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Implementation of Multimedia-assisted Collaborative Game-Based Learning to Improve Competitive Spirit and Problem Solving Ability in Literacy Learning for Elementary Students

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Abstract: Implementation of Multimedia-assisted Collaborative Game-Based Learning to Improve Competitive Spirit and Problem Solving Ability in Literacy Learning for Elementary Students. **Objectives:** This study aims to analyze the effectiveness of collaborative game-based learning assisted by multimedia in improving the competitive spirit and problem solving skills of literacy learning for elementary school students. **Methods:** A quantitative research approach was used, with an experimental research design. The specific design was a one-group pre-test post-test design. The research subjects consisted of 30 grade 4-6 students from an elementary school in Surabaya. Data were collected through pre- and post-test assessments to evaluate the impact of the intervention. **Findings:** The findings revealed that the implementation of multimedia-assisted collaborative game-based learning had a significant positive effect on students' competitive spirit and problem-solving abilities. By integrating game elements with team-based collaboration, this approach enhanced students' literacy skills while fostering critical, creative, and analytical thinking. The collaborative nature of the games allowed students to engage in healthy competition, which not only boosted their motivation but also improved their teamwork and communication skills. Additionally, students developed negotiation skills and learned how to work cooperatively to achieve common goals, which are vital social competencies. **Conclusion:** In conclusion, the implementation of multimedia-assisted collaborative game-based learning proved to be an effective strategy for enhancing students' competitive spirit, problem-solving skills, and literacy development. The approach, by combining game elements with collaborative efforts, effectively promoted critical thinking and enhanced social skills, making it a promising educational tool for elementary school students. This study suggests that game-based learning, supported by multimedia, can be an engaging and effective method to improve both cognitive and social outcomes in literacy education.

Keywords: collaborative learning, game-based learning, literacy learning, competitive spirit, problem solving skills.

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INTRODUCTION

Early in life, students are in a crucial stage of cognitive and emotional development, where the cultivation of a healthy competitive spirit can encourage enthusiasm for learning and a desire for achievement. Children in their formative years are in a critical stage of cognitive and emotional development, so integrating a healthy competitive spirit and problem solving skills in literacy learning can benefit student development. Competitive spirit, if applied positively, can be a powerful motivator for primary school students (Hanh, 2020). Social Cognitive Theory explains that competition can encourage individuals to observe, imitate, and learn from the behavior of others who are more successful (Liu et al., 2022). In the context of Collaborative Game-Based Learning (CGBL), students engage in competitive activities where they observe effective strategies, imitate successful behaviors, and improve their skills. In education, competitive spirit can motivate students to work harder to acquire knowledge, hone their skills, and achieve academic goals. When combined with intrinsic motivation, such as the satisfaction of learning itself, competitive spirit can strengthen student engagement. Literacy learning is one area where this is particularly important, as students who are motivated by healthy competition may be more persistent in reading, writing, and acquiring language (Abdel-Ghany Al-Sabbagh, 2023)

Problem solving is an important skill that helps students overcome various challenges, both inside and outside the school environment. The cognitive processes involved in problem solving are complicated, including recognizing the problem, searching for relevant information, and applying the right solution (Garbuio & Lin, 2021). Reading and writing are only the beginning of what is considered literacy in primary school, but also how students use these skills to understand, analyze, and solve problems in texts and the context of everyday life. Previous research by Tan (2018) showed that competitive orientation can improve students' performance in problem solving tasks. They found that pupils with a high competitive spirit tend to seek more creative and effective solutions, especially when faced with tasks that have clear goals. This implies that when it comes to literacy instruction, students may be more motivated to understand difficult texts, write better, and actively participate in class discussions.

Competitive spirit and problem solving skills are two important aspects of literacy learning at the primary level that have significant implications for the development of increasingly competitive students. In general, many primary school students still face challenges in developing a healthy competitive spirit, which is necessary to promote academic and personal achievement without sacrificing teamwork and empathy (Linca & Matei, 2023). In addition, effective problem-solving skills are often not well honed, despite their importance for coping with various situations in everyday life. This problem is further compounded by differences in access to educational resources, where students in developing countries may have fewer opportunities to engage in activities that foster both skills (Sanz et al., 2023).

The lack of teaching strategies that effectively integrate these two aspects can affect students' cognitive development and literacy skills. In many cases, literacy learning in primary schools still focuses on basic reading and writing skills without providing enough space so that kids can hone their problem-solving abilities via intense, competitive play. Study Evcim & Arslan (2022) shows that students who are involved in problem-solving-based literacy activities, such as group discussions or critical reading competitions, tend to have better critical thinking skills and are able to solve problems more effectively. Data from PISA in 2018 showed that only 30% of Indonesian students were able to reach level 2

or higher in literacy, which indicates their capacity to comprehend written material and resolve simple issues. In addition, a survey from the Research and Development Agency of the Ministry of Education and Culture (MoEC) in 2020 revealed that only 20% of primary schools regularly hold competitive activities such as literacy competitions or problem-solving-based quizzes. This low participation in competitive activities indicates that many students do not have the opportunity to cultivate the competitive spirit and critical thinking skills that are essential in literacy (Keramati & Gillies, 2021). This suggests that there is a need for a strategy in literacy learning that is effective in developing a healthy competitive spirit and at the same time improving problem solving skills among primary school students.

Students' long-term academic and social development can be directly influenced by their competitive spirit and problem-solving skills. Failure to address these issues can cause significant disadvantages for students as they move on to higher education. Students may struggle with academic challenges in higher education due to a lack of problem-solving and critical thinking skills (Balogun et al., 2017; Raysharie et al., 2023). In addition, a weak competitive spirit can make them less motivated to excel, both at school and in everyday life. This can also reduce their competitiveness in the increasingly complex world of work that demands strategic and innovative thinking. The lack of problem-solving skills and competitive spirit will contribute to the stagnation of the caliber of human capital in Indonesia, which may hinder the country's future economic and social development (Aslam, 2021; Selvaraj et al., 2021).

