Jurnal Review Pendidikan Dasar:
Jurnal Kajian Pendidikan dan Hasil Penelitian
Vol 11(3), Oktober 2025

e-ISSN: 2460-8475
http://journal.unesa.ac.id/index.php/PD
https://doi.org/10.26740/jrpd.v11n3.p297-312

Enhancing Elementary School Students' Understanding of Fraction Concepts through Fraction Tower Challenge Game

Fawwaz Fuadi, Universitas PGRI Sumenep
Moh. Dawil Al Fazary Fajri, Universitas PGRI Sumenep
Putra Andika, Universitas PGRI Sumenep
Abdul Wahab✉, Universitas PGRI Sumenep
Fiena Saadatul Ummah, Universitas Negeri Surabaya
✉ abdulwahab@stkippgrisumenep.ac.id

Abstract: One of the essential competencies in elementary mathematics education is students' conceptual understanding of fractions. However, many students continue to experience difficulties in learning fractions because the material is often presented in a monotonous and abstract manner. This study aimed to improve elementary school students' conceptual understanding of fractions through the implementation of the Fraction Tower Challenge, an educational game-based learning medium. The study employed a Classroom Action Research (CAR) design consisting of two cycles, each involving the stages of planning, implementation, observation, and reflection. The participants were 18 third-grade elementary school students. Data were collected through classroom observations, documentation, and written tests administered as pre-tests and post-tests in the form of essay questions. The findings indicated that the implementation of the Fraction Tower Challenge significantly improved students' conceptual understanding of fractions. The comparison between pre-test and post-test scores in the first cycle demonstrated a substantial improvement, while the second cycle showed further progress, although the increase was less pronounced than in the first cycle. Overall, the Fraction Tower Challenge enabled students to understand fraction concepts in a more enjoyable, visual, and concrete way.

Keywords: Fraction Tower Challenge, Fraction Concept,

How to Cite: Fuadi, F., Fajri, M.D.A.F., Andika, P., Wahab., A & Ummah, F.S. (2025). Enhancing Elementary School Students' Understanding of Fraction Concepts through Fraction Tower Challenge Game. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian, 11*(3), 297-312. https://doi.org/10.26740/jrpd.v11n3.p297-312

© The Author(s) 2025

Article Info:
Received: 29 June 2025; Accepted: 14 September 2025; Published Online: 28 October 2025

Published by:
Pendidikan Dasar Universitas Negeri Surabaya

INTRODUCTION

This Mathematics is one of the fundamental subjects that plays a crucial role in the cognitive development of elementary school students. It serves as the foundation for learning various other disciplines (Wahab et al., 2024). The primary objective of mathematics education is to enable students to understand the relationships among mathematical concepts, allowing them to develop comprehensive and long-lasting conceptual understanding (Linome et al., 2025; Telaubanua, 2020). However, one of the inherent characteristics of mathematics is its abstract nature, which often becomes a significant obstacle for students in understanding mathematical concepts (Hani et al., 2024; Setiawan et al., 2020).

Mathematics is often perceived as one of the least favored and most intimidating subjects among students. This negative perception largely stems from its abstract characteristics, which require higher levels of conceptual understanding (Wahab, 2023). Since mathematics heavily involves numbers and symbols, many students struggle to comprehend its concepts, leading to reduced interest in learning. In fact, mathematics is regarded as the foundation of numerous scientific disciplines, including medicine, accounting, engineering, physics, and chemistry. Moreover, mathematical concepts are closely connected to real-life situations encountered in everyday life (Sahid et al., 2024).

Mathematics learning in elementary schools plays an essential role in developing students' logical, analytical, and creative thinking skills (Ramdhani & Wahab, 2021). One mathematical topic that consistently presents learning challenges is fractions (Habeahan et al., 2025; Hani et al., 2024). Fractions constitute a fundamental concept that serves as a prerequisite for learning algebra and other advanced mathematical topics. Therefore, teachers must be able to present fraction concepts effectively by utilizing concrete, engaging, and meaningful learning experiences that foster students' conceptual understanding and their ability to apply fractions in various contexts (Yuliandari et al., 2024).

