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The Implementation of the GASING Method Integrated with the Megowak-Gowakan Game: A One-Group Pretest-Posttest Study on Mathematics Anxiety of Elementary Students

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A B S T R A C T

Mathematics anxiety is widely recognized as a psychological factor that can hinder elementary students' engagement and academic performance in mathematics. This study examined changes in students' mathematics anxiety following the implementation of the GASING (Easy, Fun, and Enjoyable) method integrated with the Balinese traditional game Megowak-gowakan. A quantitative quasi-experimental approach was applied using a one-group pretest-posttest design. The study did not include a control group, and the analysis was based on internal comparisons of pretest and posttest scores. The participants were 64 elementary school students from four districts in Bangli Regency, Bali. Data were collected through a validated mathematics anxiety questionnaire and analyzed using the N-Gain formula with SPSS version 30. The findings revealed a decrease in the mean anxiety score from 74.5 (pretest) to 52.3 (posttest), with an overall N-Gain of 0.58, indicating a moderate level of improvement. While the results demonstrate meaningful reductions in anxiety levels following the intervention, the absence of a comparison group limits the extent to which causal inferences can be drawn. Further studies employing controlled experimental designs are recommended to provide stronger empirical confirmation.

1. Introduction

Mathematics is a fundamental subject that plays a crucial role in fostering logical, analytical, and systematic thinking skills among elementary school students. Logical and analytical reasoning abilities are essential for solving mathematical problems that require accuracy and abstract reasoning (Nurlaili et al., 2025). However, numerous studies indicate that mathematics learning at the elementary school level continues to face challenges related to affective factors, particularly mathematics anxiety (Berliani & Persada, 2024). Mathematics anxiety is a

psychological condition characterized by feelings of fear, tension, and worry when students engage in numerical or mathematical activities. This condition may negatively affect students' concentration, information-processing capacity, and overall academic achievement (Marweli, 2024). In elementary education contexts, such anxiety often arises from learning processes that are highly abstract, insufficiently contextualized, and accompanied by evaluative pressure from teachers.

Conceptually, mathematics anxiety among elementary school students can be identified through several indicators, including physiological responses such as tension and restlessness, cognitive responses manifested in negative thoughts and fear of making mistakes, affective responses such as discomfort and fear, and behavioral responses reflected in students' tendencies to avoid mathematics-related tasks (Marweli & Meiliasari, 2024). Elevated levels of anxiety across these dimensions may hinder the long-term development of students' numeracy skills (Nur et al., 2024). Therefore, instructional strategies are required that not only enhance students' conceptual understanding of mathematics but are also empirically proven to reduce mathematics anxiety (Marweli & Meiliasari, 2024).

Previous research has shown that mathematics anxiety is most frequently experienced by elementary school students in mathematics subjects. Such anxiety is commonly influenced by cognitive factors, negative perceptions of mathematics, and unsupportive learning environments (Siregar, 2022). The abstract and systematic nature of mathematics is often perceived as difficult by students, contributing to heightened anxiety levels. Empirical evidence also suggests a negative relationship between mathematics anxiety and critical thinking ability, whereby higher anxiety levels are associated with lower cognitive performance (Hadi, 2020). In addition, anxiety tends to emerge when students are required to comprehend abstract concepts and face evaluative demands, resulting in fear, tension, and negative thought patterns toward mathematical tasks (Krisdiana et al., 2023). These conditions may ultimately reduce students' concentration, self-confidence, and learning outcomes. Consequently, mathematics anxiety is a prevalent issue in elementary education that necessitates appropriate pedagogical interventions to promote more positive learning experiences. Prior studies have also demonstrated that innovative and engaging learning approaches contribute to increased student motivation and active participation in elementary classrooms, which in turn support more positive learning attitudes (Ratnasari et al., 2022; Rizqi et al., 2025).

One instructional approach with the potential to reduce mathematics anxiety is the GASING method (Easy, Fun, and Enjoyable). Developed by Yohanes Surya, the GASING method emphasizes gradual conceptual understanding through intuitive, simple, and enjoyable learning experiences, enabling students to master mathematics without excessive pressure or fear (Surya, 2018). Empirical studies have demonstrated that this approach can improve elementary students' mathematics learning outcomes through interactive and enjoyable activities, thereby reducing emotional stress during instruction (Kusuma, 2019). Furthermore, the method incorporates physical activities, games, and active student participation,

which are believed to enhance self-confidence and alleviate psychological pressure in mathematics learning. Research on participatory mathematics instruction has likewise indicated that increased student learning activity positively influences classroom engagement and academic development at the elementary level (Mustika et al., 2024). Despite these advantages, existing studies have predominantly focused on the cognitive outcomes of the GASING method, while investigations examining its impact on reducing mathematics anxiety remain limited.