The topic needs to be researched because these two aspects are basic abilities that are necessary for pupils to succeed outside of the classroom, but also in their daily lives and future. Competitive spirit can encourage students to always strive to be the best, motivate them to study harder, and build a resilient mentality (Hudig et al., 2023). Meanwhile, problem solving skills enable students to face and overcome various complex challenges, both in the context of education, career, and social life. Without adequate development of these two skills, students may find it difficult to adapt to a changing and increasingly complex world. In addition, solutions to these problems are also essential in building a younger generation that is able to compete on a global level, innovate, and contribute significantly to the progress of the nation (Azmy et al., 2023). Thus, addressing these issues will help improve the quality of education, boost student achievement, and prepare them for success in the future.

Multimedia-assisted collaborative game-based learning is employed as an innovative solution that combines the power of games and technology to facilitate more effective learning, especially in developing competitive spirit and problem solving skills. As a result, the implemented game not only serves as a tool to deliver the material but also as a means to challenge students in an environment that supports healthy competition (Negescu et al., 2021). Through collaboratively designed games, students are encouraged to work in teams, share ideas, and compete in achieving a common goal, which naturally hones their competitive spirit (Alieksieieva, 2023). Recent studies have further emphasized the effectiveness of Collaborative Game-Based Learning (CGBL) in fostering teamwork, critical thinking, and problem-solving skills, demonstrating its potential in diverse educational contexts (Mao et al., 2022a; Zahra & Neo, 2024). On the other hand, multimedia contributes significantly to improving the educational process by delivering more dynamic and interactive content. Engaging visualizations, animations, and realistic simulations allow to help

pupils understand difficult ideas in a more pleasurable and natural way. Numerous studies in the field of Educational Technology have highlighted the role of multimedia tools in enhancing student engagement and learning outcomes in game-based environments (Balalle, 2024; Chen et al., 2021). When students are faced with challenges in the game, they have to apply various strategies and problem-solving techniques to win, which effectively improves their problem solving ability.

This approach also teaches students to think critically and analytically, and encourages them to look at problems from multiple perspectives, by combining high interactivity, effective collaboration, and fun game elements with adaptive multimedia technology. Students can collaborate in groups thanks to this approach, which produces an engaging and inspiring learning environment, face challenges that demand creative problem solving, and utilize technology effectively (Franco & DeLuca, 2019). With this approach, students not only hone cooperation skills and healthy competition, but also acquire important digital skills, while experiencing learning that is fun and relevant to their future needs (Sousa & Rocha, 2019). This makes it a highly suitable option for creating an effective learning environment and preparing students for real-world challenges with strong skills.

Improving the competitive spirit and problem-solving skills of elementary students' literacy learning has been a major focus of various educational strategies. However, it is crucial to clarify how the design of CGBL specifically targets and enhances literacy skills such as reading comprehension, reading speed, and narrative writing. One effective approach is the implementation of gamification and competition-based literacy challenges, which have been shown to improve problem-solving skills by increasing student motivation and engagement through real-life relevant literacy scenarios (Guerra et al., 2024). The designed games are specifically crafted to enhance literacy by incorporating text-based challenges that promote reading comprehension, encourage writing through narrative tasks, and improve students' reading speed. Literacy competition can also act as a catalyst in developing students' analytical and problem-solving skills, giving them a chance to demonstrate and refine their literacy skills (Wang et al., 2022). Yusuf et al. (2024) stated that teaching approaches tailored to students' ability levels, for instance, Teaching at the Right Level (TaRL), have shown a positive impact on pupils' capacity for problem-solving and collaborative spirit, highlighting the importance of teaching methods that encourage collaboration in literacy learning. Other studies have shown that problem-based learning in literacy is much more efficient in enhancing problem-solving abilities than traditional methods, indicating that active learning strategies are essential for developing students' literacy competencies (Veríssimo et al., 2024).

This research offers novelty by integrating a collaborative game-based learning approach assisted by interactive multimedia to improve students' competitive spirit and problem solving skills in literacy learning in elementary schools. It is different from previous studies that focused more on game-based learning individually and in specific subjects (Yustina & Yahfizham, 2023). However, the study by Yustina & Yahfizham (2023) was limited by its exclusive focus on solo play, which ignored the potential benefits of collaborative learning environments where peer interaction can increase engagement and learning outcomes. Similarly, other studies, such as those by Lin & Guo (2021), also concentrated on the effectiveness of single-player game environments in improving reading fluency. However, these studies did not explore how collaboration within game-based environments could potentially improve students' problem-solving abilities and critical thinking skills in literacy learning.

Additionally, Patel (2019) conducted research with a sample size of only 23 students, which limits the generalizability of the findings to larger populations or different educational contexts. In contrast, this study with 30 participants addresses these limitations by offering new empirical evidence on the effectiveness of collaborative game-based learning, which integrates both competition and cooperation to foster literacy skills. The application of this approach in the Indonesian educational context, which has unique cultural characteristics and educational systems, provides added value by demonstrating the model's effectiveness in local primary schools.

The urgency of this research lies in the pressing need to improve the competitive spirit and problem-solving proficiency in literacy acquisition of elementary school pupils, given that both skills are important foundations for future academic success and daily life. In the current educational context, many students face challenges in developing these skills, which can lead to low competitiveness and a lack of ability to deal with problems effectively. An innovative alternative that can offer a more interactive and engaging learning environment and support the development of competitive spirit and problem-solving skills more holistically is a multimedia-assisted collaborative game-based learning approach. Therefore, this study aims to analyze the effectiveness of multimedia-assisted collaborative game-based learning in improving the competitive spirit and problem-solving ability of elementary school students' literacy learning. The research focuses on examining how multimedia-assisted collaborative game-based learning influences students' competitive spirit and problem-solving abilities in literacy learning.

