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THE EFFECT OF AN RME APPROACH USING THE TRADITIONAL CONGKLAK GAME TO IMPROVE MATHEMATICAL LITERACY AMONG ELEMENTARY SCHOOL STUDENTS

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Abstract

Mathematics teaching at the primary level remains predominantly focused on procedural mastery. Consequently, many learners encounter challenges when required to use multiplication in authentic daily contexts. This study sought to investigate the impact of implementing the Realistic Mathematics Education assisted by congklak on third-grade students' multiplication literacy. A quantitative method with a quasi-experimental pretest posttest control group design was employed. The participants were 60 students in grade 3 at SDN Kondangjaya 3 for the 2025/2026 school year. The treatment group was Class III E, and the comparison group was Class III A. A validated and reliable 13-question multiple-choice test of mathematical literacy was used for data collection. Data were processed using descriptive analysis, paired-sample t-test, independent-sample t-test, and N-gain analysis. The findings indicated that the mean score of the experimental group increased from 58.46 to 81.85 following the treatment. Meanwhile, the control group's mean only grew from 58.46 to 62.31. The independent samples t-test indicated a statistically significant difference between groups with $p < 0.05$. The N-gain score for the experimental group was 0.57, reflecting moderate effectiveness, while the control group obtained 0.09, reflecting low effectiveness. Overall, the results show that merging Realistic Mathematics Education with the cultural game congklak creates a contextual and meaningful learning process that effectively boosts students' mathematical literacy. This instructional approach can be proposed as a creative alternative for teachers to implement contextual mathematics in elementary schools.

Keywords: realistic mathematics education, congklak, mathematical literacy, elementary school

Abstrak

Pengajaran matematika di tingkat sekolah dasar masih didominasi oleh penguasaan prosedural. Akibatnya, banyak siswa mengalami kesulitan saat diminta menggunakan perkalian dalam konteks kehidupan sehari-hari yang nyata. Penelitian ini bertujuan untuk menyelidiki dampak penerapan pendekatan Realistic Mathematics Education yang dibantu oleh congklak terhadap literasi perkalian siswa kelas tiga. Metode kuantitatif dengan desain kuasi-eksperimen pretest posttest kelompok kontrol digunakan. Partisipannya adalah 60 siswa kelas 3 di SDN Kondangjaya 3 untuk tahun ajaran 2025/2026. Kelompok perlakuan adalah Kelas III E, dan kelompok perbandingan adalah Kelas III A. Tes pilihan ganda 13 soal yang valid dan reliabel tentang literasi matematika digunakan untuk pengumpulan data. Data diolah menggunakan analisis deskriptif, uji t sampel berpasangan, uji t sampel independen, dan analisis N-gain. Hasil penelitian menunjukkan bahwa nilai rata-rata kelompok eksperimen meningkat dari 58,46 menjadi 81,85 setelah perlakuan. Sementara itu, rata-rata kelompok kontrol hanya naik dari 58,46 menjadi 62,31. Uji t independen menunjukkan adanya perbedaan yang signifikan secara statistik antara kedua kelompok dengan $p < 0,05$. Skor N-gain untuk kelompok eksperimen adalah 0,57, mencerminkan efektivitas sedang, sedangkan kelompok kontrol memperoleh 0,09, yang menunjukkan efektivitas rendah. Secara keseluruhan, hasil ini menunjukkan bahwa menggabungkan Realistic Mathematics Education dengan permainan budaya congklak menciptakan proses pembelajaran yang kontekstual dan bermakna yang efektif meningkatkan literasi matematika siswa. Pendekatan pembelajaran ini dapat dijadikan alternatif kreatif bagi guru untuk menerapkan matematika kontekstual di sekolah dasar

Kata kunci: pendidikan matematika realistic, congklak, literasi matematis, sekolah dasar

