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DEVELOPMENT OF SMART BOARD MEDIA ON THE ABILITY TO COUNT ADDITION AND SUBTRACTION MATERIALS IN GRADE II ELEMENTARY SCHOOL STUDENTS

Fanindia Oktavia Mumpuni[1], Ima Mulyawati[2]
[1,2]Universitas Muhammadiyah Prof. Dr. Hamka, Jl. Tanah Merdeka No 20 Rambutan Ciracas District, Jakarta City
e-mail : fanindiaoktavia261001@gmail.com

Abstract

This research was conducted because there are still many grade II students experiencing difficulties in Mathematics lessons on addition and subtraction operations involving numbers up to 999. This problem arises when teachers have limitations in learning media and only use theme books as learning resources. The purpose of this study is that researchers want to help students improve their numeracy skills by creating smart board learning media that can meet the criteria and feasibility. The method used in research is Research and Development (R & D) using a 4D model which includes the stages of define, design, develop, and disseminate. Experts and grade II students filled out questionnaires that were used to collect data. Participants in this study were grade II students of SDN Nagrak 03, This study was divided into 2 groups, namely a large group of 28 students and a small group of 7 students. Based on the validation results, 95% of the media expert category is valid and very useful, for material experts there are 2 validation results, namely with a 93% validation percentage and a 98% validation percentage, both of which show the valid and very useful expert category. In addition, 93% of small group answers fall into the "very decent" category, while 94% of large group answers fall into the "very decent" category. Thus, the smart board learning media used to improve the numeracy skills of grade II students of SDN Nagrak 03 is practical, or very suitable for use in Mathematics learning.

Keywords: *Smart board media, counting ability, addition and subtraction.*

Abstrak

Penelitian ini dilakukan karena masih banyak siswa kelas II mengalami kesulitan dalam pelajaran Matematika materi operasi penjumlahan dan pengurangan yang melibatkan bilangan cacah sampai 999. Masalah ini muncul ketika guru memiliki keterbatasan dalam media pembelajaran dan hanya menggunakan buku tema sebagai sumber belajar. Tujuan dari penelitian ini adalah peneliti ingin membantu siswa dalam meningkatkan kemampuan berhitung dengan cara menciptakan media pembelajaran papan pintar yang dapat memenuhi kriteria serta kelayakan. Metode yang dipakai dalam penelitian adalah Research and Development (R&D) dengan menggunakan model 4D yang meliputi tahap define (pendefinisian), design (perancangan), develop (pengembangan), dan disseminate (penyebaran). Para ahli dan siswa kelas II mengisi kuesioner yang digunakan untuk mengumpulkan data. Partisipan dalam penelitian ini adalah siswa kelas II SDN Nagrak 03, Penelitian ini dibagi kedalam 2 kelompok yaitu kelompok besar sebanyak 28 siswa dan kelompok kecil sebanyak 7 siswa. Berdasarkan hasil validasi, 95% kategori ahli media valid dan sangat bermanfaat, untuk ahli materi terdapat 2 hasil validasi yaitu dengan persentase validasi 93% dan persentase validasi 98% keduanya menunjukkan kategori ahli valid dan sangat bermanfaat. Selain itu, 93% jawaban kelompok kecil masuk dalam kategori “sangat layak”, sedangkan 94% jawaban kelompok besar masuk dalam kategori “sangat layak”. Dengan demikian media pembelajaran papan pintar yang digunakan untuk meningkatkan kemampuan berhitung siswa kelas II SDN Nagrak 03 sudah praktis, atau sangat sesuai untuk digunakan dalam pembelajaran Matematika.

Kata kunci: Media papan pintar, kemampuan berhitung, penjumlahan dan pengurangan.

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INTRODUCTION

Education is a very important need in educating students to always have faith and devotion to God Almighty, have good morals, knowledge, creativity, independence, democracy, and responsibility as citizens are fundamental human needs. Learning new skills or developing self-ability processes that will later benefit society is the essence of education (Ramadianti 2021). An alternative definition of education is the process of forming the values and practices of individuals or communities through teaching with the aim of encouraging human development to educate the life of the nation.

The process of implementing an education in school, teachers are faced with several subjects that are important points for students and are expected to master them. One of them is mathematics subjects that have numeracy material, because basically mathematics is very important for students to teach in school because mathematics is always used in life. All branches of science cannot be separated from mathematics (Pulungan 2020).

