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THE EFFECT OF THE TRADITIONAL *MA'GURECCENG* GAME IN IMPROVING THE NUMERACY SKILLS OF STUDENTS AT SD NEGERI 24 PANDANG-PANDANG

Asmaul Husna[1], Aisyah Nursyam [2], Aspikal[3]

[1,2,3]Pendidikan Matematika Universitas Muhammadiyah Bone, Bone, Indonesia.
** E-mail:* asmaul0709@gmail.com[1], ichanursyam@gmail.com[2], aspikallandu@gmail.com[3]

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ABSTRACT
Elementary school students need to have numeracy skills from an early age because these skills are an important foundation for solving various everyday problems that require logical thinking. Based on global assessment reports, such as *PISA*, it is clear that Indonesian students' performance in mathematics is not satisfactory. The main objective of this study was to identify the relationship between the use of the traditional game Ma'gurecceng and the level of numeracy skills of students studying at SD Negeri 24 Pandang-Pandang. The research was conducted using a quantitative method with a pre-experimental design in the form of *a one-group pre-test-post-test.* All 12 fifth-grade students at SD Negeri 24 Pandang-Pandang were selected as participants using a saturated sample method. Data were collected through written tests involving pre-tests and post-tests as well as student response questionnaires. Furthermore, data processing used the Wilcoxon test to compare pre-test and post-test scores. Statistical tests proved that after participating in learning activities with the Ma'gurecceng game, students' numeracy skills increased significantly. The average post-test score (81.58) was higher than the pre-test score (49.92), while the Wilcoxon test using *SPSS* gave a result (Sig.) of 0.002 ($p < 0.05$). The questionnaire data showed that 57.5% of respondents "strongly agreed," 42.5% "agreed," with no "disagree" or "strongly disagree" responses. The research findings confirm that the application of the traditional Ma'gurecceng game has a beneficial contribution to improving students' numeracy skills.

Introduction

Education is a lifelong learning process. Education is a planned process to produce effective learning, aimed at developing the overall intellectual and spiritual abilities of individuals so that they can actively contribute to building a better society (Pristiwanti, D., Badariah, B., Hidayat, S., & Dewi, 2023) . Education plays a crucial role in helping individuals develop their potential. In order for educational goals to be optimally achieved, careful planning and active involvement from various parties are required (Sulastri, Sapti, M., & Darmono, 2024) . One of the main goals of basic education is to improve students' numeracy skills. Numeracy is the ability to apply mathematical concepts to solve everyday problems. This

ability is an important foundation for mastering various subjects (Rohim, D.C., Rahmawati, S., & Ganestri, 2021) .

Numeracy is at the core of mathematics learning (Nisa, 2023) . As is well known, students' numeracy skills are included in the country's education quality standards. Every three years, *the PISA International Assessment* presents data that highlights the strengths and limitations of Indonesian students in reading, mathematics, and science (Baharuddin, M.R., Sukmawati, 2021) . Based on the results of the 2018 PISA survey, which ranked Indonesia 72nd out of 79 countries in mathematics, it was stated that Indonesian students' abilities are still far below the international average. The data shows that students are not very interested in mathematics. This is a major challenge for the education sector in Indonesia to immediately take corrective measures (Badariah, B., Pristiwanti, D., & Rosmilawati, 2022) . Basic mathematical skills are also known as numeracy. This is because both have the same range of skills (Adinda et al., 2022) .

Numeracy basically refers to an individual's ability to understand, apply, and analyze numbers in various situations so that they can be used to solve everyday problems (Baharuddin, M.R., Sukmawati, 2021) . According to Cockroft, "numeracy is a person's ability or skill to effectively use numbers in solving various problems encountered in everyday life. A person's reasoning ability is known as numeracy." Reasoning can be understood as a cognitive activity that involves analyzing and interpreting a statement by utilizing symbols or mathematical language representations in real life, either verbally or in writing (Nasir, R., Nurjannah, S., Amanda, N.F., Adria, 2023) . In the process of learning mathematics, mathematical understanding is an important target because it is directly related to improving numeracy skills. This aspect includes students' insight into concepts, principles, and procedures, including the skills to use the right strategies in solving problems they encounter (Rismala, A.I., Hadiana, O., Zaenal, R.M., Casnan, & Heriyana, 2023) .

