Improving Elementary School Students' Numeracy Skills Through the GASING Method in Maybrat

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Abstract
Numeracy skills are essential competencies for 21st-century learning, enabling students to understand quantitative information, apply mathematical reasoning, and solve everyday problems. However, elementary school students in Indonesia, particularly in disadvantaged, frontier, and outermost regions such as Maybrat Regency, continue to face challenges in developing numeracy skills. This study aimed to examine the effectiveness of the GASING Method (*Gampang, Asyik, dan Menyenangkan*; Easy, Fun, and Enjoyable) in improving elementary students' numeracy skills in Maybrat Regency. A quantitative approach with a quasi-experimental One-Group Pretest–Posttest Design was employed. The sample consisted of 37 students from four elementary schools selected through total sampling. Data were collected through numeracy tests administered before and after the intervention and analyzed using descriptive statistics, Normalized Gain (N-Gain), and the Wilcoxon Signed Rank Test. The findings showed a significant improvement in students' numeracy skills after the implementation of the GASING Method. The mean score increased from 29.73 on the pretest to 76.76 on the posttest, with an N-Gain score of 0.63, indicating a moderate level of improvement. The Wilcoxon test also revealed a statistically significant difference between pretest and posttest scores ($p < 0.05$). These results indicate that the GASING Method is effective in enhancing numeracy skills through systematic and concept-oriented learning. The findings provide empirical evidence for developing contextual and meaningful numeracy instruction, particularly in elementary education within disadvantaged, frontier, and outermost regions.

1. Introduction

Numeracy skills are fundamental competencies required for students to face the challenges of the twenty-first century. Numeracy is not limited to basic arithmetic abilities but includes the capacity to understand, interpret, reason, and apply mathematical concepts in solving problems encountered in daily life. Strong numeracy skills support logical, critical, and analytical thinking, as well as evidence-based decision-making in various contexts (Hoogland, 2023; Díez-Palomar et al., 2023). Therefore, numeracy has become an important indicator of educational quality and individual readiness to participate effectively in modern society (OECD, 2023; Putra et al., 2024). UNESCO (2022) emphasizes that strengthening literacy and numeracy is a strategic priority for achieving inclusive, quality, and sustainable education.

Despite its importance, Indonesian students continue to experience challenges in developing adequate numeracy skills. The results of the 2022 Programme for International Student Assessment (PISA) indicate that Indonesian students' mathematics performance remains below the OECD average, reflecting difficulties in understanding mathematical concepts and applying them to real-life situations (OECD, 2023). Similar findings from the National Assessment reveal that students' abilities in mathematical reasoning and contextual problem-solving have not yet reached the expected standards (Ministry of Education, Culture, Research, and Technology, 2023). These challenges become more complex in disadvantaged, frontier, and outermost regions, where limited access to learning resources, inadequate educational facilities, and geographical barriers contribute to disparities in mathematics learning quality.

One of the regions experiencing these challenges is Maybrat Regency, Southwest Papua, Indonesia, which has unique geographical and educational characteristics. The wide territorial distribution, limited infrastructure, and unequal access to educational resources create obstacles to improving the quality of basic education. Based on field observations and numeracy assessments conducted during mathematics learning activities in 2025, many students in Maybrat Regency demonstrated difficulties in mastering basic arithmetic operations, such as addition, subtraction, multiplication, and division. These difficulties affected students' ability to solve mathematical problems requiring conceptual understanding and contextual reasoning. Therefore,

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instructional approaches that move beyond procedural memorization and support meaningful mathematical understanding are urgently needed.

One potential approach for addressing these challenges is the GASING Method (*Gampang, Asyik, dan Menyenangkan*; Easy, Fun, and Enjoyable), developed by Yohanes Surya. The GASING Method emphasizes systematic learning stages that begin with concrete experiences and gradually progress toward abstract mathematical concepts, enabling students to construct deeper conceptual understanding rather than relying on memorization (Surya, 2009). The approach is theoretically aligned with constructivist perspectives, which view learning as an active process of knowledge construction through interaction and experience (Vygotsky, 1978). Furthermore, GASING corresponds with Piaget's theory of cognitive development, which highlights the importance of concrete experiences for elementary school students at the concrete operational stage (Piaget, 1972). Its learning sequence also reflects Bruner's theory of representation through enactive, iconic, and symbolic stages (Bruner, 1966), which contemporary research confirms as effective in supporting mathematical conceptual understanding (Fyfe et al., 2022; Rittle-Johnson et al., 2020).

