



Development of *Peramal* Board Media Based on Bruner's Theory in Addition and Subtraction of Decimal for Grade IV Primary School

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Abstract

Learning media is essential for creating interactive and fun lessons. However, conventional methods are still dominant in practice. An interview with the fourth-grade form teacher revealed that limited use of learning media in mathematics leads to monotonous lessons, affecting students' focus and ability to solve math story problems. This study aimed to (1) develop media design, (2) test media feasibility, and (3) test the effectiveness of the *Peramal* Board media based on Bruner's theory to improve grade IV student's ability to solve math story problems. This study is based on the ADDIE model with a mixed-method research approach. The results showed that the feasibility of the *Peramal* Board from a material expert was 91.67%, media expert 95%, student response 100%, and teacher response 93.33%, with the category very feasible. The effectiveness of the *Peramal* Board is indicated by an improvement in learning outcomes of 3.986 with a sig. (tailed-2) value of 0.000. The N-Gain test result of $0.7720 > 0.7$ shows a high criterion. The result of this study is that *Peramal* Board has successfully improved the ability of fourth-grade students to solve decimal addition and subtraction story problems.

Keywords: addition and subtraction of decimal; bruner's theory; *peramal* board media

INTRODUCTION

In this era of globalization and innovative disruption, education is considered the foundation for every human activity (Capuno et al., 2019). An important aspect of human life is education (Setyo et al., 2024). Mathematics in primary school plays an important role in preparing children for life and has a great impact on their development (Doğan & Yıldırım Sır, 2022). In learning activities, the use of media has a very crucial role (Widodo & Wahyudin, 2018). A learning medium is a key element and must be understood and applied effectively by teachers in order to teach the subject matter to students efficiently and effectively and achieve maximum results (Widari et al., 2024). Interesting media can increase student motivation to be more active in learning, enhancing the fun and meaning of learning (Fauziyah et al., 2024). At the initial level of education, teaching mathematics will only be successful if students feel interested, inspired, stimulated and the material is adapted to their mental development, given that the majority of students in primary school find it difficult to focus for a long time so it requires a variety of activities, new teaching methods, various forms of teaching, different resources and tools (Kolar-Begović et al., 2017). Since the early 1980s, Singapore has widely adopted the Concrete-Pictorial-Abstract (CPA) approach to mathematics instruction, grounded in Bruner's theory of enactive, iconic, and symbolic representation (Hoong et al., 2015). This pedagogical method supports the view that understanding students' mathematical thinking significantly contributes to improving teachers' instructional abilities (Zuliana et al., 2019). Therefore, advanced teaching methods are

essential for fostering students' skills, including a deep understanding of challenging materials, problem-solving skills, effective communication and collaboration, critical thinking, and self-management (Hammond et al., 2017).

In current mathematics education, many educators still tend to rely on conventional teaching methods (Arrasyid et al., 2022). Many teachers today still use a teacher-focused approach in teaching mathematics material, so the learning process tends to feel rigid and boring (Putri et al., 2020). Learning math is considered boring and scary by students because teachers ask them to think abstractly (Yuniasih et al., 2019). In teaching practice, frequently teachers' learning is monotonous and too verbal, where students only receive instructions without active involvement, while teachers teach only with oral explanations without any variation (Nurfadhillah et al., 2021). As highlighted, conventional learning media is still dominant in teaching and lesson practices (Aji Silmi & Hamid, 2023). Traditional learning systems that prioritize lecture methods and the use of textbooks are often less effective in meeting the needs and interests of each student (Sawitri et al., 2024). A significant problem is the lack of variety in text-based mathematics learning materials, especially related to students' ability to understand story problems (Aurelia et al., 2024). This makes the learning process seem less interesting. The urgency of this interest in learning is very important, as learning will not be acceptable to students if they do not have an interest in learning (Mamonto, 2023).