Students need mathematical understanding to make the process of learning mathematics easier. On the other hand, numeracy refers to the ability to understand arithmetic operations, including the ability to recognize symbols, read, write, and use them for daily needs (Hazimah, G.F., & Sutisna, 2023) . Understanding mathematical concepts is an important prerequisite for students to be able to solve problems and apply mathematical ideas in their daily lives. Many students believe that memorizing formulas will make it easier for them to solve mathematical problems. However, mathematics is actually a subject that focuses more on problem solving than simply memorizing formulas. To achieve this, a deeper understanding of mathematics is needed (Sulastri, Sapti, M., & Darmono, 2024) .

Numeracy involves analytical thinking skills to process information presented in various forms, such as charts, graphs, or tables. After conducting an analysis, the results can be used to anticipate trends, make decisions, or evaluate current conditions. For example, someone can use graph data to predict weather changes or make decisions based on annual sales data. Numeracy is the ability to use mathematics confidently in various aspects of life. In other words, numeracy is the ability to use number concepts and perform calculations in everyday life (Manurung, D.R., Haloho, B., & Napitu, 2023) .

Based on observations, many students have difficulty learning mathematics. They consider mathematics too difficult to understand. This affects students' numeracy skills. Mathematics is often seen as an abstract subject, which often causes difficulties for students from elementary school to college. This condition is often considered normal in the learning process . Therefore, people believe that if mathematics continues to be a problem, students will become less interested and more easily bored (Anderha & Maskar, 2021) . Good numeracy skills are essential for overcoming modern challenges where mathematical skills are increasingly important.

Students do not understand numeracy well, which is one of the empirical problems that arise. Students may not be interested in learning if they do not have many resources or do not have direct interaction with the subject matter. It is important to realize that students do not always learn in the same way, as some tend to prefer interactive learning approaches over other methods (Listrianti, F. et al., 2023) . Faced with these obstacles, learning media that can

foster students' enthusiasm for mathematics is needed, one of which is through the integration of traditional games in learning activities.

Traditional games are a cultural heritage with high educational value. One learning medium that can be used through traditional games is the bekel ball (also known as ma'gurecceng in the Bugis language). Ma'gurecceng, as a cultural heritage, can be used as a learning medium rich in local values and local wisdom. Ma'gurecceng, a traditional game that uses small rubber balls and seeds, usually in multiples of six as agreed by the players, offers an interesting and interactive learning approach (Al Ningsih, 2021) . The game of ma'gurecceng is not only fun, but it can also help students improve their numeracy skills. When children play bekel ball (ma'gurecceng), they are trained to think directly. This game also improves their reasoning and agility in picking up the bekel balls quickly (Badariah, B., Pristiwanti, D., & Rosmilawati, 2022) .

Teachers can create a more interactive and engaging learning environment by incorporating this game into the learning process. In addition to being entertaining, the traditional game of ma'gurecceng can also be an effective tool in mathematics learning. This study offers a novel approach in utilizing the traditional game *of Ma'gurecceng* as a locally-based learning medium. The main focus of this study is to explore the impact of the game in improving numeracy skills and to assess students' responses to the application of the Ma'gurecceng game through a quantitative approach. It is hoped that the results of this study will not only provide a solution to low student numeracy but also be able to provide enjoyable and meaningful learning. In addition, this study plays a role in preserving local culture through the application of traditional games in elementary school learning.