The effectiveness of the GASING method may be further strengthened through the integration of traditional games rooted in local wisdom, such as the Balinese traditional game Megowak-gowakan (Devi, 2024). This game involves physical movement, cooperation, and social interaction within an enjoyable learning atmosphere, aligning with the principles of active and contextual learning underlying the GASING method. Research has indicated that combining the GASING method with numeracy-based traditional games can significantly enhance learning outcomes through increased physical and social engagement (Putri & Dewi, 2024). Moreover, the enjoyable and collaborative nature of such games is believed to reduce students' negative affective responses toward mathematics and shift their focus from fear to more positive learning experiences (Ramadhanti et al., 2024). Studies on innovative instructional media have similarly reported that engaging learning formats contribute to increased student interest and more positive emotional responses in elementary classrooms (Mutmainnah et al., 2025).

Although numerous studies have reported the effectiveness of the GASING method in improving mathematics achievement, several methodological limitations warrant critical consideration. Devi (2024), for instance, primarily focused on describing the implementation of the GASING approach in conjunction with traditional games, without incorporating quantitative measurement of affective dimensions such as mathematics anxiety. Similarly, Lestari & Hardini (2022) demonstrated that the GASING method enhanced students' understanding of two-digit multiplication; however, their analysis was confined to pretest-posttest comparisons, thereby emphasizing cognitive outcomes alone. A comparable tendency appears in the study by Maharudin et al. (2026), which concentrated on improvements in addition skills as the principal indicator of instructional success, without integrating affective variables into the research design or statistical analysis. Collectively, these findings suggest that much of the existing scholarship on the GASING method remains predominantly oriented toward academic performance and has yet to systematically examine mathematics anxiety through rigorous quantitative approaches.

Based on this background, this study aims to examine changes in elementary school students' mathematics anxiety following the implementation of the GASING method integrated with the Megowak-gowakan traditional game using a one-group pretest-posttest design. Specifically, this study seeks to answer the following research questions: Is there a significant difference in students' mathematics anxiety levels before and after the implementation of the GASING method integrated with the Megowak-gowakan game?

2. Methodology

This study used a quantitative quasi-experimental approach using a one-group pretest-posttest design to examine changes in elementary students' mathematics anxiety after the implementation of the GASING method integrated with the Megowak-gowakan traditional game. Students' anxiety levels were measured before and after the intervention to identify any observable changes following the learning activities. Nevertheless, the absence of a comparison group represents a methodological limitation. Without a control group, it is not possible to fully ensure that the observed changes resulted solely from the intervention. Other influences, such as students' prior experiences or classroom dynamics, may also have played a role. Therefore, the results should be interpreted as reflecting changes after the intervention rather than conclusive proof of a causal effect.

The research procedure consisted of three main stages, namely preparation, implementation, and evaluation. During the preparation stage, instructional materials grounded in the GASING method were developed, emphasizing learning progression from concrete experiences to abstract understanding and mental calculation. Prior to the intervention, a pretest was administered to assess students' baseline levels of mathematics anxiety. The treatment phase involved mathematics instruction using the GASING method integrated with the *Megowak-gowakan* game. Upon completion of the intervention, a posttest was conducted to identify changes in students' mathematics anxiety levels following the learning activities. The systematic sequence of the research procedure is illustrated in Figure 1.

