

THE EFFECT OF EDUCATIONAL MONOPOLY LEARNING MEDIA ON FOURTH-GRADE STUDENTS' ACHIEVEMENT IN FRACTION OPERATIONS

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ABSTRACT

Underperformance in mastering fraction operations continues to pose a significant obstacle within elementary mathematics instruction, largely attributable to traditional teaching approaches and insufficient integration of interactive educational resources. The present investigation sought to assess the impact of an Educational Monopoly (Monopoly Edukatif) instructional tool on the academic performance of fourth-grade learners in fraction operations at SDN Jatibening 04. The study adopted a quantitative framework utilizing a quasi-experimental design with a Posttest-Only Control Group configuration. A total of 60 fourth-grade students were recruited through purposive sampling techniques, equally distributed into an experimental cohort and a control cohort of 30 students each. Students in the experimental condition engaged with instruction facilitated by the Educational Monopoly tool, while those in the control condition experienced traditional pedagogical methods. Performance data were gathered via a posttest comprising five open-ended questions and subjected to descriptive statistical procedures, Shapiro–Wilk normality assessment, Levene's homogeneity verification, independent-samples t-test, and Cohen's d for effect magnitude estimation. Findings demonstrated a statistically significant disparity in academic performance between the cohorts ($t = 6.745$, $p < 0.001$). Students in the experimental condition attained a superior mean posttest score ($M = 78.33$) compared to their counterparts in the control condition ($M = 62.00$). Additionally, the computed effect magnitude (Cohen's $d = 1.74$) reflected a substantial practical significance. These outcomes indicate that the Educational Monopoly instructional tool serves as an efficacious pedagogical resource for enhancing elementary students' competency in fraction operations through fostering active engagement, facilitating deeper conceptual understanding, and increasing overall classroom involvement.

Keywords: Educational Monopoly, Fraction Operations, Learning Achievement, Mathematics Education

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PRELIMINARY

The success of instructional processes can be measured through learning outcomes, which signify transformations in students' cognitive understanding, behavioral dispositions, and practical competencies following their engagement in educational

activities. These outcomes function as benchmarks for evaluating pedagogical effectiveness, demonstrating the degree to which predetermined instructional goals have been realized (Lomu & Widodo, 2023). Within the context of mathematics instruction, such outcomes quantify students' attainment of anticipated proficiencies and consequently constitute a critical metric for assessing teaching efficacy (Ikhsan, 2022). As a central academic subject, mathematics features prominently across all educational tiers, spanning early childhood education through tertiary institutions. Mathematical principles permeate daily experiences and constitute an essential foundation for diverse human endeavors (Huda & Mutia, 2017). The discipline cultivates vital cognitive capacities including logical reasoning, innovative thinking, and analytical problem-solving abilities necessary for navigating real-world situations (Riswandha & Sumardi, 2022). Among the essential content areas in elementary mathematics curriculum, fraction operations hold particular significance, since proficiency in this domain establishes the conceptual groundwork required for comprehending increasingly sophisticated mathematical ideas in subsequent educational stages.

Within mathematics education contexts, learning outcomes encompass the proficiencies that students develop through instructional engagement, incorporating theoretical comprehension, practical implementation, and analytical reasoning capabilities (Pandiangan et al., 2018). From an educator's perspective, student performance constitutes a crucial metric for assessing pedagogical effectiveness while simultaneously offering informative insights that facilitate the refinement of teaching methodologies and enhancement of instructional resource utilization (Vandini, 2016). Notwithstanding its significance, student achievement in fraction operations continues to fall short of expectations. Empirical investigations have documented that mathematics teaching frequently adopts a teacher-dominated approach, thereby restricting learners' active involvement in educational experiences. As a result, students demonstrate reduced motivation and encounter obstacles in constructing robust conceptual frameworks regarding fraction operations (Fajhriany & Ramadan, 2025; Nahdania & Ain, 2024). Moreover, insufficient incorporation of diverse pedagogical materials impedes students from engaging in tangible and contextually relevant learning experiences, thereby contributing to diminished academic performance in mathematics (Kusmiati et al., 2024). The predominant reliance on instructor-centered teaching practices has been identified as a primary factor underlying poor achievement in fraction operations, as this approach

constrains students' capacity to cultivate comprehensive understanding of fractional concepts and execute fraction computations with precision (Nahdania & Ain, 2024).