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INTRODUCTION

Mathematics plays an essential role in fostering students' analytical, logical, and systematic thinking abilities, which are fundamental aspects of mathematical literacy. Through mathematics learning, students are expected to develop conceptual understanding, enhance reasoning skills, and apply mathematical knowledge in daily life situations. This perspective is consistent with the view of Gusteti and Neviyarni (2022) who emphasize that mathematics education should encourage logical, systematic, and creative thinking as th.e basis for strengthening mathematical literacy. Mathematical literacy is widely recognized as one of the key competencies required in the 21st century because it involves not only computational ability but also the capacity to interpret, understand, and apply mathematical information in various real-world contexts. This competency supports students in identifying problems, designing appropriate solution strategies, and making well-reasoned decisions grounded in mathematical thinking (Putri et al., 2020). Internationally, low mathematical literacy remains a major challenge in education. Data from the 2022 PISA assessment indicate that Indonesian learners scored 366 in mathematics on average, which is 13 points lower than the score in 2018. Indonesia placed 70th out of 81 countries in the mathematics category according (OECD, 2023). This suggests that a large number of students still struggle to solve real-life math problems and to use mathematical ideas in practical ways. The data further suggest that Indonesian students mathematical literacy remains below the average level of OECD member countries and therefore requires serious attention, particularly at the elementary school level as the foundation of mathematics learning (Ilma et al., 2020).

The issue is reinforced by previous studies showing that mathematical literacy skills among Indonesian students are still categorized as low. Kurniawati et al. (2021) found that the average score for mathematical literacy among madrasa students was only 17.32%. The breakdown included 6.39% for Madrasah Ibtidaiyah, 20.01% for Madrasah Tsanawiyah, and 25.29% for Madrasah Aliyah. In addition, observations conducted by the researcher during the implementation of the Minimum Competency Assessment (AKM) at SDN Kondangjaya 3 revealed that most students experienced difficulties in translating word problems into mathematical models, even though they were able to perform basic arithmetic operations. This condition indicates that mathematics instruction still tends to emphasize procedural learning and memorization rather than the development of contextual mathematical thinking

skills. According to Masjaya and Wardono (2018) The low level of mathematical literacy results from a combination of personal, contextual, and educational influences. Personal factors are related to students' perceptions of mathematics and their self-confidence in solving mathematical problems, whereas environmental factors are associated with the limited use of instructional media and learning approaches (Fajriati & Murtiyasa, 2023). To improve mathematical literacy achievement, students should become accustomed to solving problems related to everyday activities, and teachers are encouraged to apply instructional approaches that support mathematical literacy practices (Ananda & Wandini, 2022). Piaget explained that students at the elementary level are typically in Piaget's concrete operational stage, a phase in which children begin to think logically about concrete objects but still require direct experiences to understand abstract concepts (Santrock, n.d.). Therefore, a learning approach that connects linking mathematical concepts to students' everyday experiences is needed to create more meaningful learning. This view aligns with the nature of elementary students, who continue to need hands-on experiences and context-based tools to grasp abstract mathematical ideas effectively (Muah, 2022).

One approach widely regarded as effective for tackling these challenges is Realistic Mathematics Education (RME). Introduced by Hans Freudenthal, RME holds that mathematics is best learned through real-life and contextual contexts, allowing learners to build mathematical ideas on their own via exploration and modeling activities (Nurfadilah et al., 2021). The approach is characterized as a method of teaching mathematics that draws on environmental interactions and students everyday experiences, while also giving priority to process skills in addressing specific problems (Yunus et al., 2020). RME, yang menekankan hubungan antara matematika, praktik budaya, dan konteks sosial siswa. According to Zulkardi (2013), RME seeks to connect mathematics more closely to students' daily lives so that the construction of knowledge becomes more meaningful. The integration of cultural elements into mathematics instruction is also an important aspect of the RME approach. One form of its implementation is the utilization of the traditional game congklak as a mathematics learning medium. Maharani and Muhtar (2022) explained that the incorporation of cultural artifacts in learning activities can enhance students' affective engagement, which subsequently contributes positively to the development of cognitive literacy. Among various ethnomathematical media, the traditional game congklak demonstrates strong potential for

supporting multiplication literacy, although its application in mathematics instruction remains limited. The game reflects ethnomathematical principles because it involves activities such as counting, grouping, logical reasoning, and strategic thinking that are closely related to fundamental mathematical concepts. Prahmana and D'Ambrosio (2020) argued that integrating local culture into classroom instruction enables students to connect informal knowledge with formal mathematical ideas more meaningfully. Thus, incorporating the congklak game is regarded as appropriate for facilitating contextual mathematics instruction in elementary schools.