Previous studies have demonstrated the effectiveness of the GASING Method in mathematics learning. Rahmawati and Kurniawan (2022) reported that GASING significantly improved elementary students' mathematical conceptual understanding, while Prasetyo et al. (2023) found that GASING-based instruction enhanced students' motivation and engagement. Similarly, Lestari and Hidayat (2024) concluded that the approach improved students' computational skills in number operations. However, most previous studies have focused on general mathematics achievement and have been conducted in relatively different educational contexts. Research examining the effectiveness of the GASING Method specifically for improving elementary students' numeracy skills in Southwest Papua, particularly in Maybrat Regency, remains limited. Considering that geographical, social, and educational conditions may influence the effectiveness of instructional interventions, empirical investigation in this context is necessary.

Therefore, this study aims to analyze the effectiveness of the GASING Method in improving elementary school students' numeracy skills in Maybrat Regency. Employing a One-Group Pretest–Posttest Design involving 37 students from four elementary schools, this study examines differences in students' numeracy performance before and after the intervention and measures improvement levels using Normalized Gain (N-Gain) analysis. The findings are expected to contribute empirical evidence for developing contextual, meaningful, and effective numeracy-based mathematics instruction, particularly for elementary schools located in disadvantaged, frontier, and outermost regions.

2. Method

This study employed a quantitative approach using a quasi-experimental method to examine the effectiveness of the GASING Method in improving elementary school students' numeracy skills in Maybrat Regency. The research applied a One-Group Pretest–Posttest Design, which involved a single group of participants who were assessed before and after receiving the treatment. According to Creswell and Creswell (2018), quantitative research is an approach for testing objective theories by examining relationships among variables through numerical data and statistical analysis. Following this perspective, the present study employed a quantitative approach using a quasi-experimental method to investigate the effectiveness of the GASING Method in improving elementary school students' numeracy skills. A One-Group Pretest–Posttest Design was utilized, in which a single group of participants was measured before and after the intervention. This design allows researchers to determine changes that occur following the implementation of a treatment by comparing participants' pretest and posttest scores (Creswell & Creswell, 2018).

This design was selected to determine changes in students' numeracy abilities following the implementation of the GASING Method. The intervention was conducted over Four weeks consisting of eight instructional meetings (90 minutes per meeting). Before the intervention, students completed a pretest to measure their initial numeracy skills. Subsequently, students participated in mathematics learning activities using the GASING Method as the instructional intervention. The learning activities were systematically designed based on the GASING learning stages, beginning with concrete experiences, progressing to visual representations, and finally moving toward abstract mathematical concepts. The instructional materials focused on elementary numeracy competencies, including number recognition and place value, basic arithmetic operations (addition, subtraction, multiplication, and division), number relationships and patterns, mental calculation strategies, and contextual mathematical problem-solving. At the end of the intervention, a posttest was administered to assess students' numeracy skills after receiving GASING-based instruction. The comparison between pretest and posttest scores was used to determine the effectiveness of the GASING Method in enhancing students' numeracy performance.

The population of this study consisted of all elementary school students who participated in the GASING mathematics learning program in Maybrat Regency in 2025. The total population comprised 37 students from four elementary schools. Given the relatively small population size, the study employed a total sampling

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technique, whereby all members of the population were included as research participants. Consequently, the sample consisted of 37 students representing the entire population.

The research instrument was a numeracy skills test developed based on elementary school numeracy competencies. The instrument was designed to measure students' understanding and application of fundamental mathematical concepts commonly used in daily life. The assessed competencies included understanding number concepts, performing basic arithmetic operations such as addition, subtraction, multiplication, and division, identifying numerical relationships and patterns, and solving contextual mathematical problems. The instrument was administered in both the pretest and posttest stages to evaluate changes in students' numeracy skills following the intervention.