A comparable challenge has been observed at SDN Jatibening 04. According to discussions with the fourth-grade instructor, students exhibited inadequate performance in mastering fraction operations. Among the cohort of 30 learners, 18 individuals did not achieve the established Minimum Mastery Criterion (Kriteria Ketuntasan Minimal [KKM]) across both routine evaluations and the Mid-Semester Summative Assessment. Such evidence suggests that a substantial proportion of students persistently struggle with comprehending fraction operations (Mailani, 2018).

An effective approach to enhancing mathematical achievement involves implementing innovative and engaging instructional materials. Instructional media encompass pedagogical instruments or materials employed to support educational processes, fostering effective and creative learning environments that advance the attainment of designated educational goals (Novia et al., 2022). Such media serve an essential function in establishing productive, streamlined, and substantive learning encounters for learners (Sugiantara et al., 2024). Among these resources is the Educational Monopoly (Monopoly Edukatif), a pedagogically modified version of the classic Monopoly board game that incorporates academic content within its gaming framework. Throughout gameplay, students address mathematical challenges integrated into the game structure, enabling them to apply fraction operations within a stimulating, participatory, and entertaining instructional context (Setiyawan, 2022).

Empirical research has established that game-oriented instructional materials can elevate the caliber of mathematics teaching, especially within the domain of fraction operations instruction. Educational gaming platforms have been found to heighten learners' motivational engagement, stimulate active involvement, facilitate peer interaction, and strengthen conceptual mastery through problem-solving exercises delivered within an appealing framework (Djarmika & Praherdhiono, 2024; Anastasya et al., 2025). Nevertheless, the application of Educational Monopoly as a pedagogical tool for fraction operations instruction remains unexplored within the SDN Jatibening 04 educational setting.

Therefore, this study aims to examine the effect of the Educational Monopoly learning media on the learning outcomes of fourth-grade students in fraction operations at SDN Jatibening 04.

METHODS

The investigation utilized a quantitative methodology incorporating a quasi-experimental framework with a Posttest-Only Control Group configuration. Two distinct cohorts participated in the research: an experimental cohort receiving instruction facilitated through the Educational Monopoly (Monopoly Edukatif) instructional tool and a control cohort experiencing traditional mathematics pedagogy without the experimental treatment. Upon completion of the instructional phase, both cohorts underwent a posttest to assess student achievement in fraction operations. The posttest-only configuration was chosen for its ability to circumvent potential measurement effects inherent in pretesting procedures while enabling direct evaluation of student performance following the intervention (Sugiyono, 2020).

The research was carried out at SDN Jatibening 04 in Bekasi, West Java, Indonesia, spanning an eight-month duration from October through May. The study's target population comprised all fourth-grade learners at SDN Jatibening 04, distributed across four classroom sections IV-A (30 students), IV-B (30 students), IV-C (30 students), and IV-D (30 students), for a total of 120 students. As articulated by Sugiyono (2020), a population denotes the complete set of subjects or entities exhibiting particular attributes pertinent to the investigation. Sample selection proceeded through purposive sampling methodology, an approach whereby participants are identified according to established research specifications (Sulistiyowati, 2023). Classes IV-C and IV-D were selected on the basis of their comparable academic characteristics and equivalent class sizes ($n = 30$ each), thereby establishing baseline equivalence between the experimental and control groups prior to the intervention. Through this technique, two of the four classes were drawn as the research sample, comprising 60 students in total: Class IV-C was designated as the experimental cohort ($n = 30$), whereas Class IV-D functioned as the control cohort ($n = 30$).

The curricular focus for both cohorts centered on fraction operations, encompassing conceptual comprehension as well as computational procedures for adding, subtracting, multiplying, and dividing fractions. Identical learning targets and instructional content were provided to both groups. Nevertheless, learners in the experimental cohort engaged with material through the Educational Monopoly instructional tool, while their counterparts in the control cohort received instruction via traditional pedagogical approaches typically employed by the classroom educator. Following the conclusion of

instructional activities, all participants underwent a posttest to measure their academic achievement.