METHOD

Participant

Primary data was collected from 30 grade 4-6 students at SD LabSchool UNESA 1 through surveys and observations. Purposive sampling was used to select students with similar initial literacy skills, equal access to technology, and participation in literacy programs. Inclusion criteria focused on basic literacy understanding, while exclusion criteria excluded students with learning disabilities. This method ensured a homogeneous and relevant sample for the study.

Research Design

In this study, experimental research methodologies are combined with a quantitative approach. One group pretest-posttest design is the study methodology employed. Before giving treatment, students are first given a pre-test question (initial test), and at the end of learning, students are given a post-test question (final test). The research design can be seen in Figure 1.

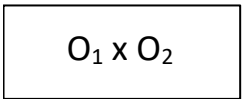

Figure 1. One Group Pre-test Post-test Design

In this study, Collaborative Game-Based Learning assisted by multimedia was applied as a treatment, as shown in Figure 1, where O1 represents the pre-test score before treatment and X represents the collaborative game-based learning treatment. After the treatment, students were given a post-test (O2) to measure changes in competitive spirit and problem-solving skills. The learning process involved several stages: in the Introduction, the teacher explained the objectives and importance of literacy with a slide presentation and short video. During the Game Introduction, the teacher introduced the game "Literacy Quest", explained the rules, and guided students in playing. In the Team Collaboration stage, students worked in small groups to complete game challenges, facilitated by the teacher using tablets or computers. Discussion and Reflection followed, where students reviewed

game results and reflected on their learning, with feedback from the teacher. Finally, in the Closing, the teacher summarized the lesson and gave individual assignments related to literacy, ensuring that the game-based learning approach was fully integrated into the curriculum.

Research Instrument

In this study, data were collected using a closed questionnaire with a Likert scale ranging from 1 to 5, aiming to capture respondents' opinions on two main variables: Competitive Spirit and Problem-Solving Ability. The Competitive Spirit Instrument consists of 12 items across four dimensions: Achievement Motivation, Critical Thinking Ability, Self-Improvement, and Self-Confidence, adapted from ries of motivation and personal development, where Achievement Motivation and Self-Confidence are key for fostering a competitive mindset (Halilsoy, 2024), Critical Thinking Ability enhances reflective decision-making in competitive settings (Ýlaslan et al., 2023), and Self-Improvement motivates individuals to enhance their skills through competition continually (Okolie et al., 2022). The Problem-Solving Ability Instrument consists of 16 items, divided into four dimensions: Understanding the Problem, Planning the Solution, Implementing the Solution, and Reevaluating, adapted from Wicaksono & Korom (2022). These dimensions were chosen based on Villa et al.'s (2023) problem-solving framework, emphasizing the critical stages of understanding, planning, implementing, and reevaluating solutions.

Data Analysis

This study's data analysis processes included administering pretest and posttest exams, and then analyzing the results using SPSS 23's validity, reliability, and paired sample t-test. This study employed the paired sample t-test to look at how primary school students' problem-solving and competitiveness levels were affected by a collaborative game-based learning approach that included multimedia.

■ RESULT AND DISCUSSION

Media Implementation

In this study, the learning media used was a collaborative-based game designed to increase students' competitive spirit and problem-solving skills in literacy learning. The game engages students in an interactive and fun activity, where they work in teams to complete learning tasks related to literacy materials. Table 1 below shows the media implementation in the learning syntax.

Table 1. Syntax of multimedia-assisted collaborative game-based learning

Stage	Teacher's Activity	Students' Activity	Media Used
Introduction	The teacher explains the learning objectives and the importance of literacy.	Listening, asking questions, and sharing experiences.	Slide presentation, short video about literacy.
Game Introduction	1. The teacher introduces the game to be used in the lesson. 2. The teacher gives instructions on how to play the game.	Listening to the instructions and understanding the game rules.	Educational game supporting literacy (e.g., word games, story puzzles).

Team Collaboration	1. The students are divided into groups to play the game collaboratively. 2. Supervise and facilitate interactions between students in groups.	Working together in groups to complete the game challenges.	Tablet/computer, multimedia-based literacy game app.
Discussion and Reflection	Moderating the discussion, providing feedback, and guiding the reflection.	Participating in the discussion and reflection.	Whiteboard, game results, and reflection notes.
Closing	1. The teacher summarizes the lesson and its relation to daily literacy. 2. The teacher gives individual assignments related to the literacy material learned.	Listening to the summary and receiving the assignment.	Slide presentation, individual assignment sheet.

Description of Learning Media: The media used in this study is a collaborative-based educational game designed to support students' literacy learning. The game involves different types of activities such as word searches, story puzzles, and text-based quizzes, which aim to improve students' reading, writing, and text comprehension skills. Each game in it is designed to present a fun challenge, while ensuring that students can learn actively and thoroughly.

Linkage to Curriculum and Learning Materials: This game is integrated with the existing literacy curriculum in primary schools. Each game used in this study is directly related to the basic competencies targeted in the literacy curriculum, such as reading, writing, and text comprehension skills. For example, the word search games and literacy puzzles are designed to train students in recognizing new words and understanding the context of sentences in texts. Thus, these media are not only engaging but also relevant to the learning objectives set by the curriculum.

Classroom Implementation: In its implementation, this collaborative-based game is used in literacy learning sessions in the classroom. Students are divided into small groups, and each group is given a challenge in the form of a game that matches the learning material. The teacher acts as a facilitator, providing instructions on how to play, monitoring the game, and ensuring productive interactions between students in the group. The use of technology, such as tablets or computers, allows students to access multimedia-based literacy games directly, which supports interactive learning. The activity is also complemented by a group discussion after playing the game, where students can share their experiences and reflect on what they have learned through the game.

