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Development and Effectiveness of UN-MATH Cards in Enhancing Problem-Solving Skills for Elementary School Students

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Abstract: Development and Effectiveness of UN-MATH Cards in Enhancing Problem-Solving Skills for Elementary School Students. **Objectives:** This research aims to develop a UNO media called UN-MATH (Uno Mathematics), which is used in game-based learning to help fourth-grade students improve their problem-solving skills in addition and subtraction materials. **Methods:** The type of research used is Research and Development (R&D). The research design applied is the ADDIE design, which consists of five stages: analysis, design, development, implementation, and evaluation. The data collection techniques used in this research consist of test and non-test techniques. Test techniques include pre-test and post-test, while non-test techniques include observation, interviews, questionnaires, and documentation. **Findings:** Based on the validation results by media experts, content experts, and language experts, the following results were obtained: the assessment from the media expert is 90% (very feasible), the content expert is 93.1% (very feasible), and the language expert is 92.8% (very feasible). The assessment from the three experts indicates that the UN-MATH card media is suitable for use. The data analysis techniques used in this study include normality tests, t-tests, and N-Gain tests. The results of the normality test show that the significance value (Sig.) > 0.05, which means the data is normally distributed. Based on the paired t-test results in the control class, a Sig. (2-tailed) value of 0.000 was obtained, indicating that the average post-test score increased compared to the pre-test score. Next, the N-Gain test results for the control class were 0.5630, which falls into the moderate and fairly effective category. The same thing happened in the experimental class, where the paired t-test results showed a Sig. (2-tailed) value of 0.000, which means the average post-test score increased compared to the pre-test. Additionally, the N-Gain test results for the experimental class were 0.7004, which falls into the moderate and fairly effective category. **Conclusion:** Thus, based on the results of the data analysis, the UN-MATH card media has proven effective in mathematics learning to enhance problem-solving skills in addition and subtraction materials.

Keywords: learning media, un-math cards, problem-solving skills.

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INTRODUCTION

Basic education is an essential foundation that must be pursued, as it equips students with the knowledge and skills needed for their future (Sun et al., 2023). Education of high quality is crucial, as it contributes to the empowerment of individuals and affects their mindset when making decisions. Although it is not universally accepted, quality education can be defined as an effort to acquire knowledge and skills that enable

individuals to interpret and apply information correctly. Therefore, quality education must be maintained and supported for a sustainable life. Even the President of the Republic of Kenya emphasized that quality education can lead to a bright future (Thangeda & Baratiseng, 2016).

Learning aims to achieve competence, acquire knowledge, and shape learners' attitudes (Puspitarini & Hanif, 2019). The efficiency of the learning process is shaped by the degree of student engagement, who are not only recipients of material but also communicators in two-way interactions (Nurjanah & Angraini, 2024). Game-based learning is an interactive method that combines education with play, thereby enhancing students' interest and engagement (Sun et al., 2020). The success of this method is determined by player engagement and interaction, as well as the presence of challenges and rewards (Ray & Ilangovan, 2024). Compared to conventional methods, game-based learning is more effective in enhancing understanding and academic achievement and reducing anxiety, especially in mathematics education (Qian & Clark, 2016).

The ability to solve mathematical problems is a cognitive activity that involves various strategies to find solutions and enhance students' logical and critical thinking. Word problems in mathematics require reading, reasoning, analysis, and problem-solving skills through systematic stages, such as understanding the problem, planning, executing, and reviewing the results (Nurjanah & Angraini, 2024).

Many students struggle with solving word problems as they perform numerical operations directly without understanding the context of the problem (Dwijayani, 2019). Most students also skip important steps in mathematical modeling, even though this modeling is essential for solving problems in a structured manner (Pongsakdi et al., 2016). As a result, many students give up before trying because they find story problems difficult to solve (Dwijayani, 2019).

One of the main challenges in story-based mathematics learning is the ability to read and understand the problem text (Smith et al., 2010). Many elementary school students still have difficulty understanding the sentence structure and vocabulary used in story problems. If they cannot understand the content of the story well, they will have difficulty identifying the relevant information to solve the problem. This is especially true for students with low literacy skills. Each student has a different level of understanding in reading and solving math problems. In one class, there are students who can understand story problems quickly, while others need additional guidance. This difference often makes it difficult for teachers to devise a teaching strategy that can effectively accommodate all students.