Primary schools (SD) within Cawas Sub-district are divided into areas known as *dabin*, consisting of 4 to 5 primary schools (Mulyono et al., 2020). Based on interviews with the former teacher of grade IV SD Dabin I Cawas, information was obtained that the application of learning media on addition and subtraction of decimal numbers is still limited. Teachers only use the text in the student's book, so that learning seems monotonous and boring. This causes low student interest in learning mathematics, where, during learning, students are not focused and sleepy. So, students have difficulty solving story problems because of their lack of interest in learning mathematics. Especially if they have to be faced with a long story question, students tend to be too lazy to read the question. The issues outlined above are challenges that educators must overcome. The ability to solve math story problems is essential for the whole life of students, but completing these tasks is a challenge for many (Vessonen et al., 2024). In understanding math story problems, students need to have good reading skills to understand the context of the problem correctly so as to avoid mistakes and solve the problem correctly (Almadiliana et al., 2021).

To address various challenges in mathematics learning, teachers can utilize appropriate learning media (Ompusunggu, 2022). Learning media can be defined as any resources utilized in the educational process to present material through tools designed to capture student's attention throughout the learning activities (Aryati & Mulyawati, 2024). Effectively designed learning media can transform abstract concepts into more real ones, help students overcome difficulties, and build a strong mathematical foundation (Witraguna & Wijaya, 2024). The results of the previous study show that the number place scoreboard (NITEBI) learning media is very effective because it can increase the average score of mathematics learning outcomes in grade IV A SD Model Sleman from cycle I and cycle II 63.91 to 85.39 (Kurnia et al., 2023). Another research that is relevant to this study shows that the results of the research on the Counting Board Media are very feasible and effective to be used in learning (Amreta et al., 2023). Other relevant research shows that *Papin* and *Koja* media obtained the results of responses to the analysis of media experts 86.3% very good, material experts 82.6% very good, student acceptance questionnaire 97% very

good, and showed an average increase in learning outcomes during the first meeting of 61.5 and during the second meeting of 79.2. (Fais et al., 2019). This success emphasizes the importance of utilizing innovative learning media in the learning of mathematics in order to achieve learning purposes.

Learning media will provide meaningful value to the learning process while increasing interaction between educators and learners. In addition, the application of cognitive theory in learning strategies can provide a meaningful learning experience, and it is essential to respect the active role of learners (Barokah et al., 2024). In the context of the education world, one of the theories used is cognitive learning theory (Fitri et al., 2024). Bruner's learning theory, which focuses on the cognitive aspect, highlights how crucial cognitive structure is to the learning process (Gombo, 2024). Bruner argues that construction-focused learning makes the material easier to understand, improves memory, increases the likelihood of knowledge transfer, and accelerates student development in reaching higher levels (Alamian & Moghadam, 2020). Bruner's theory not only bridges the gap between abstract concepts and learners' understanding but also creates a fun learning atmosphere and encourages learners' activeness (Andayani, 2022). Bruner called cognitive structures "representations" and argued that there are three types of representations, namely action, image, and symbolic representations (Wen, 2018). At the first level, which is inactive, students begin to build an understanding of new concepts by interacting directly with real objects related to the concept, such as manipulating or arranging objects. In the second level, which is iconic, students reinforce existing understandings and develop new understandings through the use of pictures or other visual displays of the idea. When students reach the symbolic level, they already have a solid basic understanding and are ready to move on to the use of symbols or other abstract forms to illustrate the concepts they have learned before. Gradually, students can easily and efficiently use these abstract symbols or representations without the need to rely on real objects or images again (Cory & Ray, 2023).

Based on these problems, the researcher has a desire to develop the media of the *Peramal* board (Addition and Subtraction of Decimals) based on Bruner's theory to improve the ability to solve addition and subtraction of decimal story problems in grade IV SD Dabin I Cawas. The *Peramal* Board media is a mathematics learning aid designed to facilitate instruction through the use of a board. The *Peramal* Board is developed in accordance with the three stages of Bruner's theory by utilizing chocolate replicas at the enactive stage, cake images at the iconic stage, and number cards at the symbolic stage. The novelty of this study lies in the application of three stages of representation from *Bruner* to the *Peramal* board media and the implementation of technology in the form of barcodes affixed to the *Peramal* board. Different from previous research, in this study, the board media was developed by researchers based on the three-stage representation of Bruner's to improve students' ability to solve story problems in mathematics in grade IV SD Dabin I Cawas. *Peramal* board is also equipped with technology integration in the form of barcodes containing instructions for using the media and barcodes containing addition and subtraction materials, which also contain quizzes packaged in interactive PowerPoint. The purpose of this study is (1) to develop a media design of the *Peramal* board media based on Bruner's theory in addition and subtraction of decimal numbers for students in grade IV of SD Dabin I Cawas, (2) to test the feasibility of developing the *Peramal* board media based on Bruner's theory in improving the ability to solve story problem of addition and subtraction of decimal grade IV students of SD Dabin I Cawas, and (3) to test the effectiveness of the development of the *Peramal*