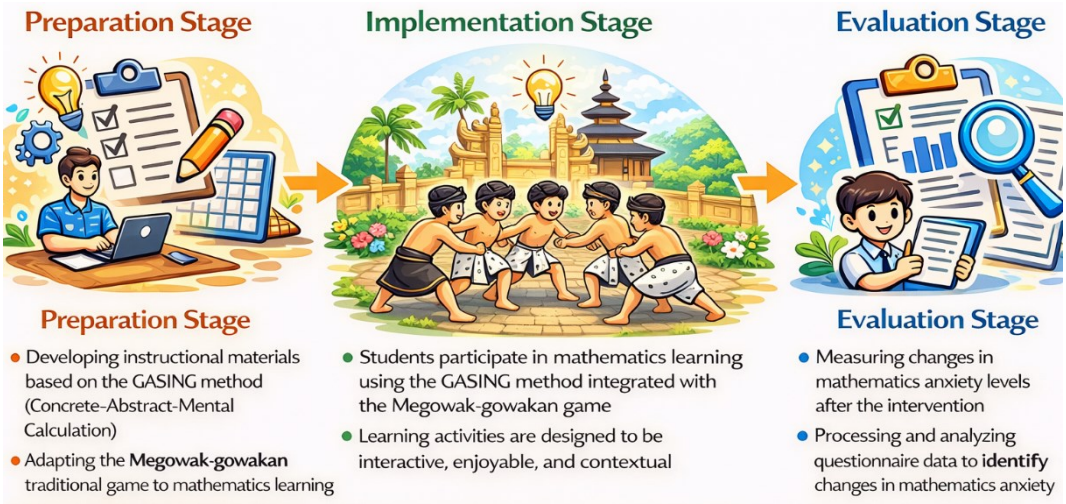

Figure 1. Stages of the Research Procedure

This research was conducted at SD Negeri 1 Sulahan in Susut District, Bangli Regency, Bali Province. Although the participants represented four districts within Bangli Regency, the intervention activities were centralized at this school to ensure uniform implementation of the treatment. All students experienced the same instructional content, time allocation, learning procedures, and schedule. The teaching sessions were facilitated by a single instructor using a carefully prepared lesson plan to maintain consistency and equal learning conditions for all

participants during the intervention period. The study was conducted over fifteen days, from August 20 to September 5, 2025. The implementation timeline was adjusted to align with the school's regular academic schedule to ensure smooth integration into ongoing learning activities. The research process included preparation, implementation, and evaluation phases, each structured to help students adapt to a learning model that emphasized engagement, enjoyment, and active participation.

The research sample was determined using purposive sampling, a technique in which participants are selected based on specific criteria relevant to the research objectives. The criteria included elementary school students who had not previously participated in GASING-based instruction or training grounded in cultural approaches and who continued to experience difficulties in understanding mathematics concepts contextually. Based on these criteria, a total of 64 students were selected from four districts in Bangli Regency, namely Bangli, Tembuku, Susut, and Kintamani, with each district represented by 16 students. The distribution of the research sample is presented in Table 1, which indicates that all participants received the same treatment, namely mathematics instruction using the GASING method integrated with the *Megowak-gowakan* traditional game.

Table 1. Distribution of the Research Sample

No.	District Name	Number of Students	Treatment
1	Bangli	16	GASING Method Integrated with the *Megowak-gowakan* Game
2	Tembuku	16	
3	Susut	16	
4	Kintamani	16	
Total	**4 Districts**	**64**	

Research data were obtained using a mathematics learning anxiety questionnaire developed based on student anxiety indicators proposed by Marweli and Meiliasari (2024). The questionnaire was designed to measure four key dimensions of mathematics anxiety, including physiological, cognitive, affective, and behavioral responses to mathematics learning activities. A four-point Likert scale, ranging from *strongly disagree to strongly agree*, was employed in constructing the instrument.

Before being administered in the main study, the instrument was evaluated for content validity through expert appraisal involving two scholars in mathematics education and educational psychology. The review encompassed four indicators represented by 20 items, resulting in a Content Validity Index (CVI) of 0.856. This value surpasses the recommended benchmark of 0.80, indicating that the instrument adequately represents the intended construct. Reliability was then examined using pilot data collected from students, yielding a Cronbach's Alpha coefficient of 0.808. The coefficient indicates strong internal consistency, confirming that the instrument meets the reliability standards required for research purposes.Detailed information regarding the research variables, indicators, and measurement scales is systematically presented in Table 2.