Media Effectiveness

Validity Test

Validity testing is conducted to ensure that the research instrument accurately measures the

intended variables. In this study, validity tests were applied to two main aspects: competitive spirit and problem-solving ability.

The validity test results in this study show that all dimensions of Competitive Spirit and Problem-Solving Ability have r-count values greater than the r-table value of 0.361, confirming their validity. For Competitive Spirit, the Achievement Motivation dimension has r-count values ranging from 0.674 to 0.856, Critical Thinking Ability ranges from 0.694 to 0.894, Self-Improvement ranges from 0.763 to 0.862, and Self-Confidence ranges from 0.689 to 0.833, all exceeding the r-table value and showing validity. For Problem-Solving Ability, the Understanding the Problem dimension has r-count values ranging from 0.695 to 0.872, Planning the Solution ranges from 0.674 to 0.764, Implementing the Plan ranges from 0.711 to 0.821, and Reviewing ranges from 0.641 to 0.865. All dimensions in both instruments are valid, as the r-count values are greater than the r-table value of 0.361, ensuring that the instruments used in this study are valid and appropriate for further measurement.

Normality Test

The purpose of normality testing is to ensure that the data follows a normal distribution, which is necessary for conducting parametric tests. The normality testing results showed that all data sets were normally distributed, meeting the assumptions required for further statistical analysis.

The results of the normality test using the Shapiro-Wilk test showed that all data tested were normally distributed. For the competitive spirit variable, both the pretest (p value = 0.327) and posttest (p value = 0.214) had significance values greater than 0.05, indicating normal distribution. Likewise, for the problem-solving ability variable, the pretest (p value = 0.431) and posttest (p value = 0.296) both showed the same results, with p values greater than 0.05, indicating that the data were normally distributed. Thus, it can be concluded that the data from both variables meet the assumption of normality and are ready to be further analyzed using parametric tests.

Reliability Test

The purpose of reliability testing is to ensure that the research tool is internally consistent. The results of the reliability testing show that both the competitive spirit and problem-solving ability variables exhibit a high level of reliability, with both instruments demonstrating consistency and trustworthiness for use in the study.

The reliability test in this study was conducted using Cronbach's alpha to measure the internal consistency of the research instrument. The test results show that the competitive spirit variable has a Cronbach's alpha value of 0.869, which exceeds the threshold of 0.7, indicating that the instrument to measure this variable has a very good level of reliability. Likewise, the problem-solving ability variable showed a Cronbach's alpha value of 0.825, which also exceeds the threshold value of 0.7, meaning that this instrument can also be considered reliable.

Descriptive Analysis

This analysis compares pre-test and post-test results for Competitive Spirit and Problem Solving to evaluate the impact of the Multimedia-assisted Collaborative Game-Based Learning intervention. Tables 2 and 3 show the comparison of pre-test and post-test scores for the Competitive Spirit and Problem Solving dimensions, with the Gain indicating significant improvement after the intervention.

Table 2. Competitive spirit descriptive analysis results

Dimensi	Pretest		Postest		Gain
	Mean	Stdev	Mean	Stdev	
Achievement Motivation	70.97	6.283	80.33	6.418	9.36

Critical Thinking Ability	72.50	6.100	81.25	6.500	8.75
Self-Improvement	71.35	6.350	79.80	6.400	8.45
Self-Confidence	69.50	6.200	78.50	6.600	9.00

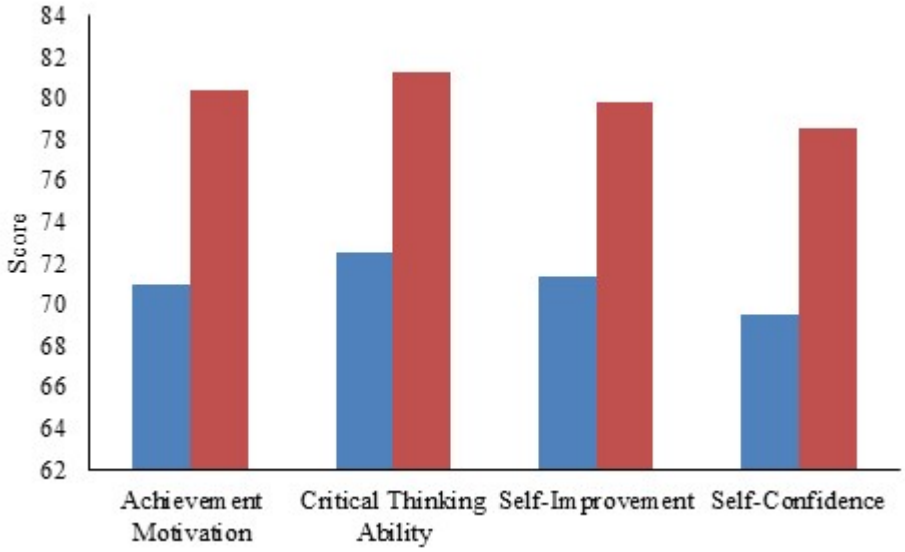

Figure 2. Competitive spirit pretest posttest scores comparison

Table 3. Problem solving descriptive analysis results

Dimensi	Pretest		Postest		Gain
	Mean	Stdev	Mean	Stdev	
Understanding the Problem	65.27	5.439	76.70	6.904	11.43
Planning the Solution	64.50	5.500	77.00	6.800	12.50
Implementing the Plan	66.00	5.300	76.50	6.900	10.50
Reviewing	65.80	5.400	77.20	6.850	11.40