Board media based on Bruner's theory in improving the ability to solve the story problem of adding and subtracting decimal of grade IV students of SD Dabin I Cawas.

METHOD

This research used a combination method (mixed method). A combination research method involves the integration of quantitative and qualitative research methods (Sharma et al., 2023). The present study utilized the research and development (R&D) method. The ADDIE model was implemented in this study. The most common use of the ADDIE model is to delineate a systematized approach to instructional design (Adeoye et al., 2024). ADDIE's model research consists of the following phases: analyze, design, develop, implement, and evaluate. The researcher analyzed the problems and media needs at the analysis phase of the study. After conducting the analysis, researchers continued with the design phase to create the prototype of the *Peramal* board media using *Canva*. The researcher conducts two tests: a material validation and a media validation test at the development phase. These tests will be done by experts. They assess the feasibility of the *Peramal* board media. In the following phase, the researcher implements the *Peramal* board media (addition and subtraction of decimals) in small and large class groups, and the last stage of the researcher conducts an evaluation related to the development of *Peramal* board media after being tested in small groups and large groups.

The researcher conducted research at SD Dabin I Cawas, which was focused on SDN 1 Gombang for small group trials located in Gombang, Cawas, Klaten Regency, and SDN 1 Tirtomarto for large group trials located in Sidorejo, Tirtomarto, Cawas, Klaten Regency. The researcher took the research location because the two elementary schools are still in one Dabin (fostered area) and need for innovative educational media in order to enhance the proficiency of grade IV students in solving mathematics story problems, particularly the addition and subtraction of decimals.

The subjects in this research include media and material experts, students in grade IV of SD Dabin I Cawas, and teachers. Experts provide data based on their knowledge and expertise in the field of learning media development, as well as their evaluation and recommendations for the media developed. In this study, two experts were involved, namely material experts and learning media experts. The material expert ensures that the material presented and the evaluation instruments used are relevant and pursuant to the stipulated learning objectives and students' needs. In addition to involving experts, this research also involves teachers and students. There were two teachers involved in this study: one was assigned to the small-group test, and the other was assigned to the large-group test. Teachers provide data on the application of the developed learning media, as well as their observations on students' responses to the media. Furthermore, there are 37 students at SD Dabin I Cawas who are involved in this study. The small-group test was administered to 12 students in grade IV at SDN 1 Gombang, while the large-group test was administered to 25 students in grade IV at SDN 1 Tirtomarto. Students provided data on their experiences in using the developed learning media, as well as their responses to the feasibility of the media.

The sampling technique carried out by the researcher for small and large classes uses saturated samples where all students in grade IV of SDN I Gombang, totaling 12 students, will be

samples for small groups, and all students at SDN I Tirtomarto as many as 25 students will be samples in large groups. The techniques used by the researcher in collecting data are interviews, questionnaires, tests, and documentation. Interviews are used as a data collection technique when researchers want to conduct preliminary studies to identify problems and potentials that need to be researched (Siregar et al., 2023). In this study, the researcher conducted an interview with the form teacher of grade IV SD Dabin I Cawas to explore information on the phenomena that are being researched related to the characteristics of students, problems in mathematics learning, and the needs of the learning media. Furthermore, the questionnaire was used to collect review data from material and media expert tests in small-group and large-group trials. The test is used as one of the evaluation methods to measure the student's ability to solve story problems in addition to subtraction of decimals before and after using *Peramal* board media. Documentation is used to save various research activities that contain the process and results by taking pictures and documenting them.

