

DEVELOPMENT OF COUNTING CARD MEDIA ON ADDITION AND SUBTRACTION MATERIALS FOR GRADE 1 THEME 1 MYSELF SUB-THEME 1

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Abstract

Mathematics learning in early elementary school plays an important role in building students' understanding of numeracy concepts. However, in practice, learning is still often dominated by lecture methods and limited use of media. This occurs at Muhammadiyah Purwodiningratan 1 Elementary School, which tends to be teacher-centered and lacks variety in the use of media, resulting in students becoming passive and experiencing difficulties in understanding basic arithmetic concepts. The type of research used was Research and Development (R&D) with the Borg and Gall procedural model. The research tools used were validation sheets given to media experts, subject matter experts, and learning experts. Data analysis techniques included quantitative and qualitative methods. Based on the validation results, the media was declared suitable for use with a detailed conversion score from media experts of 77.5 (Good Category), subject matter experts of 87.5 (Very Good Category), and learning experts of 75 (Good Category). Overall, the average assessment of the three experts reached a score of 80, indicating that the "Counting Cards" media is in the good category and suitable for use in teaching mathematics to first-grade elementary school students and is able to help students understand the concepts of addition and subtraction in a more concrete and interesting way.

Keywords: Counting Cards, Learning Media, Students, Thematic.



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INTRODUCTION

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Students' low understanding of basic arithmetic concepts indicates the need to use learning media that is appropriate for the characteristics of early grade students. Concrete and interactive learning media can help students understand abstract mathematical concepts more easily. According to Law No. 20 of 2003, education is a conscious and planned effort to create a learning atmosphere and process so that students actively develop their potential to possess spiritual strength, religious control, self-control, personality, intelligence, noble morals, and skills necessary for themselves, society, the nation, and the state (David & Budianto, 2021). Thus, the process of learning arithmetic is an interesting activity for students if carried out in a playful atmosphere (Santos & Pinho, 2023). In the 1st grade of elementary school, students begin the process of learning arithmetic, specifically addition and subtraction (Temnikova, 2021). As an effort to improve student learning outcomes in mathematics, a learning media or method that is effective, interesting, and enjoyable is still needed. In this case, the researcher uses counting cards as media (Tunggali et al., 2023). With these counting cards, students are expected to be more active, creative, and able to master mathematical knowledge, so that student learning outcomes can be improved. According to Antero (2016:68), media are intermediaries for conveying messages/information that can stimulate students to develop a desire to learn. Therefore, media are tools to help students learn, so they do not get bored with what is explained. Students are required and taught to actively interact with the teacher and their peers.

The objectives of mathematics as a subject include: (1) Fostering and developing arithmetic skills. (2) Fostering student abilities that can be transferred through mathematical activities. (3) Developing basic mathematical knowledge as a foundation for further study in junior high school. (4) Forming logical, critical, meticulous, creative, and disciplined attitudes. In the current 2013 curriculum (K13), which is being implemented, students are no longer centered around the teacher; instead, students are required to be more active and to discover things first in mathematics. Mathematics is a subject that must be studied by students from elementary school to higher levels (Sa'di et al., 2023). Not only studied, but mathematics is also needed for daily activities in problem-solving (Agbata et al., 2024). Mathematics is an important subject for everyone (Castillo, 2022). Ismail, et al. (in Hamzah & Muhlisraini, 2014) define Mathematics as the science that discusses numbers and their calculations, discusses numerical problems, concerning quality and quantity, studies relationships between patterns, shapes, and structures, a means of thinking, a collection of systems, structures, and tools. Mathematics is a definite or concrete science.

Mathematics is studied by students in school to equip them with several competencies, including the ability to think logically, analytically, systematically, critically, and creatively, as well as the ability to cooperate (Giriansyah et al., 2022). The definition of thematic/thematic learning in Abdul Majid's book (2014: 80) is integrated learning that uses themes to connect several subjects in order to provide meaningful experiences to students. A theme is a main idea or main concept that becomes the subject of discussion (Poerwadarminta, 1983). Based on the explanation above, thematic learning is a new curriculum in 2013 that has been implemented for approximately 7 years. This differs from the implementation of the 2006 curriculum or KTSP, where in the 2006 curriculum, all subjects were not mixed as they are now.

