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Development of Counting Box Media to Improve Understanding of Addition and Subtraction of Grade II Elementary School Students

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Abstract: The purpose of this study was to develop a counting box learning media that will be used to improve the understanding of addition and subtraction of grade II elementary school students that is valid, practical and effective. The type of method in this study is Research and Development (R&D). The product development model is ADDIE. Data collection techniques by conducting interviews, observations, questionnaires and tests. Analysis of research data using data analysis of validity, reliability, discrimination, level of difficulty, normality, homogeneity, hypothesis and effectiveness. The results carried out by the researcher, namely the validity of the counting box media in improving the understanding of addition and subtraction in grade II elementary school students, are suitable for use and have been validated by experts. The results of the validation of media experts were 98% (Very valid), material experts were 95.45% (Very valid), language experts were 91%% (Very valid), and practitioner experts were 95%% (Very Practical). Product trials conducted by researchers were in 2 stages, namely small-scale trials and field-scale trials. The results of the small-scale acquisition of pretest and posttest questions show that the average pretest score is 47.5, while the average posttest score is 55.5. The increase from the pretest to the posttest score is 8. On the field scale, the results of the average pretest score are 40, while the average posttest score increases to 92. So it can be concluded that there is an increase from the pretest to the posttest score of 52. Based on this, the counting box media is very valid, practical and effective to use in learning.

Keywords: Learning Media, Counting Box, Addition and Subtraction

PRELIMINARY

Learning is a teacher's support so that the process of acquiring knowledge, skills, mastery of skills, habits, attitude formation, and self-confidence in students can take place. In other words, learning is a process that helps students to learn well. One of the learning activities in elementary school is mathematics. In learning mathematics, students are accustomed to gaining understanding through experience about the properties of a set of objects (Susanti, 2020: 438). In learning, of course, there are many differences, for

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example, there are students who already understand the subject matter, and there are also students who still cannot understand the subject matter. These two differences allow teachers to adjust learning strategies to the situation of each student (Pane, 2017: 337). Learning is a process of change, namely a change in thinking and behavior as a result of interaction with the environment in meeting their life needs. Learning also means a process of effort made by individuals to obtain a new change in behavior as a whole, as a result of the individual's own experience with interaction with their environment (Abdullah, 2017: 95-96). According to Radiusman (2020: 2-3) explains that the existence of a system in this mathematical learning knowledge can enable students to understand the concepts of new mathematical learning. Understanding mathematical concepts for students in elementary schools cannot be separated from the role of teachers. Teachers must be able to explain mathematical concepts clearly and interestingly and be able to motivate students in learning. A student who receives motivation and tutoring can be considered motivated to carry out learning activities at school better (Sapriyah, 2019).

Mathematics is one of the fields of study that is considered difficult, unpleasant, even scary and boring. In fact, there are still many students who have difficulty in solving math problems (Susanti, 2020). According to Lestari and Yudhanegara (in Febriyanto, et al., 2018), the ability to understand mathematics is the ability to absorb and understand mathematical ideas. Indicators of mathematical understanding are: 1) translating and interpreting symbols, tables, diagrams, pictures, graphs, and mathematical sentences, 2) rewriting the concepts that have been learned. In everyday life, mathematics has a very important role. One of the roles of mathematics in everyday life is as a means of conveying information. This information is conveyed in mathematical language and improves systematic and critical thinking skills, while increasing creativity. Mathematics learning has many contributions in everyday life, therefore teaching mathematics to students from an early age is very necessary Ediyanto., et al. (in Fauzan & Yanti. 2021). One of the materials in grade II is addition and subtraction. Addition is a group of numbers or more into a number which is also called addition. While subtraction itself is a decrease or the opposite of addition, but subtraction does not have the properties of addition.

The process of learning mathematics, especially in addition and subtraction materials, in order to run optimally and achieve the learning objectives expected by the teacher, learning media is needed. According to Supriyono (2018) that the media has a

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function as a means of non-verbal communication. As one of the components of the system, it means that media must absolutely exist or must be utilized in every learning. Based on the problems above, a solution is needed to overcome student learning in addition and subtraction problems, the method used is the counting box learning media. However, more specifically, the media has several advantages, namely the delivery of learning materials can be integrated, clear and interesting, the learning process becomes interactive, and can improve the quality of student learning outcomes (Nurfadhillah., et al. 2021: 295). According to Rahma (2019: 89-90) the types of learning media can also be put forward, namely (1) Still visual media, (2) Advertising/display displays and (3) Focused images. The selection of learning media must also be adjusted to the learning objectives, characteristics of the subject matter, and characteristics of the students.