The validation results of the material and media experts confirm the feasibility of the *Peramal* board media and are supported by the results of the teacher and student questionnaires. The criteria for assessing the feasibility of the *Peramal* board media are shown in table 1.

Table 1. Feasibility Criteria

Percentage	Criteria
0-20%	Not feasible
21%-40%	Less feasible
41%-60%	Sufficiently feasible
61% – 80%	Feasible
81%-100%	Very feasible

(Gulo & Harefa, 2022)

The findings derived from the pretest and post-test were subjected to rigorous analysis using SPSS software, which employed a series of statistical tests, the normality test being a preliminary requisite for the analysis. In instances where the data demonstrated a normal distribution, the researcher advanced to the implementation of a series of hypothesis-driven evaluations, namely the paired t-test and the N-gain assessment. By combining data from these various sources, the researcher can gain a comprehensive understanding of the feasibility and effectiveness of developing learning media that are appropriate to the needs and context of learning. The n-gain score criteria and n-gain percentage are shown in table 2 and table 3.

Table 2. N-Gain Score Criteria

Score	Criteria
$(g) < 0,3$	Low
$0,3 < (g) < 0,7$	Medium
$(g) > 0,7$	High

Table 3. N-Gain Percentage Criteria

Percentage (%)	Interpretation
< 40%	Ineffective
40-55%	less effective
56-75%	Quite effective

RESULTS AND DISCUSSION

Results

Development of Peramal Board Media Based on Bruner's Theory

This study is designed to enhance student's ability to solve mathematical story problems, especially about the material of addition and subtraction of decimal numbers, by developing a learning media of *Peramal* (Addition and Subtraction of Decimal) board based on Bruner theory for mathematics subjects in grade IV of SD Dabin I Cawas. In the development of this media, ADDIE's instructional design methodology is applied to ensure that the media developed can achieve the learning objectives.

The phase of analysis entailed the researcher conducting interviews with class teachers to ascertain the issues encountered by fourth-grade students at SD Dabin I Cawas in their mathematics learning. An analysis of the interview data obtained from SD Dabin I Cawas revealed that the utilization of learning media remains constrained. Conventional teaching methods employed by educators resulted in grade IV students experiencing feelings of boredom and encountering challenges in solving mathematics problems, particularly those involving decimal numbers. The skill of solving math story problems is very important for students (Vessonen et al., 2024). Furthermore, the researcher analyzed the need for learning media using a needs questionnaire distributed to teachers and students in grade IV of SD Dabin I Cawas. The results of the questionnaire showed that SD Dabin I Cawas needed learning media innovation, with the response of teachers getting 93.33% and student responses 100%. During the design phase, the researcher made the design of learning media for the *Peramal* Board based on the theory of Bruner. Figure 1 shows the initial design of the *Peramal* Board learning media developed by the researcher.



Figure 1. Design of *Peramal* Board Media

The *Peramal* Board media developed by the researcher is (120 × 80) cm. The board is equipped with a *Peramal* column that is used to analyze story problems. Additionally, the board contains a column that denotes decimal place values. The coloration of the unit place value column is gold, the tenth place value column is pink, and the hundredth decimal place value column is purple. These columns are used to perform decimal addition and subtraction operations using the stacked method. The barcode contained in the *Peramal* Board contains learning materials packaged in an interactive *PowerPoint* and instructions for the utilization of the *Peramal* Board. In addition, the *Peramal* Board is equipped with a *Peramal* box that is used to store chocolate replicas, cake images, and number cards.

During the development phase, the researcher conducted a validation test of learning materials and media to assess the feasibility of the *Peramal* Board media based on Bruner's theory. The results of the material test showed a percentage of 91.67% of material experts, with very feasible criteria, which showed that the media content was in accordance with the learning objectives. Furthermore, the learning media test was carried out by media experts. In this validation, there is a suggestion to enlarge the *Peramal* column, which is used to write down the steps to solve the problem and add decorative elements to the board. The media display before and after the revision is presented in figure 2 and figure 3.