Research indicates that both the RME approach and the use of congklak as a learning medium contribute positively to mathematics education. Taqiya and Juandi (2023) reported that applying RME consistently led to an increase of about 20–30% in students' mathematical literacy. In a separate study, Nuraina et al. (2021) concluded that an ethnomathematics-based RME approach significantly improved students' grasp of mathematical concepts, accounting for 47% of the gains in competency achievement. Similar outcomes were observed by Suhada and Rabbani (2020), who noted that RME enhanced students' mathematical understanding by grounding learning activities in contextual, real-world experiences and practical skills.In addition, Gustiah et al. (2025) found that incorporating the traditional game congklak effectively raised students' learning outcomes. At the pre-cycle stage, only 18.52% of students met the mastery threshold, but this figure rose to 48.15% in Cycle I and to 88.89% in Cycle II. The game supported students in gradually building conceptual understanding, progressing from hands-on comprehension to symbolic representation while maintaining local cultural values. Fajriyah and Maharbid (2023) also showed that using congklak significantly improved students' mathematics achievement. Prior studies have yielded consistent results, demonstrating that the congklak game effectively supports the development of critical thinking and conceptual understanding in mathematics among elementary learners. Consistent with these findings, Asmaarobiyah and Arisetyawan (2024) reported that the use of congklak significantly enhanced students' mathematical critical thinking skills.

Despite the growing body of research, several limitations remain. First, the majority of previous studies discussed RME and congklak separately. As a result, the integration of both into one instructional strategy has not been widely examined. Second, earlier research has primarily focused on general learning achievement, arithmetic skills, or problem-solving

abilities, whereas studies specifically investigating Research focusing on enhancing multiplication literacy among third-grade primary students is still limited. Third, limited attention has been given to the role of traditional culture-based games in strengthening contextual learning within the PMRI framework at the lower elementary level. To fill these gaps, this research introduces novelty by designing and testing RME and congklak as a single, integrated instructional package, in which congklak activities are embedded within every phase of the RME learning cycle rather than used as a separate or supplementary medium. Because the two components are inseparable in this design, this study evaluates the effectiveness of the integrated RME and congklak intervention as a whole, rather than the independent contribution of RME or congklak in isolation. The empirical contribution this design is expected to generate is evidence of whether, and how, embedding a culturally grounded medium within every stage of the RME cycle can move third-grade students beyond procedural computation toward the ability to formulate, employ, and interpret multiplication problems in contextual situations.

Consistent with this, the research aims to examine the impact of Indonesian Realistic Mathematics Education supported by congklak on enhancing third-grade elementary students' multiplication literacy. This research adopted a quantitative method with a quasi-experimental design, which included both an experimental group and a control group assessed through pretests and posttests. The findings are expected to contribute theoretically to the development of culturally grounded contextual mathematics instruction and to provide elementary school teachers with an innovative alternative for fostering students mathematical literacy in a more meaningful manner.

METHODS

This research utilized a quantitative method with a quasi-experimental design using nonequivalent control groups. The study took place at SDN Kondangjaya 3 in the academic year 2025/2026 and involved 60 pupils from grade 3. Grade III E with 30 learners was set as the treatment group. They were taught using the Realistic Mathematics Education approach integrated with the traditional congklak game, in which congklak was not a supplementary add-on but was embedded within every phase of the RME. In contrast, Grade III A with 30 learners functioned as the comparison group and received regular classroom instruction. The

data collection tool consists of 13 multiple-choice questions. These questions are integrated with the context of the traditional congklak game to measure students' ability to formulate, apply, and interpret mathematics in various real-life contexts. The questions are made based on process indicators from (OECD, 2022), namely formulate, employ, and interpret, and the 13 items were distributed across these three indicators so that every indicator was represented by multiple items rather than concentrated in a single category exact number of items per indicator, formulate = 8 items, employ = 9 items, interpret = 3 items. For validation, content validity was confirmed by a panel of experts in mathematics education, who reviewed each item for its alignment with the intended process indicator and with the congklak context before the instrument was administered. Empirical validity was then examined through Pearson Product-Moment correlation using data from a try-out administration 29 number of try-out participants and the r-table criterion used, and items whose corrected item-total correlation fell below the critical value were revised or discarded, leaving the 13 items used in the pretest and posttest reported here. The instrument's reliability was determined using Cronbach's Alpha, which yielded a coefficient of 0.731, indicating acceptable internal consistency for the final set of items.