Data collection was conducted through achievement tests administered in two stages. The pretest was given before the implementation of the GASING Method to identify students' initial numeracy abilities. Following the instructional intervention, the posttest was administered to measure students' numeracy achievement after participating in GASING-based mathematics learning activities. Both tests were constructed using equivalent indicators to ensure consistency and comparability of the results.

The collected data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics were used to summarize students' numeracy performance through measures such as mean scores, minimum and maximum scores, and standard deviations. Prior to hypothesis testing, the Shapiro–Wilk normality test was conducted to determine whether the data met the assumption of normal distribution. To evaluate the magnitude of improvement in students' numeracy skills, Normalized Gain (N-Gain) analysis was employed. The N-Gain values were interpreted according to established criteria to determine the level of learning improvement achieved after the intervention. Furthermore, hypothesis testing was conducted to examine whether there was a statistically significant difference between students' pretest and posttest scores. Since the data did not meet the assumption of normality, the Wilcoxon Signed Rank Test was used as a non-parametric statistical procedure. All statistical analyses were performed at a significance level of 0.05.

3. Results and Discussion

3.1. Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to obtain a comprehensive overview of the changes in students' numeracy skills before and after the intervention. The data analyzed in this study consisted of pretest and posttest numeracy scores collected from 37 participants. Descriptive analysis serves as the initial stage in quantitative research, aiming to describe the characteristics of the data, including measures of central tendency, score distribution, and variability, before conducting further statistical analyses to test the research hypotheses (Lakens, 2022). Through this analysis, researchers can gain an initial understanding of students' numeracy performance before and after the implementation of the intervention.

Based on the results of data analysis using SPSS software, an improvement in students' numeracy skills was observed following the intervention. In the pretest, the minimum score was 0, the maximum score was 90, the mean score was 29.73, and the standard deviation was 25.872. These findings indicate that students' initial numeracy skills varied considerably prior to the intervention. The relatively high standard deviation suggests substantial differences among students' baseline abilities, with some students demonstrating very limited numeracy skills while others already possessed a relatively stronger understanding of numerical concepts before participating in the learning activities.

Following the instructional intervention, the posttest results revealed a notable improvement in students' numeracy achievement. The minimum score increased to 30, while the maximum score reached 100. The mean score rose to 76.76, with a standard deviation of 18.864. These results indicate that most students experienced significant improvement in their numeracy skills after participating in the learning program. Furthermore, the decrease in the standard deviation compared to the pretest results suggests that students' scores became more evenly distributed, indicating a more homogeneous level of numeracy achievement following the intervention.

As shown in Table 1, a comparison of the mean scores between the pretest and posttest revealed an increase of 47.03 points. This substantial improvement indicates a positive change in students' numeracy skills after the implementation of the intervention. The difference in mean scores provides preliminary evidence that the learning approach may have contributed to enhancing students' numeracy performance. However, changes in mean scores alone are insufficient to establish the statistical effectiveness of the intervention. Therefore, further analyses considering data variability, statistical significance, and potential measurement error are necessary to provide stronger empirical support for the study's conclusions (Lakens, 2022).

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Table 1. Descriptive Statistics of Pretest and Posttest Numeracy Scores.

Variable	N	Minimum	Maximum	Mean	SD
Pretest	37	0	90	29.73	25.872
Posttest	37	30	100	76.76	18.864

This finding suggests that the GASING Method may contribute not only to improving overall achievement but also to reducing learning disparities among students. According to Darling-Hammond et al. (2020), effective instructional practices should promote both academic excellence and educational equity by providing meaningful learning opportunities for all students regardless of their initial ability levels.

The improvement in students' numeracy achievement is consistent with previous studies emphasizing the importance of conceptual and student-centered mathematics instruction. Hattie (2023) reported that instructional approaches emphasizing active learning, feedback, and meaningful engagement have a substantial positive impact on students' academic achievement. Similarly, Nunes and Bryant (2022) argued that students develop stronger mathematical understanding when learning experiences connect abstract concepts to meaningful contexts and real-life applications. These principles are reflected in the GASING Method, which encourages students to construct mathematical understanding gradually through concrete experiences and active participation.