Based on the results of observations and interviews with grade II teachers at SD Negeri 2 Nglongsor, SD Negeri 1 Ngepeh, SD Negeri 1 Prambon and SD Negeri 2 Prambon, problems were found in learning, especially in mathematics subjects regarding addition and subtraction material. These problems include the use of learning media that are still rarely used, learning methods that are still not varied enough in the learning process, students still have difficulty understanding the concept of addition and subtraction, students also often make mistakes in writing numbers in mathematics, for example writing the number 3 upside down, students have difficulty understanding math problems, especially addition and subtraction problems, in addition, students still often make mistakes in calculations on addition and subtraction problems because they are not careful in understanding the problems, and students have difficulty in recognizing place values in addition and subtraction problems. Several previous studies related to counting box media have had a positive impact. The research conducted by (Kasanah & Alifiyah, 2023) entitled Development of Learning Media "Counting Box" to Improve Mathematics Learning Outcomes for Addition and Subtraction Story Problems for Grade III MI/SD. From the results of the study, it was found that the counting box learning environment met the criteria and was very suitable for use as a learning support. It can be concluded that the counting box learning environment can be used as a learning environment for class III MI/SD for story problems in mathematics subjects with a total score of 98.80%. Based on the problems above, the researcher is interested in conducting a study entitled Development of Counting Box Media in Improving the Understanding of Addition and

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Subtraction of Class II Elementary School Students. The purpose of this study is to develop valid, practical and effective Counting Box media to improve the understanding of class II elementary school students on addition and subtraction materials.

METHOD

The type of research used is Research and Development. The research used focuses on the development of counting box media in improving the understanding of addition and subtraction of grade II elementary school students using the ADDIE model. Data collection techniques by conducting interviews, observations, questionnaires and tests. The population in this study were all grade II students in Tugu District in the 2023/2024 academic year. The technique used by the researcher was the purposive sampling technique. The researcher chose four samples at SDN 2 Nglongsor, SDN 1 Ngepeh, SDN 1 Prambon and SDN 2 Prambon based on the consideration of almost the same problem, namely regarding understanding of addition and subtraction in grade II elementary school. The data analysis used was quantitative and qualitative data analysis. The ADDIE development research model consists of five stages including Analyze, Design, Development, Implementation, and Evaluation (Safitri, 2022: 53). The implementation of the counting box learning media that has been developed by researchers will be carried out in 2 stages, namely on a small scale by testing it on 8 students at SD Negeri 2 Nglongsor, while on a field scale test it was tested on 15 students at SD Negeri 1 Ngepeh, 21 students at SD Negeri 1 Prambon, and 16 students at SD Negeri 2 Prambon. Researchers also provide a response questionnaire for students, the aim is to be able to find out students' responses to the counting box media used by researchers, whether it is practical to use or not.

RESULTS

Level of Analysis (*Analyze*)

This analysis is done by collecting data related to student characteristics and how the learning process is. From the results of the interview, the counting box learning media has never been made or used in learning process activities. The research was conducted through interview activities at SD Negeri 2 Nglongsor, SD Negeri 1 Ngepeh, SD Negeri 1 Prambon, and SD Negeri 2 Prambon. Based on the interview activities,

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information was obtained that the counting box learning media had never been used to improve the understanding of addition and subtraction for grade II elementary school students. The teaching materials that had been used previously were in the form of books so that the teaching materials used were less varied for grade II elementary school students.

Design Stage (*Design*)

At the design stage, the researcher collected the materials and media tools that would be used to develop learning media that were adjusted to the conditions of elementary school grade II students. The materials used were Addition and Subtraction. In addition, at this stage, the researcher collected the materials that would be used in making counting box media. The initial step in compiling the framework of learning media is to collect the tools needed to make learning media, the materials used such as wooden boards, plywood, and styrofoam. The design parts of the Counting Box learning media are as follows.

Table 4.2 Desain Media *Counting Box*

 Counting Box Learning Media Form Design	 Counting Box Learning Media Content Design
 Addition and Subtraction Problem Board Design	 Addition and Subtraction Answer Board Design

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 Answer Result Board Design	 Egg Rack and Beater Design

Source: Researcher Processing (2024)

Development Stage (*Development*)

At this stage, the researcher conducted an expert test. The purpose of the product expert test is to obtain assessments and suggestions from media experts, material experts, language experts, and expert practitioners. According to the experts, it can be used by researchers to improve the counting box learning media. Validation from media, material, language and practitioner experts aims to determine the level of validity before being tested on grade II students. The following are the results of the recapitulation of expert assessments presented in table 4.3 below:

Table 4.3 Recapitulation of Expert Tests

No.	Data Source	Score (%)	Criteria
1.	Media Expert	98%	Very valid
2.	Subject Material Expert	95,45%	Very valid
3.	Linguist	91%	Very valid
4.	Practitioner Expert	95%	Very valid
Rata-rata		**94,86%**	**Very valid**

Source: Researcher Processing (2024)

Based on table 4.8 above, it can be concluded that the recapitulation of the expert test shows an average percentage of 94.86%. From this percentage, the counting box media developed is included in the category of "Very valid".