Based on classroom observations and interviews with teachers, many students experience difficulties in understanding fraction concepts, particularly in comparing fractions, performing fraction addition, and applying fractions to everyday situations. These difficulties are attributed to several factors, including conventional teaching

methods, limited use of engaging instructional media, and insufficient opportunities for students to experience fractions through concrete learning activities. Classroom observations further revealed that many students understand fractions merely as symbolic representations without grasping the underlying concepts. Consequently, students often rely on memorizing procedures instead of developing conceptual understanding, resulting in misconceptions when comparing fractions or performing operations involving different denominators.

These classroom findings are supported by empirical studies indicating that students' active engagement in mathematics learning remains relatively low. Many students become bored and unmotivated because fraction instruction is frequently delivered through lectures and repetitive exercises (Khoiriyah et al., 2024). Furthermore, limited interaction and insufficient hands-on learning experiences hinder students from developing a deep conceptual understanding of fractions. Therefore, fraction instruction should be implemented through more engaging, interactive, and enjoyable learning approaches so that students can better understand mathematical concepts while developing more positive attitudes toward mathematics.

To address these challenges, innovative instructional strategies that promote concrete conceptual understanding are required. One promising approach is Game-Based Learning (GBL). Game-Based Learning integrates educational games into the instructional process to facilitate concept delivery and student engagement (Fatimah et al., 2024; Pandya et al., 2024). This approach represents a contemporary instructional paradigm designed to increase students' learning motivation while simultaneously improving learning outcomes. Beyond enhancing conceptual understanding, Game-Based Learning also develops students' social skills, critical thinking, and problem-solving abilities by providing immediate feedback and appropriately challenging learning experiences (Islam et al., 2024; Putra et al., 2024).

The effectiveness of Game-Based Learning can also be explained through the constructivist learning theory. This approach enables students to actively construct new knowledge based on their prior experiences and existing understanding. Constructivist learning emphasizes meaningful, active, creative, and productive knowledge construction. It aims to encourage students to formulate questions, seek solutions

independently, develop comprehensive conceptual understanding, and become autonomous learners capable of critical thinking (Gunanto, 2021).

Games themselves have existed throughout human history and have become an integral part of many cultures. Likewise, mathematicians have developed numerous mathematical games, such as Cardano Rings (Chinese Rings), the Tower of Hanoi created by Lucas, and Ernő Rubik's Rubik's Cube. These examples illustrate the close relationship between games and mathematics. Connecting mathematical concepts with games enables students to relate mathematics to their own experiences and everyday lives. Nevertheless, effective implementation requires careful consideration of game rules, classroom management, student interactions, students' readiness to participate, and the duration of gameplay to maximize learning outcomes (Ersen & Ergül, 2022).

Previous empirical studies have demonstrated the effectiveness of Game-Based Learning in mathematics education. Afiyah and Sutriyani (2024), for example, reported that Game-Based Learning supported by flashcards significantly improved students' understanding, retention, and application of fraction concepts. Similarly, Dhuha et al. (2024) found that the Quizizz application effectively enhanced mathematics learning outcomes by increasing students' enthusiasm and enjoyment during learning activities. These findings indicate that educational games can transform mathematics into a more enjoyable learning experience while improving students' conceptual understanding.

Furthermore, Game-Based Learning offers numerous advantages in mathematics instruction. Compared with conventional instructional approaches, interactive learning media provide more effective and efficient learning opportunities. When aligned with curriculum objectives and implemented through student-centered learning, Game-Based Learning becomes increasingly effective in promoting conceptual understanding. It also provides technology-supported interactive learning experiences that enable students to learn while playing, thereby fostering positive learning motivation and stronger mathematics self-efficacy (Ramli et al., 2022).

Game-Based Learning also serves as an instructional strategy for overcoming learning barriers by functioning as a therapeutic medium for addressing cognitive difficulties. Educational games encourage students to develop problem-solving skills, creativity, and collaborative interactions, all of which contribute to improved learning

motivation and educational effectiveness (Amalia & Athiyyah, 2024; Rahayu et al., 2024). Educational games, whether digital or non-digital, are specifically designed to facilitate learning activities and strengthen instructional processes by embedding educational content that enhances students' mastery of subject matter (Adrillian et al., 2024).