The findings are also supported by research conducted by Siegler et al. (2021), who found that students' mathematical achievement improves significantly when instruction focuses on conceptual understanding rather than procedural memorization. Their study highlighted that deep conceptual learning enables students to transfer mathematical knowledge more effectively across different problem-solving situations. Because the GASING Method prioritizes conceptual mastery before introducing formal mathematical procedures, the significant increase in numeracy scores observed in this study may be attributed to students' improved conceptual understanding.

Furthermore, research by Schukajlow and Rakoczy (2023) demonstrated that students who actively engage in mathematical reasoning and problem-solving activities tend to achieve higher levels of mathematical proficiency and confidence. The GASING Method incorporates these elements by encouraging students to participate actively in learning activities, explore mathematical concepts, and solve problems through guided instruction. Such learning experiences may explain the substantial improvement in numeracy performance found in the present study.

From a broader educational perspective, the results support the argument that effective mathematics instruction can significantly improve learning outcomes even in challenging educational contexts. The notable increase in mean scores and the reduction in score variability suggest that the GASING Method may be particularly valuable for elementary schools in disadvantaged, frontier, and outermost (3T) regions. By emphasizing conceptual understanding, active engagement, and gradual learning progression, the method provides an instructional framework capable of supporting both achievement growth and educational equity.

3.2. Normality Test

A normality test was conducted to examine the distribution characteristics of the research data before selecting the appropriate inferential statistical technique. This test aimed to determine whether the data followed a normal distribution, thereby providing a basis for choosing between parametric and non-parametric statistical analyses. In this study, the Shapiro–Wilk test was employed because the sample size consisted of fewer than 50 participants. Assessing the normality assumption is an essential step in quantitative data analysis, as it directly influences the selection of appropriate statistical procedures (Kim & Park, 2021).

Based on the results of the SPSS analysis, the Shapiro–Wilk significance value for the pretest data was 0.003, while the significance value for the posttest data was 0.011. Both significance values were lower than the predetermined alpha level of 0.05. Therefore, it can be concluded that the pretest and posttest numeracy scores did not meet the assumption of normal distribution.

Since the normality test indicated that the data were not normally distributed, the differences in students' numeracy skills before and after the intervention could not be analyzed using parametric statistical methods. Consequently, a non-parametric statistical procedure, namely the Wilcoxon Signed Rank Test, was employed. This test is appropriate for analyzing differences between two related samples when the assumption of normality is violated (Corder & Foreman, 2021). The use of this procedure enabled the researcher to obtain conclusions that were more consistent with the characteristics of the collected data.

The normality test was performed using the Shapiro–Wilk procedure to examine whether the pretest and posttest scores followed a normal distribution. Assessing data normality is an important prerequisite in

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quantitative research because the selection of subsequent statistical analyses depends on whether the data satisfy the assumptions required for parametric tests (Hair et al., 2022).

As shown in Table 2, the Shapiro–Wilk test produced a significance value of 0.003 for the pretest scores and 0.011 for the posttest scores. Both values were below the significance level of 0.05, indicating that the distributions of the pretest and posttest data deviated significantly from normality. Therefore, the null hypothesis of normal distribution was rejected, and it was concluded that the data were not normally distributed.

Table 2. Results of the Shapiro–Wilk Normality Test

Data	Statistic	Sig.
Pretest	0.898	0.003
Posttest	0.920	0.011

The non-normal distribution of the scores may be attributed to the substantial variation in students' initial numeracy abilities and the different rates of learning progress achieved during the intervention. According to Tabachnick and Fidell (2019), educational data often violate the assumption of normality because students enter learning environments with diverse backgrounds, prior knowledge, and achievement levels. Such variability can lead to skewed distributions, particularly in studies involving relatively small samples.

Given that the assumption of normality was not met, the use of parametric statistical tests such as the paired-samples t-test was considered inappropriate. Consequently, the Wilcoxon Signed Rank Test was selected as a non-parametric alternative for comparing pretest and posttest scores. Hair et al. (2022) explain that non-parametric procedures are more appropriate when data are not normally distributed because they do not require strict distributional assumptions and are less affected by extreme values. Therefore, the Wilcoxon Signed Rank Test provided a statistically appropriate method for evaluating the effectiveness of the GASING Method.