Implementation Stage (*Implementation*)

Implementation in this study is the stage of applying the developed learning media in real classroom situations. After the learning media is declared suitable for use, the next step is to apply it to grade II elementary school students. At this stage, the researcher conducted small-scale and field tests. In testing on a small scale, the researcher tested it on 8 students at SD Negeri 2 Nglongsor, each of whom also had different abilities, namely low, medium, and high abilities. After conducting trials on students, the researcher was able to determine the effectiveness and practicality of using counting box media in the learning process, if there were still shortcomings during

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learning, the researcher would revise the learning media that had been developed. The results of the pretest and posttest showed that the average pre-test score for 8 students was 47.5. While the average posttest score increased to 55.5. So it can be concluded that there was an increase from the pretest to the posttest score of 8. The student response questionnaire that had been analyzed by the researcher showed a percentage of 99.07%. Based on these criteria, the learning media that had been developed was included in the "Very Good" qualification. In addition, the teacher response questionnaire in a small-scale test of the counting box learning media can reach a percentage of 97.5%. So, it can be seen from the percentage obtained that the media is in the very practical category. While the field trial with a total of 52 students. Based on what the researcher did regarding the results of the pretest and posttest on a field scale, it is known that the average pretest score for 52 students was 40. While the average posttest score increased to 92. So it can be concluded that there is an increase in understanding of addition and subtraction from the pretest to posttest scores of 52 in the field scale test.

Evaluation Stage ((*Evaluation*)

The evaluation stage is a stage of improvement carried out at each stage in the ADDIE development model. At the analysis stage, an evaluation is carried out to determine the product to be developed. The results of the improvement at the evaluation stage are determining the product to be developed based on the needs analysis, the results of the product developed are counting box learning media. While at the design and product development stage, the results of the evaluation carried out are to perfect the product based on the input provided by experts. The revised product based on expert assessment will be applied in field trials until valid, practical and effective criteria are obtained.

DISCUSSION

The product in this study is using counting box learning media to improve the understanding of addition and subtraction of grade II elementary school students using the ADDIE model which consists of 5 stages, namely Analyze, Design, Develop, Implementation and Evaluation. The method used in the study is (Research and Development). The stages carried out to produce counting box learning media are as follows: a) information gathering stage, b) planning stage, c) development stage, and d)

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validation and trial stage. Counting box is a program based on student needs. Activities carried out based on student needs, not only teacher needs. The advantages that support counting box media are learning while playing. While the disadvantages of counting box media are that students are usually impatient in doing counting activities. When carrying out activities, some students are enthusiastic about doing them so that the results are in the early stages of development. In addition, preparing counting box game activities takes time to make (Sari, 2023: 1538). The use of learning media in the teaching and learning process can generate new interests and desires, generate motivation and even have psychological effects on learning (Wulandari, 2023: 3929). The use of teaching media in the teaching and learning process can generate new interests and desires, generate motivation and even have psychological effects on learning. Learning media is any form of tool or material used by teachers in the learning process to help students understand and master learning materials. The counting box learning aid is a box-shaped learning medium made of strong cardboard that is modified with simple tools and equipment (Rozi, 2022: 228). The counting box media itself can also make the teaching and learning process more interesting and enjoyable, so that students are more enthusiastic about learning. The use of learning media, teachers must know their learning needs and the problems faced by students related to the subjects being taught. In this context, media needs to be developed based on suitability, basic skills, materials and characteristics of students. Teachers can act as creators, namely creating and using media that is appropriate, effective, and interesting for students. However, when using it in the classroom, it must be emphasized that students are the ones who should use this learning aid (Karo-Karo, 2018: 91). In general, the advantages of media in the learning process are that it facilitates interaction between students so that learning activities are more effective and efficient. However, more specifically, there are several more detailed communication benefits. For example, according to Kemp and Dayton (Falahudin, 114-116), several benefits of media in learning have been identified, namely (1) Presentation of material can be similar, (2) The learning process becomes clearer and more interesting, (3) The learning process becomes more interactive, (4) Efficiency of Time and Energy, (5) Improving the quality of student learning outcomes, (6) Media allows the learning process to be carried out anywhere and anytime, (7) Learning media can foster a positive attitude in students towards

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material and a learning process, (8) Changing the role of students in a more positive and effective direction, (9) Media can make abstract topics more concrete, (10) Media can also overcome the limitations of space and time and (11) Media can help overcome the limitations of human senses.

This counting box media has proven to be "Effective" to be applied in the learning process with the difference in pretest and posttest scores of students before and after using the counting box learning media. And after this media, the students' understanding increased and the students' responses to the counting box learning media were very happy and interested. Effective counting support is used to increase the possibility of reducing students' dyscalculia. The use of this media is good because it is characterized by media content that is interesting to students, content that is appropriate and in accordance with the objectives or material being taught. This is the guideline used in developing the counting box stand (Wiranda, 2021: 1004).

CONCLUSION

Based on the results of the data analysis that has been done, it can be concluded that the counting box learning media is a counting box that contains various mathematical formulas as well as practice questions and educational games. The counting box media can be stated as very valid based on the results of expert assessments, very practical based on the results of practitioner assessments, and effective for improving student learning outcomes in addition and subtraction materials for elementary school students. From the results of research and development of the counting box learning media that has been carried out, of course this media can be used to improve mathematical abilities in addition and subtraction materials for elementary school students.

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