Story-based mathematics not only requires calculation skills but also critical and analytical thinking skills. Students must be able to sift through important information from the problem, identify the relationships between numbers and concepts, and apply appropriate problem-solving strategies (Domu, 2024). However, many students who are accustomed to direct questions (without story context) have difficulty developing logical and systematic thinking when faced with story-based questions. Story problems are often longer than regular calculation problems, requiring students to read and understand them before solving. For students with a short attention span or less interest in mathematics, they tend to lose focus before completing the problem.

Learning media are physical or non-physical tools that convey messages to stimulate learners' thinking, will, and attention. This media supports the learning process so that goals are achieved maximally, helps students understand the material more quickly, and increases their interest in learning. However, in practice, when delivering the material, teachers often face obstacles because the learning media is less engaging and boring (Puspitarini & Hanif, 2019).

The ADDIE development model was chosen in this study because it has a systematic and flexible structure in developing learning media, including UN-MATH cards. This model provides clear stages, from needs analysis to evaluation, ensuring that the developed media meets the needs of students and learning objectives. Additionally, ADDIE allows for revisions at each stage, so deficiencies in the media can be promptly corrected without having to complete the entire process first. This advantage distinguishes it from other models such as 4D or Borg & Gall, which may offer less flexibility in revisions and phased implementation.

In addition to its flexibility, ADDIE is also oriented towards continuous evaluation, which ensures the feasibility and effectiveness of learning media in improving students' ability to solve math word problems. The stages of analysis, design, development, implementation, and evaluation in ADDIE are highly relevant to the development of the UN-MATH cards, as this model supports interactive and engaging game-based learning. By using this model, it allows for adjustments based on the responses of students and teachers, making the resulting media more optimal in supporting mathematics learning.

The observations I have conducted in the fourth-grade class at SDN Wates 01 show that although the students are already fluent in arithmetic, they struggle to solve word problems because they are less able to analyze problems sequentially. In addition, the learning media used is not varied and has not been effective in enhancing understanding and interest in learning. The available media, such as sticky notes, have not succeeded in helping students comprehend the material thoroughly. A lack of reinforcement, like rewards or praise, also makes students less engaged and quickly lose interest during learning. Backed by the outcome of an interview with the fourth-grade teacher at SDN Wates 01, it was found that in mathematics learning, especially in addition and subtraction word problems, students still find it challenging to understand and have low interest. Around 60% of the students have yet to master the content and show little engagement throughout the instructional sessions.

The researcher will develop the UN-MATH card learning media (Uno Mathematics) based on the description above. The development of the UN-MATH card media serves as a learning tool for students, allowing them to engage in more interactive, challenging, and enjoyable learning. These UN-MATH cards were created by the researchers themselves using the Canva application. The UN-MATH card media is in the form of cards played in groups, focusing on matching the colors and numbers displayed on the cards. The UN-MATH cards contain story problems involving addition and subtraction. The UN-MATH cards consist of 104 cards, which include 72 question cards and 32 action cards, comprising eight +2 cards, four +4 cards, eight reverse cards, eight skip cards, and four wild cards.

The research conducted by (Sari, yosi wulan, 2015) focuses on the development of UNO card media for narrative writing learning in the fourth grade of elementary school. The main objective of this research is to improve expository narrative writing skills by using games as a strategy to enhance student engagement in writing. This research uses the ADDIE model to develop learning media. The ADDIE model is applied in the process of designing UNO cards, validation, implementation, and media evaluation. The research results show that the media validation scores are 92% (media aspect), 90.56% (material aspect), and 90% (language aspect). Meanwhile, student responses to this media reached 89.29% (very good category). The improvement in learning outcomes after using UNO cards was recorded at 31.79%. This research contributes to the development of game-based media to enhance conceptual understanding in learning. The results show that UNO cards can be used as an interactive learning

medium, as well as highlighting the importance of student engagement in game-based learning.

The research conducted by (Harlin & Arini, 2023) focuses on the development of UNO card media for mathematics learning on the topic of weight units. The main focus of this research is the understanding of mathematical concepts by converting numbers on cards into weight units, as well as utilizing game aspects to enhance the understanding of mathematical concepts. In this research, the ADDIE model is used to develop learning media. The ADDIE model is applied in the design of UNO cards, validation, implementation, and media evaluation. The research results show that the media validation score is 90%, while the material validation score reaches 94%. Students' responses to this media received a score of 96% (very practical category). For its effectiveness, a t-value of 6.199 was obtained, which is greater than the t-table value of 1.730, indicating a significant improvement in student learning outcomes. This research contributes to the development of game-based media to enhance conceptual understanding in learning. The research results indicate that UNO cards can be used as an interactive learning medium, as well as highlighting the importance of student engagement in game-based learning.

