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The implementation of tug of war interactive game to increase students' enthusiasm in learning multiplication

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Abstract - This classroom action research aims to increase students' enthusiasm in learning multiplication through the implementation of an interactive Tug of War game for second-grade students at MI NU Mathalibul Huda Mlonggo. The research was conducted in two cycles using the Kemmis and McTaggart model, involving 35 students (15 males and 20 females). Data were collected through observation, questionnaires, tests, and documentation. Initial observation showed low student enthusiasm (average 23.4%). After implementing the modified Tug of War game—which integrates multiplication problems with physical tug-of-war activities, group collaboration, and healthy competition—student enthusiasm increased significantly. In Cycle I, the average enthusiasm reached 74% (high category). In Cycle II, it rose to 87% (very high category). Improvements were also observed in students' understanding of multiplication concepts, as evidenced by the increase in the number of students achieving mastery. The findings indicate that the Tug of War interactive game effectively creates a fun, active, and meaningful learning environment that aligns with the characteristics of young learners. This approach not only boosts enthusiasm and participation but also fosters collaboration and reduces mathematics anxiety. The study recommends the wider use of traditional game-based learning in elementary mathematics education.

Keyword: Tug of War game, student enthusiasm, game-based learning, multiplication, classroom action research, elementary mathematics

1. Introduction

In elementary education, particularly at the Madrasah Ibtidaiyah level, fostering student enthusiasm is a crucial factor in creating effective and meaningful learning processes. Enthusiasm reflects students' attention, interest, active participation, and motivation during learning activities. High enthusiasm encourages greater engagement, leading to improved understanding and academic outcomes (Paulina et al., 2023). In mathematics learning, especially multiplication concepts in second grade, enthusiasm plays a vital role because this material requires strong conceptual understanding and repeated practice, which students often perceive as difficult and monotonous (Safitri, 2025; Fadhila, 2025).

However, reality in the field shows that student enthusiasm in many elementary schools remains low. Conventional, teacher-centered learning methods cause students to become passive, easily bored, and less motivated (Syahada, 2024). This condition was also found in the initial observation conducted in Class 2F at MI NU Mathalibul Huda Mlonggo. The average student enthusiasm level was only 23.4%, categorized as low. Indicators such as asking questions, expressing opinions, participating in activities, and paying attention to lessons were still very limited (see Table 1.1 in the original report).

Game-Based Learning (GBL) has emerged as an effective alternative to overcome these challenges. Several studies have shown that learning based on games can significantly increase student motivation and active participation in mathematics (Islami et al., 2025; Na'im, 2025; A'yun et al., 2026). One innovative approach is adapting traditional games into interactive learning media. The Tug of War (tarik tambang) game, when modified by integrating multiplication problems, combines physical activity, healthy

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competition, teamwork, and cognitive exercises. This approach is considered highly suitable for second-grade students who are in a developmental stage that favours play and movement.

The existing literature consistently demonstrates that game-based learning enhances students' motivation, engagement, and participation in mathematics by creating interactive and enjoyable learning experiences. However, many studies primarily emphasize affective outcomes, such as motivation and interest, while providing comparatively limited evidence regarding the long-term development of mathematical reasoning and problem-solving skills (Rebollo et al., 2021; Shahril & Hanafi, 2026; Leonardou et al., 2022).

Several studies report that digital games, augmented reality, and electronic game-based learning effectively improve students' understanding of mathematical concepts, particularly multiplication and basic arithmetic operations. Nevertheless, the effectiveness of these technologies often depends on adequate technological infrastructure, teachers' digital competence, and students' familiarity with digital learning environments, factors that are not consistently addressed across the literature (Al-Barakat & AlAli, 2025; Rebollo et al., 2021; Nanchadee et al., 2025).

Research also suggests that collaborative and competitive game formats promote active participation, peer interaction, and learning motivation by encouraging students to solve mathematical problems collectively. Despite these positive findings, relatively few studies directly compare different game mechanics or identify which game designs are most effective for specific mathematical topics, age groups, or learning objectives (Plass et al., 2013; Van Putten et al., 2020; Jimenez et al., 2011).

The literature consistently indicates that game-based learning enhances students' enthusiasm, motivation, and learning outcomes in mathematics by promoting active participation and creating engaging learning experiences. However, many studies focus primarily on immediate improvements in engagement and achievement, while relatively few investigate whether these benefits are sustained over time or transferred to broader mathematical competencies (Panjaitan & Dasari, 2024; Maghfiroh et al., 2024; Rahayu et al., 2025).

