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DEVELOPMENT OF SUBTRACTION FLASH CARDS THROUGH CAMP MODEL TO INCREASE SELF EFFICACY

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Abstrak

Tujuan dari penelitian ini adalah sebagai berikut: (1) menjelaskan prosedur yang digunakan untuk membuat media pembelajaran berbentuk kartu flashcard pada materi pengurangan bilangan 1–10 menggunakan pendekatan Model Kemp; (2) mengevaluasi validitas dan kelayakan media menggunakan penilaian pakar; dan (3) mengevaluasi bagaimana media tersebut berdampak pada peningkatan self-efficacy siswa kelas I di SDN 2 Kalipucung, Kabupaten Blitar. Metodologi yang digunakan adalah penelitian dan pengembangan (R&D), dan fokusnya adalah bagaimana membuat dan mengevaluasi media inovatif untuk pembelajaran di sekolah dasar. Untuk mengukur self-efficacy, instrumen penelitian termasuk lembar validasi ahli dan angket tanggapan siswa sebelum dan sesudah menggunakan media. Hasil validasi menunjukkan bahwa, berdasarkan evaluasi dari ahli materi dan media, media yang dikembangkan tergolong sangat layak. Selain itu, hasil pengujian efektivitas menunjukkan bahwa siswa memiliki self-efficacy yang lebih besar setelah menggunakan media; skor rata-rata meningkat dari kategori "cukup" menjadi kategori "baik". Hasilnya menunjukkan bahwa penggunaan media flashcard yang didasarkan pada Model Kemp tidak hanya layak secara teoritis dan praktis, tetapi juga membantu meningkatkan kepercayaan diri siswa dalam belajar matematika.
Kata kunci : Flashcard; Model Kemp; Self Efficacy.

Abstract

The objectives of this study are to: (1) outline the steps involved in creating instructional materials based on flashcards that teach subtraction of numbers 1–10 using the Kemp Model; (2) evaluate the media's viability and validity using expert assessments; and (3) investigate how the media affects Grade I students at SDN 2 Kalipucung, Blitar Regency, in terms of their increased self-efficacy. Using a research and development (R&D) methodology, the study concentrated on creating and assessing cutting-edge educational materials for use in primary school. Pretest–posttest measures of self-efficacy, student response questionnaires, and expert validation sheets were among the tools used to collect data. According to validation results, the media was very feasible in the opinion of media and subject matter experts. Additionally, after using the media, students' self-efficacy significantly increased, as evidenced by effectiveness testing, which showed average scores moving from the "fair" to the "good" category. These results imply that flashcard materials created with the Kemp Model are useful in boosting students' confidence in their ability to acquire mathematics in addition to being theoretically and practically sound.
Keywords*: Flashcard; Kemp Model; Self Efficacy*

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I. Introduction

Mathematics learning in elementary school, especially the subtraction of numbers from 1 to 10 in grade I, has a strategic role in fostering students' numeracy skills and logical thinking patterns. Therefore, the concept of subtraction needs to be introduced through a contextual and fun approach so that students can understand its operational meaning deeply. The use of concrete media, such as manipulative props or picture cards, has proven effective in helping students visualize and internalize mathematical concepts.

Materials and delivery strategies are important for an effective learning process. An effective delivery strategy allows students to actively participate. Silberman (2004) revealed that active learning can improve students' understanding of concepts because students are directly involved in the process. This idea is in line with the principle of contextual learning suggested by the Ministry of National Education (2008), which links teaching materials with students' real experiences to create applicative understanding.

Interviews with the first-grade teacher of SDN 2 Kalipucung (September 15, 2024) showed that there are obstacles in using varied and targeted learning media, as well as students' low self-efficacy in dealing with mathematics materials. Self-efficacy, as proposed by Bandura, refers to an individual's self-confidence in his or her ability to complete certain tasks. Students' low self-efficacy has a direct impact on their motivation and academic performance.

Flashcard-based learning media development is an alternative option. According to Fatih (2018), the environment in which learning is taking place is very important in the use of learning media because it can motivate and make it easier for students to learn. This media has the potential to make learning visual, concrete, and easy to use for individual and group activities. Flashcards can improve memory and understanding by providing effective visual stimulation.