Media Counting Cards are learning media in the form of cards designed to help students understand the concepts of addition and subtraction through concrete counting activities. This media allows students to learn actively through observing, counting, and verifying answers independently. Based on the observations of the 1st-grade teacher at Muhammadiyah Purwodiningratan 1 Elementary School in Yogyakarta during PLP II, conducted on August 15, 2019, and in April 2020, through unstructured observations and interviews, several problems were identified: (1) Students have different learning styles. (2) Misconceptions often occur regarding the mathematics learning material delivered by the teacher. (3) Generally, for subtraction and addition topics in lower grades, students experience difficulties in understanding them. (4) Material understanding cannot be conveyed abstractly to students.

Based on the observations at Muhammadiyah Purwodiningratan 1 Elementary School Yogyakarta during research, the learning activities only used books provided by the school. The content of the books used in learning is incomplete and difficult for students to understand. This is different from counting cards. Counting cards can simplify the learning process in the classroom in a fun way, so students do not get bored easily. As an effort to increase the active role of students in learning, it is necessary to develop appropriate media that can optimize students. Media can help students understand number concepts in learning. Media plays a very important role in improving the quality of learning (Nurfadhillah et al., 2021). Media can be used to build understanding and mastery of abstract mathematical concepts and symbols by making them concrete (Widyaningrum et al., 2022). Concrete media can introduce mathematical concepts and symbols from an early age, adapted to the child's thinking level (Fauziyyah et al., 2023).

Learning media are anything used in learning activities that function as a channel for messages/information that can stimulate students' thoughts, messages, interests, and attention, so that the educational communication interaction process between teachers and students can run quickly, effectively, and efficiently (Rusmayadi et al., 2024). The use of media can foster students' creativity and activity in learning (Harpeni et al., 2020). Media is not only used by teachers classically in front of the class but students must also be given the opportunity to try (Widjathi, 2021). The uniqueness of this study lies in the development of a double-sided Counting Card, which allows students to check their answers independently. In addition, this media is adapted to the themes and sub-themes of the 2013 Curriculum and implements student-centered learning.

There is explains several principles in media selection, namely: (a) There must be clarity about the purpose and objectives of the selection, (b) The selected media must be introduced with its properties and characteristics, (c) There must be a number of comparable media because media selection is a decision-making process from alternative solutions demanded by the objectives (Chotib, 2018). The characteristics of media can also be seen according to Arief S. Sandiman (2018: 28) regarding the ability to stimulate the senses of sight, hearing, touch, taste, and smell, or their suitability with the hierarchy of learning levels as worked on by Gagne, and so on. These media characteristics, as stated by Kemp (1975), form the basis for selecting media according to a specific learning situation. He said, "The question of what media attributes are necessary for a given learning situation becomes the basis for media selection." It can be stated that learning media can be grouped into 3 groups, namely: (a) Graphic media such as: pictures/photos, sketches, diagrams, charts, graphs, cartoons, posters, maps and globes, flannel boards, and bulletin boards. (b) Audio media such as: radio, magnetic tape recorders, and language laboratories. (c) Still projection media such as: filmstrips, slides, transparency media, opaque projectors, microfiche, film, loop films, television (TV), video, and games & simulations. Thus, the classification of media, media characteristics, and media selection are inseparable parts of determining learning strategies. Therefore, the description above can be concluded that the characteristics of learning media can be grouped into audio, visual, print media, media projected into multimedia, and cannot be separated because they form a unified whole in the determined learning. Teaching materials are a form of learning where students learn and work actively, where students are more involved in participating in learning to interact with their peers (Liber et al., 2024). Therefore, the use of counting card development media for addition and subtraction material is very supportive in the teaching and learning process of students (Hafilda & Murtyas Galuh Danawati, 2024).

The difference or novelty of this study is that it discusses the suitability of the counting card media used as an effort to integrate concrete media and the students' independent reflection process. Then there is the double-sided counting card design that allows for error checking. Based on the problems in the school, the researcher is interested in developing media that can help students understand Addition and Subtraction material. The researcher developed counting

card media that can be used in Mathematics learning for addition and subtraction material. The counting cards developed by the researcher are in accordance with the characteristics of the students. With the counting cards developed by the researcher, it is hoped that they can improve student learning achievement and increase student motivation in learning activities. The purpose of this study was to develop Counting Card learning media and determine the feasibility of this media based on the validation results from experts.

RESEARCH METHOD

Research Design

Research Design This study uses research and development (R&D). The development model adopted in this study refers to the procedural model according to Borg and Gall. According to Borg and Gall (1988) in Sugiyono, research and development R&D is research used to develop and validate products used in education and learning. The development model used in the flashcard learning media for 1st-grade elementary school students uses Borg and Gall's model (Sugiyono, 2021).