Based on the empirical evidence and classroom problems identified, this study implemented a Game-Based Learning strategy through the Fraction Tower Challenge. This educational game was specifically designed to help students develop a deeper understanding of fraction concepts in an engaging and interactive manner. Through the activities incorporated into the game, students not only learn to compare fractions directly but also understand fraction addition by constructing towers that reach predetermined heights. In addition to improving students' conceptual understanding of fractions, the game also contributes to the development of broader learning skills. Accordingly, this Classroom Action Research aimed to improve elementary school students' conceptual understanding of fractions through the implementation of the Fraction Tower Challenge. It is expected that this study will provide an effective solution to the challenges of teaching fractions in elementary schools while offering an innovative instructional model that can be widely adopted in mathematics education.

METHODS

This study employed a Classroom Action Research (CAR) design (Glenn et al., 2023; Pelton, 2010) to improve elementary school students' conceptual understanding of fractions through the implementation of the Fraction Tower Challenge game. The research was conducted in two cycles, with each cycle following four systematic stages: planning, implementation, observation, and reflection. During the planning stage, the researchers prepared the instructional materials, including lesson plans, a learning module based on the Fraction Tower Challenge, assessment instruments, and observation guidelines for evaluating students' participation. In the implementation stage, learning activities were carried out according to the prepared lesson plans using the Fraction Tower Challenge as the primary instructional medium to facilitate students' understanding of fraction concepts. The observation stage involved systematically monitoring classroom activities, students' engagement, and any challenges encountered during the learning

process. Finally, the reflection stage focused on analyzing the collected data to evaluate the effectiveness of the intervention, identify areas requiring improvement, and formulate revisions for the subsequent cycle.

The participants of this study were elementary school students from a public elementary school. Prior to the intervention, the students had received an introductory lesson on fractions. However, the preliminary assessment indicated that most students still experienced difficulties in understanding relationships among fractions, identifying equivalent fractions, and representing fractions in both visual and numerical forms. Data were collected using multiple techniques to obtain comprehensive and in-depth information, including written tests, classroom observations, interviews, and documentation. The written tests consisted of pre-tests and post-tests designed to assess students' conceptual understanding of fractions before and after the intervention. The collected data were analyzed using both qualitative and quantitative descriptive approaches to provide a comprehensive and contextual description of students' improvement in conceptual understanding throughout the implementation of the Fraction Tower Challenge.

RESULTS

To improve students' conceptual understanding of fractions, learning media should not only be engaging but also capable of facilitating concrete and enjoyable learning experiences. One innovative approach adopted in this study was the Fraction Tower Challenge, an educational game designed to actively involve students in the learning process. This instructional medium addresses students' difficulties in understanding fractions, which have traditionally been taught in an abstract manner.

The **Fraction Tower Challenge** is a three-dimensional (3D) educational game consisting of wooden blocks representing different fractions. Its primary advantage lies in its ability to provide a tangible representation of fractions that students can touch, manipulate, assemble, and directly observe. Consequently, the game not only creates an enjoyable learning environment but also strengthens students' mathematical understanding through multisensory engagement involving visual, kinesthetic, and cognitive experiences. The game focuses on reinforcing fraction concepts, including recognizing different types of fractions, comparing fraction values, and understanding the

relationships among equivalent fractions. It is particularly suitable for third-grade elementary school mathematics because it supports contextual, interactive, and constructivist learning, enabling students to actively construct knowledge through exploration, problem-solving, and collaborative activities.

The study was conducted in two action research cycles. During the first cycle, learning activities were implemented collaboratively. To determine students' initial understanding of fractions, a pre-test was administered before the intervention. The pre-test aimed to provide baseline information regarding students' conceptual understanding of fractions prior to the implementation of the instructional strategy. It consisted of three essay questions designed to assess students' ability to recognize fractions, compare fraction values, and solve simple contextual problems involving fractions. The pre-test was administered to all 18 students participating in the study.

The results of the first-cycle pre-test indicated that students' conceptual understanding of fractions remained relatively low and had not yet reached the expected level of learning mastery. Many students experienced difficulties in identifying fractions, finding common denominators, and interpreting fractions in both visual and numerical representations. These findings suggested that the previous instructional approach had not adequately supported students' learning needs, particularly regarding conceptual understanding of fractions. In response, the researchers implemented a Game-Based Learning approach using the **Fraction Tower Challenge** as the primary instructional medium. This approach was selected because it accommodates the characteristics of elementary school students, who generally enjoy playing and learn more effectively through concrete experiences and visual representations.