A new study shows that students in grade I SD better understand math concepts, including addition and subtraction, by using flashcards. Sr and Nugraheni (2024) found that with a two-cycle classroom action method (PTK), the cognitive ability of grade I students at SDN Sindang Mulya 03 had been improved through the use of flashcards on addition and subtraction materials up to the number 20, and student scores improved significantly. An additional study by Hapsari et al. (2024) found that flashcard media can make improvements in learning outcomes and become a motivation in learning mathematics for class I2 students of SDN Tingkir Lor 02.

In addition, Nina et al. (2023) revealed that the use of flashcard media to improve the critical thinking skills of fourth-grade students at SDN Sawentar 02 Kanigoro can improve students' critical thinking skills. The results of expert validation show that flashcard media is very suitable for use as a learning tool for elementary school students because there is an increase in scores on the post-test results.

For the implementation to be structured and systematic, this media was developed concerning the Kemp Learning Model. Kemp's model, as explained by Morrison, Ross, and Kemp (2004), is a flexible and learner-centered learning design framework. The model includes planning, development, and evaluation processes by considering students' characteristics, instructional objectives, teaching strategies, and appropriate media selection. The implementation of this model is believed to not only support the achievement of learning objectives but also contribute to strengthening students' self-efficacy through active engagement and meaningful learning experiences.

Several previous studies have examined the effectiveness of using flashcards in mathematics learning (Khafida, 2020; Sholeh, 2023). However, most of them have not integrated a systematic design approach such as the Kemp Model, especially in the context of efforts to increase students' self-efficacy in subtraction material in grade I SD. Thus, there is room for significant scientific contributions from this research.

This study has the following objectives: (1) to explain how the Kemp Model was used to develop flashcard media for subtraction materials; (2) to evaluate the validity and feasibility of the media; and (3) to evaluate how the media impacted the self-efficacy of grade I students of SDN 2 Kalipucung, Blitar Regency, which increased. It is hoped that this research can help in building innovative, efficient, and contextualized learning methods at the basic education leve

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II. Research Methods

Research and development is a type of research that aims to produce learning media in the form of flashcards on the material of reducing numbers 1-10 with the Kemp Model approach and test its feasibility, practicality, and effectiveness in increasing the self-efficacy of grade I elementary school students. The Kemp model was chosen because it provides a systematic and flexible structure that integrates learning media into the teaching and learning process.

The research was conducted at SDN 2 Kalipucung, Sanankulon District, Blitar Regency, East Java Province. The research ran during the odd semester of the 2024/2025 academic year, and the main implementation was conducted between September and December 2024.

The research subjects consisted of 25 first-grade students, consisting of 10 male and 15 female students. The purposive sampling technique was used as a sample selection technique, namely by considering the suitability of the characteristics of students with media needs and the readiness of the class teacher in accompanying the implementation activities. The first grade teacher was also involved as the main partner in the process of observation, media implementation, and evaluation.

The development procedure uses the steps in the Kemp Model, which include: (1) identifying learning problems; (2) analyzing student characteristics; (3) formulating operational learning objectives; (4) organizing teaching materials logically; (5)

determining appropriate learning strategies; (6) selecting media and learning resources; (7) designing learning evaluations; (8) implementing products in actual learning; and (9) revising products based on evaluation feedback.

Needs identification was conducted through in-depth interviews with the class teacher and direct observation in the classroom. It was found that the limited media used by the teacher resulted in low active involvement of students, especially in understanding the concept of number reduction. In addition, it was found that learners mostly showed a low level of self-confidence when solving math questions, which indicates a problem in the aspect of student self-efficacy. To increase learners' motivation to participate in learning activities at school, self-efficacy, also commonly referred to as self-efficacy, plays an important role. Learners need to have confidence that they will succeed in school (Mufidah et al., 2023).