Several studies demonstrate that digital games, computer-based multiplication games, and game-oriented instructional models effectively strengthen students' conceptual understanding of multiplication and multiplicative reasoning. Nevertheless, the effectiveness of these approaches depends not only on the quality of the game design but also on teachers' instructional facilitation, students' prior mathematical knowledge, and access to appropriate technological resources, factors that are often insufficiently examined in existing research (Kamaruddin et al., 2022; Bakker et al., 2014; Bakker et al., 2016).

Research further suggests that well-designed educational games incorporating motivational techniques and sound pedagogical principles can improve learners' cognitive engagement while reducing the cognitive burden often associated with mathematics learning. Despite these promising findings, relatively few studies compare different game mechanics, assessment strategies, or instructional designs to determine which approaches are most effective for developing specific mathematical skills across diverse learner populations (Leonardou et al., 2020; Es-Sajjade & Paas, 2020; Kärki et al., 2025).

Recent studies also highlight the potential of games to improve multiplication skills across various educational contexts, including primary education and special education, demonstrating that playful learning can support both conceptual understanding and procedural fluency. However, much of the available evidence is based on short-term interventions conducted in controlled settings, leaving limited understanding of the long-term educational impact and classroom scalability of game-based mathematics instruction. Future research should therefore employ longitudinal and comparative experimental designs to examine how different game-based approaches influence mathematical reasoning, problem-solving abilities, and sustained learning motivation across diverse educational environments (Sylejmani et al., 2025; Bakker et al., 2016; Panjaitan & Dasari, 2024).

Furthermore, recent studies indicate that both digital and traditional games can improve students' interest and achievement in multiplication learning, highlighting the importance of playful instructional strategies across diverse educational contexts. However, much of the existing evidence is based on short-term interventions, leaving limited understanding of the sustained impact of game-based learning on mathematical achievement and higher-order thinking. Future research should employ longitudinal and experimental designs, incorporate objective learning performance measures, and compare digital, traditional, and hybrid game-based approaches to determine their relative effectiveness in mathematics education (Pratiwi et al., 2025; Suhantiningsih, 2025; Shahril & Hanafi, 2026).

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Although research on Game-Based Learning in elementary mathematics is growing, the specific implementation of the Tug of War game for teaching multiplication in second-grade classes, especially in the context of Madrasah Ibtidaiyah in rural areas, is still limited. Therefore, this classroom action research aims to describe the implementation of the interactive Tug of War game and analyze its effectiveness in increasing students' enthusiasm in learning multiplication at MI NU Mathalibul Huda Mlonggo.

This article is structured as follows: Section 2 explains the research method, Section 3 presents the results and discussion of the implementation in two cycles, and Section 4 provides conclusions and recommendations.

2. Method

This study used a Classroom Action Research (CAR) approach to address the problem of low student enthusiasm in mathematics learning. Classroom Action Research was chosen because it allows teachers to systematically improve learning practices in their own classrooms through reflective cycles (Kemmis & McTaggart, 1988; Arikunto, 2019). The research followed the spiral model developed by Kemmis and McTaggart, which consists of four interconnected stages: Planning, Acting, Observing, and Reflecting. This research was conducted in two cycles until the success indicators were achieved.

2.1 Research Setting and Participants

The research was conducted at Madrasah Ibtidaiyah (MI) NU Mathalibul Huda Mlonggo, located in Desa Jambu, Kecamatan Mlonggo, Kabupaten Jepara, Central Java, Indonesia. The school is a private Islamic educational institution founded in 1935 with NPSN 60712557. The study took place in Class 2F during the even semester of the 2025/2026 academic year.

The participants consisted of 35 students (15 males and 20 females) with an average age of 7–8 years. Most students came from families with modest economic backgrounds, primarily farmers, fishermen, and craftsmen. Based on initial observations, these students were generally active and cheerful during physical activities and games but tended to become passive, easily bored, and less focused during conventional mathematics lessons. Their initial understanding of multiplication concepts was also relatively low.

The researchers served as the practitioner (teacher) while collaborating closely with the homeroom teacher. This dual role enabled direct observation and immediate reflection during the learning process.

2.2 Research Procedure

The implementation of the interactive Tug of War game was carried out in two cycles, with each cycle consisting of one meeting lasting 2 × 35 minutes.

Cycle I was held on June 12, 2026. The planning stage included preparing the Lesson Implementation Plan (RPP), multiplication questions (factors 1–5), Tug of War props, observation sheets, and student worksheets. Students were divided into two large groups. In the core activity, each group had to answer multiplication questions correctly to earn the right to pull the rope. Correct answers granted points and pulling power, while incorrect answers resulted in lost turns.

Cycle II was implemented on June 13, 2026, based on the reflection from Cycle I. Improvements were made, including: (1) dividing students into smaller groups of 4–5 students to increase individual participation, (2) adding more varied questions including simple word problems, (3) providing clearer game rules, and (4) incorporating appreciation elements such as stickers, applause, and verbal praise. The material focused on multiplication (6–10) and simple story problems.