From the comparison of the two previous studies, this UN-MATH card development research has several key innovations compared to the previous research. Among them, the focus is on problem-solving in mathematical story problems, not just understanding concepts or writing skills; using a mathematical modeling approach in card design, not just modifying visual design; and a more complex evaluation, including students' thinking strategies in solving story problems, not just the general effectiveness of the media. This research also reinforces the theory of student engagement in challenge-based learning by providing a systematic thinking structure in solving problems. With these innovations, the UN-MATH research not only continues the UNO card innovation in learning but also develops new ways to teach mathematical problem-solving skills more effectively and applicably.

Based on the background of the problem that has been described, the research problem can be formulated as follows: (1) how is the design of the UN-MATH card media development to improve the ability to solve story problems on addition and subtraction material? (2) how feasible is the UN-MATH card media for improving the ability to solve story problems on addition and subtraction? (3) how effective is the development of the UN-MATH card media product in improving the ability to solve story problems in addition and subtraction material?

METHOD

Participants

The population used in this study is the fourth-grade students of SDN Wates 01. The technique used to select the research subjects is the non-probability sampling technique. This technique is a sampling method that does not give each element an equal chance to be selected as a sample (Sugiyono, 2020). There are two subjects in this study, namely small-scale test subjects and large-scale test subjects. The research subjects used to test the questions are all students of class IV A and IV B at SDN Wates 01, totaling 39 students. The subjects in the small scale were selected using purposive sampling technique, which is a sample selection technique considering certain criteria. The subjects selected for this small-scale trial are 12 fourth-grade students from SDN Wates 01, chosen based on three categories: high achievement, medium achievement, and low achievement. This sampling aims to determine whether the developed product is effective when used by all students with different cognitive abilities. Meanwhile, the research subjects in the large-scale test used all fourth-grade students of SDN Wates 01, totaling 27 students.

Research Design and Procedures

The type of research used in this study is development research (Research and Development). The research design applied is the ADDIE design, which consists of five stages: analysis, design, development, implementation, and evaluation (Sugiyono, 2020). In the analysis stage, a study is conducted on the needs for product development. This stage includes the identification of existing problems and the analysis of their solutions. The process begins with analyzing the problem, followed by an analysis of the characteristics of the learners, including aspects of knowledge, skills, and development. Next, an analysis of the learning objectives is conducted to support the development of the product to be created. At the design stage, the design of learning media is carried out, tailored to the needs that have been previously identified. This process includes the design of the media concept that will be developed using the Canva application. This stage begins with preparing the materials to be included in the UN-MATH cards, followed by determining the components of the UN-MATH cards, such as the card colors and several action cards. In the development stage, media development is carried out based on the design that has been created. Before the media is applied to the students, it is first validated by media, material, and language validators. Design validation aims to ensure that the product is suitable for implementation in learning, both in terms of design, content, and language used. After the validation is conducted, the product revisions are adjusted based on the suggestions and feedback from the expert validators. The next stage is a product trial in a small group consisting of 12 fourth-grade students from SDN Wates 01. The results of the trial are analyzed to determine whether there are still aspects that need improvement in the implementation of the learning. The final stage is a trial in a large group. From the results of the small group and large group trials, it can be analyzed whether the developed product is effective for application in learning. This research lasted for six months until the UN-MATH card media could be used in large-scale trials.

Instruments

The instruments used in this study consist of tests and non-tests. The test instruments include pretests and posttests given to students before and after the treatment. The cognitive test used in this study consists of 30 descriptive questions. After conducting a validity test at a 5% significance level, it was found that 3 questions were invalid, leaving only 27 questions with good validity. The results of the reliability calculation using Cronbach's Alpha show a value of 0.884, indicating that the cognitive test questions have high reliability. The descriptive questions in this test have varying levels of difficulty, but they all share the same indicator, which is to measure students' ability to solve story problems related to addition and subtraction.

The non-test instruments used in this research consist of observation, interviews, questionnaires, and surveys. Interviews were conducted with the fourth-grade teacher at SDN Wates 01 through 25 questions discussing mathematics learning in the fourth grade. The distribution of the needs questionnaire was conducted with teachers and students regarding the use of the UN-MATH card media, by providing 20 questions in the questionnaire. The provision of the UN-MATH product validation questionnaire is given to expert validators in media, content, and language. The aspects evaluated by media experts include appearance, writing, materials, usage, and the child's developmental level. The aspects of evaluation by content experts include learning, content, material currency, and their ability to stimulate student curiosity. The aspects of evaluation by language experts include the ability to motivate students, alignment with student development, dialogic and interactive nature, and adherence to language rules. Each of these aspects is

represented by three question items. The response questionnaire was given to teachers and students, consisting of 10 questions that evaluate their satisfaction with the implementation of the developed product. All the questionnaires in this study were developed independently and have been confirmed to be valid and reliable.