To help their students understand the material better, teachers also need to make out-of-the-box efforts to find new forms of educational media. There is no learning process in schools that runs smoothly without the use of several types of learning media (Sari 2019). Learning media is media that facilitates learning with tools or the like that teachers can use to convey information in such a way that it is easily understood and understood by students (Rohani 2019). Innovative and methodical teaching approaches, especially in the field of addition and subtraction, can be found in the use of learning media. Elementary school students, especially lower grade students, have to devote a lot of time and energy to learning basic arithmetic skills, such as addition and subtraction. In accordance with the opinion held (Arsyad &; Suhaemi, 2019) that the basic foundation that students must master before switching to advanced number operations is addition and subtraction.

Based on the conclusions above, learning media is needed that is able to captivate the audience and improve students' numeracy skills, as mentioned earlier. Ability is a talent inherent in humans and often consists of skill, intelligence, speed, and understanding (Nurrohmah and Muryaningsih 2022). Numeracy is a part of mathematics that deals with real numbers (Yantoro and Wilutama 2020) and Performing calculations including addition, subtraction, multiplication and division operations (Ahida Suci et al. 2018). So it can be concluded that the ability to count is something that should be introduced from an early age

because proficiency in counting requires sufficient time and practice. The ability to count falls into the realm of cognitive development because to learn the concept, one must be able to understand and solve related problems.

Smart boards are one of the tools that can be used to improve numeracy skills. For Sadiman, as reported by the journal, Maghfi and Suyadi (2020), said that smart board media is an efficient means of conveying information to the intended audience, in this case students. According to Suharmanto (2019), stated that this calculation board media was made with the aim of making the topic of mathematical units more interesting, so that children do not get bored while learning, and are expected to help students in learning to count.

One example is that researchers want to create visual media smart boards that can be touched and seen to help teachers and students in the delivery and reception of learning materials. The smart board media is made rectangular in shape and has a bag made of HMR *(High Moisture Resistant)* board material for stick placement. The materials used are waterproof boards, flannel, sticks and acrylic paint. Smart board media teaches basic mathematical concepts in addition and subtraction material involving chopping up to 999 with storage and borrowing techniques. So that students' motivation, numeracy skills, curiosity, and enthusiasm for learning can all be increased through the use of smart board media that will be created and used for the learning process.

Several previous studies that have examined the development of smart board media such as: (1) Rusanti, Khoirul Umam, and Wahyuning Subayani (2022) entitled "Development of Make a Match Based Puzzle Media Material Determining the Main Idea of Class 3 Paragraphs" obtained a percentage of 93.75% included in the very valid criteria. (2) Winarni and Prastiti (2023) entitled "Development of Visual Media "PANJUMBAR" to Improve the Operation Ability of Counting Sums in Elementary School Students" The average media validity is 4.8 (very relevant). (3) Rahayu and Paksi (2018) entitled "Development of Rotating Flannel Board Media to Help Teachers Understand the Material Impact of Globalization on Elementary School Students" Based on validity trial data, learning media and materials are in the very valid category with a learning media score of 86.7% and 84% material. (4) Saily Selly, Khoirul Umam, and Wahyuning Subayani (2022) entitled "Media Development of Grade 2 Elementary School Mathematics Fractional Flannel Board" media validation received a score of 93.75% with the Very valid category. (5) Nadhifah, Yanti, and Rosyidi (2021) entitled

"Development of *Smart Subtraction Bag* Board Media as an Effort to Increase Learning Motivation of Grade 1 Elementary School Students" The findings of the student learning motivation questionnaire showed an increase from 30% before media use to 82% afterwards in small group trials. This shows that in the very high group, students' enthusiasm for learning increased by 52%.

The novelty of this research is that no one has ever used smart board media to improve students' numeracy skills, especially the ability in addition and subtraction materials involving numbers up to 999 or numbers up to hundreds through stacking methods that use savings and loans techniques based on place values.

Given this, it is clear that there are problems in teaching and learning mathematics, particularly on topics such as structured addition and subtraction using place values up to 999. It can be seen from the lack of learning media, most learning still relies on pictures taken from student books, then teacher books as the only source of learning so that the learning process only uses textbooks and subject matter, and the last is little or even no active student participation in the learning process.