The game procedure in both cycles integrated cognitive, psychomotor, and affective aspects: students discussed in groups, answered questions, and engaged in physical tug-of-war activities while practicing collaboration and healthy competition.

2.3 Data Collection Techniques

To ensure the validity and reliability of the data, this study used triangulation of data collection techniques:

(1) Observation The main technique used structured observation sheets. In the initial observation and during each cycle, five main indicators of enthusiasm were observed: (1) activeness in asking and answering questions, (2) expressing opinions/ideas, (3) participation in learning activities, (4) attention and concentration, and (5) expressions of joy and spirit. Observations were conducted simultaneously by the researcher and the collaborating teacher.

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(2) Questionnaire A closed questionnaire with 10 statements (using Likert scale: Strongly Agree, Agree, Disagree, Strongly Disagree) was distributed to students at the end of each cycle. The instrument was developed based on indicators from Khosiyati (2010), Afdhal (2015), and Sardiman (2018).
(3) Learning Achievement Test Pre-test and post-test were administered to measure students' mastery of multiplication concepts as supporting data.
(4) Documentation Documentation included photographs of learning activities, field notes, student worksheets, and video recordings (with permission).

2.4 Data Analysis Technique

Data analysis was carried out both quantitatively and qualitatively. Quantitative data from observations and questionnaires were analyzed descriptively by calculating the percentage of active students using the formula: Percentage = (Number of students showing the indicator / Total number of students) × 100%
The percentage results were then categorized into five levels: Very High (81–100%), High (61–80%), Moderate (41–60%), Low (21–40%), and Very Low (0–20%).

Qualitative data from field notes, reflections, and documentation were analyzed using the interactive model of Miles and Huberman (2014), which includes data reduction, data presentation, and conclusion drawing/verification.

The success criteria of this action research were: (1) an increase in the average student enthusiasm score of at least 30 points from the initial condition (minimum 70% or High category), (2) improvement in each enthusiasm indicator, and (3) positive student responses toward the learning process.

3. Results and Discussion

3.1 Results

This section presents the findings from the two cycles of the classroom action research on the implementation of the interactive Tug of War game to enhance students' enthusiasm in learning multiplication.

Pre-Cycle Condition Before the intervention, an initial observation was conducted in January 2026. The average level of student enthusiasm was very low at only 23.4%. Most students appeared passive, rarely asked questions, were reluctant to express opinions, and easily lost focus during mathematics lessons. This condition confirmed the need for innovative learning media.

Cycle I Cycle I was implemented on June 12, 2026, focusing on basic multiplication (1–5). Students were divided into two large groups. The implementation of the Tug of War game created a lively atmosphere. Students showed increased enthusiasm, especially during the physical pulling activity and when their group succeeded. Observation results indicated that the average enthusiasm level rose to 74% (High category). However, some limitations were still found: several students were shy to come forward, group coordination was not optimal due to large group sizes, and some students were still confused about the rules at the beginning.

Cycle II Based on the reflection of Cycle I, improvements were made in Cycle II (June 13, 2026). Students were divided into smaller groups (4–5 students), rules were explained more clearly, and appreciation was added. The material covered multiplication (6–10) and simple word problems. The learning process ran more smoothly and livelier. Students became more confident, actively discussed in groups, and showed high spirit during the game. The average enthusiasm level increased to 87% (Very High category). The percentage of students showing active behavior in all indicators (asking questions, expressing opinions, participation, attention, and joy) also improved significantly.

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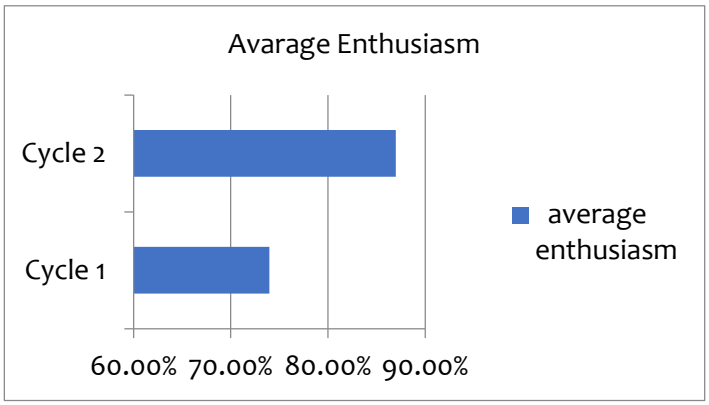

Supporting data from the learning achievement test showed that the number of students who achieved mastery increased substantially from Cycle I to Cycle II. In addition, student responses through questionnaires also showed positive perceptions toward the game, with most students stating they felt happy, not bored, and motivated to learn mathematics.