Data Analysis

This research employs data processing techniques that include early-stage and final analyses. The early data analysis was descriptive, focusing on surveys about educator and student needs, as well as feedback forms from both groups related to the UN-MATH card-based materials. The needs questionnaire for teachers and students is used to develop the UN-MATH card product. The teacher and student need survey results include the UN-MATH cards measuring 7×8.5 cm, made of ivory paper with a colored card appearance, and consisting of two card sides. On the front side of the card, the font used is Times New Roman, size 9.9, and on the reverse side of the card, the font employed is Rig Solid Bold Halfton, size 28.6. Next, the analysis of teacher and student responses regarding the UN-MATH card media is used to measure the feasibility of the UN-MATH card product. The viability of the media percentage results is then interpreted according to the following provisions:

Table 1. Media eligibility criteria

Presentation	Criteria
82% < skor ≤ 100%	Very feasible
63% < skor ≤ 81%	Worthy
44% < skor ≤ 62%	Quite decent
25% < skor ≤ 43%	Not worthy

Next, a final data analysis of the academic performance of fourth-grade learners at SDN Wates 01 was conducted before and following the implementation of the UN-MATH card materials. Final data analysis was conducted using SPSS with calculations for the normality, t-test, and N-Gain tests. The normality test assesses whether the learning outcome data is usually distributed. The t-test is utilized to analyze if there is an improvement in the academic performance of students, derived from comparing their pre-test and post-test scores. The *t*-test uses the paired sample test because the data comes from paired samples. The N-Gain test was conducted next to calculate the mean academic progress of fourth-grade students at SDN Wates 01 before and after employing the UN-MATH card resources. The categories of N-Gain score acquisition are classified into three levels: high ($G > 0.7$), medium ($0.3 < G < 0.7$), and low ($G < 0.3$). Meanwhile, the effectiveness of the product is assessed based on four N-Gain categories in percentage form: very effective if $G > 76\%$, fairly effective if within the range of $56\% < G < 75\%$, less effective if $40\% < G < 55\%$, and ineffective if $G < 40\%$.

■ RESULT AND DISCUSSION

Analysis

At this stage, identification is carried out to find the problems occurring in classroom learning. Based on the results of interviews and observations, several obstacles were found in the learning process, including a lack of innovation in the application of learning media and the limited availability of interactive concrete media. The learning media used is still limited to PowerPoint and sticky notes. Teachers tend to apply a lecture and question-and-answer-based learning model without variations of more interactive methods. Additionally, in teaching mathematics, the teacher only relies on the textbooks provided by the

school without additional media support. In providing practice questions, the teacher does not offer a variety of questions, especially higher-order thinking skills (HOTS) questions. As a result, students find it difficult to solve math word problems, especially those with a higher level of difficulty. This condition causes some students to feel afraid and consider mathematics as a difficult subject.

Design

Here are the results of the UN-MATH card media design for 4th grade on addition and subtraction material. UNO cards inspired the initial concept of the UN-MATH card learning media. The UN-MATH card media has several modified card components that serve different functions to ensure compatibility with the developed learning media. The completeness of the UN-MATH card media consists of 72 question cards and 32 action cards, and it is accompanied by the UN-MATH card guidebook and answer key. This UN-MATH card consists of two cards: the question card and the action card. This question card consists of numbers 0-5, each with various colors, including yellow, red, green, and blue. Each number from 0-5 consists of three cards.

In designing the UN-MATH card media, use the Canva application. This UN-MATH card guidebook contains the definition of UN-MATH cards, the philosophy of UN-MATH card colors, the components of UN-MATH cards, and instructions for using UN-MATH cards. The Canva application was used to design this guidebook. This answer key contains the answers to the questions found on the UN-MATH cards. The judge, namely the teacher, holds this answer key. The teacher will inform the player who answers whether the answer is correct or incorrect. This answer key is designed using Canva. The UN-MATH card packaging is designed to store UN-MATH cards neatly. The UN-MATH card packaging was designed using Canva.