Method

The approach used in this study was quantitative with a pre-experimental type, and the design used was a one-group pre-test-post-test (Fauziyah & Anugraheni, 2020) . This design was chosen because it provided an opportunity for researchers to assess the differences in the conditions of the same group of students before and after being given treatment, namely through learning using the traditional Ma'gurecceng game. The pre-test and post-test results were compared, allowing researchers to assess the effectiveness of the game in developing students' numeracy skills. The purpose of this study was to empirically examine how the traditional Ma'gurecceng game affects the improvement of fifth-grade students' numeracy skills. This study was conducted at SD Negeri 24 Pandang-Pandang, Bantaeng Regency, South Sulawesi, during October-November 2024, with three meetings, each lasting 45 minutes. The following is *the one-group pretest-posttest* experimental research *design*:

Table 1. *One-group Pretest-Posttest Design*

Group	*Pretest*	Treatment	*Posttest*
Students	O_1	X (*Ma'gurecceng*)	O_2

(Fauziyah & Anugraheni, 2020) .

Explanation:
X = Treatment (learning through the traditional game of *ma'gurecceng*)
O_1 = *Pretest* (pre-learning test)
O_2 = *Posttest* (post-learning test)

The population is defined as the area that is the focus or main concern of the study, where we select specific characteristics that we want to study from the objects or subjects within it (Suriani, N., Risnita, & Jailani, 2023) . The research population included all 12 fifth-grade students at the school. The sample, as a smaller part of the population, was carefully selected to represent the general characteristics of all fifth-grade students (Asrulla et al., 2023)

. The entire population was used as respondents because the number was not large, so saturated sampling technique was used. Data were collected using a descriptive test consisting of six fraction questions administered at the pre-test and post-test stages, which were intended to measure students' numeracy skills before and after learning with the Ma'gurecceng media. The written tests collected were analyzed using the *SPSS* program with the Wilcoxon Signed Rank Test method, while questionnaires were given to assess students' responses to the application of the traditional Ma'gurecceng game media in supporting the improvement of numeracy skills.

Results and Discussion

Results

After the traditional *Ma'gurecceng* game was used, research data was collected to show the extent to which students' numeracy skills had improved. This study was conducted in one class with 12 fifth-grade students. The study consisted of three stages: *a pre-test* before learning, learning using the traditional *Ma'gurecceng* game, and *a post-test* after learning. Each test consisted of 6 essay questions aimed at measuring students' initial and final numeracy (counting) skills. The average scores of both tests are presented in the table.

Table 2. Average *Pre-test* and *Post-test* Scores

Tes Uraian	Rata-rata
Pretest	49,92
Posttest	81,58

A comparison of the average scores before and after learning shows an increase in numeracy skills using the traditional *ma'gurecceng* game. The average pretest score of students before participating in learning based on the traditional ma'gurecceng game was 49.92, while after the treatment, the average posttest score rose to 81.58. The next step was to analyze the difference between the *pretest* and *posttest* averages using the Wilcoxon statistical test with the help of the SPSS program. The Wilcoxon test is a statistical method used to compare the mean values of two paired samples. This analysis not only considers the direction of the difference but also the magnitude of the difference that appears in the paired data. With thus, the Wilcoxon test provides an overview of whether there is a significant difference between the two conditions being tested (Kaporina, A., Hernanda, Y., & Nurlaily, 2023).

In general, the Wilcoxon test is used to assess differences between paired data, for example by comparing results before and after treatment to measure the effectiveness of an intervention. This test is non-parametric, making it suitable for use when data is not normally distributed or is on an ordinal scale. In other words, the Wilcoxon test can be an alternative to the paired t-test in analyzing two related samples. When the population cannot be considered normally distributed or the data is on an ordinal scale, this can be used as a substitute for the paired t-test (Kaporina, A., Hernanda, Y., & Nurlaily, 2023) .

Statistical decisions are based on comparing the calculated W value with the critical value from the Wilcoxon table for the sample size (n) and the selected significance level (α) (usually 0.05) or by using the p-value approach from the SPSS calculation results. When the p-value is smaller than α, the null hypothesis is considered invalid and the results indicate a significant difference between the two paired data groups. (Ahmad, F., Sari, 2025) . The hypotheses proposed in this study are as follows:

1. Null Hypothesis (H0): There is no significant change in the numeracy skills of fifth-grade students at SD Negeri 24 Pandang-Pandang before and after the implementation of traditional ma'gurecceng game-based learning.
2. Alternative Hypothesis (Ha): Fifth-grade students at SD Negeri 24 Pandang-Pandang experience significant development in numeracy skills after participating in learning using the traditional ma'gurecceng game.