Figure 2. *Peramal* Board Media Display Before Revision



Figure 3. *Peramal* Board Media Display after Revision

The revised learning media, in accordance with the advice of media experts, is then tested by the experts. The media test, which was conducted by experts, yielded results that demonstrated a 95% rate, measured against very feasible criteria, so the learning media is worth testing according to the suggestions.

Table 4. The Display of *Peramal* Box, Chocolate Replicas, Cake Images and Number Cards


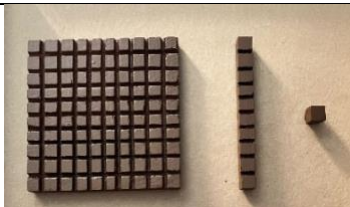
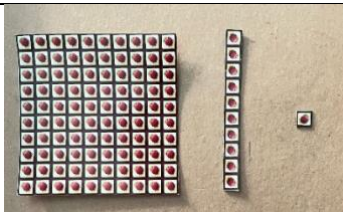

No.	Name	Picture	Description
1.	<i>Peramal</i> box		<i>Peramal</i> box in size (28 × 28 × 12) cm is used to store chocolate replicas, cake pictures, and number cards
2.	Chocolate replicas		Chocolate replicas with the size of (10 × 10 × 1) cm represents the unit value, size (10 × 1 × 1) cm represents the tithe value and size (1 × 1 × 1) cm represents the hundredth value, which is used in the enactive stage
3.	Cake images		Cake images with the size of (10 × 10) cm represent unit values, size (10 × 1) cm represents tenths and size (1 × 1) cm represents the hundredth value. These cake images are used on the iconic stage.
4.	Number cards		Number cards consist of three sets of numbers zero to nine, with a total of 30 cards. These number cards are used in the symbolic stage.

Table 4 displays a *Peramal* box, chocolate replicas, cake images, and number cards. There are magnets attached to the back of each chocolate replica, cake images, and number cards, which are stored in the *Peramal*'s box. The method of use can be pasted on the unit, tithe, and hundredth columns on the *Peramal* Board to perform the operation of adding and subtracting decimal numbers by stacking them according to the value of the place.

The researcher tested the *Peramal* Board based on Bruner's theory in the implementation phase in small and large groups. The small group trial involving 12 students showed an improvement in the average ability of grade IV students in solving addition and subtraction decimal story problems from 49.67 to 89.75. A large group trial with 25 students begins with a pretest in order to ascertain the initial ability to solve mathematical story problems. The *Peramal*

Board, based on Bruner's theory, is applied in two meetings, referring to the three stages of representation. In the enactive stage, students use chocolate replicas for mathematical operations; on the iconic level, they use images of cakes; and at the symbolic stage, students solve the problems contained in the worksheet by writing the steps to solve the story problem in the *Peramal* Board column and performing operations with number cards. The test findings showed an enhancement in the mean ability of fourth-grade students in solving addition and subtraction decimal story problems from 45.12 to 87.12. During the evaluation phase, the ultimate product was obtained from the media of the *Peramal* Board based on Bruner's theory, which had been developed, revised, tested, and tested for its feasibility and effectiveness. In accordance with the results of the effectiveness and feasibility test that has been carried out, the media of the *Peramal* Board obtained very feasible and very effective criteria to improve the ability to solve the story problem of addition and subtraction of decimal numbers in grade IV of elementary school.

The Feasibility of Peramal Board Based on Bruner's Theory

This study is focused on exploring whether the development of *Peramal* Board media based on Bruner's theory is feasible in improving the ability to solve story problems of addition and decimal number subtraction in grade IV students of SD Dabin I Cawas. In this study, material tests and learning media tests were conducted by material and learning media experts, respectively.

Table 5. Results of Validation Materials and Media Expert

Expert	Score Obtained	Maximum Score	Percentage	Criteria
Material	44	48	91.67%	Very feasible
Media	57	60	95%	Very feasible

Table 5 shows the findings of obtaining the materials and media expert responses from the questionnaire distributed by the researcher. The material and media test is designed to evaluate the quality of the material and media developed in the *Peramal* Board media. The test of media quality is conducted by media experts, while the instructional content is examined by material experts to ensure its alignment with the established learning objectives. Based on the material feasibility test yielded a result that indicates a 91.67% level of feasibility, which is a very feasible category. Meanwhile, the findings of the media feasibility test were 95%, which is considered to be in the very feasible category. Furthermore, the feasibility of the *Peramal* board media is also seen from the responses of the teachers and students.