Development

After going through the design phase, the next step is the production process in the development stage. The product produced is in the form of UN-MATH card media. The design created during the planning stage will be realized as a product. After the product is developed, validation will be conducted by media, material, and language experts, and improvements or revisions will be made if necessary.

The material used for the production of UN-MATH cards and UN-MATH card packaging is ivory paper. Ivory paper produces the guidebook cover and answer key, while the contents are made with 100-gram HVS paper.

This product is developed in the form of printed media equipped with questions and their explanations. Here are the results of the developed media:

Figure 1. Question card

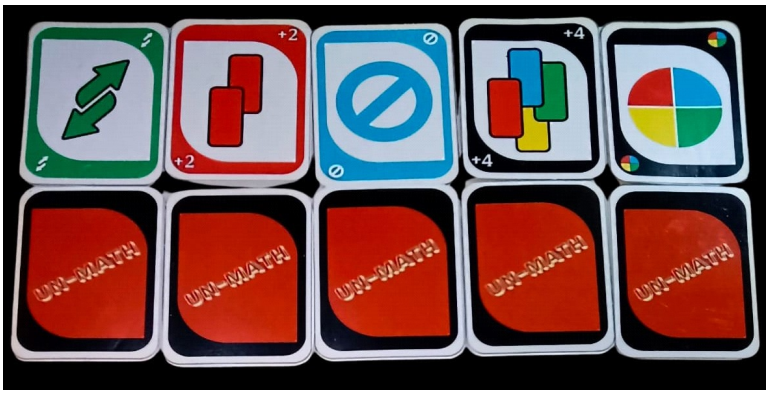

Figure 2. Action card

After the development process is complete, the UN-MATH card media is validated by expert validators in the fields of media, content, and language. The assessment was provided through a validation test sheet. The validation results from the experts are presented in table 2.

The UN-MATH card product, validated by media, material, and language experts, received a score of 121 with a percentage of 91.6%, indicating that the product is highly feasible. Thus, the UN-MATH card learning media is very suitable for teaching.

Implementation

In its implementation, the printed UN-MATH card media is then applied in school learning. The UN-MATH card media was implemented in two trials: a small-scale trial and a large-scale trial. The small group product usage trial aims to obtain information regarding students' responses to the developed product. The respondents in the small group trial are fourth-grade students from SDN Wates 01, totaling 12 students. The determination of small group respondents used purposive sampling techniques, considering the cognitive aspects of the students. The sample consists of four students with high cognitive abilities, four students with moderate cognitive abilities, and four students with low cognitive abilities.

Table 2. Expert validation results (media, materials, language)

Assessment Aspects	Maximum Score	Score Earned	Presentation	Criteria
Media	60	54	90%	Very feasible
Material	44	41	93.1%	Very feasible
Language	28	26	92.8%	Very feasible
Overall Skor	132	121	91.6%	Very feasible

The stage of conducting this small group trial consists of several phases. First, the students completed a pre-test to determine their initial ability to solve math story problems on addition and subtraction before using the UN-MATH card media. Second, the students participated in game-based learning using UN-MATH cards. Third, the students completed a post-test to assess their ability to solve story problems on addition and subtraction after participating in the learning using the UN-MATH card media.

The teacher first explains the material related to addition and subtraction. Next, the students are divided into several groups with members who have heterogeneous abilities. After that, the teacher introduced the UN-MATH card media that would be used. The use of the UN-MATH card media has game rules that are almost

the same as regular Uno. The difference lies in the game being played in groups and the presence of question cards in this medium. The UN-MATH card media consists of two types of cards, namely question cards and action cards. Students will receive a score of 1 if they successfully answer the question on each card and a score of 0 if their answer is incorrect. At the end of the lesson, the teacher will accumulate the scores obtained by each group. The group with the highest total score will receive a prize from the teacher.

The UN-MATH card media that has been tested on a small group was then tested on a large group. The trial of using the UN-MATH card media on a large group was conducted with a sample of 27 fourth-grade students from SDN Wates 01. The implementation of the large group trial is the same as the small group, which consists of three stages. First, the students completed a pre-test to determine their initial ability to solve mathematical story problems on addition and subtraction before using the UN-MATH card media. Second, the students participated in game-based learning using UN-MATH cards. Third, the students completed a post-test to assess their ability to solve mathematical story problems on the same material after participating in the learning using the UN-MATH card media.