During the implementation stage, the teacher reviewed the basic concepts of fractions using an interactive and contextual approach. Instruction was supported by the **Fraction Tower Challenge**, a three-dimensional learning medium consisting of wooden blocks proportionally representing different fractions. Through this approach, students not only received verbal explanations but also had opportunities to observe, manipulate, and arrange fraction blocks physically, making the learning process more meaningful. Students were then organized into small collaborative groups and challenged to construct fraction towers according to specific instructions. Throughout the activity, students actively discussed ideas, compared fraction sizes, and explored equivalent and non-

equivalent fractions. These collaborative activities promoted not only conceptual understanding but also social skills such as teamwork, communication, and shared responsibility.

Following the game-based learning activities, students completed a post-test designed to evaluate improvements in their conceptual understanding of fractions. The post-test contained questions with a level of difficulty comparable to the pre-test, covering fraction representation, identification of equivalent fractions, and contextual fraction problem-solving. The post-test results served as the primary basis for evaluating the effectiveness of the instructional intervention.

The findings from the first-cycle post-test demonstrated a significant improvement in students' conceptual understanding of fractions. Compared with the pre-test results, most students achieved higher scores, indicating better understanding of fraction representations, the ability to compare fractions, and the ability to solve simple contextual fraction problems. Although considerable progress was observed during the first cycle, the researchers concluded that the learning outcomes had not yet reached the predetermined success criteria. Several students still experienced difficulties in comparing non-equivalent fractions and solving contextual problems of moderate complexity. Therefore, the intervention continued into the second cycle to further enhance students' learning outcomes.

Reflection after the first cycle identified several issues requiring improvement. Some students were still engaged in off-task conversations during classroom instruction, several complained about completing assignments, conceptual understanding remained relatively low for a number of students, some students frequently forgot previously learned fraction concepts, and many continued to perceive mathematics as an uninteresting subject. Consequently, several improvements were introduced, including increasing teacher attention during instruction, providing greater encouragement and enjoyable classroom activities, offering additional guidance through engaging instructional media, and fostering students' interest in mathematics through educational games.

The second cycle followed the same four stages of planning, implementation, observation, and reflection. However, unlike the collaborative learning approach adopted in the first cycle, students completed the activities individually. At the beginning of the

cycle, all students completed another individual pre-test consisting of three essay questions designed to evaluate their ability to recognize fractions, compare fraction values, and solve contextual fraction problems. This assessment provided diagnostic information that enabled the researchers to refine instructional strategies and implement differentiated support for students who still demonstrated limited conceptual understanding.

The second-cycle pre-test results showed higher levels of conceptual understanding than those obtained during the first-cycle pre-test. These findings indicated that the Game-Based Learning approach using the **Fraction Tower Challenge** had already produced positive effects on students' conceptual development. Nevertheless, because the learning objectives had not yet been achieved optimally and consistently across all students, the intervention continued during the second cycle using an individual rather than collaborative game-based learning approach. This modification provided students with greater opportunities for personal exploration and reflection while learning fraction concepts.

At the conclusion of the second cycle, students completed another post-test consisting of three essay questions similar to those used during previous assessments. This post-test aimed to evaluate the continued effectiveness of the **Fraction Tower Challenge** in improving individual students' conceptual understanding of fractions. The results of the second-cycle post-test provided the basis for determining the overall effectiveness of the classroom action research.

The second-cycle findings revealed a continued improvement in students' conceptual understanding of fractions. Although the magnitude of improvement was not as dramatic as that observed during the first cycle, the results demonstrated a consistent upward trend in students' learning progress. These findings indicate that the **Fraction Tower Challenge** successfully created an effective, engaging, and meaningful learning environment that enabled students to understand mathematical concepts previously perceived as abstract.