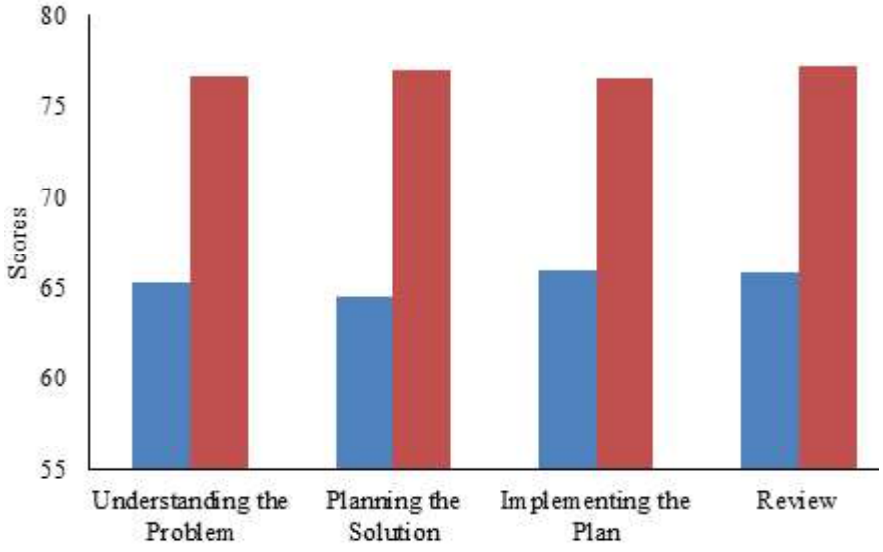

Figure 3. Problem solving pretest posttest scores comparison

The Descriptive Analysis compares pre-test and post-test results for Competitive Spirit and Problem Solving to assess the impact of the Multimedia-assisted Collaborative Game-Based Learning intervention. Significant improvements were observed across all dimensions, with positive gains in Achievement Motivation, Critical Thinking Ability, Self-Improvement, and Self-Confidence in Competitive Spirit, as well as in Understanding the Problem, Planning the Solution, Implementing the Plan, and Reviewing in Problem Solving. These results highlight the effectiveness of the intervention in enhancing students' skills.

Paired Sample t-Test

A paired sample t-test was used to compare two conditions or measurement times on the same variable, and the average was then analyzed. Tables 4 and 5 below display the study's test findings.

Tables 4 and 5 present the results of the paired sample t-test for the two main variables in this study: competitive spirit and problem-solving ability. The t-test results show significant differences between pretest and posttest scores for each dimension, with large t-values and very small Sig. (2-tailed) values (0.000) for all dimensions. The high Cohen's d values, ranging from 1.10 to 1.32, indicate very large effect sizes, suggesting that the intervention had a strong impact on both variables. Overall, these results demonstrate that the intervention significantly improved competitive spirit and problem-solving ability, with a substantial effect on each dimension tested.

Table 4. Paired sample t test results on the competitive spirit dimension

Dimension	Mean Difference	t-value	df	Sig. (2-tailed)	Cohen's d
Achievement Motivation	3.214	7.152	29	0.000	1.31
Critical Thinking Ability	2.543	6.895	29	0.000	1.25
Self-Improvement	1.864	5.904	29	0.000	1.10
Self-Confidence	1.976	5.451	29	0.000	1.17

Table 5. Paired sample t test results on the problem solving dimension

Dimension	Mean Difference	t-value	df	Sig. (2-tailed)	Cohen's d
Understand the Problem	3.251	8.246	29	0.000	1.32
Planning the Solution	2.945	7.658	29	0.000	1.28
Implementing the Plan	2.439	6.865	29	0.000	1.21
Review	2.351	6.719	29	0.000	1.18

The Effect of Collaborative Game-Based Learning on Competitive Spirit in Literacy Learning for Elementary Students

The results showed that the implementation of Collaborative Game-Based Learning showed a positive impact on the Competitive Spirit in Literacy Learning of elementary students. Collaborative Game-Based Learning combines game elements with team collaboration principles, where students work together in groups to achieve specific learning objectives through game-based activities. This approach, which includes elements of instant feedback, shared goals, and competition in games, provides opportunities for students to engage in more dynamic, enjoyable, and effective learning (Gentry et al., 2019). Instant feedback in the game environment helps students understand their performance in real-time, motivating them to improve and compete more effectively. Additionally, the shared goals aspect of teamwork encourages collaboration while allowing students to compete to achieve these

goals within the game, reinforcing both collaboration and healthy competition.

Regarding literacy, Collaborative Game-Based Learning facilitates the teaching of reading, writing, and text comprehension skills in an interactive and non-monotonous way. For example, collaboration-based games involving word searches, literacy puzzles, or text-based quizzes allow students to practice their literacy skills while honing critical and creative thinking abilities. In these activities, students are directly involved in an enjoyable learning process, which can make them more motivated to improve their literacy skills (Fusco et al., 2022). When students play, they are not just completing literacy tasks. However, they are also learning to solve problems, think analytically, and make decisions that impact the outcome of the game, which indirectly supports literacy mastery.

Collaborative game-based learning places a strong emphasis on encouraging students to develop a positive sense of competition. Unlike traditional learning approaches that prioritize individual competition, Collaborative Game-Based Learning encourages students to compete in an atmosphere that supports collaboration. Students work in teams to achieve a shared objective, but simultaneously, they also compete to win the game. This allows them to experience both sides of learning: learning to work together in a group and learning to compete constructively. In these educational games, students learn to strategize, share ideas, and communicate effectively, thus strengthening their social skills while increasing self-confidence (Drigas et al., 2020). The competitive spirit built through these games is not only instantaneous but also shapes more responsible and independent learning habits. Each dimension of competitive spirit, such as achievement motivation, self-confidence, and critical thinking, is strengthened through game-based competition. When students feel that there is an exciting element of competition, they tend to be more motivated to prepare themselves, be it by studying harder or by practicing certain literacy skills (Rahayu et al., 2022). The sense of wanting to achieve the best results in the game gives them the drive to try harder, while the element of collaboration ensures that students also learn to support each other and appreciate the efforts of their peers.