Table 2. Research Instrument

Variable	Indicator	Main Indicator	Measurement Scale
Students' Mathematics Learning Anxiety	1. Physiological response	1. Physical reactions during mathematics learning	Mathematics learning anxiety questionnaire (pretest and posttest) with a 1–4 scoring rubric
	2. Cognitive response	2. Negative thoughts and worries	
	3. Affective response	3. Feelings toward mathematics	
	4. Behavioral response	4. Attitudes and behaviors in learning activities	

Data analysis was conducted using a quantitative statistical approach based on comparisons between pretest and posttest scores within a one-group design. The N-Gain test, processed with SPSS version 30, was used to measure the extent of change in students' mathematics anxiety after the implementation of the GASING method integrated with the Megowak-gowakan traditional game. The N-Gain values were calculated by comparing students' scores before and after the intervention to determine changes across the four dimensions of mathematics anxiety: physiological, cognitive, affective, and behavioral. The results were then classified into high, moderate, and low categories to facilitate interpretation. Descriptive statistics were also applied to compare the mean anxiety scores before and after the intervention. Because no control group was included, the analysis focused solely on internal pretest-posttest score differences, and the results were interpreted as evidence of change following the program rather than as conclusive proof of causal impact.

3. Results and Discussion

This study was conducted to examine the effect of implementing the GASING method integrated with the traditional *Megowak-gowakan* game on reducing mathematics learning anxiety among elementary school students. Research data were collected through a mathematics anxiety questionnaire administered to 64 students from four districts in Bangli Regency before and after the intervention. The instrument employed a four-point Likert scale and was used to measure four dimensions of mathematics anxiety, namely physiological, cognitive, affective, and behavioral responses.

The analysis results revealed differences in the mean levels of students' mathematics learning anxiety before and after the implementation of the intervention. Subsequently, the data were analyzed using the N-Gain test with the assistance of SPSS version 30 to determine the effectiveness of the GASING method integrated with traditional games in reducing students' mathematics anxiety. A summary of the comparison between pretest and posttest mean scores, along with the N-Gain values for each anxiety indicator, is presented in Table 3.

Table 3. Comparison of Mean Pretest and Posttest Scores and N-Gain Values

No.	Mathematics Anxiety Indicator	Mean Pretest	Mean Posttest	N-Gain	Effectiveness Category
1	Physiological response (tension, restlessness)	75.3	54.8	0.51	Moderate
2	Cognitive response (negative thoughts, worries)	78.1	56.4	0.56	Moderate
3	Affective response (fear, discomfort)	73.9	50.6	0.60	Moderate
4	Behavioral response (avoidance of mathematics tasks)	70.7	47.5	0.63	High
	Overall Mean	**74.5**	**52.3**	**0.58**	**Moderate**

The findings indicate a reduction in students' mathematics learning anxiety following the implementation of the GASING method integrated with the traditional game Megowak-gowakan. The decrease in the mean score from 74.5 to 52.3, accompanied by an N-Gain value of 0.58, reflects a moderate level of improvement. Substantively, this result suggests that learning experiences grounded in concrete activities and structured play may foster a more emotionally supportive classroom environment. Nevertheless, because the study employed a one-group pretest-posttest design without a comparison group, the observed change should be interpreted as evidence of post-intervention improvement rather than as fully isolated causal proof. Although the reduction was consistent, it cannot be entirely separated from potential external influences such as students' adaptation to the instructional setting or novelty effects associated with the method.

A comparative analysis across dimensions shows that the behavioral aspect demonstrated the highest improvement, with an N-Gain of 0.63. This finding indicates that the most immediate change occurred in students' participation and engagement during lessons. Behavioral responses are typically more sensitive to environmental modifications because they are observable and directly linked to classroom interaction. As noted by Herman & Bachtiar (2018), behavioral manifestations of anxiety often include avoidance, reluctance to respond, and passivity. The structured progression from concrete to abstract learning in the GASING approach, combined with playful activities, appears to provide a psychologically safer space for students to engage without excessive pressure. Compared with prior studies emphasizing cognitive achievement outcomes of GASING, the present findings broaden the perspective by highlighting its influence on behavioral engagement, which may serve as a precursor to changes in other domains.

The affective dimension also showed a relatively strong decline, with an N-Gain of 0.60. Although slightly lower than the behavioral dimension, this result underscores the capacity of play-based instruction to positively shape students' emotional states. Within affective learning theory, positive emotional experiences are recognized as foundational for fostering psychological safety and learning comfort (Sari & Saam, 2022). Activities involving movement, collaboration, and social interaction allow students to experience mathematics in a less tense and more relaxed atmosphere. In contrast to earlier research on numeracy-oriented traditional games (Ramadhanti et

al., 2024), this study demonstrates that the benefits of play extend beyond increased interest or achievement to include measurable reductions in anxiety. However, it is important to acknowledge that any enjoyable classroom climate, regardless of the specific method, may also influence emotional conditions.