The following table shows the results of the Wilcoxon *Output Ranks* statistical test using the SPSS program.

Table 3. Results of the Wilcoxon *Output Ranks* statistical test

Ranks				
		N	**Mean Rank**	**Sum of Ranks**
Posttest - Pretest	Negative Ranks	0[a]	0,00	0,00
	Positive Ranks	12[b]	6,50	78,00
	Ties	0[c]		
	Total	12		

The interpretation of the ranks table was carried out by considering three things, namely negative ranks which describe a decrease in scores from the pre-test to the post-test, positive ranks which indicate an increase in scores, and ties which show identical scores between the pre-test and post-test. Based on the ranks output in the *SPSS* test, it can be confirmed that all 12 respondents did not experience a decrease in the negative ranks category, while in the positive ranks category, all respondents experienced an increase with a mean rank of 6.50 and a total sum of ranks of 78.00. Therefore, the conclusion is that there was an increase in the *pretest* to posttest scores. The following table shows the results of the Wilcoxon statistical test using the SPSS program.

Table 4. Wilcoxon Statistical Test Results

Test Statistics[a]	
	Posttest - Pretest
Z	-3,061[b]
Asymp. Sig. (2-tailed)	0,002

The main function of the table above is to determine the status of the hypothesis, whether it can be accepted or must be rejected. The reference used is the (Sig.) value: when the number is smaller than 0.05, the alternative hypothesis is accepted, while if it is greater than 0.05, the null hypothesis is retained. The Wilcoxon test analysis using *SPSS* shows a (Sig.) value of 0.002. Because this number is smaller than 0.05, the null hypothesis is rejected and, consequently, the alternative hypothesis is considered valid. These findings indicate that learning using the traditional game of ma'gurecceng has a significant impact on the numeracy skills of fifth-grade students at SD Negeri 24 Pandang-Pandang *g.*

In addition to conducting tests, the researcher also used a questionnaire to measure students' responses to learning. The questionnaire contained 10 statement items with a four-option Likert scale (SS, S, TS, STS), the overall results of which are presented in the following table and graph:

Table 5. Questionnaire Recapitulation Results

No	Kategori Respons	Jumlah Respons	Persentasi
1	Sangat Setuju (SS)	69	57,5%
2	Setuju (S)	51	42,5%
3	Tidak Setuju (TS)	0	0%
4	Sangat Tidak Setuju (STS	0	0%
Total		120	100%

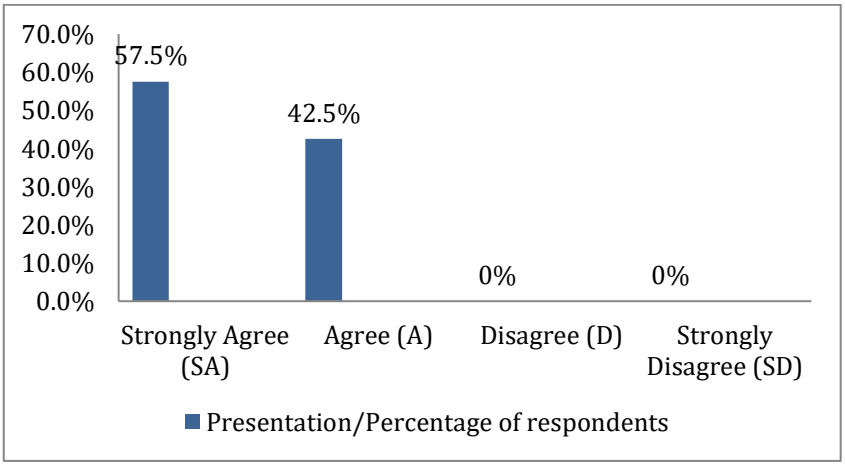

Figure 1. Graph of Questionnaire Response Summary

Table 4.2 and Figure 4.2 show that students' responses were generally positive toward learning based on the traditional game of ma'gurecceng, with 69 (57.5%) responses in the "strongly agree" category, 51 (42.5%) responses were in the "agree" category ( ), and no students stated "disagree" or "strongly disagree." The results indicate that a contextual and enjoyable approach through games can create an engaging learning environment, make the material easier to understand, and motivate students to learn mathematics, particularly fractions.