3.1.1 Pre-Cycle Condition: Students' Initial Enthusiasm Toward Multiplication Learning

Before implementing the interactive Tug of War game, an initial classroom observation was conducted in January 2026 to identify students' level of enthusiasm during multiplication lessons. The observation focused on five behavioural indicators of learning enthusiasm: (1) paying attention to the teacher's explanation, (2) asking questions, (3) expressing opinions or answers, (4) actively participating in learning activities, and (5) showing positive emotional responses such as enjoyment, confidence, and willingness to complete learning tasks. These indicators were selected because they represent observable manifestations of students' engagement during classroom instruction.

The preliminary findings revealed that students demonstrated a relatively low level of enthusiasm toward mathematics, particularly multiplication learning. The average enthusiasm score reached only 23.4%, placing the class in the very low category. This finding indicated that fewer than one-quarter of the expected enthusiastic learning behaviours were consistently displayed throughout the lesson.

Observation data showed that students generally assumed passive roles during mathematics instruction. Most students remained silent while the teacher explained multiplication concepts and rarely initiated interaction by asking questions. Even when the teacher invited students to respond, only a small number volunteered answers, while the majority preferred to avoid eye contact or waited for classmates to respond first. Students who were uncertain about multiplication facts often chose to remain silent rather than attempt an answer, suggesting limited confidence in their mathematical abilities.

Attention during instruction was also inconsistent. Although students initially focused on the teacher, their concentration gradually declined as the lesson progressed. Several students became distracted by conversations with classmates, played with classroom materials, or directed their attention toward unrelated activities. Such distractions frequently interrupted the instructional flow and reduced opportunities for meaningful mathematical discussion.

Participation in learning activities likewise remained minimal. During guided exercises, many students relied heavily on teacher assistance instead of attempting to solve multiplication problems independently. Collaborative interaction among classmates occurred infrequently because students tended to wait for direct teacher guidance rather than discuss possible solutions with peers. Consequently, classroom interaction remained largely teacher-centred, with students functioning primarily as passive recipients of information.

The emotional atmosphere during mathematics lessons further reflected students' limited enthusiasm. Several students appeared hesitant, anxious, or uninterested whenever multiplication exercises were introduced. Some expressed that multiplication was difficult to understand, while others completed activities only because they were instructed to do so. Expressions of enjoyment, excitement, or curiosity toward mathematics were rarely observed throughout the lesson.

These initial observations clearly demonstrated that conventional instructional approaches had not sufficiently stimulated students' active engagement in multiplication learning. Although the teacher delivered explanations systematically, the absence of interactive learning experiences appeared to

Kajian Pendidikan, Seni, Budaya, Sosial, dan Lingkungan, Volume 01 Number 01 (Juni 2026), p. 01-01
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contribute to declining attention, limited participation, and reduced motivation. The findings therefore confirmed the necessity of introducing an innovative instructional strategy capable of combining cognitive learning with enjoyable physical interaction. The Tug of War game was subsequently selected as an intervention because it integrates teamwork, competition, movement, and multiplication practice within a single learning activity.

3.1.2 Cycle I: Initial Implementation of the Interactive Tug of War Game

Cycle I was conducted on **12 June 2026** and focused on multiplication facts involving numbers **1 to 5**. The instructional objective was to introduce multiplication concepts through an interactive game that encouraged active participation while reinforcing students' computational skills. Prior to beginning the lesson, the teacher explained the objectives of the activity, demonstrated the game procedures, and introduced the classroom rules governing participation.

Students were divided into two large teams, each consisting of approximately half of the class. Every team competed by answering multiplication questions correctly to earn opportunities to pull the rope toward their side. The physical movement associated with the Tug of War game immediately attracted students' attention because it differed considerably from their usual classroom learning experiences.

During the early stages of implementation, students displayed considerable excitement and curiosity. Many eagerly anticipated their turn to participate, while classmates enthusiastically supported team members by providing encouragement and applause. The competitive yet cooperative nature of the activity created an energetic classroom atmosphere in which students remained attentive throughout the lesson.

Compared with the pre-cycle condition, substantial improvements were observed across all indicators of learning enthusiasm. Students paid closer attention to multiplication questions because correct answers directly influenced their team's performance. They became more willing to volunteer responses and demonstrated greater confidence when solving multiplication problems publicly. The possibility of contributing to team success appeared to reduce students' fear of making mistakes and encouraged greater classroom participation.

The physical component of the game also contributed significantly to maintaining students' concentration. Instead of remaining seated throughout the lesson, students alternated between cognitive problem-solving and physical movement. These frequent changes in activity reduced boredom and helped sustain students' interest over the duration of the mathematics lesson.