Based on these findings, the researcher developed 30 flashcards (60 faces) with a size of 8x12 cm. The cards were classified into three types: 10 cards with pictures of fruit, 10 cards with pictures of surrounding objects, and 10 cards with numbers. Each card is made of matte laminated hardcover and packed in a 1500 gsm grayboard box to maintain durability. The pictures on the cards are designed with bright, expressive colors and adapted to the context of the early childhood environment. The design emphasis is on contextual, visual, and concrete learning.

After the product was developed, a validation process was carried out by media and material experts. Media experts assessed the visual, aesthetic, and usability aspects of the cards, while material experts assessed the suitability of the content with the basic competencies and learning objectives of grade I mathematics. The validation instrument used a four-level Likert scale rating sheet that included aspects of content appropriateness, clarity of visual messages, and pedagogical integration. The validation results were calculated using the average score and categorized according to the criteria of high, medium, or low validity.

This study was conducted with developmental research (R&D) to create flashcard media for subtraction materials for numbers 1-10 using the Kemp Model. In addition, they will also test whether this model is reasonable, practical, and effective in increasing the self-efficacy of grade I students. The Kemp model was chosen because of its flexible and systematic way to integrate learning media into the learning process (Widya et al., 2021).

After going through the validation and improvement process, the product was tested in a limited trial with grade I students. The trial was conducted in two learning meetings with subtraction material 1-10. During the trial, students were directed to use the cards individually and in groups in play while learning activities, such as matching pictures with numbers, pair games, and composing counting stories.

To measure the effectiveness of the media, a self-efficacy questionnaire for learners was used. The questionnaire consists of 10 statements with four scale options (1 = strongly disagree, 4 = strongly agree). This instrument is based on Bandura's self-

efficacy dimensions, namely magnitude (level of difficulty), strength (level of strength of belief), and generality (scope of belief context (Rahmi et al., 2020).

In addition, observations were made during the learning process to assess student engagement, activity, and response to the media. Observations were conducted using a narrative format sheet, with categories of observed behavior including participation, initiative, and cooperation in group activities. Classroom teachers were also asked for feedback through open-ended interviews on the use of the media and its impact on learning.

The benchmark for the success of this media development was determined based on three main indicators: (1) product validity based on the results of the experts' assessment; (2) practicality based on the smooth implementation and responses of students and teachers during the use of the media; and (3) effectiveness based on a significant increase in students' self-efficacy after learning. The product is said to be successful if it meets the criteria of valid (average score > 3.00), practical (implementation runs smoothly without significant obstacles), and effective (there is an increase in the average score of students' self-efficacy ≥ 20%) (Mufidah et al., 2023).

III. Results and Discussion

A. Research Findings

This research produces flashcard media for learning math material for subtraction of numbers 1-10, and tests its effectiveness in increasing the self-efficacy of grade I students**.**

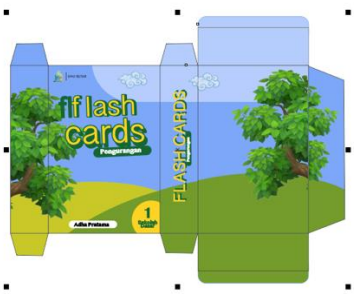
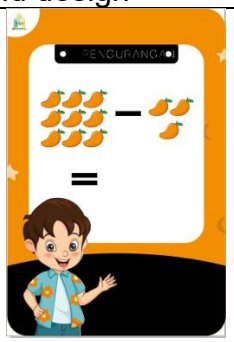
1. Analysis

This analysis stage analyzes the general characteristics of students and their learning styles. Analysis of the learning situation in grade 1 SDN 2 Kalipucung in the material of reducing numbers 1-10 requires special attention, including the need for a more interactive and fun approach so that students are motivated to learn. The general characteristics of students in grade 1 at SDN 2 Kalipucung show that some students may have less supportive learning experiences at home. In addition, it is important for teachers to identify students' learning styles so that they can adjust teaching methods and learning media.