Discussion

Traditional games always evoke laughter, making them relevant in various contexts and able to be played collectively in a fun atmosphere (Kaporina, A., Hernanda, Y., & Nurlaily, 2023) . In fact, traditional games contain elements that play an important role in stimulating children's creativity and intellectual abilities. The ma'gurecceng game can even be applied in the context of school learning, especially mathematics. Students can be directly involved in learning through the traditional *ma'gurecceng* game (Renasip, Taufik, M., & Rahayu, 2023) . In this study, the traditional *ma'gurecceng* game was used to teach fifth-grade students at SD Negeri 24 Pandang-Pandang about fractions. The main focus of this syntax was to develop students' numeracy skills while expanding their understanding of the principles and elementary operations of fractions.

The learning syntax consists of three main phases. The first phase is preparation and *pretest*. In this phase, teachers not only prepare students mentally, provide orientation about learning objectives, and explain the relationship between the *ma'gurecceng* game and fractions, but also test students' numeracy skills through *a pretest*. The results *of the pretest*

for fifth-grade students had an average score of 49.92, indicating that they had an initial understanding of the concept of fractions that needed to be improved. The second phase of learning was the main learning intervention, which was carried out over three meetings, and the number of *gurecceng* seeds used in each session was adjusted to gradually increase the complexity and explore the concept of fractions.

In the first meeting, students were taught the basic concept of fractions using 4 *gurecceng* seeds. The researcher, as the teacher, explained the rules of the game and linked them to the representation of fractions at the beginning of the meeting. With a limited number of seeds, students were invited to understand the simple concept of parts of a whole. $\frac{1}{4}$For example, if a player managed to collect 1 seed out of the 4 seeds played, it would be described as 1/4 of the total number of seeds. Building a visual and practical understanding of numerators and denominators in the context of a game with a relatively small number of elements was the main focus of this session. After the first game, discussion about how students found and expressed fractions based on the results of their game with 4 *gurecceng* seeds was emphasized.

The process of adding and subtracting fractions using 6 *gurecceng* seeds is studied in the second session. The larger number of seeds allows for the exploration of fractions with more diverse denominators. The activities in the game are intended to encourage students to perform addition and subtraction of fractions. For example, students can combine the 2 seeds they have with 1 seed from the catch $\left(\frac{2}{6}+\frac{1}{6}=\frac{3}{6}\right)$ or students can give their friends 2 seeds from the 6 seeds they have $\left(\frac{6}{6}-\frac{2}{6}=\frac{4}{6}\right)$. The focus of this meeting is how students translate the actions of the game with 6 *gurecceng* seeds into mathematical operations. This includes the importance of using the same denominator for addition and subtraction. Inspired by the situation in the game, at the end of the second meeting, the practice activities included solving fraction problems involving addition and subtraction with denominators up to six.

The goal of the third meeting was to improve understanding of multiplication and division of fractions using 8 *gurecceng* seeds. By using a larger number of seeds, more complex game scenarios could be created to learn the concepts of multiplication and division of fractions. For example, if each of the two players managed to collect $\frac{3}{8}$ parts of the seeds, then the total number of seeds collected could be linked to multiplication $\left(2\times\frac{3}{8}=\frac{6}{8}\right)$. For division, teachers can provide challenges such as dividing 8 *gurecceng* seeds into several groups with equal numbers to help students understand the concept of fraction division in a specific context. The discussion in the third meeting covers the four basic operations of multiplication or division of fractions.