Observation results showed that the average enthusiasm score increased dramatically from 23.4% during the pre-cycle observation to 74% in Cycle I, placing classroom enthusiasm within the **high** category. This substantial improvement suggested that integrating game-based learning with physical activity effectively transformed students' attitudes toward multiplication learning.

Despite these encouraging outcomes, classroom observations also identified several challenges requiring improvement. First, some students remained reluctant to participate actively despite the enjoyable learning environment. These students tended to allow more confident classmates to answer multiplication questions, indicating that confidence had not yet developed equally across all learners.

Second, the relatively large team sizes created coordination difficulties. Because many students belonged to each team, opportunities for individual participation became somewhat limited. Several students waited for extended periods before actively contributing to the game, reducing overall engagement for those individuals.

Third, a number of students initially experienced confusion regarding the game procedures. Although the teacher explained the rules before beginning the activity, several participants required repeated clarification during implementation. This occasionally interrupted the flow of the lesson and slowed the pace of classroom activities.

Finally, although competition generated excitement, some students focused primarily on winning rather than carefully considering multiplication answers. As a result, a few responses were delivered impulsively without sufficient calculation. These observations suggested that modifications were necessary to achieve a better balance between enjoyment and meaningful mathematical learning.

The reflection conducted after Cycle I concluded that the Tug of War game had demonstrated considerable potential for increasing learning enthusiasm. However, adjustments in group organization, instructional clarity, and motivational reinforcement were required to maximize its educational effectiveness during the subsequent cycle.

Kajian Pendidikan, Seni, Budaya, Sosial, dan Lingkungan, Volume 01 Number 01 (Juni 2026), p. 01-01
e-issn **3047-4124**
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3.1.3 Cycle II: Improved Implementation and Increased Learning Enthusiasm

Based on the reflection from Cycle I, several modifications were introduced during Cycle II, which was implemented on 13 June 2026. These improvements aimed to increase individual participation, improve classroom organization, and strengthen students' confidence while maintaining the enjoyable characteristics of the Tug of War activity.

The first major improvement involved reducing group size. Instead of forming two large teams, students were organized into small groups consisting of four to five members. This arrangement significantly increased opportunities for every student to participate directly in answering multiplication questions and contributing to team success.

The second improvement involved providing clearer demonstrations of the game procedures before beginning the activity. The teacher modelled each stage of the game, explained scoring procedures more systematically, and allowed students to ask questions before the competition started. As a result, students entered the activity with greater understanding of the rules, reducing interruptions during implementation.

The learning material was also expanded beyond multiplication facts involving numbers one through five. Cycle II focused on multiplication involving numbers six to ten, together with simple multiplication word problems requiring students to apply multiplication concepts in everyday situations. This adjustment enabled the teacher to evaluate whether the game remained effective when students encountered more challenging mathematical tasks.

Additional motivational reinforcement was introduced through verbal praise, applause, and simple classroom appreciation for active participation rather than merely rewarding winning teams. This approach encouraged students to value effort, cooperation, and persistence throughout the learning process.

The classroom atmosphere during Cycle II became noticeably more dynamic and collaborative than during the previous cycle. Students displayed greater confidence when answering multiplication questions and actively discussed possible solutions with teammates before providing responses. Rather than depending solely on high-achieving classmates, most group members contributed ideas during problem-solving activities.

Students also demonstrated stronger emotional engagement throughout the lesson. Expressions of excitement, laughter, encouragement, and mutual support were consistently observed as groups competed enthusiastically while maintaining positive sportsmanship. Even students who had previously shown hesitation became increasingly willing to participate because the smaller group format reduced feelings of anxiety and increased individual responsibility.

Observation results revealed further improvement across all indicators of learning enthusiasm. Students maintained attention more consistently during teacher explanations, participated actively during discussions, asked more questions when uncertain, expressed opinions more confidently, and demonstrated greater enjoyment throughout the learning activities.

The average enthusiasm score increased from 74% in Cycle I to 87% in Cycle II, placing overall classroom enthusiasm within the very high category. This improvement indicates that the refinements introduced after the first cycle successfully enhanced both the effectiveness of the Tug of War game and students' active engagement in multiplication learning.

3.1.4 Supporting Evidence from Learning Achievement and Student Responses

The observational findings were further supported by students' learning achievement and questionnaire responses collected at the conclusion of each cycle.

Learning achievement tests administered after each cycle demonstrated that improvements in learning enthusiasm were accompanied by better mathematical performance. During Cycle I, several students still experienced difficulties applying multiplication concepts accurately, particularly when solving unfamiliar problems. Nevertheless, the majority demonstrated better understanding than during the pre-cycle condition.