The results of the normality analysis also highlight the heterogeneity of students' numeracy achievement. Such diversity is commonly observed in elementary school settings, particularly in regions with varying educational opportunities and learning conditions. Therefore, the use of a non-parametric approach strengthened the validity of the statistical conclusions and ensured that the findings accurately reflected the characteristics of the collected data.

3.3. N-Gain Analysis

The Normalized Gain (N-Gain) analysis was conducted to determine the extent of improvement in students' numeracy skills by comparing their pretest and posttest scores. N-Gain analysis is widely used in educational research to evaluate the effectiveness of instructional interventions because it measures learning improvement proportionally by comparing the actual gain achieved by students with the maximum possible gain they could attain. Unlike simple score differences, N-Gain provides a more objective measure of learning effectiveness by considering students' initial performance levels (Hake, 2021).

The N-Gain calculation in this study was based on the numeracy scores obtained before and after the implementation of the GASING Method. The results revealed an average N-Gain score of 0.63. According to the established N-Gain interpretation criteria, this value falls within the moderate improvement category ($0.30 \leq g < 0.70$). This finding indicates that the implementation of the GASING Method was reasonably effective in improving students' numeracy skills. The moderate category suggests that the intervention succeeded in facilitating meaningful learning progress and contributed positively to students' understanding of mathematical concepts and numeracy competencies.

The improvement observed through the N-Gain analysis is consistent with the descriptive statistical results, which showed a substantial increase in students' mean scores from 29.73 on the pretest to 76.76 on the posttest. This improvement demonstrates that the GASING Method enabled students to achieve considerable learning gains during the intervention period. The systematic and gradual learning process embedded in the GASING Method may have supported students in developing a stronger conceptual understanding of mathematics, thereby enhancing their ability to perform numerical operations and solve mathematical problems.

As shown in Table 3, the distribution of students' N-Gain scores varied across the three improvement categories. Of the 37 participants, 18 students (48.65%) achieved a high level of improvement, 14 students (37.84%) demonstrated a moderate level of improvement, and only 5 students (13.51%) were classified within the low improvement category. These findings indicate that nearly half of the participants experienced substantial progress in their numeracy skills following the intervention. The predominance of students in the

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moderate and high categories further suggests that the GASING Method was beneficial for most learners participating in the study.

Table 3. Distribution of Students Based on N-Gain Categories

Category	Number of Students	Percentage (%)
Low	5	13.51
Moderate	14	37.84
High	18	48.65
Total	37	100.00

The variation in improvement levels among students indicates that learners did not respond to the intervention in exactly the same manner. Several factors may explain these differences, including students' prior knowledge, learning readiness, cognitive abilities, learning motivation, and engagement during instructional activities. Students who possessed stronger foundational mathematical skills and actively participated in learning activities may have benefited more from the instructional intervention, resulting in higher N-Gain scores. Conversely, students with limited prior knowledge or lower levels of engagement may have experienced slower learning progress despite showing positive improvement overall.

The findings also suggest that the GASING Method has the potential to reduce learning gaps among students. This observation is supported by the decrease in the standard deviation from the pretest to the posttest, indicating that students' numeracy performance became more homogeneous after the intervention. Such a result implies that the instructional approach not only improved overall achievement but also helped lower-performing students make meaningful progress toward the achievement levels of their peers.

From an educational perspective, the moderate average N-Gain score obtained in this study demonstrates that the GASING Method can serve as an effective instructional strategy for strengthening numeracy skills among elementary school students, particularly in disadvantaged, frontier, and outermost regions such as Maybrat Regency. The method's emphasis on conceptual understanding, gradual progression from concrete to abstract learning experiences, and active student participation appears to support meaningful learning and numeracy development. Therefore, the findings provide empirical evidence that the GASING Method can contribute to improving the quality of mathematics learning and promoting numeracy achievement in elementary education settings.