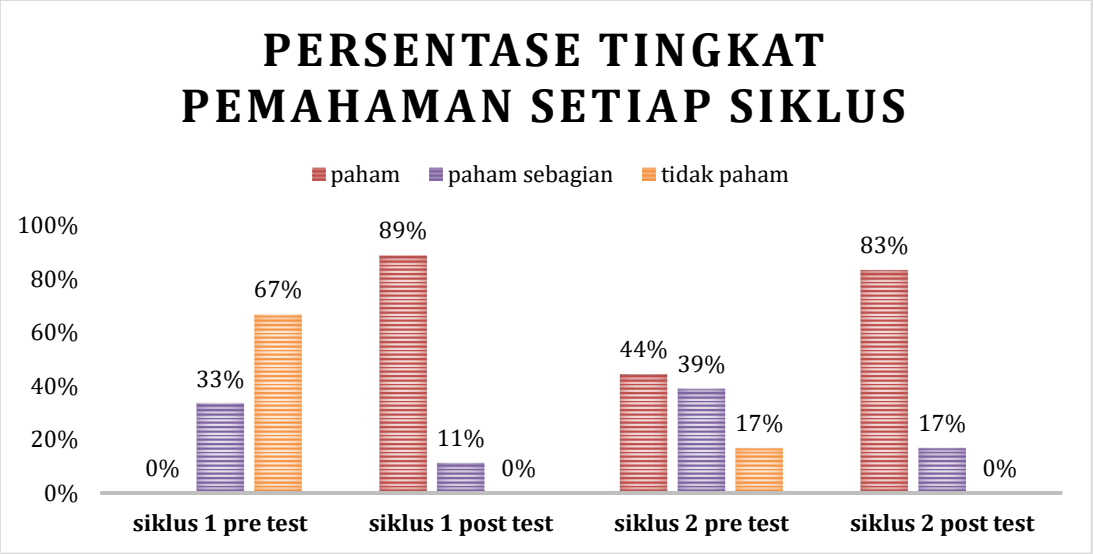

Figure 1. Pretest and Posttest

Overall, the classroom action research demonstrated substantial improvements in students' learning mastery across the two research cycles. During the first cycle, the implementation of the **Fraction Tower Challenge** resulted in noticeable gains in conceptual understanding. The second cycle, conducted through individual learning activities, produced further improvements. Analysis of learning mastery indicated three categories of achievement: understanding, partial understanding, and lack of understanding. During the first-cycle pre-test, none of the students were categorized as demonstrating full understanding, while 33% demonstrated partial understanding and 67% showed insufficient understanding. Following the intervention, 89% of students achieved full understanding, whereas the remaining 11% demonstrated partial understanding. Reflection suggested that the remaining difficulties were associated with limited opportunities for individual participation, dominance of certain group members, and confusion regarding equivalent fractions.

In the second-cycle pre-test, 44% of students demonstrated full understanding, 39% showed partial understanding, and only 17% remained in the insufficient understanding category. Following the second-cycle intervention, 83% of students achieved full understanding, 17% demonstrated partial understanding, and none remained in the insufficient understanding category. The comparison between the two research cycles indicates a consistent improvement in students' learning mastery. Most importantly, the complete elimination of the insufficient understanding category in the second cycle

provides strong evidence that the implementation of the **Fraction Tower Challenge** had a positive and meaningful impact on improving elementary school students' conceptual understanding of fractions.

DISCUSSION

The findings indicate that elementary school students' understanding of fraction concepts can be significantly improved through the use of the Fraction Tower Challenge educational game-based learning media. These findings reinforce the views of mathematics education experts who argue that fraction concepts are more easily understood when presented through concrete, visual, and contextual learning approaches. Furthermore, games that integrate play experiences with instructional content, commonly referred to as educational games, serve as effective learning tools. Educational games, whether digital or non-digital, are specifically designed to support educational activities by strengthening the teaching and learning process. Such games incorporate instructional content that enhances learners' understanding of specific subject matter (Adrillian et al., 2024).

Moreover, the success of the Fraction Tower Challenge in improving students' understanding of fraction concepts highlights the importance of active, collaborative, and enjoyable learning approaches for elementary school students. In this context, game-based learning functions not only as a visual learning aid but also as a pedagogical approach that promotes students' affective and psychomotor development. This is particularly important during the cognitive development stage of elementary school children because, according to Piaget, children aged 7–11 years are in the concrete operational stage, during which they understand mathematical concepts more effectively when interacting with tangible objects that they can manipulate directly (Rohaendi & Laelasari, 2020). In addition, the use of educational games such as the Fraction Tower Challenge indirectly enhances students' motivation to learn. Students become more interested in learning materials when they enjoy and actively participate in the instructional process. The principle of edutainment, which combines education and entertainment, becomes highly relevant in this context because learning is no longer monotonous or teacher-centered but instead fosters two-way interactions among students, learning media, teachers, and peers (Ersen & Ergül, 2022; Gunanto, 2021).