Following the improvements implemented in Cycle II, the number of students achieving the predetermined mastery criterion increased substantially. Students completed multiplication exercises with greater confidence and accuracy while requiring less teacher assistance. Performance improvements were particularly noticeable when students solved multiplication word problems, suggesting that increased engagement during the game contributed to deeper conceptual understanding rather than simple memorization.

Kajian Pendidikan, Seni, Budaya, Sosial, dan Lingkungan, Volume 01 Number 01 (Juni 2026), p. 01-01
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Student questionnaire responses likewise provided strong evidence supporting the effectiveness of the Tug of War game. Most students indicated that they enjoyed learning mathematics through game-based activities because the lessons felt more interesting and less monotonous than conventional instruction. Many students stated that the combination of physical movement, teamwork, and competition motivated them to participate actively throughout the lesson.

Several students reported that they no longer felt afraid of making mistakes because the collaborative nature of the game encouraged mutual support among teammates. Others expressed that mathematics became easier to understand because learning occurred through enjoyable practice rather than repetitive individual exercises.

Students also indicated that they preferred learning multiplication through interactive games because the activities reduced boredom and helped them maintain concentration throughout the lesson. Many participants stated that they looked forward to future mathematics lessons using similar instructional approaches.

Taken together, the observation results, learning achievement tests, and student questionnaire responses consistently demonstrate that the interactive Tug of War game successfully enhanced students' enthusiasm for learning multiplication. The intervention not only created a more enjoyable classroom atmosphere but also promoted active participation, strengthened collaborative learning, improved confidence, and contributed to better mathematics achievement. These findings suggest that integrating physical games with mathematics instruction represents an effective strategy for transforming traditionally passive learning environments into engaging, student-centred classrooms that support both cognitive development and positive learning attitudes.

3.2 Discussion

The results of this study indicate that the implementation of the interactive Tug of War game was effective in increasing students' enthusiasm in learning multiplication. The significant increase from 23.4% (pre-cycle) to 87% (Cycle II) demonstrates the success of this intervention.

The effectiveness of the Tug of War game can be explained through several aspects. First, the integration of physical activity with cognitive tasks (multiplication questions) is highly suitable for second-grade students who have kinesthetic and visual learning styles. This finding aligns with previous research stating that game-based learning increases student engagement by combining movement and academic content (Islami et al., 2025; Na'im, 2025).

Second, the element of healthy competition and teamwork in the game encouraged collaboration and responsibility. Students not only solved problems individually but also helped each other in groups, which strengthened social skills and intrinsic motivation. This is in line with the findings of Rahmawati et al. (2025) regarding the benefits of traditional games in developing social values and cultural awareness.

Third, the fun and non-monotonous learning atmosphere reduced mathematics anxiety and changed students' perception that mathematics is a difficult subject. The increase in test scores also showed that higher enthusiasm contributed to better conceptual understanding.

Compared to conventional methods, the Tug of War game created a more student-centered learning environment. The results of this study support the broader theory of Game-Based Learning (GBL) which states that games can increase motivation, participation, and learning outcomes in elementary mathematics (Paulina et al., 2023; A'yun et al., 2026). However, this research also highlights the importance of continuous reflection and improvement between cycles so that the game can be adapted to the characteristics of the students.

Some limitations were noted, such as the need for adequate space for physical activities and time management during the game. Nevertheless, overall, the interactive Tug of War game proved to be an effective, fun, and culturally relevant innovation for teaching mathematics in elementary schools.

The findings of this classroom action research demonstrate that the implementation of the interactive Tug of War game significantly increased students' enthusiasm for learning multiplication. The steady improvement in students' enthusiasm, from 23.4% during the pre-cycle observation to 74% in Cycle I and 87% in Cycle II, indicates that integrating game-based learning into mathematics instruction can substantially transform classroom engagement. Beyond the numerical increase, qualitative observations also revealed meaningful changes in students' classroom behaviour. Students became more attentive to teacher explanations, participated more actively in discussions, expressed greater confidence when answering multiplication questions, collaborated more effectively with classmates, and displayed more

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positive emotional responses throughout the learning process. These findings suggest that the Tug of War game functioned not merely as a recreational activity but as an instructional strategy capable of improving both students' behavioural engagement and the overall quality of mathematics learning.