To accommodate students with different literacy levels or those less interested in competition, CGBL can be adapted by focusing more on team-based achievements rather than individual competition. For students with lower literacy levels, the game can provide easier challenges and more guidance, allowing them to progress at their own pace while still being engaged in the game. For those less inclined towards competition, the focus can be placed more on cooperative goals, fostering a sense of teamwork and mutual support, thus reducing the pressure of direct competition. This way, pupils improve not just their reading and writing abilities, but also their communication, negotiation, and teamwork skills. Thus, students not only develop their literacy skills but also social skills such as communication, negotiation, and teamwork.

In the long run, the integration of Collaborative Game-Based Learning in literacy learning can shape the character of students who are not only competitive but also have good social skills, are able to adapt to various situations, and can work effectively in teams. The competitive spirit formed through CGBL teaches them to always try to give their best, while still maintaining the spirit of collaboration and respect for differences of opinion. This is a very important attitude, especially in an increasingly complex world that requires individuals who are able to work together, innovate, and compete in a healthy manner. Collaborative game-based learning helps students become better readers and writers, but it also helps them become better competitors and better team players.

The Effect of Collaborative Game-Based Learning on Problem Solving Ability in Literacy Learning for Elementary Students

The results showed that the implementation of Collaborative Game-Based Learning showed a positive impact on the Problem Solving Ability in Literacy Learning of pupils in elementary school. In Collaborative Game-Based Learning, students are given various challenges that are not only related to literacy skills, such as reading and writing, but also involve complex problem solving in the form of games (Mao et al., 2022). For example, literacy puzzles or text-based quizzes that require students to find solutions to given problems. In this situation, pupils must not only comprehend the text or find specific words, but they also have to solve problems related to the game context, such as looking for patterns or identifying hidden information. This process hones their cognitive skills to think more critically and analytically, as they have to assess the situation, search for information, and formulate an appropriate solution (Yafie et al., 2020).

In addition, Collaborative Game-Based Learning strengthens students' problem solving skills by emphasizing four key dimensions of problem solving: identifying the problem, planning the solution, implementing the solution, and reviewing the results. In each collaborative game, students work in groups to complete a common task. They must discuss, share ideas, and unify strategies to achieve a common goal (Laakso et al., 2021). This process of collaboration involves scaffolding, where students learn from each other, share insights, and provide feedback that enhances their understanding of the problem-solving process. They may also engage in trial and error, testing different approaches and learning from mistakes together. This collaboration fosters cognitive and social mechanisms such as negotiation, critical thinking, and adaptability. These interactions help students improve their communication and problem-solving abilities while learning to appreciate different perspectives and work efficiently as a team (Perry et al., 2023). Thus, the ability to solve problems acquired is not only individual but also collaborative, helping students enhance their analytical thinking, teamwork, and adaptability. These skills are valuable both socially and academically.

The application of Collaborative Game-Based Learning also gives students a chance to overcome challenges in a more enjoyable and less stressful way (Amran et al., 2021). Challenging game-based learning motivates students to keep trying despite difficulties (Yafie et al., 2021). They see mistakes as part of the educational process that requires adjustment. They see mistakes as part of the educational process that requires adjustment. Engaging in games provides a fun experience, so students feel more comfortable trying different solutions without fear of failure. This is very important in developing problem solving skills, as students are not only taught to find the correct solution, but also to overcome frustration and adapt to changing situations. Through this approach, students enhance their reading comprehension as well as their capacity to think creatively, find solutions in various contexts, and manage challenges positively and productively.

CONCLUSION

The findings of this study indicate that the use of Collaborative Game-Based Learning significantly contributes to enhancing elementary students' competitive spirit and problem-solving abilities in literacy learning. Through the combination of game mechanics and collaborative principles, this approach not only strengthens students' literacy competencies but also develops critical, creative, and analytical thinking skills. Working in teams to achieve shared goals while engaging in healthy competition helps foster essential social skills such as communication, negotiation, and cooperation. Moreover, the engaging and enjoyable nature of this learning model increases student motivation, encouraging

them to confront challenges constructively and persist in solving problems. Therefore, Collaborative Game-Based Learning emerges as an effective strategy for promoting both academic and socio-emotional development in literacy education.

Future studies are encouraged to explore the long-term impact of Collaborative Game-Based Learning on students' academic performance and social development across diverse educational settings and grade levels. Expanding the sample size and including schools from various regions would enhance the generalizability of the findings. In addition, further research could investigate the role of teacher training and digital literacy in optimizing the implementation of multimedia-supported game-based learning. Exploring different types of games, subjects beyond literacy, and integrating affective and motivational measurements could also provide a more comprehensive understanding of how this approach influences student learning outcomes holistically.

REFERENCES

Alieksieieva, H. (2023). Global partnership in education as an enhancement of university prestige and economic impact. *American Journal of Biomedical Science & Research*, *20*(5), 509–517. https://doi.org/10.34297/AJBSR.2023.20.002742

Abdel-Ghany Al-Sabbagh, A.. (2023). Enhancing English language skills through gamification: A case study at Umm Al Quwain University. *International Journal of Instructional Technology and Educational Studies*, *4*(3), 29–43. https://doi.org/10.21608/ihites.2023.240979.1163

Amran, A., Jalil, H. A., Muhamad, M., & Nasharuddin, N. A. (2021). Factors contributing to collaborative game-based learning (CGBL) effectiveness. *Asian Social Science*, *17*(11), 1–17. https://doi.org/10.5539/ass.v17n11p1

Aslam, R. (2021). Impact of learning motivation on students' academic achievement: mediating role of constructive feedback. *Pakistan Social Sciences Review*, *5*(3), 472–484. https://doi.org/10.35484/pssr.2021(5-iii)35