Game-Based Learning offers an innovative strategy to help students overcome learning barriers by serving as a therapeutic medium for addressing cognitive difficulties. Educational games also foster students' problem-solving skills, social interaction, and creativity, all of which contribute to increased learning motivation and educational effectiveness (Amalia & Athiyyah, 2024; Rahayu et al., 2024). Furthermore, educational games combine play experiences with learning activities to strengthen instructional processes. Whether delivered through digital or non-digital formats, these games contain educational content specifically designed to improve learners' mastery of subject matter (Adrillian et al., 2024).

During the first cycle, students' conceptual understanding improved substantially. This result is understandable because game-based learning represented a novel instructional approach compared with the conventional teaching methods that students had previously experienced in the classroom. Students' enthusiastic responses to the educational game encouraged active engagement in learning activities, leading to stronger understanding of fundamental fraction concepts, including fraction representation, fraction values, and equivalence relationships. In the second cycle, although the improvement was less pronounced than in the first cycle, students demonstrated deeper and more mature conceptual understanding. This finding suggests that students had progressed beyond initial exposure and experimentation toward the internalization of fraction concepts. Moreover, the instructional strategy shifted from collaborative group work in the first cycle to individual learning activities in the second cycle. This modification enabled students to solve mathematical problems independently, strengthen their personal understanding, and develop greater confidence in solving contextual mathematics problems.

Furthermore, the instructional approach implemented in this study aligns with the principles of constructivism, which emphasize that learners actively construct knowledge through direct experience, exploration, and problem-solving. The importance of social interaction in learning, combined with collaborative play activities facilitated by the Fraction Tower Challenge, created opportunities for meaningful dialogue among students, thereby supporting the development of their Zone of Proximal Development (ZPD) (Muhibbin & Hidayatullah, 2020; Rohaendi & Laelasari, 2020; Shah, 2022). Students were not merely passive recipients of information but active participants who

engaged in constructing fraction models, participating in group discussions, and reflecting on both their mistakes and successes during gameplay. These activities created reflective and collaborative learning experiences that positively contributed to students' conceptual understanding.

The implementation of this study, which focused on improving students' understanding of fraction concepts through the Fraction Tower Challenge educational game-based learning media, demonstrated a substantial increase in students' learning mastery from Cycle I to Cycle II. This improvement not only reflects the effectiveness of the Fraction Tower Challenge in presenting fraction concepts through concrete and multisensory experiences but also reinforces the constructivist principle of learning by doing, which underpins effective mathematics instruction. Students directly manipulated fraction blocks, observed relationships among fractions, and engaged in exploration and reflection throughout the gameplay activities. Active involvement through visual and kinesthetic learning approaches enabled students to develop clearer mental representations of mathematical concepts that had previously been difficult to understand. Therefore, the use of the Fraction Tower Challenge as an educational game-based learning medium has been proven to significantly improve students' learning mastery, both in terms of the number of students achieving conceptual understanding and the overall quality of learning, making instruction more active, enjoyable, and meaningful.

CONCLUSION

The implementation of the **Fraction Tower Challenge** game-based learning media across two action research cycles made a significant contribution to improving elementary school students' conceptual understanding of fractions. The game not only fostered active participation and created an enjoyable learning environment but also successfully bridged the gap between students' conceptual understanding and the practical application of fraction concepts in mathematics learning. Its effectiveness was demonstrated by the progressive improvement in students' pre-test and post-test scores across both cycles. These findings confirm that innovative game-based instructional media can effectively enhance students' conceptual understanding while increasing their engagement and motivation during the learning process. Therefore, the **Fraction Tower Challenge** represents a promising instructional alternative for supporting more

meaningful, interactive, and contextual mathematics learning at the elementary school level.

REFERENCES

Adrillian, H., Mariani, S., Prabowo, A., Zaenuri, Z., & Walid, W. (2024). Media Pembelajaran Berbasis Game Edukasi Matematika Untuk Meningkatkan Motivasi Dan Hasil Belajar Peserta Didik: Systematic Literature Review. *Jurnal Riset dan Inovasi Pembelajaran*, *4*(2), 751–767. https://doi.org/10.51574/jrip.v4i2.1444

Afiyah, K. N., & Sutriyani, W. (2024). Efektivitas Metode Game-Based Learning Berbantuan Media Flashcard Pecahan Terhadap Hasil Belajar Matematika Siswa. *LINEAR: Journal of Mathematics Education*, *5*(2), Article 2. https://doi.org/10.32332/xmy86j91

Amalia, E., & Athiyyah, A. (2024). Penggunaan Metode Pembelajaran Game Based Learning (GBL) Untuk Meningkatkan Minat Belajar Siswa Pada Mata Pelajaran Sejarah Kebudayaan Islam Kelas VII D MTs Negeri 1 Ciamis. *Jurnal Kreativitas Mahasiswa*, *2*(1), Article 1.