During the lesson, the teacher first explains the material related to addition and subtraction. Next, the students are divided into several groups with members who have heterogeneous cognitive abilities. At the game stage, the teacher introduces the UN-MATH card media to the students. The use of UN-MATH card media has the same rules as regular Uno. The difference lies in the game being played in groups and the presence of question cards in the UN-MATH card media. The UN-MATH card media consists of two types of cards, namely question cards and action cards. Students will receive a score of 1 if they successfully answer the question on the card and a score of 0 if they answer incorrectly. At the end of the lesson, the teacher accumulates the scores obtained by each group in the game. The group with the highest total score will receive a prize from the teacher.

Evaluation

There are no specific steps at this stage because formative evaluation is conducted during the implementation of the ADDIE model, specifically at each stage. Meanwhile, the summative evaluation is conducted during the implementation phase at the school.

The Effectiveness of UN-MATH Card Media

To determine the effectiveness of the UN-MATH card media, data analysis can be conducted using SPSS through normality tests, homogeneity tests, t-tests, and N-Gain tests.

This study uses the Shapiro-Wilk statistical test to assess normality with a significance level of 0.05. The test results show that each data point has a different significance score. In the control class, the pre-test showed a significance score of 0.372, while the post-test was 0.083. For the experimental class, the pre-test significance score is 0.614, and the post-test is 0.057. Based on these results, it can be seen that the pre-test and post-test data for the control class and the experimental class have $\underline{p} > 0.05$, indicating that the data in both groups are normally distributed.

Next, a homogeneity test is conducted to determine whether the data comes from a population with the same variance. The homogeneity test was calculated using SPSS. Based on the results of the homogeneity test, the average significance values of the pre-test and post-test were 0.656 and 0.707, respectively. From these results, it can be seen that the average significance values of the pre-test and post-test are greater than 0.05, indicating that the population has homogeneous variance.

Then, a paired t-test was conducted. The paired t-test criteria state that if the significance value (Sig.) is less than 0.05, then there is a

significant difference between the pre-test and post-test learning outcomes. Based on the t-test results, the data shows a Sig. (2-tailed) value of 0.000. Because 0.000 < 0.05, this indicates a significant difference between the pre-test and post-test results. Thus, it can be concluded that there is an increase in the average post-test score compared to the previous pre-test score.

The next analysis is to test the effectiveness of using UN-MATH card media using the N-Gain test. Based on the N-Gain test results in the control class, the obtained N-Gain score is 0.5630, which falls into the moderate category, with an effectiveness level of 56.30%, which is considered quite effective. Meanwhile, the N-Gain test results in the experimental class showed a score of 0.7004, which also falls into the moderate category, with an effectiveness level of 70.04%, which is considered quite effective. Thus, the UN-MATH card media can be used to help improve problem-solving skills in solving addition and subtraction word problems.

In this study, the aspect of students' problem-solving abilities is assessed based on four indicators, namely understanding the problem, planning the solution, solving the problem according to the plan, and evaluating the solution results.

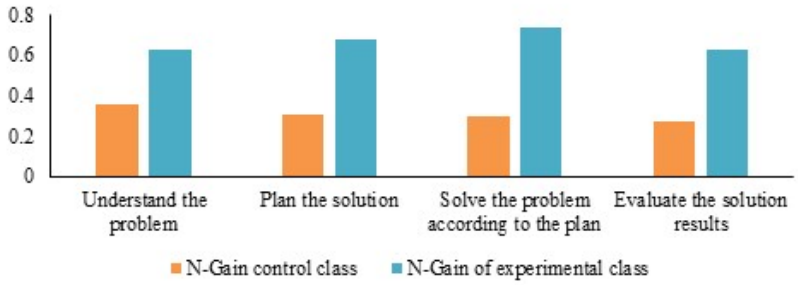

Figure 3. Diagram for testing the n-gain problem-solving ability indicator

Based on Figure 3, it can be seen that the N-Gain test analysis was conducted on each observed problem-solving ability indicator, namely understanding the problem, planning the solution, solving the problem according to the plan, and evaluating the solution results. In the control class, where learning was conducted without using media, the N-Gain values for each indicator were as follows: understand the problem 0.36; plan the solution 0.31; solve the problem according to the plan 0.30; and evaluate the solution results 0.27. Meanwhile, in the experimental class that used media in learning, the N-Gain values obtained were as follows: understand the problem at 0.63; plan the solution at 0.68; solve the problem according to the plan at 0.74; and evaluate the solution results at 0.63. The highest increase in N-Gain value was obtained in the indicator of solving problems according to plan, while the lowest increase was found in the indicator of understanding problems. Overall, the average N-Gain score of the control class is 0.56, while the experimental class is 0.70, both of which fall into the moderate category. Thus, it can be concluded that the use of UN-MATH card media is quite effective in improving students' learning outcomes, especially in the indicator of solving problems according to plan.