Azmy, A., Pertiwi, L., Agusta, N. F., & Kwerawarni, D. T. (2023). The effect of organizational leadership, employee development, and performance management on employee engagement. *International Journal of Multicultural and Multireligious Understanding*, *10*(10), 389–403. https://doi.org/10.18415/ijmmu.v10i10.5146

Balalle, H. (2024). Exploring student engagement in technology-based education in relation to gamification, online/distance learning, and other factors: A systematic literature review. *Social Sciences & Humanities Open*, *9*, 1–10. https://doi.org/10.1016/j.ssaho.2024.100870

Balogun, A. G., Balogun, S. K., & Onyencho, C. V. (2017). Test anxiety and academic performance among undergraduates: The moderating role of achievement motivation. *The Spanish Journal of Psychology*, *20*, E14. https://doi.org/10.1017/sjp.2017.5

Chen, Y.-C., Lu, Y.-L., & Lien, C.-J. (2021). Learning environments with different levels of technological engagement: a comparison of game-based, video-based, and traditional instruction on students' learning. *Interactive Learning Environments*, *29*(8), 1363–1379. https://doi.org/10.1080/10494820.2019.1628781

Drigas, A., Dede, D. E., & Dedes, S. (2020). Mobile and other applications for mental imagery to improve learning disabilities and mental health. *International Journal of Computer Science*, *17*(4). https://doi.org/10.5281/zenodo.3987533

Evcim, Ý., & Arslan, M. (2022). An investigation

into the development of the force and energy unit through STEM integration in science courses and its effects on students' critical thinking skills. *International Journal of Psychology and Educational Studies*, *8*(3), 128-139. https://doi.org/10.52380/ijpes.2021.8.3.398

Franco, P. F., & DeLuca, D. A. (2019). Learning through action: creating and implementing a strategy game to foster innovative thinking in higher education. *Simulation and Gaming*. https://doi.org/10.1177/1046878118820892

Fusco, N. M., Jacobsen, L. J., Klem, N., Krzyzanowicz, R., & Ohtake, P. J. (2022). A serious game employed to introduce principles of interprofessional collaboration to students of multiple health professions. *Simulation and Gaming*, *53*(3), 253–264. https://doi.org/10.1177/10468781221093816

Garbuio, M., & Lin, N. (2021). Innovative idea generation in problem finding: Abductive reasoning, cognitive impediments, and the promise of artificial intelligence. *Journal of Product Innovation Management*, *38*(6), 701–725. https://doi.org/10.1111/jpim.12602

Gentry, S. V., Gauthier, A., Ehrstrom, B. L. E., Wortley, D., Lilienthal, A., Car, L. T., … Car, J. (2019). Serious gaming and gamification education in health professions: Systematic review. *Journal of Medical Internet Research*, *14*(2), 1–31. https://doi.org/10.2196/12994

Guerra, L. H. G., Juárez, G. H., Pérez-Lezama, C. V., González, E. G. Q., Campos-García, G. A., & Cacho, M. L. B. (2024). Enhancing problem-solving skills: The synergy of competitive programming and gamification strategy. *2024 IEEE Global Engineering Education Conference (EDUCON)*, 1–7. IEEE. https://doi.org/10.1109/EDUCON60312.2024.10578845

Halilsoy, T. (2024). The importance of self-confidence. *Akademik Tarih ve Dusunce Dergisi*, *11*(5), 2975–2989. https://doi.org/10.46868/atdd.2024.803

Hudig, J., Scheepers, A. W. A., Schippers, M. C., & Smeets, G. (2023). Motivational mindsets, mindset churn, and academic performance: The role of a goal-setting intervention and purpose in life. *Current Psychology*, *42*(27), 23349–23368. https://doi.org/10.1007/s12144-022-03462-8

Ýlaslan, E., Adýbelli, D., Teskereci, G., & Üzen Cura, Þ. (2023). Development of nursing students' critical thinking and clinical decision-making skills. *Teaching and Learning in Nursing*, *18*(1), 152–159. https://doi.org/10.1016/j.teln.2022.07.004

Keramati, M. R., & Gillies, R. M. (2021). Advantages and challenges of cooperative learning in two different cultures. *Education Sciences*, *12*(1), 1–14. https://doi.org/10.3390/educsci12010003

Laakso, N. L., Korhonen, T. S., & Hakkarainen, K. P. J. (2021). Developing students' digital competences through collaborative game design. *Computers and Education*, *174*, 1–15. https://doi.org/10.1016/j.compedu.2021.104308

Lin, C.-Y., & Guo, Y.-H. (2021). Enhancing EFL adolescent learners' vocabulary acquisition via online single player role-play games. *Language Literacy: Journal of Linguistics, Literature, and Language Teaching*, *5*(1), 10–22. https://doi.org/10.30743/ll.v5i1.3506

Linca, F. I., & Matei, F. L. (2023). Teamwork efficiency of students: Does the university environment contribute to the development of this competence? *Review of Psychopedagogy*, *12*(1), 81. https://doi.org/10.56663/rop.v12i1.60

Liu, Y., Tu, Y., Yang, H., Gao, J., Xu, Y., & Yang, Q. (2022). Have you "involution" today—Competition psychology scale for college students. *Frontiers in Psychology*, *13*, 1–8. https://doi.org/10.3389/fpsyg.2022.951931

Mao, W., Cui, Y., Chiu, M. M., & Lei, H. (2022). Effects of game-based learning on students' critical thinking: A meta-analysis. *Journal of Educational Computing Research*, *59*(8), 1682–1708. https://doi.org/10.1177/07356331211007098

