 100\%$ $H = 93.1\%$	
Category	Very effective

Based on the table above, the pretest results show that of the 29 students, only 7 students completed it and 22 students were declared incomplete. While the results of the posttest or after using the development results in the form of arithmetic dakotika media in the learning process of 29 students there were 27 students who had completed and only 2 students who were declared incomplete. And from these data arithmetic dakotika media obtained an average of 93.1% and were in the very effective category so that arithmetic dakotika media was stated to be very effective for increasing understanding of the concept of multiplication.

The final stage is evaluation. This stage is carried out to see whether the arithmetic dakotika media at the implementation stage still has deficiencies or not, if there are still deficiencies, it is necessary to conduct studies or improvements for improvement. If at the implementation stage there are no deficiencies that need to be corrected, then arithmetic dacotics media can be declared feasible, practical and effective to be applied in learning activities.

CONCLUSION

This research aims to develop arithmetic dakotika media, determine the feasibility, practicality and effectiveness of arithmetic dakotika media to improve understanding of the concept of multiplication in class II elementary school. This research uses the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Development counting dakotika media is based on problems that arise and needs in the learning process that are identified through the analysis stage. Counting dakotika media is designed to suit students' needs, materials and characteristics. The computing dakotika media was then developed and validated by experts (media experts, material experts and language experts) to determine the level of feasibility of the counting dakotika media.

Based on the validation results from three validators, the counting dakotika media was declared very feasible with an overall average score of 97%. After validation, counting dakotika media is implemented in the learning process. The

practicality of counting dakotika media was obtained from analysis of questionnaire responses from teachers and 29 students. Based on the response questionnaire, the arithmetic dacotikamedia was stated to be very practical with an overall average score of 91.95 %. Based on the results of the test for understanding the concept of multiplication, the arithmetic dakotika media was stated to be very effective in increasing understanding of the concept of multiplication with an overall average score of 93.1%. After the product is implemented, an evaluation is carried out to find out whether there are still deficiencies or not in the counting dakotika media product. Based on the data obtained, the arithmetic dakotika media developed was declared very valid, practical and effective for use in the multiplication learning process in class II elementary schools.

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