Table 6. Results of Teacher and Students Responses

Response	Score Obtained	Maximum Score	Percentage	Criteria
Teacher	14	15	93.33%	Very feasible
Students	275	275	100%	Very feasible

Table 6 shows the findings of obtaining the teachers' and students' responses from the questionnaire distributed by the researcher. The results obtained from the teacher's response were 14 out of 15 maximum scores. The teacher's responses were 93.33%, and the student response questionnaire received a percentage of 100% with a total of 25 students. Both of them obtained very feasible assessment criteria. These results show that the *Peramal* Board's media, based on Bruner's theory, is very feasible to use. Although there are some limitations, evaluations from

teachers show that this media is easy to apply and matches the cognitive level of grade IV primary school students.

The Effectiveness of the Peramal Board Based on Bruner's Theory

This study is focused on exploring whether the development of *Peramal* Board media based on Bruner's theory is effective in improving the ability to solve multiplication and subtraction story problems in grade IV students of SD Dabin I Cawas. In this study, evaluations were carried out using pretests and post-tests. Pretests are given before learning using the media of the *Peramal* Board based on Bruner theory, and post-test questions are given after students use *Peramal* Board media based on Bruner theory in learning addition and subtraction of decimal numbers. The next stage is a normality test, paired sample t-test, and n-gain test to determine the effectiveness of the *Peramal* Board media based on the Bruner theory. Before conducting the paired sample t-test, a normality test was carried out with Shapiro-Wilk first to ensure that the data was distributed normally. If the data is normally distributed, a paired sample t-test can be used. Table 7 shows the outcome of the normality test that has been processed with SPSS.

Table 7. Normality Test

Test	Statistic	Df	Sig.
Pretest	0.968	25	0.585
Posttest	0.949	25	0.235

The Shapiro-Wilk test was used to test the normality of the pre-and post-test scores in a large group. For the pretest, the statistical result of the test was 0.968 with degrees of freedom (df) = 25, which resulted in a sig value. by 0.585. The value of sig. 0.585 indicates that an analysis of the data reveals no substantial discrepancy between the pretest scores and the normal distribution (sig. > 0.05). As for the large group post-test, the statistical value of the test was 0.235 with a degree of freedom of 25 and a sig. 0.235. Value sig. The 0.235 indicates that the post-test score does not differ significantly from the normal distribution. Therefore, it can be concluded that the assumption of normality is met in both sets of scores, which allows parametric analysis to assess the effectiveness of the development of the *Peramal* Board media based on Bruner's theory.

The paired sample t-test is the next parametric test that is utilized to assess whether there is a significant difference between the initial and final variables. When the p-value is smaller than the specified level of significance (2-tailed), it indicates the presence of a significant difference between the two variables under study. In statistical terms, this is referred to as the significance value. This result indicates that the treatment applied has had a considerable impact on the change observed between the initial and final variables.

Table 8. Paired Sample T-test

Test	N	Mean	Std.Deviation	Std. Error	Sig. (2-tailed)
Pretest	25	45.12	10.671	2.134	0.000
Posttest	25	87.12	6.685	1.337	

The paired sample t-test result obtained using SPSS based on table 8 showed an improvement in learning outcomes of 3.986 with sig. two-tailed value of $0.000 < 0.05$, indicates that the result is statistically significant. This outcome confirms the statistical significance of the test. This outcome indicates a substantial discrepancy between the students' learning abilities before and after utilizing the *Peramal* Board media based on the theory of Bruner and that there is a significant difference between the students' learning abilities before and after utilizing the *Peramal* Board media.