2. Design

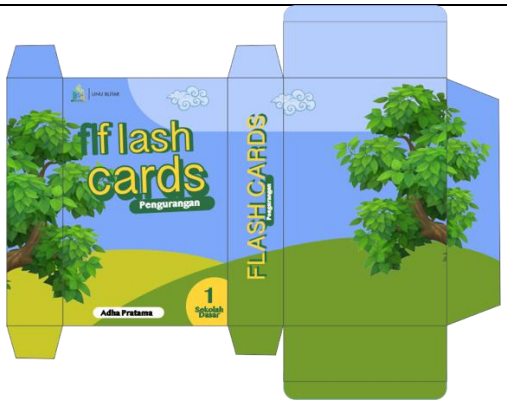
In the media selection, the researcher chose flashcard media using Art Cartoon 400 Gsm paper, and as many as 30 front and back cards. Researchers used CorelDRAW to plan the material and images displayed on 400 Gsm Art Cartoon paper. For grade 1, the researcher chose subtraction 1-10. The right choice of material is very important to optimize the process of developing teaching materials in the classroom. In making this media design, several components are determined, including images

and questions for the front and back of the card. The results of making flashcard media designs using CorelDRAW are as follows:Tabel 1. Desain Pembuatan Rancangan Media *Flashcard*

No	Description	Images
1	We open the corel draw application	 Images 1. *Icon Corel Draw* 2019
2	Design the cover of the flashcard box according to the pattern of the flashcard box. Design with attractive colors, images, and text.	 Images 2 Flashcard box cover design
3	Create a background design for flashcards with attractive images and colors accompanied by the campus logo.	 Gambar 3. Flashcard Background design
4.	Create subtraction problems with pictures according to the desired problem	 Gambar 4. Design of subtraction flashcards with pictures

Source : Research Results

The results of making several flashcard media designs based on subtraction 1-10 grade I material are shown in the following table:Tabel 2. Design of Flashcard Media Development Results

Flashcard Holder Box Cover


Images 5. Box cover of subtraction flashcards 1 - 10

	Media Front	Back Side of the media
Image 1		
Image 2		

Source : Research Results

3. Development

At this stage the validation process is carried out. As stated by Prasetyo in (Restiani et al, 2024), a quality product if it meets the criteria of validity and effectiveness. The validation process was carried out by two people, namely media experts and material experts. The assessment is carried out using a validation assessment instrument consisting of several indicators such as media display, color design, image design, media material, and media convenience that is adjusted to phase A students. The following table shows the results of the validation:

Table 3. Results of Flashcard Media Validation Assessment

Aspects	Maximum Score	Media Expert Score	Material Expert Score	Average
Media Display	5	5	5	5
Color Design	5	4	5	4.5
Image Design	5	4	5	4.5
Media Material	5	5	5	5
Ease of Media	5	5	5	5
Total Score	25	23	25	24
Average Total	5	4.6	5	4.8

Source: Research Results

Based on the validation results, the flashcard media obtained a total average score of 4.8 out of a total scale of 5, which can be categorized as “very feasible” for the use of media in learning mathematics in grade I SD. Minor revision recommendations from validators have been implemented before the product was tested.

In addition, the validity test was carried out on the self-efficacy assessment questionnaire used for research with the results, namely:

Table 4. Validity Test Results

Number of Statements	Count	Decision
P1	0,472	Valid
P2	0,599	Valid
P2	0,861	Valid
P3	0,472	Valid
P4	0,814	Valid
P5	0,741	Valid
P6	0,500	Valid
P7	0,425	Valid
P8	0,472	Valid

Source : Research Results

Based on the validity test that researchers have done regarding the validity of the student self-efficacy questionnaire to 25 respondents using the Product Moment formula, the results of r product moment are higher than r table (r count> 0.396) with these results it can be concluded that the questionnaire is proven valid for use in research and data collection in the field.

Researchers tested the reliability of the questionnaire used in the study and collected data on the self-efficacy variable, using the Alpha Cronbach coefficient reliability formula. The results of the questionnaire reliability test are as follows:

Table 5. Reliability Test Results of Self Efficacy Questionnaire

Reliability Statistics

Alpha Cronbach	Multiple Statements
0,816	10

Source : Research Results

Based on the results of the reliability test that the researchers have conducted regarding the reliability of the student self-efficacy questionnaire to 25 respondents using the Alpha Cronbach coefficient reliability, the results of r count ≥ 0.632 by obtaining a value of 0.816 with the results can conclude that the questionnaire has a "very strong" or reliable category for use in research and data collection at the specified school.