Data collection was conducted through a written constructed-response achievement assessment administered as a posttest to both cohorts. The assessment instrument was constructed according to five competency indicators: (1) comprehending fractional concepts, (2) executing addition operations with fractions, (3) executing subtraction operations with fractions, (4) executing multiplication operations with fractions, and (5) executing division operations with fractions (Ningsih et al., 2023). Before proceeding with data analysis, the instrument underwent validity verification utilizing the Pearson Product-Moment correlation coefficient at a 0.05 significance threshold. Assessment items demonstrating positive correlation coefficients with r values surpassing the critical threshold (r_{table}) were deemed valid, while items not satisfying these standards were removed from the instrument.

Data examination comprised both descriptive and inferential statistical procedures. Descriptive statistics provided summary measures of students' posttest performance. Preliminary assumption verification involved the Shapiro–Wilk normality assessment, chosen due to the sample comprising fewer than 50 participants, and Levene's test for evaluating variance homogeneity. Hypothesis verification proceeded through an independent-samples t-test to ascertain whether significant performance differences existed between the experimental and control cohorts (Sugiyono, 2020). Additionally, effect magnitude analysis was conducted to quantify the extent of Educational Monopoly instructional media's influence on student achievement. The statistical hypotheses examined in this investigation were formulated as follows:

- $H_0: \mu_1 \leq \mu_2$, signifying that implementation of the Educational Monopoly instructional tool yields no favorable impact on student achievement in fraction operations.
- $H_1: \mu_1 > \mu_2$, signifying that implementation of the Educational Monopoly instructional tool exerts a favorable impact on student achievement in fraction operations.

RESULT AND DISCUSSION

Descriptive Statistics

This investigation was undertaken to assess the impact of the Educational Monopoly (Monopoly Edukatif) instructional tool on fraction operations achievement

among fourth-grade learners at SDN Jatibening 04. The research utilized a Posttest-Only Control Group Design, wherein the experimental cohort engaged with instruction facilitated by the Educational Monopoly tool, whereas the control cohort experienced traditional pedagogical methods. Subsequent to the intervention phase, both cohorts completed a posttest comprising five constructed-response items developed to evaluate students' proficiency in fraction operations. Descriptive statistical summaries of posttest performance are displayed in Table 1.

Table 1. Descriptive Statistics of Posttest Scores

Group	n	Minimum	Maximum	Mean	SD
Experimental (IV-C)	30	60	95	78,33	8,521
Control (IV-D)	30	40	80	62,00	10,243

As presented in Table 1, learners in the experimental cohort attained a superior mean posttest score ($M = 78.33$, $SD = 8.521$) compared to their counterparts in the control cohort ($M = 62.00$, $SD = 10.243$). The descriptive statistical results reveal a notable disparity in mean posttest performance between the two cohorts. Learners in the experimental cohort who engaged with instruction facilitated by the Educational Monopoly tool demonstrated markedly higher achievement than those in the control cohort who received traditional instruction. These results indicate that adoption of the Educational Monopoly instructional tool enhanced student performance in fraction operations.

Assumption Testing

Before testing the research hypothesis, the assumptions for parametric analysis were examined through tests of normality and homogeneity of variance.

1. Normality Test

The normality of the posttest scores was assessed using the Shapiro–Wilk test because each group consisted of fewer than 50 participants. The results are presented in Table 2.

Table 2. Shapiro–Wilk Normality Test Results

Group	Shapiro–Wilk Statistic	Df	Sig.	Conclusion
Experimental	0,954	30	0,142	Normal
Control	0,947	30	0,087	Normal

The Shapiro–Wilk test indicated that both groups were normally distributed, as the significance values exceeded the 0.05 criterion ($p = 0.142$ for the experimental group

and $p = 0.087$ for the control group). Therefore, the assumption of normality was satisfied.

2. Homogeneity Test

The homogeneity of variance between the two groups was examined using Levene's test. The results are presented in Table 3.