Table 9. N-Gain Test

N-Gain	N	Minimum	Maximum	Mean	Criteria
N-Gain score	25	0.63	0.98	0.7720	High
N-Gain percentage	25	62.90	97.96	77.1986	Effective

Referring to table 9 the N-Gain test findings using SPSS obtained a mean value score from the N-Gain score, which is $0.7720 > 0.7$. This shows that the category obtained is high, which means that the effectiveness of the *Peramal* Board media in learning the material of addition and subtraction of decimal numbers is high. Strengthened by a mean value of N-Gain percent of $77.1986\% > 76\%$. This shows that the interpretation is effective, which means that the use of the *Peramal* Board media in learning the material of addition and subtraction of decimal numbers is effective.

Discussion

The findings of this study indicate that the application of the *Peramal* Board based on Bruner's theory as a learning medium is effective in improving the ability of fourth-grade students at SD Dabin I Cawas to solve story problems in addition and subtraction of decimals. The ability to solve math story problems is essential for students throughout their lives, but completing this task is a challenge for many (Vessonon et al., 2024). Moreover, in learning mathematics, decimals are important material (Rahayu et al., 2018). This challenge can be overcome by using the Media of *Peramal* Board based on Bruner's theory, which has been proven to overcome problems in learning (Ompusunggu, 2022). The lack of variation in mathematics learning at SD Dabin I Cawas, especially related to student's ability to understand story problems, has been solved by the application of Bruner's theory on the board media (Aurelia et al., 2024). The findings of this study are consistent with those of prior research that showed the feasibility and effectiveness of using board media in mathematics learning in increasing the average student mathematics learning outcomes (Amreta et al., 2023; Fais et al., 2019; Kurnia et al., 2023).

The findings of the study show that the media of the *Peramal* Board has succeeded in facilitating students in undergoing the three stages of representation of Bruner's theory, namely the representation of actions, images, and symbols (Wen, 2018). In the enactive stage, students engage directly with physical objects, with chocolate replicas representing units, tenths, and hundredths, to concretely understand the process of addition and subtraction of decimals. The *Peramal* Board allows students to directly see how decimal numbers are added or subtracted through those physical representations. In the iconic stage, students manipulate the story of addition and subtraction of decimal numbers by using visual representations in the form of cake images representing units, tenths, and hundredths. This makes it easier for students to visualize the value of decimals when performing addition and subtraction operations. Finally, at the

symbolic stage, students perform mathematical operations in the abstract after they have gained an understanding of the concepts through concrete and visual experiences. At this phase, students are starting to practice using mathematical symbols and numbers to perform decimal addition and subtraction operations (Cory & Ray, 2023). Students solve story problems by writing the steps known, asked, answered, and concluded in the *Peramal* column using markers. Then, students perform addition and decimal subtraction operations using number cards affixed to the *Peramal* Board. The story problem questions of decimal addition and subtraction are packaged in an interactive PowerPoint in the form of a quiz that aims to transform abstract concepts into dynamic and interesting visual experiences (Nabila et al., 2025).

The feasibility of using *Peramal* Board based on Bruner's theory as a learning medium is also evident from the positive responses gained from media and material experts, teachers, and students. The material feasibility score shows a percentage of 91.67%, and media feasibility is 95%, which shows very feasible criteria (Gulo & Harefa, 2022). Furthermore, the student's response score reached 100%, and the teacher's response score was 93.33%. The four assessment results show very feasible criteria in accordance with previous research which shows the results of responses to the analysis of media experts, material experts, student acceptance questionnaires of *Papin* and *Koja* with very good criteria (Fais et al., 2019). The high eligibility criteria obtained from the research results indicate that the development of *Peramal* Board media based on Bruner's theory is very feasible to use in learning.