4. *Media Usage Trial*

The trial was conducted on grade I students for one meeting. Learning activities were implemented with an active-participatory approach, where students used cards individually and in groups to solve subtraction problems, match numbers, and role play using picture stories.

The observation results showed that all students were actively involved. Students showed high interest in the media used, and there was no apparent resistance or reluctance during the learning process. The grade I teacher stated that "children are more focused and enthusiastic when cards are used, especially when asked to tell stories based on card pictures."

5. Increased Student Self-Efficacy

Self-efficacy was measured through pretest and posttest questionnaires. The questionnaire was organized based on three dimensions: magnitude, strength, and generality, with 15 statements.

Table 2. Comparison of Self-Efficacy Scores Before and After Media Use

No	Student Code	Pre	Post	Difference	Average
1	GA	6	8	2	7
2	ARP	5	8	3	6,5
3	AM	5	7	2	6
4	RF	4	9	5	6,5
5	MRQ	5	8	3	6,5
6	RA	4	9	5	6,5
7	S	4	9	5	6,5
8	MAR	4	9	5	6,5
9	F	4	9	5	6,5
10	AAG	4	7	3	5,5
11	AK	6	8	2	7
12	EO	6	8	2	7
13	ASA	5	10	5	7,5

14	R	6	9	3	7,5
15	SAP	5	6	1	5,5
16	RS	4	7	3	5,5
17	AS	2	8	6	5
18	RS	3	9	6	6
19	NK	2	9	7	5,5
20	BS	3	8	5	5,5
21	RR	4	7	3	5,5
22	MAR	3	10	7	6,5
23	MAA	5	7	2	6
24	AM	3	8	5	5,5
25	TAM	5	9	4	7
Average		4,3	8,3	4	6,3

Source: Research Results

The results of data processing showed an increase in self-efficacy scores from an average of 4.3 to 8.3. This increase shows a significant improvement from the fair to good category. The most improved dimension is strength, where students seem more persistent in completing the task despite encountering difficulties. A comparison of pretest scores and posttest scores can be seen in the following graph:

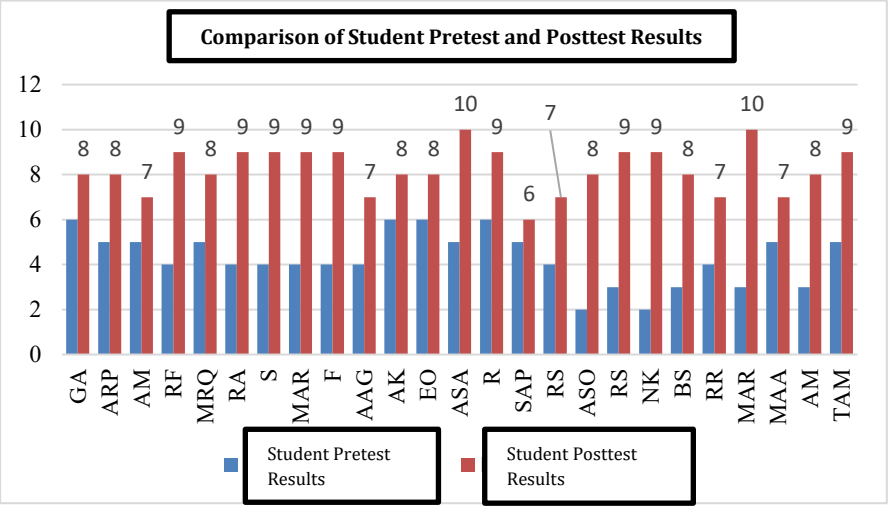


Image 6. Comparison Chart of Student Pretest and Posttest Results

B. Discussion

1. Media Effectiveness in Increasing Self-Efficacy

The increase in students' self-efficacy scores after using the media shows that flashcards have a positive impact on the learning process of mathematics. In accordance with Bandura's theory, which states that self-efficacy is influenced by successful learning experiences. Activities using media allow students to experience

success in completing simple tasks, which strengthens their self-confidence (Wahyuningtyas et al., 2023).