The research procedure consisted of three stages: preparation, implementation, and analysis. During implementation, both groups took a pretest and a posttest. Students in the treatment group participated in learning activities across four phases that followed the RME learning cycle, with congklak embedded as the central medium in every phase rather than as a supplementary activity. In the first phase, orienting to contextual problems, the teacher introduced a everyday, congklak-related situation, for instance, distributing an equal number of seeds into several holes, and asked students to describe the situation in their own words, which situated the upcoming mathematics in a context students could act on directly. In the second phase, exploring concepts using congklak, students physically played congklak and recorded how many seeds were placed into each hole and how many holes were filled, which prompted horizontal mathematization, that is, the informal translation of the concrete distributing-and-counting activity into a mathematical representation such as repeated addition (4 + 4 + 4) or an array of equal groups. In the third phase, conducting mathematization and formalization, students were guided to compare their repeated-addition representations across different numbers of holes and seeds, leading them toward

vertical mathematization, in which the informal repeated-addition models were progressively reorganized and symbolized into the formal multiplication notation and procedures (recognizing that 4 + 4 + 4 could be written as 3 x 4). In the fourth phase, performing reflection, students discussed and justified their solutions in front of the class, compared different strategies, and related the formal multiplication concept back to the original congklak context, which reinforced the connection between the formal model and its real-world origin. This sequence follows Gravemeijer's (1994) guided reinvention process and is consistent with the horizontal to vertical mathematition pathway described in the Discussion section. For data analysis, the researcher applied descriptive statistics. Prerequisite tests included the Shapiro-Wilk test for normality and Levene's test for homogeneity. Hypothesis testing used Paired Samples t-Test, Independent Samples t-Test, and N-Gain analysis to evaluate the impact of the treatment (Hake, 1 C.E.). All statistical tests were carried out at a 0.05 significance level with IBM SPSS version 24.

RESULTS AND DISCUSSION

This research intended to analyze the effect of applying Realistic Mathematics Education (RME) combined with the traditional congklak game on students' mathematical literacy in multiplication at the elementary level. The effectiveness of the program was determined by contrasting pretest and posttest outcomes between the experimental and control groups. Empirical data were processed using descriptive analysis, prerequisite tests, hypothesis tests, and N-Gain calculations to evaluate how much students' learning had improved following the treatment.

Descriptive Statistical Analysis

The researcher applied descriptive statistical methods to present and compare students' performance in mathematical literacy before and after the intervention across both groups. The findings indicated that the experimental group demonstrated a greater improvement in mathematical literacy compared to the control group. The mean score of the experimental group increased from 58.46 on the pretest to 81.85 on the posttest, whereas the control group showed only a slight increase from 58.46 to 62.31. Furthermore, the posttest standard deviation of the experimental group was lower than that of the control group, indicating that students' learning outcomes in the experimental group were more evenly distributed.

Table 1. Descriptive Statistical Analysis Results

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Eksperimen	30	38	85	58.46	12.388
Pos-Test Eksperimen	30	62	100	81.85	9.990
Pre-Test Kontrol	30	31	77	58.46	11.356
Pos-Test kontrol	30	31	85	62.31	16.331
Valid N (listwise)	30				

Normality and Homogeneity Tests

As an initial step before hypothesis testing, the researcher assessed data normality. For this purpose, the Shapiro–Wilk test was employed on the pretest and posttest scores of both the experimental and control groups. Based on the statistical analysis, the experimental class achieved significance values of 0.081 before the intervention and 0.077 after the intervention. Similarly, the control class showed significance values of 0.071 for the pretest and 0.076 for the posttest. All significance values exceeded 0.05, indicating that the data were normally distributed and met the assumptions required for parametric analysis.

Table 2. Results of the Normality Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelas	Statistic	df	Sig.	Statistic	df	Sig.
Hasil Belajar Siswa	Pre-Test Eksperimen (Congklak)	.173	30	.022	.938	30	.081
	Pos-Test Eksperimen (Congklak)	.153	30	.072	.937	30	.077
	Pre-Test Kontrol (Konvensional)	.140	30	.137	.936	30	.071
	Pos-Test Kontrol (Konvensional)	.131	30	.200*	.937	30	.076

Before testing the hypothesis, the homogeneity of variance between the experimental and control groups was examined. This was done using Levene's Test. The result showed a significance level of 0.032, which is less than 0.05, meaning the variances were not homogeneous. As a result, the Independent Samples t-Test was run with the Equal Variances Not Assumed option, since this approach is recommended when the homogeneity assumption is violated.