Dhuha, S. H. D., Kurniati, N., Lu'luilmaknun, U., & Soepriyanto, H. (2024). Pengaruh Model Game Based Learning Menggunakan Aplikasi Quizizz terhadap Minat dan Hasil Belajar Matematika Siswa. *Mandalika Mathematics and Educations Journal*, *6*(2), 775–784. https://doi.org/10.29303/jm.v6i2.8215

Ersen, Z. B., & Ergül, E. (2022). Trends of Game-Based Learning in Mathematics Education: A Systematic Review. *International Journal of Contemporary Educational Research*, *9*(3), 603–623.

Fatimah, O. L., Fathani, A. H., & Awae, W. (2024). Analisis Peningkatan Minat Belajar Siswa Melalui Penerapan Model Game-Based Learning. *Jurnal Riset dan Inovasi Pembelajaran*, *4*(1), 73–83. https://doi.org/10.51574/jrip.v4i1.1240

Glenn, M., Sullivan, B., Roche, M., & McDonagh, C. (2023). *Action Research for the Classroom: A Guide to Values-Based Research in Practice*.

Gunanto, S. G. (2021). Game-Based Learning: Media Konstruktif Pembelajaran Mandiri Bagi Siswa. *Rekam: Jurnal Fotografi, Televisi, Animasi*, *17*(1), Article 1. https://doi.org/10.24821/rekam.v17i1.4951

Habeahan, S. M., Susilawati, Panggabeahan, E. M., & Harahap, T. H. (2025). Meningkatkan Pemahaman Siswa Dalam Membandingkan Dan Mengurutkan Pecahan Melalui Model Pembelajaran Berbasis Masalah. *QOSIM : Jurnal Pendidikan, Sosial & Humaniora*, *3*(1), Article 1. https://doi.org/10.61104/jq.v3i1.760

Hani, M., Karlimah, & Apriani, I. F. (2024). Analisis Penggunaan Media Pembelajaran pada Materi Pecahan Senilai di Kelas IV Sekolah Dasar. *Syntax Idea*, *6*(3), 1355–1372. https://doi.org/10.46799/syntax-idea.v6i3.3109

Islam, K. R., Komalasari, K., Masyitoh, I. S., Juwita, J., & Adnin, I. (2024). Pengaruh Model Pembelajaran Game Based Learning terhadap Motivasi Belajar Peserta Didik. *Ideas: Jurnal Pendidikan, Sosial, Dan Budaya*, *10*(3), Article 3. https://doi.org/10.32884/ideas.v10i3.1640

Khoiriyah, S., Amelia, N. T., Maharani, D. P., Novitasari, D., & Melisa, L. (2024). E-Komik Sebagai Inovasi Media Pembelajaran Matematika di SD. *Jurnal Penelitian*

Multidisiplin Terpadu, *8*(11), Article 11. https://oaj.jurnalhst.com/index.php/jpmt/article/view/5618

Linome, O., Mengga, M., Making, M. I. J., Sunbanu, Y., & Dethan, J. (2025). Persepsi Guru Sekolah Dasar terhadap Penggunaan Media Powerpoint Interaktif dalam Pembelajaran Pecahan. *Edukreatif: Jurnal Kreativitas dalam Pendidikan*, *6*(1), Article 1. https://ijurnal.com/1/index.php/jkp/article/view/389

Muhibbin, & Hidayatullah, M. A. (2020). Implementasi Teori Belajar Konstruktivisme Vygotsky Pada Mata Pelajaran PAI di SMA Sains Qur`an Yogyakarta. *Belajea: Jurnal Pendidikan Islam*, *5*(1), 113–130.