The substantial proportion of students achieving moderate and high gains may be attributed to the instructional characteristics of the GASING Method, which emphasizes conceptual understanding, active participation, and gradual progression from concrete experiences to abstract mathematical representations. According to Boaler (2022), mathematics learning becomes more effective when students are encouraged to develop conceptual understanding through meaningful learning experiences rather than relying solely on memorization and repetitive procedures. Such learning environments enable students to build stronger mathematical connections and improve their ability to apply mathematical concepts in different contexts.

The findings are also consistent with research conducted by Niss and Jablonka (2020), who emphasized that numeracy development requires opportunities for students to engage actively with mathematical ideas, reason quantitatively, and solve contextual problems. Students who participate actively in learning activities tend to develop deeper mathematical understanding and greater confidence in applying mathematical knowledge. The GASING Method facilitates these processes through structured learning sequences that gradually guide students toward conceptual mastery.

Although most students achieved moderate to high gains, a small proportion of students remained in the low category. Differences in learning gains may be influenced by variations in prior knowledge, learning readiness, motivation, and individual learning characteristics. According to Star and Stylianides (2023), students often respond differently to mathematics interventions because learning outcomes are shaped by multiple cognitive and instructional factors. Consequently, some students may require additional support and instructional time to achieve learning gains comparable to their peers.

Overall, the N-Gain distribution demonstrates that the GASING Method was effective in improving students' numeracy skills. The large proportion of students in the moderate and high categories suggests that the method provides meaningful learning experiences capable of enhancing mathematical understanding and supporting numeracy development among elementary school students. These findings are particularly important in the context of Maybrat Regency, where effective instructional strategies are needed to address educational challenges and improve learning outcomes in primary education.

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3.4. Difference Test between Pretest and Posttest Scores (Wilcoxon Signed Rank Test)

Based on the results of the normality test, which indicated that the data did not satisfy the assumption of normal distribution, hypothesis testing was conducted using the Wilcoxon Signed Rank Test. The Wilcoxon test is a non-parametric statistical procedure used to determine whether there is a significant difference between two related measurements, namely students' numeracy scores before and after the intervention (Corder & Foreman, 2021). This method was considered appropriate because the study involved a single group of participants measured at two different points in time.

As shown in Table 4, the Wilcoxon Signed Rank Test produced a Z value of −5.23 and a significance value of 0.000 ($p < 0.05$). Because the significance value was lower than the alpha level of 0.05, the null hypothesis was rejected. These results indicate a statistically significant difference between students' numeracy scores before and after the implementation of the GASING Method. In other words, the improvement observed in students' scores cannot be attributed to random variation alone but reflects a meaningful change in numeracy performance following the intervention.

Table 4. Results of the Wilcoxon Signed Rank Test

Comparison	Z	Sig.
Posttest – Pretest	-5.23	0.000

The statistical significance identified through the Wilcoxon test strengthens the findings obtained from both the descriptive analysis and the N-Gain analysis. The substantial increase in mean scores from 29.73 on the pretest to 76.76 on the posttest, combined with an average N-Gain score of 0.63, demonstrates that the intervention had a positive impact on students' numeracy development. These results suggest that the GASING Method successfully facilitated students' understanding of mathematical concepts and improved their ability to apply numerical reasoning in solving mathematical problems.

The findings of this study are consistent with previous research highlighting the effectiveness of the GASING Method in mathematics learning. Rahmawati and Kurniawan (2022) reported that the implementation of the GASING Method significantly improved elementary school students' conceptual understanding of mathematics. Similarly, Prasetyo et al. (2023) found that GASING-based instruction increased students' learning motivation and classroom engagement, which subsequently contributed to improved mathematics achievement. Furthermore, Lestari and Hidayat (2024) demonstrated that the GASING approach effectively enhanced students' computational skills in basic arithmetic operations. The consistency between the present findings and previous studies suggests that the GASING Method is not only effective in improving mathematical achievement but also capable of strengthening broader numeracy competencies.