Table 3. Results of the Homogeneity Test

Test of Homogeneity of Variances

Hasil Belajar Siswa

Levene Statistic	df1	df2	Sig.
3.046	3	116	.032

Statistical Hypothesis Test

To examine the hypotheses, the researcher used an independent t-test. The purpose of this test was to determine if the average learning outcomes differed significantly between the two groups. As the variances were not homogeneous, the analysis referred to the "Equal Variances Not Assumed" section**.** The results of the t-test are presented in Table 4.

Table 4. Independent Samples t-test Results

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	1.160	.286	-8.048	58	.000	-23.872	2.966	-29.810	-17.935
Equal variances not assumed			-8.048	56.503	.000	-23.872	2.966	-29.813	-17.931

An independent samples t-test was conducted to determine whether significant differences existed in mathematical literacy abilities between the experimental and control groups after the intervention. The analysis produced a significance value of 0.000, which is below 0.05. As a result, Ho was rejected and Ha was accepted. These findings indicated that a statistically significant difference existed between the mean scores of the two groups. A mean difference of -23.872 indicated that the experimental group achieved higher results than the control group after the application of the RME approach integrated with the congklak game as a teaching medium.

To examine the improvement within each group, a Paired Samples t-test was conducted. The results are presented in Table 5.

Table 5. Paired Samples t-test Results

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-Test Eksperimen - Pos-Test Eksperimen	-23.385	9.357	1.708	-26.879	-19.891	-13.689	29	.000
Pair 2	Pre-Test Kontrol - Pos-Test kontrol	-3.847	12.736	2.325	-8.602	.909	-1.654	29	.109

To compare pretest and posttest scores within groups, a paired samples t-test was used. The treatment group produced a p-value of 0.000, less than the 0.05 threshold, indicating a significant improvement from pretest to posttest. In contrast, the control group showed a p-value of 0.109, greater than 0.05, meaning there was no meaningful difference between the pretest and posttest scores. Consequently, we can conclude that applying RME with congklak as a learning medium significantly contributed to improving students' mathematical literacy.

N-Gain Test

An N-Gain analysis was carried out to measure how effective the Realistic Mathematics Education approach combined with the congklak game was in enhancing students' mathematical literacy. The results indicated that the treatment group achieved an average N-Gain of 57.27%, which falls into the moderate effectiveness category. Meanwhile, the comparison group only reached an average N-Gain of 8.87%, categorized as not effective. Based on these results, it can be concluded that applying RME supported by congklak was moderately effective in improving elementary students' multiplication literacy.

Table 6. N-Gain Analysis Outcomes

Descriptives

	Kelas			Statistic	Std. Error
NGain_Persen	Eksperimen	Mean		57.2798	3.52371
		95% Confidence Interval for Mean	Lower Bound	50.0730	
			Upper Bound	64.4866	
		5% Trimmed Mean		56.8252	
		Median		54.1957	
		Variance		372.496	
		Std. Deviation		19.30017	
		Minimum		19.40	
		Maximum		100.00	
		Range		80.60	
		Interquartile Range		26.23	
		Skewness		.497	.427
		Kurtosis		.114	.833
	Kontrol	Mean		8.8781	5.94733
		95% Confidence Interval for Mean	Lower Bound	-3.2855	
			Upper Bound	21.0418	
		5% Trimmed Mean		9.9263	
		Median		.0000	
		Variance		1061.121	
		Std. Deviation		32.57485	
		Minimum		-75.01	
		Maximum		60.01	
		Range		135.02	
		Interquartile Range		34.77	
		Skewness		-.292	.427
		Kurtosis		.113	.833

