SCHOLA
ISSN (Online): 2988-7100
Vol. 3, No. 2, November 2025, Page. 44-54
Available Online at journal.upgris.ac.id/index.php/imajiner

The Effectiveness of Interactive Quizwhizzer Games with a Deep Learning Approach to Improve the Understanding of Fractional Concepts for Fifth Grade Elementary School Students

Pradista Selfia1[1], Desi Aryani2[2], Fifin Eka Yuliana3[3]
[1,2,3]Universitas Persatuan Republik Indonesia Semarang
[1]distaselfia94@gmail.com

ABSTRAK

Penelitian ini memiliki latar belakang kemampuan pemahaman konsep pecahan siswa yang rendah dengan ditunjukkan oleh nilai hasil ulangan. Tujuan penelitian ini adalah mengetahui efektivitas penggunaan Quizwhizzer dengan pendekatan *deep learning* untuk meningkatkan kemampuan pemahaman konsep pecahan siswa kelas V SD. Jenis penelitian ini adalah penelitian eksperimen dengan desain *one group pretest posttest design*. Sampel dalam penelitian ini adalah kelas V SDN Sendangmulyo. Teknik pengumpulan data menggunakan tes dan dokumentasi. Instrument penelitian yang digunakan adalah soal *pretest* dan *posttest* kemampuan pemahaman konsep matematika materi pecahan. Analisis data yang digunakan adalah uji normalitas, uji homogenitas, uji paired sampel t test dan uji N Gain. Hasil uji normalitas nilai *pretest* didapatkan nilai sig 0,061 maka nilai *pretest* tersebut normal dan hasil uji normalitas nilai *posttest* didapatkan nilai sig 0,078 maka nilai *posttest* tersebut normal. Berdasarkan hasil uji homogenitas didapatkan nilai sig 0,934 maka nilai *pretest* dan *posttest* siswa adalah homogen. Berdasarkan hasil *output "Paired Samples t Test"* didapat bahwa nilai *Sig 2 tailed yaitu* 0,000 < 0,05, Maka H_0 ditolak dan H_1 diterima. Selain itu, berdasarkan uji n gain sebesar 0,339 artinya terdapat peningkatan dengan kategori sedang. Oleh karena itu, dapat disimpulkan kemampuan pemahaman konsep pecahan siswa kelas V SD dapat meningkat dengan penggunaan Quizwhizzer dengan pendekatan *deep learning* saat pembelajaran matematika.

Kata Kunci: Game Interaktif Quizwhizzer; *Deep learning*; Pemahaman Konsep Pecahan

ABSTRACT

This research is motivated by the low conceptual understanding of fractions among students, as evidenced by their test scores. The purpose of this study is to determine the effectiveness of using Quizwhizzer with a *deep learning* approach to improve the understanding of fractional concepts among fifth grade elementary school students. This study is an experimental research employing a one-group *pretest-posttest* design. The sample consisted of fifth-grade students at SDN Sendangmulyo. Data collection techniques included testing and documentation. The research instruments used were *pretest* and *posttest* questions regarding the conceptual understanding of mathematical fractions. Data analysis involved normality tests, homogeneity tests, paired sample t-tests, and N-Gain tests.The normality test results for the *pretest* scores yielded a significance value (sig) of 0.061, and the *posttest* scores yielded a sig of 0.078, indicating that both were normally distributed. Based on the homogeneity test, a sig value of 0.934 was obtained, meaning the *pretest* and *posttest* scores were homogeneous. Furthermore, the "Paired Samples t-Test" output showed a Sig (2-tailed) value of 0.000 < 0.05, resulting in the rejection of H_0 and the acceptance of H_1. Additionally, the N-Gain test result was 0.339, indicating an improvement in the "medium" category. Therefore, it can be concluded that the conceptual understanding of fractions among fifth-grade students can be

improved through the use of Quizwhizzer with a *deep learning* approach in mathematics learning.

Keywords: Interactive Quizwhizzer Game; *Deep learning*; Understanding Fractional Concepts

INTRODUCTION

Education is a conscious preparation carried out by educators to guide, teach, and train students for their future lives. It is an undeniable necessity as a means to develop human resources possessing the ability and intelligence to think logically, critically, creatively, proactively, and adaptively toward the growth and developments of the era in all stages of life (Diana, 2023). According to H. Horne, education is a continuous (eternal) process of high-level adjustment where humans undergo physical and mental development, freedom, and awareness of God, manifested intellectually, emotionally, and within the human environment (Abd Rahman, 2022). One of the core subjects implemented in elementary school is mathematics education.

Mathematics is a subject that occupies a vital position in education. It is consistently taught at all levels of education, from elementary to high school (Lovika, 2020). Permendiknas Number 22 of 2006 concerning primary and secondary education units stipulates that mathematics must be provided to all students to develop logical, analytical, systematic, critical, and creative thinking, as well as cooperative abilities (Permen, 2006). These competencies are necessary for students to acquire, manage, and utilize information to survive in an ever-changing and competitive environment. Mathematics is divided into three scientific fields: algebra, calculus, and geometry.