Pandya, H. S., Rohana, R., Yuliasari, A., & Nur'Aini, S. D. (2024). Pengaruh Model Pembelajaran Game Based Learning Terhadap Hasil Belajar Matematika Peserta Didik. *SEMANTIK: Prosiding Seminar Nasional Pendidikan Matematika*, *2*(1), 74–82.

Pelton, R. P. (2010). *Action Research for Teacher Candidates: Using Classroom Data to Enhance Instruction*. Rowman & Littlefield Education.

Putra, L. D., Arlinsyah, N. D., Ridho, F. R., Syafiqa, A. N., & Annisa, K. (2024). Pemanfaatan Wordwall pada Model Game Based Learning terhadap Digitalisasi Pendidikan Sekolah Dasar. *Jurnal Dimensi Pendidikan dan Pembelajaran*, *12*(1), Article 1. https://doi.org/10.24269/dpp.v12i1.8749

Rahayu, A. W., Azizah, I. N., Ratnawati, Y. D., Shufiyah, S. S., Juhaeni, J., Purwanti, A. A., & Safaruddin, S. (2024). Pengaruh Model Pembelajaran Game based learning "One Board" terhadap Hasil Belajar Siswa Madrasah Ibtidaiyah. *Journal of Instructional and Development Researches*, *4*(2), Article 2. https://doi.org/10.53621/jider.v4i2.305

Ramdhani, L., & Wahab, A. (2021). Problematika Pemecahan Masalah Geometri Di Madrasah Tsanawiyah Al-Arief Giligenting Sumenep Berdasarkan Teori Van Hiele. *Jurnal Ilmiah Mandala Education*, *7*(3). https://www.academia.edu/download/74476737/1846.pdf

Ramli, I. S. M., Maat, S. M., & Khalid, F. (2022). Digital Game-Based Learning and Learning Analytics in Mathematics. *Pegem Journal of Education and Instruction*, *13*(1), 168–176.

Rohaendi, S., & Laelasari, N. I. (2020). Penerapan Teori Piaget dan Vygotsky Ruang Lingkup Bilangan dan Aljabar pada Siswa Mts Plus Karangwangi. *PRISMA*, *9*(1), 65–76.

Sahid, N. W., Prihaswati, M., & Mawarsari, V. D. (2024). Analisis Kebutuhan Media Pembelajaran Matematika Berbasis Game Edukasi Pada Siswa SMP Kelas VIII. *AKSIOMA : Jurnal Matematika Dan Pendidikan Matematika*, *15*(1), Article 1. https://doi.org/10.26877/aks.v15i1.18514

Setiawan, Y. U., Yandari, I. A. V., & Pamungkas, A. S. (2020). Pengembangan Kartu Domino Pecahan Sebagai Media Pembelajaran Matematika di Kelas IV Sekolah Dasar. *Primary : Jurnal Keilmuan Dan Kependidikan Dasar*, *12*(1), Article 1. https://doi.org/10.32678/primary.v12i01.2706

Shah, M. A. (2022). Teachers as Reflective Practitioners: From Individualism to Vygotskian Social Constructivism. *Alberta Journal of Educational Research*, *68*(3), 297–307. https://doi.org/10.11575/ajer.v68i3.68598

Telaubanua, Y. (2020). Efektivitas Penggunaan Alat Peraga Pada Pembelajaran Matematika Pada Sekolah Dasar Pokok Bahasan Pecahan. *Juwarta*, *14*(4), 709–722.

Wahab, A. (2023). Pelatihan Peningkatan Pemahaman Peserta Didik Dengan Metode Banding Selesaian Pada Guru Madrasah Aliyah: Indonesia. *Jurnal Pengabdian Masyarakat*, *1*(2), 75–82.

Wahab, A., Andini, N., Assholehah, A. S., & Ibliyah, K. (2024). Upaya Meningkatkan Kemampuan Berhitung Matematika Materi Operasi Hitung Perkalian Dengan Metode Jarimatika. *RAINSTEK: Jurnal Terapan Sains Dan Teknologi*, *6*(4), 311–318.

Yuliandari, R. N., Anggraini, D. M., Rahmah, U. N., Zahroo, F., & Fatmawati, F. (2024). Peningkatan Pemahaman Konsep Pecahan Siswa Sekolah Dasar dengan Media Kertas Lipat. *Dawuh Guru: Jurnal Pendidikan MI/SD*, *4*(1), Article 1. https://doi.org/10.35878/guru.v4i1.1085