DISCUSSION

The main finding of this study is that the integration of the Indonesian Realistic Mathematics Education approach with the traditional game congklak significantly improved elementary students' multiplication mathematical literacy. This result directly addresses the research objective to examine an alternative instructional approach that connects complex mathematical concepts with learners' concrete daily experiences. In scientific terms, the improvement can be explained through the process of horizontal mathematization. The use of congklak provided tangible media for students to represent repeated addition and grouping activities, which served as the foundation for constructing formal multiplication concepts. This process aligns with Gravemeijer theory of guided reinvention (1994), in which students develop mathematical understanding by progressing from contextual situations to formal models. The findings also support Piaget's perspective that children in the concrete operational stage require direct interaction with physical objects to understand abstract concepts. This mechanism also helps explain why the experimental group outperformed the control group rather than the two groups merely differing in average score: the control group's conventional instruction moved directly from the teacher's explanation to symbolic multiplication procedures, offering students little opportunity to first build their own informal representation of the operation, whereas the experimental group's congklak-based activities gave students a physical, manipulable model to reason with before the formal symbol was introduced. In terms of the three PISA process indicators used to construct the instrument, the congklak activities most directly supported the formulate process, since students had to translate the physical act of distributing seeds into a mathematical statement, and the employ process, since they then had to carry out the resulting repeated-addition or multiplication procedure; the interpret process was supported chiefly through the reflection phase, in which students related their formal answer back to the congklak context to check whether it made sense. Because the 13-item instrument produced a single composite literacy score rather than separate sub-scores for each process, this study cannot statistically compare gains on formulate, employ, and interpret individually, and the discussion above should be read as a theoretically grounded account of how the intervention plausibly supported each process rather than as a claim of differential, measured improvement across the three indicators.

Reporting process-level sub-scores is therefore identified as a direction for future work on this instrument, alongside the broader recommendations noted in the Limitations. Compared to previous studies, this research extends the existing literature in two ways. First, while Taqiya and Juandi (2023) and Nuraina et al. (2021) Previous studies explored RME's influence on broad mathematical literacy. In contrast, this study concentrated on multiplication skills and integrated a culturally relevant medium into the instruction. Second, previous studies on congklak such as Gustiah et al. (2025) and Fajriyah and Maharbid (2023)primarily reported effects on general achievement and arithmetic skills. In contrast, the present study demonstrated that congklak can be systematically integrated within the Indonesian Realistic Mathematics Education framework to develop students' capacity to formulate, apply, and interpret multiplication problems in contextual situations, in accordance with the Organisation for Economic Co-operation and Development mathematical literacy framework.

The lower standard deviation in the experimental group's posttest scores also indicates that the intervention contributed to reducing learning disparities. This suggests that contextual and culturally based instruction not only improves average achievement but also supports more equitable learning outcomes. This finding is consistent with the constructivist view that active engagement with instructional media strengthens conceptual retention and reduces dependence on procedural memorization. Despite these contributions, this study was limited to a single school setting and focused only on multiplication material. Therefore, future research should examine the implementation of this approach across multiple schools, different grade levels, and various mathematical topics, and could also adopt such a design to disentangle the contribution of each component. The development of more comprehensive instruments for assessing mathematical literacy and the investigation of long-term effects on critical thinking and problem-solving abilities are also recommended. In conclusion, the findings provide empirical evidence that culturally contextualized mathematics instruction can serve as an innovative alternative for strengthening mathematical literacy at the elementary school level.

CONCLUSION

This research concluded that applying the Realistic Mathematics Education model supported by the traditional congklak game successfully enhanced the multiplication literacy of grade 3 elementary students. By combining mathematics instruction with contextual and

cultural aspects, learners gained a more meaningful and concrete grasp of multiplication ideas. In addition to performing calculations, students were also capable of constructing, using, and interpreting multiplication problems in real-life situations. The contribution of this study is that it offers empirical proof that merging RME with a cultural game can be an innovative strategy to strengthen mathematical literacy at the primary school level.

The findings advance the present state of knowledge by demonstrating that culturally grounded instructional media such as congklak not only increase students' engagement but also bridge students' informal experiences with formal mathematical concepts. This approach further supports the preservation of local cultural values within the mathematics learning process. The practical implication of this study is that elementary school teachers can utilize traditional games as learning media to design mathematics instruction that is more contextual, significant, and connected to students' everyday experiences. For educational practitioners and curriculum developers, the findings suggest the importance of incorporating ethnomathematics into instructional strategies to foster mathematical literacy.

Nevertheless, this study was limited by the use of a quasi-experimental design within a single school setting and by its focus solely on multiplication material. Therefore, future studies are recommended to expand the research setting to multiple schools and different grade levels, to develop more comprehensive instruments for assessing mathematical literacy across various mathematical topics, and to examine the lasting effects of instructional media grounded in ethnomathematics on students' abilities to think critically and solve problems.

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