One important explanation for the effectiveness of the intervention relates to the developmental characteristics of young elementary school learners. Second-grade students generally possess high levels of physical energy, relatively short attention spans, and strong preferences for concrete, interactive learning experiences. Conventional mathematics instruction, which frequently emphasizes individual seatwork and teacher-centred explanations, may not adequately accommodate these developmental needs. Consequently, students often lose concentration, become passive, or perceive mathematics as monotonous and difficult. The Tug of War game addressed these challenges by integrating physical movement with cognitive problem-solving. Students alternated between answering multiplication questions and participating in enjoyable physical activities, allowing them to remain mentally and physically engaged throughout the lesson. Such integration corresponds with constructivist perspectives suggesting that children learn more effectively when actively involved in meaningful learning experiences that combine action, interaction, and reflection. Previous studies similarly conclude that game-based learning enhances student engagement because movement and play naturally sustain children's attention while supporting academic learning (Islami et al., 2025; Na'im, 2025).

The physical dimension of the Tug of War game also appears to have contributed significantly to maintaining students' concentration during mathematics instruction. Young learners often experience cognitive fatigue when required to maintain prolonged attention during abstract mathematical explanations. Incorporating physical movement into learning activities provides opportunities for brief cognitive refreshment while maintaining instructional continuity. Rather than distracting students from learning objectives, the physical activity became directly connected to successful mathematical performance. Students recognized that answering multiplication questions correctly enabled their team to participate successfully in the game, thereby strengthening the relationship between academic effort and enjoyable classroom experiences. This finding supports educational theories suggesting that active learning environments facilitate sustained attention by reducing boredom and increasing students' emotional investment in instructional activities.

A second important factor contributing to the intervention's success concerns the integration of healthy competition and collaborative teamwork. Throughout both research cycles, students worked together to solve multiplication problems before participating in the Tug of War activity. Unlike traditional competitive classroom environments where students compete individually for recognition, this intervention emphasized collective success. Every team member contributed to achieving shared goals, encouraging cooperation rather than excessive individual competition. As students discussed multiplication answers, encouraged one another, and celebrated collective achievements, they simultaneously developed mathematical understanding and interpersonal skills.

The collaborative nature of the game appeared particularly beneficial for students who initially demonstrated limited confidence in mathematics. During the pre-cycle observation, many students hesitated to answer multiplication questions publicly because they feared making mistakes. However, the group-based learning environment reduced individual anxiety by distributing responsibility among team members. Students became increasingly willing to contribute ideas because they received encouragement from classmates rather than facing evaluation individually. This supportive social interaction gradually strengthened students' confidence, allowing more learners to participate actively during classroom discussions. Such findings reinforce previous research demonstrating that cooperative game-based learning not only enhances academic engagement but also promotes communication skills, peer collaboration, and social responsibility among elementary school students (Rahmawati et al., 2025).

The intervention likewise created a more positive emotional climate for mathematics learning. Mathematics anxiety is widely recognized as one of the factors limiting students' willingness to engage actively in mathematical tasks, particularly among younger learners. Before the intervention, several students appeared reluctant to participate because they perceived multiplication as difficult and feared providing incorrect answers. The Tug of War game gradually changed these perceptions by presenting multiplication practice within an enjoyable and supportive learning context. Students increasingly associated mathematics lessons with excitement, curiosity, teamwork, and enjoyment rather than anxiety or frustration.

Kajian Pendidikan, Seni, Budaya, Sosial, dan Lingkungan, Volume 01 Number 01 (Juni 2026), p. 01-01
e-issn **3047-4124**
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This positive emotional transformation became increasingly evident during Cycle II. Classroom observations documented frequent expressions of laughter, encouragement, applause, and enthusiastic participation throughout the learning activities. Students no longer viewed multiplication exercises as isolated academic tasks but rather as meaningful components of an enjoyable classroom experience. Positive emotions are known to facilitate learning by increasing motivation, enhancing attention, and improving information processing. Therefore, the increased enthusiasm observed in this study likely contributed not only to improved classroom participation but also to deeper conceptual understanding of multiplication.

The improvement in students' learning achievement further supports the relationship between enthusiasm and academic performance. Although the primary objective of this research was to enhance learning enthusiasm, achievement test results indicated that students' conceptual understanding of multiplication also improved throughout the intervention. The number of students achieving mastery increased substantially from Cycle I to Cycle II, suggesting that greater engagement during learning activities contributed positively to mathematical understanding. Students who actively participated in answering questions, discussing multiplication strategies, and collaborating with teammates gained more opportunities to reinforce multiplication concepts through repeated meaningful practice.

These findings support the broader theoretical framework of Game-Based Learning (GBL), which argues that educational games promote learning by combining cognitive challenges with motivational elements such as curiosity, achievement, immediate feedback, cooperation, and enjoyment. Rather than functioning merely as entertainment, educational games create learning environments in which students become intrinsically motivated to solve academic problems because successful learning directly contributes to meaningful game experiences. Previous studies similarly conclude that well-designed mathematics games improve students' motivation, classroom participation, and learning outcomes by transforming abstract mathematical concepts into engaging instructional activities (Paulina et al., 2023; A'yun et al., 2026).