In order for students to have a direct learning experience and fully understand the concepts taught, the smart board media must be incorporated into the educational process. Researchers plan to use the findings to create a smart board material that is eligible for use in grade II Mathematics lessons at SDN Nagrak 03, with the aim of improving students' numeracy skills in addition and subtraction of integers to 999.

METHOD

On April 22-24, 2024, research conducted at SDN Nagrak 03, Nagrak Village, Gunungputri District, Bogor Regency, Indonesia, conducted data collection. The participants of this study amounted to 28 people, all of whom were grade II students of SDN Nagrak 03. The R&D model is used as a research methodology. The purpose of research and development (R&D) is to overcome knowledge gaps in certain fields by developing or creating new products or perfecting existing products in education (Muqdamien et al. 2021). The concept of the development model in this study uses *the 4D (Four D)* model learning tool development method *introduced by Thiagarajan through 4 (four) stages, namely* Define, Design, Develop *and* Disseminate (Rofiyadi and Handayani 2021).

According to Tegeh (2019), this model is very suitable to be recommended to researchers because of its use in presentations that are presented simply. In addition, this model involves several steps. The first stage is define, during which analysis and collection of information is carried out in order to understand the problems associated with the learning process. The second stage is design, where the media to be used is selected based on the material to be delivered. The third stage, namely the development of smart board media, is. The last stage is dissemination, which is carried out to promote media that has been created and is suitable for use by students.

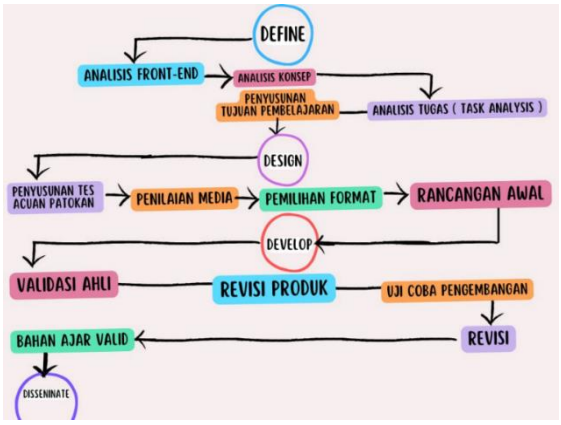

Figure 1. Stages of a 4D Model

In this study, using pre test and post test to compare whether there was a change from students before using smart board media and after using smart board media. Then this study obtained data from the distribution of questionnaires, ranging from media experts, material experts, and student respondents. According to Sugiyono in the journal Fadillah &; Ninawati (2020), stated that data collection was obtained from the dissemination of instruments that would be answered by experts and student respondents. The study has 3 experts in validating this media, namely there are two material experts and also one media expert. The material experts in this study are mathematics material lecturers from Muhammadiyah University Prof.Dr.Hamka and homeroom teacher of grade II SDN Nagrak 03. The media expert is a media expert lecturer from the University of Muhammadiyah Prof.Dr.Hamka. There were 28 grade II students sampled in this study. The study was conducted in large and small groups, with 28 students in large groups and 7 students in small groups.

The Likert scale was used in the investigation of this survey. Using questionnaires that collect answers and recommendations from professional respondents and grade II students, quantitative descriptive data is collected throughout the data collection procedure.

After the media assessment process by material experts and media experts as well as student respondents, an analysis was carried out to measure media validation using percentage descriptive techniques with the formula:

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

Notes :

p = Percentage

f = Percentage Frequency searched

n = Number of Students

The data obtained from the validation results were calculated using the Likert scale, the following score assessment was used:

Table 1. Percentage Range and Media Feasibility Criteria

Percentage Range	Criteria	Information
76% ≤ S_v < 100%	Valid	No Revision Required
50% ≤ S_v < 76%	Quite Valid	Minor Revisions
26% ≤ S_v < 50%	Less valid	Major Revisions
0% ≤ S_v < 26%	Invalid	Not Worth it, needs revision

Table 1 describes the media eligibility criteria of the percentage of results obtained from the data analysis process.

Tablel 1. Questionnaire Scoring Criteria

Number	Score	Information
1.	5	Totally Agree
2.	4	Agree
3.	3	Simply Agree
4.	2	Disagree Less
5.	1	Strongly Disagree

Table 2 describes the scoring criteria for each question presented.

RESULTS AND DISCUSSION

This research is in the form of developing smart board media on the ability to count addition and subtraction material in Mathematics lessons intended for grade II students of SDN Nagrak 03. This media is a 3-dimensional media, in this media it is explained how to use stacking methods for addition and subtraction material based on the correct place value.