Research Target/Subject

Research Target/Subject The target users of this media are first-grade elementary school students, specifically for addition and subtraction material in Theme 1 (Myself) Sub-theme 1. However, due to the limitations imposed by the COVID-19 pandemic, the research subjects were limited to validator lecturers or experts, consisting of subject matter experts, media experts, and learning experts, without direct testing on students in schools.

Research Procedure

Research Procedure The development procedure was modified from Borg and Gall's 10 stages to 5 main stages due to time and cost constraints. The five stages include:

Potential and Problems: Analysis of learning problems in elementary schools.

Data Collection: Literature study and needs analysis.

Product Design: Designing the "Counting Cards" media.

Design Validation: Assessment by expert lecturers.

Design Revision: Product improvements based on validator input and finalized at this stage.

Instruments, and Data Collection Techniques

Instruments and Data Collection Techniques Initial data collection techniques were conducted through observation and unstructured interviews with first-grade teachers to identify learning problems. The main instrument for testing product feasibility was an observation sheet or validation questionnaire given to experts (in materials, media, and learning) online. In addition, there was a curriculum analysis to determine the Core Competencies and Basic Competencies.

Data Analysis Technique

Qualitative and quantitative data analysis techniques were used. Qualitative data analysis techniques are used to refine the final product developed, in the form of input, suggestions, responses, and criticisms from validators who are experts in material, media, and learning. Quantitative data analysis yielded the results of expert validation assessments during the product trial. The assessment used in this research is the *Likert* scale with a scale of 1-4, following the provisions (Suharsimi, 2010: 285). The alternatives can then be concluded as follows.

Table 1. Scoring guidelines

Category	Assessment Score
Strongly Agree	4
Agree	3
Somewhat Agree	2
Somewhat Disagree	1

The formula used is:

$$X = \Sigma x / N$$

Explanation:

X = average score

Σx = total assessment score

N = number of validators

The data obtained is then calculated using the formula stated in the technical guidelines for the preparation of affective assessment tools in high schools as follows:

Table 2. Assessment Categories

Achievement Level	Qualifications	Description
$M_i + 1,5. S_{Di} \leq x \leq M_i + 3,0.S_{Di}$	Very good	Revised as necessary
$M_i + 0. S_{Di} \leq x \leq M_i + 1,5.S_{Di}$	Good	Not many revisions
$M_i - 1,5. S_{Di} \leq x \leq M_i + 0.S_{Di}$	Enough	Quite a few revisions
$M_i - 3. S_{Di} \leq x \leq M_i - 1,5.S_{Di}$	Less	Total revision

RESULTS AND DISCUSSION

The development of the "counting card" media, limited to the fifth stage, namely potential problems, data collection, product design, design validation, and product revision, is sufficiently covered by the subject matter expert as follows.

A. Potential and Problems

In the potential and problem stage, the "counting card" media was developed based on the problems found at SD Muhammadiyah Purwodiningratan I during observational and interview research with the 1st-grade teacher was not documented. Based on undocumented observations and interviews with the teacher, it was known that the learning was centered only on the teacher (teacher-centered) and the learning methods used by the teacher lacked variety because they only used lecture and assignment methods, which resulted in low interaction between teachers and students, and students also tended to be passive in participating in learning. Besides that, there was a lack of use of learning media in the learning process and the absence of learning media that attracted students' attention. From

the results of the observations and interviews conducted, data collection was continued to be used in data analysis.

B. Data Collection

The development of the "counting card" media aims to make it easier for students to learn addition and subtraction materials, both in the community and school environments, as well as vowel materials. The use of this media is expected to make students understand better when learning addition, subtraction, and vowel materials. In addition, the researchers conducted a needs analysis observation at SD Muhammadiyah Purwodiningratan 1, by analyzing the curriculum that was implemented to determine Core Competencies, Basic Competencies, and indicators. After analyzing the curriculum, it was known that the curriculum used in the school was the 2013 curriculum. Besides analyzing the curriculum, the researchers developed media. The development of the "counting card" media was based on the results of theoretical studies on thematic learning, student characteristics, addition and subtraction materials, as well as vowels, and theories about learning media obtained from books and journals. In addition, literature studies also involved studying relevant theories adapted to the developed research.

C. Product Design

In developing the "counting card" media, it was adapted to the predetermined design. The benefit of the media design is to determine the pattern or form of the developed media. The steps in creating the "counting card" media are as follows.