In the cognitive domain, the N-Gain of 0.56 indicates a reduction in negative thoughts and worries related to making mistakes in mathematics tasks. Compared with behavioral and affective dimensions, cognitive change was more moderate. This pattern is understandable, as entrenched negative beliefs and perceptions of ability tend to be relatively stable and resistant to short-term intervention. Sunarti (2021) argues that mathematics anxiety is closely associated with self-perceived competence and cognitive load. Although the structured and incremental nature of GASING may alleviate mental burden, cognitive restructuring likely requires more sustained intervention. Additionally, prior learning experiences and academic support outside the classroom may have contributed to change in this dimension.

The physiological dimension exhibited the smallest decrease, with an N-Gain of 0.51, though still within the moderate range. Physical symptoms such as tension or restlessness are generally more resistant to short-term instructional interventions because they relate to stress responses that may already be internalized. Incorporating movement-based activities through Megowak-gowakan may have contributed to a more relaxed atmosphere and reduced psychological strain (Kusuma, 2019). Nevertheless, physiological responses can also be shaped by external factors including health conditions, peer dynamics, and adaptation to classroom routines. Therefore, the observed decline cannot be attributed exclusively to the instructional intervention.

Overall, the comparative pattern across dimensions suggests that externally observable aspects, particularly behavior, respond more rapidly to playful instructional innovation, followed by affective, cognitive, and finally physiological components. This progression implies that engaging and activity-based learning may initially enhance participation and emotional regulation before producing deeper cognitive and physiological shifts. Such findings are consistent with research indicating that enjoyable, activity-oriented instruction often yields early effects on engagement and emotional adjustment prior to influencing more complex cognitive structures (Ramirez et al., 2021). Although the absence of a control group limits strong causal inference, the consistent decline across all dimensions provides empirical indication that integrating GASING with traditional games may represent a relevant pedagogical strategy for reducing mathematics anxiety.

Interpretation of the results should nevertheless consider potential non-intervention factors. Reductions in anxiety may have been influenced by natural adaptation to classroom processes, increased familiarity with the measurement instrument, motivational effects arising from participation in a novel approach, or evolving peer interactions. Maturation effects during the study period cannot be fully excluded. In quasi-experimental research, repeated testing, maturation, and environmental influences commonly threaten internal validity when a comparison group is absent (Cook & Shadish, 2020). Consequently, while improvement was observed

following the instructional program, the lack of a control group constrains the ability to attribute change solely to the intervention.

This study also presents several methodological limitations. The quasi-experimental design without a control group precludes direct comparison with alternative instructional approaches. The relatively brief duration of intervention may not capture long-term shifts in anxiety patterns. Moreover, reliance on self-report measures introduces potential response bias. Future research is recommended to employ controlled experimental designs, extend intervention periods, and incorporate mixed-method approaches to strengthen inferential evidence.

Despite these limitations, the study contributes empirical evidence to the quantitative examination of the affective impact of the GASING method, an area previously dominated by cognitive outcome research. The integration of local cultural elements through Megowak-gowakan aligns with ethnomathematical perspectives emphasizing contextual and meaningful learning as a means of supporting students' emotional well-being (Rahmadhani, 2022). By combining cognitive, social, and emotional dimensions within an engaging learning environment, culturally grounded mathematics instruction may offer an innovative alternative for addressing mathematics anxiety among elementary school students.

4. Conclusion

This study examined differences in elementary students' mathematics anxiety before and after the implementation of the GASING method integrated with the Megowak-gowakan traditional game using a one-group pretest-posttest design. The findings show a consistent decrease in anxiety across behavioral, affective, cognitive, and physiological dimensions following the intervention, suggesting that combining structured learning stages with culturally rooted game activities may help foster a more emotionally supportive classroom environment. The most noticeable improvement occurred in students' behavioral engagement, followed by affective and cognitive aspects, while physiological responses shifted more gradually. This pattern indicates that play-oriented instruction may initially influence observable participation and emotional comfort before contributing to deeper psychological adjustments related to mathematics anxiety.

However, because this study employed a quasi-experimental design without a control group, the findings should be interpreted as indicative of change after the intervention rather than as definitive causal evidence. External factors such as adaptation, classroom dynamics, or novelty effects may also have contributed to the observed outcomes. Therefore, while the study provides empirical support for the potential of culturally integrated GASING instruction in addressing mathematics anxiety, further research using controlled experimental designs is necessary to strengthen causal conclusions.

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