An additional contribution of the present study concerns the importance of reflective improvement throughout the classroom action research process. Although Cycle I produced substantial increases in learning enthusiasm, classroom observations identified several limitations, including oversized learning groups, unclear game procedures for some students, and unequal participation among group members. Rather than viewing these issues as failures, they served as valuable information guiding instructional improvements during Cycle II. Modifications such as reducing group size, providing clearer explanations of game procedures, and emphasizing appreciation for participation significantly improved classroom implementation. Consequently, students demonstrated higher confidence, greater cooperation, and increased enthusiasm during the second cycle.

This finding illustrates one of the principal strengths of classroom action research, namely its cyclical process of planning, implementation, observation, reflection, and revision. Educational innovations rarely achieve optimal effectiveness during their initial implementation. Continuous reflection enables teachers to adapt instructional strategies according to students' characteristics, classroom dynamics, and observed learning needs. Therefore, the success of the Tug of War game cannot be attributed solely to the instructional medium itself but also to the teacher's willingness to evaluate and refine implementation procedures systematically.

Despite the encouraging findings, several limitations should be acknowledged. First, the implementation of the Tug of War game required adequate classroom space to ensure students could participate safely in physical activities. Schools with limited physical facilities may need to modify the game format or conduct activities in larger open spaces. Second, careful time management proved essential because organizing teams, explaining rules, and conducting game sessions required additional instructional time compared with conventional teaching methods. Teachers must therefore balance game activities with curriculum objectives to ensure sufficient opportunities for explanation, discussion, and assessment.

Another limitation concerns the scope of the study. The research involved a single second-grade classroom in one elementary school, limiting the generalizability of the findings to broader educational contexts. Student characteristics, school culture, teacher experience, and available learning resources may influence the effectiveness of game-based learning in different settings. Future research could therefore investigate the implementation of the Tug of War game across multiple schools, different grade levels, and various mathematical topics to determine the consistency of its educational benefits. Experimental research

Kajian Pendidikan, Seni, Budaya, Sosial, dan Lingkungan, Volume 01 Number 01 (Juni 2026), p. 01-01
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designs comparing the Tug of War game with other game-based learning strategies would likewise provide stronger empirical evidence regarding its relative effectiveness.

Overall, the findings demonstrate that the interactive Tug of War game represents an effective, enjoyable, and developmentally appropriate instructional innovation for teaching multiplication in elementary schools. By integrating physical movement, collaborative learning, healthy competition, and mathematical problem-solving within a single instructional activity, the intervention successfully transformed a traditionally passive learning environment into an active and student-centred classroom. The substantial improvement in students' enthusiasm, accompanied by enhanced classroom participation and better learning achievement, suggests that game-based learning can play an important role in improving both the quality of mathematics instruction and students' attitudes toward learning. Consequently, the Tug of War game offers a practical and culturally relevant alternative for elementary teachers seeking to create mathematics classrooms that are engaging, motivating, and conducive to meaningful learning.

4. Conclusion

This classroom action research has successfully demonstrated that the implementation of an interactive Tug of War game can significantly increase students' enthusiasm in learning multiplication for second-grade students at MI NU Mathalibul Huda Mlonggo. Through two cycles of action, student enthusiasm rose dramatically from an initial low level of 23.4% to 87% (Very High category) in Cycle II. This improvement was accompanied by increased active participation, better group collaboration, higher attention during lessons, and improved learning outcomes in multiplication concepts.

The findings confirm that integrating traditional games with academic content creates a joyful, active, and meaningful learning environment that aligns well with the developmental characteristics of young learners. The Tug of War game effectively combines physical activity, cognitive exercise, and social interaction, thereby addressing the common problems of passive learning and mathematics anxiety in elementary education.

This study contributes to the growing body of knowledge on game-based learning by providing empirical evidence on the adaptation of the traditional Tug of War game in mathematics instruction. The positive results suggest that culturally relevant traditional games have strong potential as innovative media in primary education, especially in rural Islamic schools.

Recommendations For teachers, it is suggested to adopt and adapt the Tug of War interactive game or similar traditional game-based approaches, particularly for abstract subjects such as mathematics. Teachers should pay attention to group size, clear rules, and gradual increases in difficulty to maximize student engagement.

For schools, providing adequate facilities and training for teachers in innovative learning media is highly recommended to support the implementation of more engaging teaching methods.

For future researchers, it is recommended to expand this study by examining the long-term effects of this game on students' mathematics achievement, retention, or its application to other subjects and different grade levels. Further research using larger samples or comparative experimental designs would also enrich the findings.

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