The findings indicated that the mean of the student's pretest score increased from 45.12 to 87.12 in the post-test after the use of learning media, indicating that the media of the *Peramal* Board based on Bruner's theory succeeded in improving the ability of students to solve story problems in addition and subtraction of decimals. The increase in students' average scores in this study is in line with previous research that the use of NITEBI media increased mean score of mathematics learning outcomes in grade IV A SD Model Sleman from cycle I and cycle II 63.91 to 85.39 (Kurnia et al., 2023). The results of this study also obtained normality test results with Shapiro-Wilk which showed that the data were normally distributed where the pretest significance value was 0.585 and the posttest significance was 0.235 (sig. > 0.05). Because the data is normally distributed, then the effectiveness of *Peramal* Board media based on Bruner's theory is tested using paired sample t-test and n-gain test. The obtained of the paired sample t-test also revealed significant differences in the abilities of the fourth-grade students before using the media and after using the media of the *Peramal* Board based on Bruner's theory with an improvement in learning outcomes of 3.986 with sig. two-tailed value of $0.000 < 0.05$. In the N-Gain test, results were obtained of $0.7720 > 0.7$, which showed high criteria. This means that the media of the *Peramal* Board, based on Bruner's theory, is very effective in improving the ability to solve story problems, adding and subtracting decimal numbers (Alamian & Moghadam, 2020). The results obtained are relevant to previous research which shows that the use of Counting Board Media is very feasible and effective in learning (Amreta et al., 2023).

During the field trial, it was seen that students showed high enthusiasm for the material taught. This shows that the use of the *Peramal* Board makes students more interested and motivated to learn, as well as providing an enjoyable and meaningful learning experience (Fauziyah et al., 2024). The use of Bruner's theory on learning media is proven to increase students' enthusiasm for learning mathematics, students learn with enthusiasm without pressure, so learning mathematics using learning media is very useful (Safitri et al., 2024). In particular,

the *Peramal* Board is effective in describing the process of saving on decimal addition and taking on decimal subtraction, which directly helps students understand the mechanism of grouping numbers in the context of decimal numbers. The concept of place value of numbers is the basis that must be understood to learn decimals (Agustin et al., 2018). This concrete representation of the mathematical process is very helpful for students who have difficulty understanding abstract concepts to become more real, help students overcome difficulties, and build a strong mathematical foundation (Witraguna & Wijaya, 2024). The same is true for the addition and subtraction of decimal numbers, especially in cases involving story problems using the media of the *Peramal* Board based on Bruner's theory, which is approved to overcome problems in mathematics learning in grade IV.

Although the *Peramal* Board was effective in helping fourth-grade students SD Dabin I Cawas solve the story problem of decimal addition and subtraction, there were limitations encountered. This medium is designed specifically for the addition and subtraction of decimal numbers with two digits after a comma, so its application is limited to other types of operations or for more complex sets of numbers. In addition, due to its physical nature, the use of the *Peramal* Board in large classes requires a considerable amount of media, which can pose challenges in terms of creating, distributing, and storing media. These limitations suggest that while the *Peramal* Board is an effective tool, its use needs to be tailored to the needs and scale of the existing class.

CONCLUSION

Conclusion

The development of the *Peramal* Board media is based on the Bruner theory with the ADDIE model. ADDIE stages are carried out in the phases of analysis, design, development, implementation, and evaluation. At the implementation phase, small group and large group trials were carried out using enactive, iconic, and symbolic phases from Bruner. The conclusion is that the *Peramal* Board, based on Bruner's theory, has proven to be very feasible to be developed with the results of the material feasibility test getting a percentage of 91.67%, the results of media feasibility of 95%, student response of 100% and teacher response of 93.33%. The results of the media effectiveness test also showed satisfactory results with an improvement in learning outcomes of 3.986 with a sig. (2-tailed) value of 0.000, which shows that there was a significant difference in the student's ability to solve story problems before and after using the *Peramal* Board media. The N-Gain test result was 0.7720, which is higher than the accepted minimum of 0.7; it indicates high criteria. Strengthened by the mean value of N-Gain percent of 77.1986% > 76%. This shows that the interpretation is effective. So, it could be deduced that the *Peramal* Board based on Bruner's theory has been successfully developed according to the ADDIE stage and is very feasible and effective in improving the ability to solve the story problem of addition and subtraction of decimals in grade IV of SD Dabin I Cawas.

Suggestion

The *Peramal* Board can be further developed to improve the student's ability to solve story problems, especially in mathematics learning, by adding animated videos at the iconic stage. The following research should involve trials with larger populations and diverse student groups to assess the effectiveness of the *Peramal* Board based on Bruner's theory in improving students' ability to solve addition and subtraction of decimal story problems.

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