Mathematics is not a standalone science that can be resolved independently; rather, it exists to solve social, economic, and natural problems. It is not merely a structural science containing symbols or objects, sets, and abstract and deductive concepts, but a symbolic and universal language that enables the development of logical and critical thinking patterns, as well as the understanding and solving of everyday problems (Diana, 2023). However, in reality, students in Indonesia still lack problem-solving skills and an understanding of mathematical concepts—abilities that are urgently needed to be developed to improve the quality of education in Indonesia (Diana, 2023).

Mathematics is perceived by some students as more difficult compared to other subjects. This is why mathematics learning is often the least favorite and most tedious for students. Mathematics instruction still emphasizes formula memorization and calculation, resulting in students lacking the ability to understand concepts (Hani, 2025). It is evident that students find it difficult to solve problems when the questions they receive differ from the examples provided by the teacher.

In mathematics, there are materials whose concepts are constantly used to solve problems in everyday life. One such topic is fractions. This material is taught starting from elementary school. Given the importance of fractions in daily life, it is crucial for students to master and understand them from the elementary education level. Frequently, students encounter difficulties when working on mathematical problems, particularly regarding fractions. Learning difficulties can be defined as a child's inability to complete tasks assigned by the teacher (Yeni, 2015). In line with this, Panggabean and Tamba (2020) state that

learning difficulties represent a condition where a child experiences failure in specific subjects. According to Jamaris (2013), learning difficulties are conditions pointing to a number of disorders that affect the acquisition, organization, storage, understanding, and use of both verbal and non-verbal information. Thus, it can be concluded that learning difficulties are states in which students experience obstacles or disruptions in receiving or absorbing the lessons provided by the teacher.

One of the objectives of mathematics education is to develop the ability to understand concepts. Conceptual understanding is a very important and fundamental element because it significantly assists students in comprehending the material being studied (Shifania, 2023). It is an ability where an individual is capable of restating what has been learned. According to Zulkardi, the ability to understand mathematical concepts is a skill possessed by students to solve problems or questions in mathematics (Irene, 2023). An individual can be said to have mastered conceptual understanding if they meet the indicators of conceptual understanding. An indicator is something that provides clues, information, or guidelines for users in developing measurement tools. According to Heruman, indicators demonstrating conceptual understanding include: (1) restating a concept, (2) classifying objects according to certain properties in accordance with the concept, (3) providing examples and non-examples of a concept, (4) presenting concepts in various forms of mathematical representation, (5) developing necessary or sufficient conditions for a concept, (6) using, utilizing, and selecting specific procedures or operations, and (7) applying concepts or algorithms in problem-solving (Rina, 2021).

According to Dwiranata et al. (2019), conceptual understanding is a follow-up to concept planting, aimed at ensuring students have a deeper grasp of a mathematical concept. Conceptual understanding consists of two definitions. First, it is a continuation of concept-planting instruction within a single session. Second, it is conducted in a different session while remaining a continuation of the initial concept planting. In such sessions, the concept planting is assumed to have been delivered in a previous meeting, semester, or grade. Conceptual understanding is a competency demonstrated by students in understanding concepts and performing procedures (algorithms) flexibly, accurately, efficiently, and appropriately.

According to Kesumawati (as cited in Ulfah, 2020), conceptual understanding is a student's ability to master subject matter while being able to re-express it in other easily understood forms, provide data interpretations, and apply concepts in accordance with their cognitive structure. Bloom, as quoted by Arifudin (2020), states that conceptual understanding is the ability to grasp meanings, such as being able to express presented material in a more comprehensible form, providing interpretations, and being able to apply them. From the explanations of understanding and concepts above, the author concludes that conceptual understanding is the ability possessed by a student to convey acquired knowledge back to others so that those individuals truly understand what is being communicated.

However, facts in the field indicate that many elementary school students still experience difficulties in understanding these mathematical concepts. These difficulties often

lead to low learning motivation and unsatisfactory mathematics learning outcomes (Hidayat & Ramadhani, 2022). Based on observations in the fifth grade at SDN Sendangmulyo, information was obtained showing that many students still do not understand mathematical concepts, such as the concept of fractions. The low learning outcomes in mathematics are not solely due to difficult material but can also be caused by the implemented learning process. Mathematics teaching and learning were found to be still teacher-centered, while the learning process is practiced conventionally. The classroom learning process does not provide opportunities for students to construct their own understanding, causing them to become passive learners who do not participate in the learning process. Mathematics instruction on fractions did not utilize media, resulting in a lack of students' understanding of the concept. Students frequently face difficulties in solving problems related to fractional arithmetic operations. From these cases, a lack of students' conceptual understanding of fractional arithmetic operations is evident. This is in line with a research report by Amaliyah (2020), which states that the level of mathematical learning difficulties experienced by students is high, at 61%. After conducting interviews with the mathematics teacher, it was revealed that students struggle to apply the concepts used and find it difficult to determine the formulas to be used when faced with problems that differ from the examples provided in the material on fractional arithmetic operations.