1. Counting card media design

This learning media is a type of Educational Play Tool (APE) in the form of addition and subtraction game cards that will be used for thematic learning, theme 1 myself, sub-theme 1, sub-theme 1, me and new friends. This media is in the form of cards with dimensions of 6.5 cm x 10.5 cm, equipped with images such as red and orange backpacks, notebooks with red covers, white shirts with red armbands and collars, pink pants, and a boy wearing a school uniform, and also has number cards. From the designs described above, the "counting card" media used has attractive colors for students. In addition, it is equipped with a guide on how to play and a box to store the cards.



Figure 1. Pants Shape



Figure 2. Bag Shape



Figure 3. Boy's Shape



Figure 4. Trousers Shape



Figure 5. Book Shape



Figure 6. Shape of Numbers



Figure 7. Shape of a Number Sign

2. Instrument User Manual for "counting card" media

User manual for "counting card" media, containing user instructions/game rules, and answer key. The user manual is printed on 310gr ivory paper in A5 size.

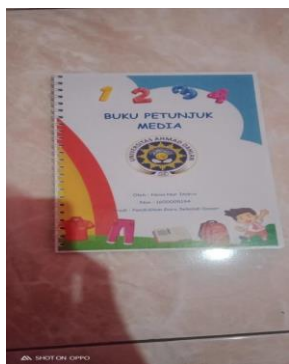


Figure 8. Media User Manual

D. Validation Results Data

In the second stage of the initial production that has been made, it will then be validated by experts by assessing the product produced. These results aim to improve the product to be even better. The validation is carried out by three experts, consisting of a material expert, a media expert, and an learning expert.

1. Material Expert Validation Test Results

The results of the material validation expert's assessment of the quality of the "counting card" media were carried out by Mr. Hengkang Bara Suprpto, M.Pd., a PGSD UAD lecturer who is an expert in the material field, on December 12, 2020. This material validation was conducted by providing an observation sheet to the material expert online.

The results of the material expert's assessment of the quality of the "counting card" media received a score of 87.5. When converted into qualitative data, it falls into the "strongly agree" category. The score obtained from the assessment by the material expert can be concluded that the quality of the "counting card" media is "strongly agree"

2. Media Expert Validation Test Results

The assessment by the media validation expert on the quality of the "counting card" media was carried out by Mr. M. Ragil Kurniawan, M.Pd., a PGSD UAD lecturer who is an expert in the media field, on October 2, 2020. This media validation

was conducted by providing an observation sheet to the media expert after the researcher introduced the media to the media expert online.

The results of the media expert's assessment of the quality of the "counting card" media received a score of 77.5. When converted into qualitative data, it falls into the "strongly agree" category. The score obtained from the assessment by the material expert can be concluded that the quality of the "counting card" media is "strongly agree"

3. Learning Expert Validation Test Results.

The results of the learning validation expert's assessment of the quality of the "learning card" media were carried out by Mrs. Asih Mardati, M.Pd., a PGSD UAD lecturer who is an expert in the learning field, on October 5, 2020. This learning validation was conducted by providing an observation sheet to the learning expert after the researcher explained the learning on the media by referencing the lesson plan (RPP) to the learning expert.

The results of the learning expert's assessment of the quality of the "counting card" media received a score of 75. When converted into qualitative data, it falls into the "strongly agree" category. The score obtained from the assessment by the material expert can be concluded that the quality of the "counting card" media is "strongly agree"

E. Design Revision

Based on the assessment, criticism, and suggestions regarding the "counting card" media from the 3 experts, including the media expert, material expert, and learning expert. Improvements or revisions to the "Counting Card" material and media were then carried out based on the assessments and input from each lecturer. Based on suggestions from validators, the Counting Card media underwent several improvements, including the addition of a user manual and improvements to the card's appearance to make it clearer and more appealing to students.

F. Product Revision

1. Media Expert Analysis

The media expert analysis provided assessments in the form of constructive criticism and suggestions to improve the developed media to be even better. The constructive criticism and suggestions are as follows:

- a. The "counting card" media needs to be improved by adding a user manual so that the use of the "counting card" media is clearer,
- b. Arrows should be added inside the user manual to make it easier for students to use the manual.

2. Material Expert Analysis

The material expert analysis provided assessments in the form of constructive criticism and suggestions to improve the developed media to be even better. The criticisms and suggestions are as follows:

- a. Improvements should be made in accordance with the correlation in the product draft
- b. Improvements in command sentences in the material.