Visual media such as flashcards allow for easier information processing because they are concrete (Rena et al., 2023). Visual media in early childhood learning improve memory and active involvement of learners. In this context, learners not only have visual but also emotional engagement, as the media is packed with familiar and fun images. This is because flashcards combine images and text that attract students' attention, which can increase motivation and engagement in learning (Ulumudin et al., 2024).

2. Relevance to Kemp's Learning Model

Relation to Kemp Learning Model. The use of Kemp Model in learning design also contributes significantly to the success of learning. Each stage in this model ensures that the media is designed according to student characteristics and learning objectives. The study by Sari et al. (2020) shows that the use of the Kemp Model in basic mathematics learning media design can improve learning effectiveness because it considers student characteristics holistically and thoroughly.

Learning will be more effective when media and teaching strategies are designed systematically and based on real needs in the field. In this study, the integration between the Kemp Model and the use of visual media has created a fun, structured, and meaningful learning experience. This not only improves understanding of the material, but also supports the affective aspect, namely self-efficacy.

3. Compatibility with Previous Research

The findings of this study are consistent with previous studies that show the effectiveness of using flashcards in learning mathematics. Research by Khafida Aulia (2020) stated that flashcards proved to be valid and practical and able to improve student understanding. Meanwhile, Negara et al. (2023) emphasized that active learning strategies, such as problem-based learning, can increase self-efficacy in students. These results are in line with the findings in this study, which suggests that the use of interactive and positive experience-oriented media can provide encouragement for students to be more confident in learning mathematics.

4. Implication of Findings

Based on these findings, it can be concluded that developing learning media based on the Kemp Model with the use of flashcards can be an effective effort in improving the quality of mathematics learning in grade I SD. In addition to the impact on cognitive aspects (understanding the concept of subtraction), this media also supports the improvement of students' affective aspects.

This finding has important implications for teachers and practitioners of basic education, as the selection of learning media should consider not only the clarity of the material, but also its psychological effects on students. By utilizing a systematic design

and visually pleasing approach, learning mathematics can be a positive experience for students.

IV. Conclusion

The research aims to develop flashcard learning media on the material of reducing numbers 1-10 using the Kemp Model approach, as well as to test the validity, practicality, and effectiveness of the media in increasing the self-efficacy of grade I elementary school students. The results showed that the flashcard media developed could meet the valid criteria based on the assessment of material experts and media experts, with an average score that was classified as very feasible. The media has an attractive visual design, content that is in accordance with the basic competencies of the curriculum, and language that is easily understood by students in phase A of development.

The use of media in learning activities takes place effectively. Students show high enthusiasm and engagement during the learning process. Learning activities carried out in groups and individually with the help of flashcards encourage students to be more active, independent, and dare to express their opinions. In addition, students are also able to solve subtraction problems through games and simulations using the cards provided, without pressure and in a fun atmosphere.

A significant increase was seen in the self-efficacy aspect of students. The pretest and posttest results showed a jump in the average score from the moderate category to the good category. The dimension of self-efficacy that experienced the greatest development was students' belief in their ability to solve math problems despite difficulties. This shows that appropriately designed learning media oriented towards positive learning experiences can have a strong affective impact on learners.

The integration of visual media and systematic learning models such as the Kemp Model has proven effective in structuring learning that is not only cognitive but also affective. The learning design process that considers student characteristics, instructional objectives, and real learning contexts is able to produce meaningful and in-depth learning experiences. This research confirms the importance of a holistic media development approach, taking into account aspects of content, strategy, and learner psychology.

Thus, flashcard media based on the Kemp Model can be used as an alternative to innovative and applicable mathematics learning media for elementary school level. In addition, it can also be used as a reference in developing other media in different subjects and levels of education, as well as encouraging teachers to be more creative in designing learning based on the real needs of students. This research also opens opportunities for further research that highlights the integration of learning media with other instructional models to improve the quality of basic education as a whole.

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