The results of this study also align with broader empirical evidence regarding concept-based mathematics instruction. A meta-analysis conducted by Carbonneau et al. (2013) found that learning experiences involving concrete manipulatives significantly improved students' mathematical understanding compared to conventional instructional approaches. Likewise, Fyfe et al. (2022); Putra (2024) emphasized that instructional sequences progressing from concrete experiences to abstract representations contribute positively to students' conceptual understanding and long-term mathematical achievement. Since the GASING Method employs a similar progression from concrete activities toward symbolic mathematical representations, the positive outcomes observed in this study provide additional empirical support for these theoretical perspectives.

From a theoretical standpoint, the effectiveness of the GASING Method can be explained through constructivist learning theory, which emphasizes that knowledge is actively constructed through learners' interactions with their environment (Vygotsky, 1978). By engaging students in meaningful learning activities and guiding them through gradual conceptual development, the GASING Method enables learners to build mathematical understanding more effectively than through rote memorization alone. The findings are also consistent with Piaget's theory of cognitive development, which suggests that elementary school students learn most effectively through concrete experiences before progressing to abstract reasoning (Piaget, 1972).

The positive results obtained in this study are particularly important within the context of disadvantaged, frontier, and outermost regions such as Maybrat Regency. Students in these regions often face challenges related to limited educational resources, geographical barriers, and restricted access to high-quality learning opportunities. The significant improvement in numeracy skills observed in this study indicates that appropriately designed instructional approaches can help overcome some of these challenges and contribute to reducing educational disparities. Consequently, the GASING Method may serve as a practical and effective strategy for enhancing mathematics learning outcomes in geographically remote and educationally underserved areas.

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Furthermore, the findings of this study support previous research demonstrating that student-centered instructional interventions can enhance numeracy competencies through more meaningful learning experiences (Diniyah et al., 2022; Mullis et al., 2021). Active student engagement in the learning process is a crucial factor contributing to the improvement of numeracy skills, as it provides learners with opportunities to explore concepts, solve problems, and construct understanding based on their learning experiences. Therefore, the present study reinforces previous findings that instructional approaches placing students at the center of the learning process can lead to more optimal development of numeracy competencies. Overall, the results of the study demonstrate that students' numeracy skills improved substantially following the intervention. This improvement was reflected in the increase in mean scores from 29.73 on the pretest to 76.76 on the posttest, the moderate N-Gain score of 0.63, and the statistically significant difference identified through the Wilcoxon Signed Rank Test ($p < 0.05$). Taken together, these findings provide strong empirical evidence that the GASING Method positively influences students' numeracy development and can be considered an effective instructional approach for improving numeracy skills among elementary school students.

The findings indicate that the GASING Method contributed significantly to the improvement of students' numeracy skills and offers promising implications for mathematics education, particularly in elementary schools located in disadvantaged and remote regions.

The improvement in students' numeracy scores observed after the implementation of the GASING Method indicates that the intervention had a positive contribution to students' mathematical learning development. The structured learning sequence of GASING, which emphasizes concrete experiences, gradual conceptual understanding, and enjoyable mathematical activities, may have supported students in developing stronger numeracy skills. However, this finding should be interpreted with caution because the present study employed a One-Group Pretest–Posttest Design without a control group. Therefore, although the increase in posttest scores suggests the potential effectiveness of the GASING Method, other factors that may have contributed to students' improvement cannot be completely eliminated.

Several external factors may have influenced the observed improvement, including students' familiarity with test formats due to the pretest experience, increased exposure to similar mathematical problems during the intervention period, additional practice opportunities, teacher support and guidance, as well as other learning activities that students may have received outside the research intervention. These factors may have interacted with the GASING implementation and contributed to changes in students' numeracy performance. Consequently, the increase in scores cannot be attributed exclusively to the GASING Method.

Nevertheless, the findings provide empirical evidence that GASING-based instruction has the potential to enhance elementary students' numeracy skills, particularly in the context of Maybrat Regency, where students face challenges related to limited learning resources and educational access. Future studies are recommended to employ stronger experimental designs, such as randomized controlled trials or quasi-experimental designs involving comparison groups, to further confirm the specific effect of the GASING Method while controlling for potential confounding variables.