3. Learning Expert Analysis

Similar to the media expert, the learning expert also provided assessments along with constructive criticism and suggestions to further improve the media. The suggestions provided by the learning expert are as follows:

- a. Cards should be made double-sided with error checking
- b. Images should match the theme
- c. Steps should be student-centered
- d. Pay attention to the use of media with learning outcomes

Table 3. Quantitative Data of Expert Assessment Results on the "Counting Card" Media

No	Penilaian	Nilai	Kategori
1	Media Expert	77,5	Valid
2	Content Expert	87,5	Highly Valid
3	Learning Expert	75	Valid

Based on the results of the assessment above, it is further processed using Suharsimi's formula to determine the feasibility of the "counting card" media by processing the average value as follows:

$$x = (\sum x) / N$$

$$X = (77,5 + 87,5 + 75) / 3$$

$$X = 80.$$

So, the average obtained from the media expert, material expert, and learning expert assessments is 80. It can be said that the average validation score obtained is good. Because the calculation results from the three experts in the assessment category are included in Valid. This means there are revisions/improvements, but not too many.

From the scores obtained above, it is continued to obtain the average result from the three experts, and the score obtained is 80. The scores obtained above can be presented using a bar chart, as follows.

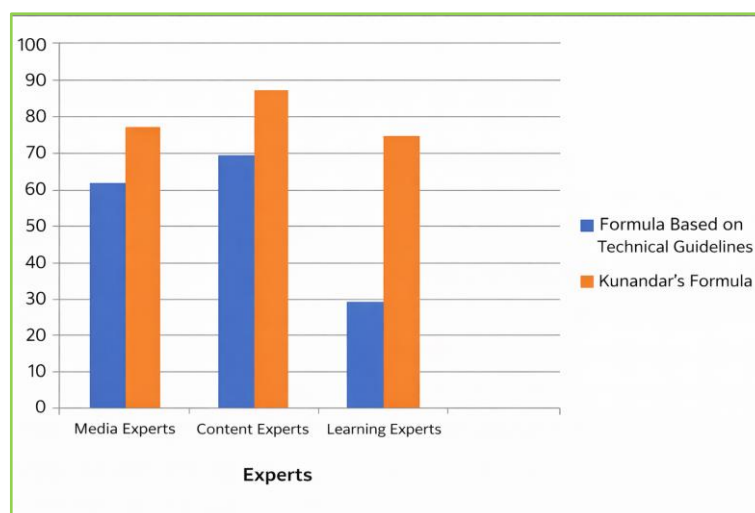


Figure 9. Expert Assessment Results Diagram

From the diagram above, it is explained that the media expert received a score of 62 with the category "valid", subsequently this score was processed using Kunandar's formula, resulting in 77.5. Meanwhile, for the material expert, a score of 70 with the category "very valid" was obtained. The processed score using Kunandar's formula resulted in a score of 87.5. For the learning expert, a score of 30 with the category "valid" was obtained, and using Kunandar's formula, a score of 75 was obtained. The validation results show that the Counting Card media obtained an excellent rating. These findings are in line with previous studies which state that the use of card media can improve elementary school students' understanding of counting concepts.

CONCLUSION

Based on the results of this research and development, it can be concluded that this research and development produced a product in the form of "counting cards" media on the material of addition and subtraction, theme 1 "Myself", sub-theme 1, learning 3 for 1st grade in elementary school.

1. The stages carried out to produce the "counting cards" media by developing according to the steps of the Brog and Gall development model according to Sugiyono, only reached the fifth stage, namely design revision, starting from potential and problems, data collection, product design, design validation, and design revision.
This was done by the researcher due to limitations in ability, time, and cost. Because of the COVID-19 pandemic, research was not possible. Then, to proceed to product creation, the following steps were taken: determining the material, determining the media design (cards, instruction booklet, box for card storage), and expert validation.
2. Based on the table of results from the validation assessment by media experts, material experts, and learning outcomes, it can be known that the media expert results were 62 with a very good category, resulting in 77.5. Material experts scored 70 with a very good category, resulting in 87.5. Learning experts scored 30 with a very good category, resulting in 75. Based on these assessment results, it can be concluded that the "counting cards" media, with a score of 80, is suitable for use in learning. Based on this assessment, it can be concluded that the "counting cards" media is feasible for use in learning. In addition, the Counting Card media that was developed has fulfilled the research objectives, namely to produce learning media that is suitable for use and in line with the characteristics of early elementary school students.

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AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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