The use of UN-MATH card media has been proven to enhance students' ability to solve addition and subtraction story problems. This improvement in learning outcomes can be explained through several key factors related to the characteristics of game-based learning media. First, the engaging nature of the UN-MATH card game encourages students to be more active and involved in the learning process. Well-designed games can enhance engagement, so students do

not feel bored and are more motivated to learn (Chen et al., 2017). Second, student engagement in learning becomes more intensive due to the elements of competition and challenge in the game. When students feel that learning is an enjoyable and meaningful experience, they tend to be more focused and put in more effort to complete the given tasks. This improvement is in line with previous research findings that show that game-based learning can enhance student participation and enthusiasm, which ultimately has a positive impact on their learning outcomes (Hanjayani, 2022).

The difference in scores between the control class and the experimental class shows that the UN-MATH card media applied in the experimental class had a greater impact compared to the control class. This is evidenced by the N-Gain score in the experimental class, which reached 0.7004. Thus, it can be concluded that the intervention provided is quite effective in improving students' problem-solving abilities (Veloo & Chairhany, 2013).

In addition to the learning media itself, there are other factors that may contribute to the improvement of students' scores. The role of the teacher in guiding the use of the UN-MATH cards is very important, as a competent teacher can help students understand the rules of the game. In addition, student motivation can also increase along with their growing confidence in solving the problems presented in the game. Although there is generally an improvement in learning outcomes, it is possible that some students do not experience significant progress. This could be caused by several factors, such as a lack of experience in game-based learning and difficulty in understanding the game rules. Students who are accustomed to conventional learning methods may take longer to adapt to more interactive learning models such as the use of UN-MATH cards.

Based on the research conducted by (Tutriani et al., 2023) the UNO Math cards showed a greater improvement in understanding the concept of integer operations, while the UN-MATH Card excelled more in problem-solving based on story problems. This is due to the different focuses of each media. UN-MATH Card focuses on problem-solving in word problems, which requires understanding the problem and developing a solution strategy. Meanwhile, the UNO Math cards place more emphasis on integer operations, which are procedural and straightforward.

The results of this study indicate that the use of the UN-MATH Card is quite effective in improving mathematical problem-solving skills, particularly in addition and subtraction word problems. These findings can be utilized by teachers in daily learning by integrating these cards as interactive media that make students more active, motivated, and engaged in the learning process (Tutriani et al., 2023). Although this research focuses on addition and subtraction, the UN-MATH Card has the potential to be further developed in various other mathematical concepts, such as multiplication, division, and fractions, with adjustments to the design and content of the questions. This research shows significant results, schools can consider adopting the UN-MATH Card more widely as part of a game-based learning strategy. Thus, this media can become an innovative solution to enhance student engagement in mathematics learning at various educational levels.

The limitation of this study is the small sample size, which is restricted to only one elementary school, so the results cannot be generalized to a larger population. Suggestions for future research include testing the effectiveness of the UN-MATH cards on other mathematical topics, such as multiplication, division, and fractions. Additionally, it is recommended to conduct research with a larger sample size and from various schools to make the results more representative.

CONCLUSION

The UN-MATH card media was developed with a focus on students and employs game-based learning principles. The feasibility test results showed that the UN-MATH card media scored 91.6%, placing it in the feasible category. The difference in learning outcomes on a small and large scale indicates that the UN-MATH card learning media can help improve problem-solving skills for addition and subtraction word problems. Significant differences between the initial and final test scores, across both small and large scales, can be seen in the T-test outcomes. Cognitive assessment in this study used 27 essay-type questions.

The N-Gain test found that learning with the UN-MATH card media is quite effective and can improve students' abilities in addressing addition and subtraction word problems. The small-scale N-Gain analysis revealed a value of 0.5630, indicating a significant improvement in the moderate category and an effectiveness level of 56.30%, which shows that this is quite effective. Meanwhile, on a larger scale, the N-Gain analysis revealed a result of 0.7004, indicating a significant improvement in the high category and an effectiveness level of 70.04%, which is quite effective. Thus, the UN-MATH card media is quite effective in the fourth grade to improve problem-solving skills in addition and subtraction story problems.

UN-MATH card media can serve as an option to improve academic performance, inspire students, and strengthen their ability to solve word problems involving addition and subtraction. The questionnaires from teachers and students indicate that the UN-MATH card media is visually appealing and makes classroom learning enjoyable, increasing students' enthusiasm for tackling addition and subtraction word problems. Suggestions related to the UN-MATH card learning media include adding elements or images corresponding to the questions to make the design more appealing.