Mejía-Villa, D. A., Torres-Guevara, D. L. E., Prieto-Sandoval, D. V., Cabra, D. J., & Jaca, D. C. (2023). Training for sustainability through biomimicry and creative problem-solving processes. *Thinking Skills and Creativity*, *49*, 1–17. https://doi.org/10.1016/j.tsc.2023.101359

Oancea Negescu, M. D., Ladaru, G. R., Vasilache, P. C., & Angheluta, P. S. (2021). Learning mobility for tertiary education in the context of globalization in the European Union. *SHS Web of Conferences*, *129*, 1–10. https://doi.org/10.1051/shsconf/202112908012

Okolie, U. C., Igwe, P. A., Mong, I. K., Nwosu, H. E., Kanu, C., & Ojemuyide, C. C. (2022). Enhancing students' critical thinking skills through engagement with innovative pedagogical practices in Global South. *Higher Education Research & Development*, *41*(4), 1184–1198. https://doi.org/10.1080/07294360.2021.1896482

Patel, K. (2019). Development of problem solving skills amongst undergraduate engineering students through a team-game-tournament collaborative learning method. *Proceedings - IEEE 10th International Conference on Technology for Education, T4E 2019*, 303–307. https://doi.org/10.1109/T4E.2019.00019

Perry, N. E., VandeKamp, K. O., Mercer, L. K., & Nordby, C. J. (2023). Investigating teacher-student interactions that foster self-regulated learning. In *Using Qualitative Methods To Enrich Understandings of Self-regulated Learning: A Special Issue of Educational Psychologist* (pp. 5–15). https://doi.org/10.4324/9781410608529-2

Raysharie, P. I., Harinie, L. T., Inglesia, N., Vita, V., Wati, S., Sianipar, B., ... & Putri, F. (2023). The Effect of Student's Motivation on Academic Achievement. Journal Pendidikan Ilmu Pengetahuan Sosial, 15(1), 168-175.

Rahayu, F. S., Nugroho, L. E., Ferdiana, R., & Setyohadi, D. B. (2022). Motivation and engagement of final-year students when using e-learning: A qualitative study of gamification in pandemic situation. *Sustainability*, *14*(14), 1–22. https://doi.org/10.3390/su14148906

Sanz, C., Coma-Roselló, T., Aguelo, A., Álvarez, P., & Baldassarri, S. (2023). Model and methodology for developing empathy: An experience in computer science engineering. *IEEE Transactions on Education*, *66*(3), 287–298. https://doi.org/10.1109/TE.2022.3231559

Selvaraj, A., Radhin, V., KA, N., Benson, N., & Mathew, A. J. (2021). Effect of pandemic based online education on teaching and learning system. *International Journal of Educational Development*, *85*, 1–11. https://doi.org/10.1016/j.ijedudev.2021.102444

Sousa, M. J., & Rocha, Á. (2019). Digital learning: Developing skills for digital transformation of organizations. *Future Generation Computer Systems*, *91*, 327–334. https://doi.org/10.1016/j.future.2018.08.048

Tan, C. Y. (2018). Examining school leadership effects on student achievement: The role

of contextual challenges and constraints. *Cambridge Journal of Education*, *48*(1), 21–45. https://doi.org/10.1080/0305764X.2016.1221885

Van Hanh, N. (2020). The real value of experiential learning project through contest in engineering design course: A descriptive study of students' perspective. *International Journal of Mechanical Engineering Education*, *48*(3), 221–240. https://doi.org/10.1177/0306419018812659

Veríssimo, C., Pereira, L., Fernandes, A., & Martinho, R. (2024). Complex problem solving as a source of competitive advantage. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(2), 1–23. https://doi.org/10.1016/j.joitmc.2024.100258

Wang, S., Peng, F., & Li, M. (2022). Enhancing the problem-solving skills of vocational students through skills competition. *Journal of Contemporary Educational Research*, *6*(12), 9–15. https://doi.org/10.26689/jcer.v6i12.4546

Wicaksono, A. G. C., & Korom, E. (2022). Review of problem-solving measurement: An assessment developed in the Indonesian context. *Participatory Educational Research*, *9*(1), 116–136. https://doi.org/10.17275/per.22.7.9.1

Yafie, E., Gonadi, L., Maningtyas, R. T., Haqqi, Y. A., Maulidia, L. N., & Azizah, A. R. (2021). Development of mobile assisted training with seamless learning basis to improve parents' parenting skill and overcome speech delay for two-year-old children. *Proceedings of the 1st International Conference on Continuing Education and Technology (ICCOET 2021)*, *589*(Iccoet), 122–128. Retrieved from https://www.atlantis-press.com/proceedings/iccoet-21/125962243%0A

Yafie, E., Samah, N. A., Mohamed, H., & Haqqi, Y. A. (2020). Collaborative mobile seamless learning (CMSL) based on android apps to improving critical thinking in higher education in the post-Covid-19 era. *Journal of Advanced Research in Dynamical and Control Systems*, *12*(SP7), 428–441. https://doi.org/10.5373/JARDCS/V12SP7/20202125

Yustina, A. F., & Yahfizham, Y. (2023). Game based learning matematika dengan metode squid game dan among us. *Jurnal Cendekia/ : Jurnal Pendidikan Matematika*, *7*(1), 615–630. https://doi.org/10.31004/cendekia.v7i1.1946

Yusuf, F. B., Firdaus, F. M., & Kadir. (2024). Enhancing problem-solving skills and spirit of mutual cooperation in mathematics learning through teaching at the right level approach. *Jurnal Ilmiah Sekolah Dasar*, *8*(1), 90–100. https://doi.org/10.23887/jisd.v8i1.68232

Zahra, I., & Neo, M. (2024). Transforming education with collaborative games: An interactive learning ecosystem to foster students' critical thinking and problem-solving skills. *17th Annual International Conference of Education, Research and Innovation*, 2439–2447. https://doi.org/10.21125/iceri.2024.0658