This research was conducted to develop smart board media that meets the eligibility criteria to be implemented in Mathematics lessons, especially on addition and subtraction materials for grade II. In this study, smart board media has been carried out by Rusanti, Khoirul Umam, and Wahyuning Subayani (2022), Winarni and Prastiti (2023), Rahayu and

Paksi (2018), Saily Selly, Khoirul Umam, and Wahyuning Subayani (2022), and Nadhifah, Yanti, and Rosyidi (2021) came to the conclusion that smart board media is suitable for social studies and mathematics learning. The update of this research is that no one has ever used smart board media to improve students' numeracy skills, especially the ability to add and subtract numbers to hundreds using savings and loans techniques based on stacking and place values in the context of grade II elementary school mathematics. Research develops smart board media using basic board materials and sticks. The developed smart board media added tools in the form of writing Hundreds, Tens, and Units so that students understand how to solve problems using a way of stacking based on the correct place value.

The media development process goes through several stages, such as validation by experts and conducting research in small groups and large groups. After that, it can only be known whether the material made is good for education. In addition to student assessments, the media validation process also involves two subject matter experts and one media expert. Using 4D models, this smart board medium was developed. The process must go through four stages: defining, designing, developing, and deploying (Rofiyadi and Handayani 2021).

The first step taken is to analyze and define the needs of developing smart board media for grade II mathematics learning at SDN Nagrak 03. Researchers interviewed grade II students of SDN Nagrak 03 to find out what help they needed, and the findings showed that students struggled with concepts discussed in math lessons that focused on subtraction and addition. In addition, interviews with grade II teachers of SDN Nagrak 03 revealed that students pay less attention in class and teachers do not use contextual or real media to help their students learn addition and subtraction.

The second stage of design, after analyzing the problems that have occurred in grade II SDN Nagrak 03, researchers are looking for the right and appropriate learning media for addition and subtraction material, namely smart board media. Activities on smart boards mimic real-life situations or give students tools to deal with problems in a more organized way, therefore they are chosen as a medium to improve students' numeracy skills. After that, researchers will plan to make media to be used on smart boards in mathematics lessons. The next smart board design idea differs from previous smart boards in that it will incorporate place value tools into the smart board medium, allowing students to face challenges in a more organized way. The numeracy ability of students can be improved through the use of smart board media.

The third stage of development, there are several stages, namely the production stage, the implementation stage, and the evaluation stage. At the production stage, the collection of tools and materials is carried out according to the Theme 1 theme book for class II, then the assembly of materials will be designed according to the original form.

Socialized or implemented, research tests the product to see if the product meets their needs and is worth using. In this media, there is product validation conducted by media experts, material experts, and researchers validating products in small groups consisting of 7 students and 28 students in large groups in grade II SDN Nagrak 03 to fill out surveys. The following smart media boards have been created and designed.

Figure 2. Media board before decorated

Figure 3. Media board after decoration

Figure 4. Sticks that are put in the bag

This smart board media is a three-dimensional media with additional explanations or tools to solve problems using the method of speaking, so that the calculation skills possessed by students can increase.

The results can be concluded by using smart board media because addition and subtraction materials can provide direct experience to students, especially in everyday life. After the creation of the media, the next stage is the validity test stage. At this stage, it is carried out to see the assessment of the feasibility level of the media that has been developed. This stage is assessed by material experts, media experts, and student responses.

Tabel 3. Media Expert Validation

Aspect	Score	Criterion
Media fascination	93%	Practical Learning Media
Media resilience	90%	Practical Learning Media
Physical media	100%	Practical Learning Media

Based on table 3 which summarizes the findings of media expert validation, there are three media components that are taken into consideration, namely the beauty aspect gets a percentage of 93%, the durability aspect gets a percentage of 90%, and the physical aspect. gets a percentage of 100%. Expert validation of smart board media resulted in a classification

of "Practical Learning Media" which states that smart board media is valid or very feasible to use.