Table 3. Levene's Test for Homogeneity of Variance

Data	Levene Statistic	df1	df2	Sig.	Conclusion
Posttest	1,875	1	58	0,176	Homogen

The significance value obtained from Levene's test was 0.176 ($p > 0.05$), indicating that the variances of the experimental and control groups were homogeneous. Consequently, the assumptions required for conducting an independent-samples t-test were fulfilled.

Hypothesis Testing

An independent-samples t-test was conducted to determine whether the use of the Educational Monopoly learning media significantly affected students' learning outcomes in fraction operations. The results are summarized in Table 4.

Table 4. Independent-Samples t-Test Results

Parameter	Value
Experimental group mean	78,33
Control group mean	62,00
Mean difference	16,33
T	6,745
df	58
P (2-tailed)	0,000
Conclusion	H0 rejected

The independent-samples t-test demonstrated a statistically significant performance difference between the experimental and control cohorts ($t(58) = 6.745$, $p < 0.001$). The mean posttest performance of the experimental cohort exceeded that of the control cohort significantly, suggesting that learners who engaged with the Educational Monopoly instructional tool exhibited superior proficiency in fraction operations.

Effect Size

To determine the magnitude of the intervention effect, Cohen's d effect size was calculated. The results are presented in Table 5.

Table 5. Effect Size Analysis

Parameter	Value
Experimental group mean	78,33

Parameter	Value
Control group mean	62,00
Pooled standard deviation	9,386
Cohen's <i>d</i>	1,74
Interpretation	Large

The computed Cohen's *d* value of 1.74 reflected a substantial effect magnitude. This outcome establishes that the adoption of the Educational Monopoly instructional tool generated both statistically significant enhancement in student achievement and considerable practical influence on their performance in fraction operations.

Discussion

The outcomes of this investigation establish that adoption of the Educational Monopoly (Monopoly Edukatif) instructional tool markedly enhanced fourth-grade learners' achievement in fraction operations. This conclusion is substantiated by the independent-samples *t*-test, which disclosed a statistically significant performance disparity between the experimental and control cohorts ($t = 6.745$, $p < 0.05$). Moreover, the intervention yielded a substantial practical impact, as evidenced by a Cohen's *d* value of 1.74. These findings indicate that implementation of Educational Monopoly generated both statistically significant gains and considerable pedagogical importance in advancing students' mathematical performance.

These findings align with prior research examining game-oriented instructional materials within mathematics education. Mahendra and Sukartono (2023) documented that incorporating Monopoly gaming media into elementary mathematics instruction fostered learners' active engagement and elicited favorable reactions, with students characterizing the learning experience as both pleasurable and captivating. Similarly, Mailani (2018) established that utilizing a fraction-focused Monopoly game markedly elevated students' mathematical achievement by intensifying their involvement and motivation throughout instructional activities, thereby strengthening their conceptual grasp of fractions. Additionally, Setiyawan (2022) evidenced that mathematical bingo games successfully enhanced students' performance in fraction operations through the provision of enjoyable and participatory learning encounters.

The outcomes further substantiate the discoveries of Anastasya et al. (2025), who established that educational gaming platforms contribute both to enhanced mathematical performance and elevated learning engagement. Students typically exhibit heightened interest and enthusiasm when mathematical principles are conveyed through pleasurable

instructional experiences. Correspondingly, Kurniawan (2022) determined that realistic mathematics instruction augmented by Mabimubi media successfully advanced students' performance in integer operations by affording opportunities for hands-on practice and active involvement throughout classroom teaching. Collectively, these findings strengthen the expanding evidence base validating the efficacy of game-oriented learning as a pedagogical strategy for elementary mathematics instruction.

Multiple factors may account for the enhanced achievement of learners in the experimental cohort. Initially, the Educational Monopoly instructional tool actively involved students in organized play-oriented learning experiences, facilitating their construction of mathematical understanding through experiential engagement or hands-on practice. This active involvement fostered greater student engagement in the educational process compared to those receiving traditional instruction. Instead of passively absorbing information delivered by the instructor, students engaged with mathematical challenges, deliberated potential solutions, and implemented fractional concepts during gameplay.