The purpose of using an increasing number of *gurecceng* seeds during these three meetings is to provide *scaffolding* in learning the concept of fractions. It starts with a simple representation with 4 seeds, performs addition and subtraction operations with six seeds, and ends with multiplication and division activities using eight seeds. This strategy is expected to help students gain a deeper and more comprehensive understanding of fractions.

The posttest and final reflection are the last stages. To measure changes in students' numeracy skills, after the learning activities using the *ma'gurecceng* game, students were given *a posttest* with an instrument comparable to *the pretest*. The posttest results showed a remarkable increase; the average score obtained by students was 81.58, indicating that the integration of the traditional ma'gurecceng game was very effective in helping students understand fractions. The final reflection session, conducted after the test, provided an opportunity for students to share what they had learned, understand how the game helped them comprehend the material, and identify difficulties and ways to overcome them.

The learning structure that integrates the traditional ma'gurecceng game shows great potential in honing the numeracy skills of fifth-grade students, especially in fractions. The

increase in the average score from the pretest to the posttest underlines that this contextual and fun learning strategy can serve as an efficient alternative in deepening the understanding of mathematical concepts.

Previous studies have shown evidence that the traditional ma'gurecceng game plays a major role in improving students' numeracy skills. This is reflected in the increase in average learning achievement, from 61% in the initial cycle to 87% in the final cycle. This development was seen gradually from meetings I to VIII, then the research was stopped at cycle II meeting VIII because the average score of the participants had exceeded the specified target threshold, which was 87% (Pokhrel, 2024) .

A finding (Mulyatna et al., 2020) concluded that "the ball game is a relevant learning medium for mathematics that aligns with the characteristics of elementary school students." Children's natural love of play allows ball games to be used as an innovative strategy to overcome difficulties in learning mathematics and increase students' enthusiasm for learning. By taking advantage of this interest, mathematics learning can be made more exciting and meaningful.

The conclusions from the previous discussion are: a) the average numeracy ability of students before the use of traditional ma'gurecceng game-based learning was recorded at 49.92; b) after the traditional ma'gurecceng game-based approach was implemented, the average increased to 81.58; c) the Wilcoxon test results showed a Sig. (2-tailed) was lower than the threshold (Sig.) of 0.05 (0.002 < 0.05). In addition, the questionnaire results showed that 57.5% of students responded "strongly agree," 42.5% responded "agree," and no students responded "disagree" or "strongly disagree" to the learning method applied. By using traditional *ma'gurecceng* game-based learning in mathematics learning, this shows that there is an effect on improving the numeracy skills of 5th grade students at SD Negeri 24 Pandang-Pandang.

Conclusion

Based on the average *pretest* and *posttest* scores, there was an increase in students' numeracy skills through mathematics learning based on the traditional *ma'gurecceng* game. The average *pretest* score of students before using traditional games was 49.92, and the average *posttest* score of students after using traditional games was 81.58. The Wilcoxon statistical test produced a Sig. (2-tailed) value of 0.002, which is lower than 0.05. This indicates that Ha can be accepted and Ho must be rejected. In addition, the questionnaire results showed that 57.5% of students responded "strongly agree," 42.5% responded "agree," and no students responded "disagree" or "strongly disagree" to the learning method applied. Therefore, the conclusion is that the alternative hypothesis proves that the use of the traditional ma'gurecceng game in mathematics learning has a significant impact on improving students' numeracy skills. The results of the study show that the application of the traditional *ma'gurecceng* game in learning has advantages and disadvantages. The disadvantage of this learning method is that the game takes a long time in class and the classroom becomes too crowded and noisy, disturbing other students. On the other hand, this learning method makes students more enthusiastic and less bored when learning mathematics, which encourages them to be more active in learning. The researcher realizes that this research process has been a valuable experience in connecting the scientific approach with cultural practices that exist in society. Therefore, the researchers encourage future researchers to explore more local potential that can be utilized in learning, whether in the form of games, folk tales, or other local wisdom. Future research should be conducted with a broader scope and a more in-depth analytical approach, so that the results have the potential to become the basis for the formulation of education policies rooted in local culture.

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