***Tabel 4. Material Expert Validation** (first)*

Aspect	Score	Criterion
Feasibility of the material	94%	Very decent
Material submission	90%	Very decent

***Tabel 5. Material Expert Validation** (Second)*

Aspect	Score	Criterion
Feasibility of the material	97%	Very decent
Material submission	100%	Very decent

Based on the data in tables 4 and 5, the material validation process consists of two parts. The first part is the feasibility of the material gets a score of 94% and 97% from two material experts. The second part of material delivery gets a score of 90% and 100%. Thus, smart board media validation findings from material experts fall into the category of "very feasible" or useful.

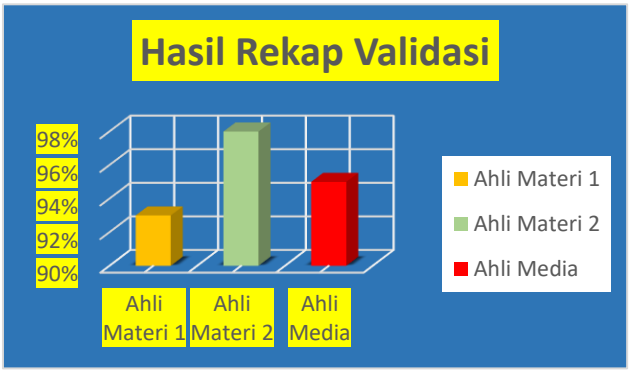

Figure 5. Validation Recap Results

From the results of material and media expert validation, it can be concluded that smart board media can be said to be "very feasible" to be used in the learning process of addition and subtraction material in grade II Mathematics learning.

The research was conducted at SDN Nagrak 03 in both large and small groups. There were 7 students forming small groups and 28 students forming large groups. The resulting media in the form of smart boards is the focus of this research which aims to determine practicality. Then the researchers conducted a pre-test and post-test on a small group first, the results of the small group test on the smart board learning media got an average value of 79.29 without using media and an average value of 92.86 using smart board media. So it can be concluded that smart board media is very effective and does not need to be revised again for use. In addition, after conducting the pre-test and post-test, students were asked to fill out a questionnaire in which there were 10 questions in asking about the quality of the media and the technical quality of the smart board media created.

Tabel 6. Small Group Response

Aspect	Score	Criterion
Media quality	93%	Very decent
Technical quality	94%	Very decent

Table 6 is the result of the response of a small group of students totaling 7 students with a result of 93% for the aspect of media quality, and for the aspect of technical quality of the media obtained a result of 94%.

Tabel 7. Large Group Response

Aspect	Score	Criterion
Media quality	94%	Very decent
Technical quality	94%	Very decent

While in table 7 is the result of the response of a large group of students totaling 28 students, for the media quality aspect it gets a percentage of 94% and for the technical quality aspect it gets a percentage of 94%. Researchers also conducted pre-test and post-test on large groups and obtained pre-test results of 77.32 without using media and 95.18 using smart board media that had been created.

It can be concluded that the response of students from small groups and large groups to smart board media can be said to be "very feasible" or "practical learning media" which means that smart board media is valid for use in the learning process of addition and subtraction material in grade II Mathematics learning, because smart board media is able to involve student roles directly and make students have more curiosity. So that the ability to count possessed by students will increase.

CONCLUSION

Based on the research submitted, media and materials experts confirmed the creation of smart board media for mathematics learning taught in small and large groups of seven and twenty-eight students, respectively, in the second grade at SDN Nagrak 03. The study concluded that smart board media is an excellent tool to improve the mathematical calculation skills of grade II students.

The results showed that 95% of smart board media that had been confirmed by media experts, got a percentage of 93% and 98% by material experts with very valid categories. The results of the study conducted in small groups with only seven students resulted in a very suitable assessment of 93%. In addition, a study conducted on a large sample of 28 grade II students of SDN Nagrak 03 produced a very realistic figure of 94%. The results of validation by two material experts and one media expert, as well as research in small and large groups show that smart board media is an excellent tool for teaching basic mathematical concepts to second graders. Because of the findings of this study, smart board media highly meets suitability requirements, and is effectively used in math lessons, particularly those involving addition and subtraction. Future research will test the efficacy of smart board media produced by improving the numeracy skills of grade II children using addition and subtraction problems.

Suggestions and messages that researchers can convey are as follows: (1) Students should have strong proficiency in using and using learning materials. (2) In order for students to understand information thoroughly, teachers should use special media that can directly involve them when teaching mathematics, especially topics related to addition and subtraction. (3) School administrators should encourage educators to develop new forms of media and incorporate them into the physical space of the school to improve student engagement and retention of course content.

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