Second, the gaming platform afforded students opportunities to apply fraction operations through problem-solving exercises integrated within the game board and question prompts. Students were tasked with analyzing mathematical scenarios, identifying suitable resolution approaches, and executing fraction computations with precision. This iterative practice within contextually meaningful learning situations likely reinforced both theoretical comprehension and computational proficiency, corroborating prior research on the efficacy of gamified mathematics pedagogy (Djarmika & Praherdhiono, 2024).

Third, the engaging and participatory characteristics of the Educational Monopoly learning context likely facilitated heightened motivation and classroom involvement. Positive affective experiences throughout learning have been demonstrated to strengthen students' readiness to engage actively, maintain concentration, and persevere through mathematical challenges. Furthermore, the cooperative dimension of the gaming activity promoted student communication, exploration of alternative approaches, assessment of peers' contributions, and collaborative knowledge building. These outcomes correspond with constructivist pedagogical theory, which posits that knowledge is dynamically constructed through social engagement and authentic educational experiences (Sugiantara et al., 2024).

The substantial effect magnitude documented in this investigation further establishes that the pedagogical advantages of the Educational Monopoly instructional tool transcend mere statistical significance. From a pragmatic standpoint, the disparity in mean

posttest performance between the experimental and control cohorts illustrates that incorporating educational gaming into mathematics pedagogy can markedly elevate students' academic achievement. Therefore, game-oriented instructional materials such as Educational Monopoly may function as an efficacious alternative to traditional instructor-centered methodologies, especially for conveying abstract mathematical principles such as fraction operations.

Collectively, the outcomes indicate that the Educational Monopoly instructional tool constitutes an efficacious pedagogical resource for enhancing elementary learners' performance in fraction operations. Through the integration of mathematical problem-solving within organized gaming structures, the tool establishes an engaging educational context that facilitates active involvement, conceptual mastery, collaborative interaction, and substantive learning encounters. These findings offer empirical validation for incorporating game-oriented instructional materials into elementary mathematics classrooms as an effective approach for advancing student achievement.

Research Limitations

This investigation presents several constraints. First, the research was executed exclusively among fourth-grade learners at SDN Jatibening 04 with a comparatively limited sample, restricting the transferability of findings to alternative educational institutions possessing different learner attributes, instructional contexts, and pedagogical environments. Second, the study concentrated solely on fraction operations and transpired across a relatively brief timeframe; consequently, the results cannot be extended to alternative mathematical domains or disciplines, nor do they capture the sustained impact of the Educational Monopoly instructional tool on students' knowledge persistence. Finally, this investigation examined exclusively the association between the Educational Monopoly instructional tool and student achievement. Additional variables potentially affecting learning performance, including foundational mathematical competence, motivational orientation, learner engagement, family involvement, educator expertise, and classroom climate, remained unexplored. Additionally, the constructed-response achievement assessment predominantly evaluated students' computational performance in fraction operations and may not comprehensively reflect advanced cognitive abilities, analytical reasoning capacities, or thorough conceptual understanding.

CONCLUSION

This investigation establishes that the Educational Monopoly (Monopoly Edukatif) instructional tool markedly enhances fourth-grade learners' achievement in fraction operations at SDN Jatibening 04. Learners who engaged with instruction through the Educational Monopoly tool attained significantly superior posttest performance compared to those receiving traditional pedagogy. Furthermore, the substantial effect magnitude (Cohen's $d = 1.74$) signifies that the intervention possessed considerable practical importance. These outcomes suggest that incorporating game-oriented instructional materials into mathematics teaching can effectively advance students' conceptual comprehension and academic performance in fraction operations.

The outcomes indicate that educators should contemplate integrating Educational Monopoly as an alternative pedagogical resource to establish more captivating and efficacious mathematics learning environments. Educational institutions are likewise encouraged to facilitate the cultivation and adoption of innovative game-oriented instructional materials. Subsequent investigations should assess the effectiveness of Educational Monopoly across diverse mathematical content areas, grade levels, or academic disciplines, while simultaneously exploring supplementary variables that may affect learning performance, including motivational engagement, participation intensity, and higher-order reasoning competencies.

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