3.5. Implications for Educational Research

The findings of this study contribute to the growing body of research on effective approaches for improving numeracy skills in elementary education. First, the study provides empirical evidence that concept-oriented and student-centered instructional approaches can significantly enhance numeracy achievement, particularly in contexts where students face limited educational resources. This reinforces the importance of instructional models that prioritize conceptual understanding rather than procedural memorization.

Second, the results highlight the potential of the GASING Method as a pedagogical innovation for mathematics education in rural and underserved areas. Educational researchers may use these findings as a foundation for exploring the effectiveness of GASING across different grade levels, mathematical domains, and educational settings. Future studies may also compare the effectiveness of GASING with other instructional approaches to identify the specific components that contribute most significantly to students' numeracy development.

Third, the study contributes to discussions on educational equity by demonstrating that appropriate instructional interventions can improve learning outcomes in regions facing educational disadvantages. The findings suggest that future research should continue to investigate strategies that support numeracy development among students in remote and marginalized communities, thereby helping to reduce disparities in educational achievement.

Finally, the study supports theoretical perspectives derived from constructivist learning theory, cognitive development theory, and representation theory by providing empirical evidence that learning experiences progressing from concrete to abstract understanding can facilitate numeracy development. Future research may

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further examine the mechanisms through which GASING influences students' conceptual understanding, motivation, and mathematical reasoning.

3.6. Limitations

Several limitations should be considered when interpreting the findings of this study. First, the research employed a One-Group Pretest–Posttest Design without a control group. Although the results indicate significant improvements in students' numeracy skills, the absence of a comparison group limits the ability to establish causal relationships with complete certainty. Other external factors may have contributed to the observed improvements.

Second, the study involved a relatively small sample of 37 students drawn from four elementary schools in Maybrat Regency. Consequently, the findings may not be fully generalizable to larger populations or to elementary schools in different geographical and educational contexts.

Third, the study focused primarily on students' numeracy achievement as measured through pretest and posttest assessments. Other variables that may influence learning outcomes, such as learning motivation, student engagement, teacher effectiveness, socioeconomic background, and classroom learning environments, were not examined in this research.

Fourth, the intervention was conducted within a limited period of implementation. As a result, the study was unable to assess the long-term effects of the GASING Method on students' retention of numeracy skills and continued mathematical development over time.

Therefore, future research is recommended to employ more rigorous experimental designs involving control groups, larger and more diverse samples, longer intervention periods, and additional variables that may influence numeracy achievement. Such studies would provide a more comprehensive understanding of the effectiveness and sustainability of the GASING Method in different educational contexts.

4. Conclusion

This study examined the effectiveness of the GASING (*Gampang, Asyik, dan Menyenangkan*) Method in improving the numeracy skills of elementary school students in Maybrat Regency. The findings revealed a substantial improvement in students' numeracy performance following the implementation of the GASING Method. Descriptive statistical analysis showed that the mean score increased from 29.73 on the pretest to 76.76 on the posttest, indicating a gain of 47.03 points. The N-Gain analysis produced an average score of 0.63, which falls within the moderate category, suggesting that the intervention achieved a satisfactory level of effectiveness in enhancing students' numeracy skills. Furthermore, the Wilcoxon Signed Rank Test revealed a statistically significant difference between pretest and posttest scores ($p < 0.05$), confirming that the observed improvement was not due to chance. These findings demonstrate that the GASING Method is an effective instructional approach for developing numeracy skills among elementary school students. The method's emphasis on conceptual understanding, gradual progression from concrete to abstract representations, and active student participation appears to support meaningful mathematical learning. The results also indicate that the GASING Method can be successfully implemented in educational contexts characterized by geographical and infrastructural challenges, such as those found in Maybrat Regency. Therefore, the study provides empirical evidence supporting the use of the GASING Method as a strategy for strengthening numeracy learning in elementary education, particularly in disadvantaged, frontier, and outermost regions.

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Declaration of Conflicting Interests

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Data Availability

The datasets generated during and/ or analyzed during the current study are available from the corresponding author on reasonable request.

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Declaration on AI Use

AI were used only to improve readability and language under strict human oversight; no content, ideas, analyses, or conclusions were generated by AI.

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