REFERENCES

Chen, P., Kuo, R., Chang, M., & Heh, J. S. (2017). The effectiveness of using in-game cards as reward. *Research and Practice in Technology Enhanced Learning*, *12*(1). https://doi.org/10.1186/s41039-017-0054-8

Domu, I. (2024). Factors that influence students' ability to solve mathematics story problems. *1*(3), 1–9.

Dwijayani, N. M. (2019). Development of circle learning media to improve student learning outcomes. *Journal of Physics: Conference Series*, *1321*(2). https://doi.org/10.1088/1742-6596/1321/2/022099

Hanjayani, D. (2022). the Effectiveness of the team games tournament learning model based on virus material exploration on student learning outcomes. *Journal of Education Technology and Inovation*, *5*(1), 126–135. https://doi.org/10.31537/jeti.v5i1.963

Harlin, M. D., & Arini, N. W. (2023). *Pengembangan Media kartu uno pada materi satuan berat di kelas iv sekolah dasar* [development of uno card media on weight units material in fourth grade elementary school]. *Jurnal Cendekia/†: Jurnal Pendidikan Matematika*, *7*(3), 3027–3038. https://doi.org/10.31004/cendekia.v7i3.2731

Nurjanah, P., & Angraini, L. M. (2024). Analysis of students ' mathematical problem-solving in translating story problems into mathematical models. *3*(4), 230–250. https://doi.org/10.56855/jpr.v3i4.1105

Pongsakdi, N., Laine, T., Veermans, K., Hannula-Sormunen, M. M., & Lehtinen, E. (2016). Improving word problem performance in elementary school students by enriching word problems used in mathematics teaching. *NOMAD, Nordic Studies in Mathematics Education*,

21(2), 23–44.

Puspitarini, Y. D., & Hanif, M. (2019). Using Learning media to increase learning motivation in elementary school. *Anatolian Journal of Education*, *4*(2), 53–60. https://doi.org/10.29333/aje.2019.426a

Qian, M., & Clark, K. R. (2016). Game-based Learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, *63*(September), 50–58. https://doi.org/10.1016/j.chb.2016.05.023

Ray, M., & Ilangovan, A. (2024). Digital game-based learning in higher education: esl teachers and students perceptions. *World Journal of English Language*, *14*(5), 638–653. https://doi.org/10.5430/wjel.v14n5p638

Sari, yosi wulan, J. (2015). *Pengembangan media kartu uno untuk pembelajaran menulis narasi di kelas iv sekolah dasar [*development of uno card media for narrative writing learning in fourth grade elementary school]. *03*, 1670–1680.

Smith, G. G., Gerretson, H., Olkun, S., & Joutsenlahti, J. (2010). Effect of causal stories in solving mathematical story problems. *Hacettepe University Journal of Education*, *39*(1996), 284–295.

Sugiyono. (2020). *Metodologi penelitian kuantitatif, kualitatif dan R & D* [methodology of quantitative, qualitative, and R&D Research].

Sun, L., Chen, X., & Ruokamo, H. (2020). Digital game-based pedagogical activities in primary education: a review of ten years' studies. *International Journal of Technology in Teaching and Learning*, *16*(2), 78–92. https://doi.org/10.37120/ijttl.2020.16.2.02

Sun, L., Kangas, M., Ruokamo, H., & Siklander, S. (2023). A systematic literature review of teacher scaffolding in game-based learning in primary education. *Educational Research Review*, *40*(June), 100546. https://doi.org/10.1016/j.edurev.2023.100546

Thangeda, A., & Baratiseng, B. (2016). Education for sustainability: quality education is a necessity in modern day. how far do the educational institutions facilitatequality education? *Journal of Education and Practice*, *7*(2), 9–17. www.iiste.org

Tutriani, N., Apriani, F., & Vebrian, R. (2023). *Pengembangan permainan kartu uno pada pembelajaran matematika materi bilangan bulat positif* [development of uno card game in mathematics learning on positive integer material]. *Journal on Education*, *5*(2), 5460–5472. https://doi.org/10.31004/joe.v5i2.1297

Veloo, A., & Chairhany, S. (2013). Fostering students' attitudes and achievement in probability using teams-games-tournaments. *Procedia - Social and Behavioral Sciences*, *93*, 59–64. https://doi.org/10.1016/j.sbspro.2013.09.152