This has become a primary concern for educators and educational researchers, given that a strong understanding of basic fractional concepts is crucial as a foundation for understanding more complex material at higher levels. In an effort to overcome these issues, various learning approaches and strategies have been developed. One approach that has received considerable attention is the deep learning strategy in mathematics education. This strategy emphasizes deeper and more meaningful learning, where students do not merely memorize formulas and procedures but also understand the meaning behind mathematical concepts, how these concepts are interrelated, and how they can be applied in real-world contexts (Annisa et al., 2023). This deep learning approach is highly relevant to modern learning objectives that emphasize critical thinking and problem-solving skills.

The deep learning approach seeks to transform the traditional learning paradigm, which tends to emphasize memorization and information repetition, into a more constructive and reflective form of learning. This shift does not merely assist students in understanding the subject matter but also encourages them to foster critical thinking skills, creativity, and problem-solving abilities (Putri, 2024). Furthermore, Haryanti et al. (2024) provide a more specific definition of deep learning as an instructional approach that emphasizes deep conceptual mastery, moving beyond the mere ability to memorize or recognize facts quickly. The primary goal of this approach is to ensure that students not only achieve cognitive improvement through a profound understanding of the core of a concept or theory but are also able to relate it to relevant practical contexts in real life.

Deep learning is defined as an approach that emphasizes conceptual understanding and the critical application of knowledge. This approach prioritizes the creation of a supportive learning atmosphere, where the learning process occurs with awareness, possesses meaning, and provides an enjoyable experience. In his research, Hattie (2012) found that the

implementation of deep learning strategies has an effect size of 0.69, which exerts a significant influence on the development of student learning outcomes. Consistent with this, Darling-Hammond (2017) states that deep learning is a learning process that encourages student participation in exploring and applying essential concepts. This process supports students in enhancing their critical thinking proficiency and prepares them to face various challenges in the real world (Ulfah et al., 2022).

One effort to apply deep learning in conceptual understanding that can support and optimize the learning process is the use of learning media (Gusmania & Dani, 2018; Kurniawati, 2018; Nomleni & Manu, 2018). Media are tools that facilitate teachers in delivering material (Tafonao, 2018; Nurrita, 2018). This aligns with the statement by Adam et al. (2015), which asserts that learning media encompass everything—both technical and physical—within the learning process that can simplify the teacher's task of delivering subject matter to students.

The use of media as a companion in the learning process is essential to overcome issues that arise during instruction (Afrizal, 2015). According to Nurfadhillah (2021), learning media can be defined as physical or non-physical tools intentionally used to facilitate the understanding of subject matter between teachers and students, with the aim of strengthening and enhancing it. This view aligns with Zainiyati (2017), who states that learning media encompass everything used to convey messages from a source to a receiver in a way that stimulates the students' thoughts, attention, interests, and desire to engage in learning, ultimately achieving effective learning outcomes. Consequently, instructional material is more quickly absorbed by students, fostering interest and motivation for further learning. An educator must utilize digital-based learning media (Widarma & Saleh, 2020) and must know how to employ innovative, efficient, and effective learning tools (Susanto et al., 2022).

Educational games represent a form of learning media expected to rapidly improve student understanding because they are supported by engaging gameplay (Novaliendry, 2013). Games are vital for brain development, as they can increase concentration and train individuals to solve problems accurately and quickly (Wibisono et al., 2010). Educational games allow students to gain a better understanding and make learning more enjoyable (Risnawati et al., 2018). One educational game that can be implemented in the classroom is Quizwhizzer. This media is engaging, interactive, prioritizes cooperation and communication, and can create positive interactions among students through gameplay within the learning process (Susanto & Ismaya, 2022).

Quizwhizzer is an educational game applicable to learning environments. It was created by a Harvard student named Tim, who was determined to create a digital version of a game originally developed by a physics teacher using PowerPoint. The development of this game began in mid-2017 under the name Quiznetic. This project was a remarkable achievement because it was adopted not only by physics teachers but by many educators worldwide. After several years, Quiznetic evolved into Quizwhizzer (Trias, 2022).

Quizwhizzer is suitable for mathematics instruction because it contains various games that prevent learning from becoming monotonous. The media is attractive, interactive,

focuses on cooperation and correspondence, and can foster positive correspondence among students through play (Faijah, Nuryadi, & Marhaeni, 2022). Within a Quizwhizzer quiz, teachers can create several questions for students in a competitive format, following specific and organized paths similar to a "Snakes and Ladders" system. Additionally, Quizwhizzer can be played during class or assigned as homework. Through Quizwhizzer, students feel challenged to answer questions quickly and accurately to earn points, making speed and correctness a distinct value. At the end of the session, Quizwhizzer immediately ranks the participants in the class (Safitri et al., 2019).

Quizwhizzer can present learning materials through quizzes and games designed to make learning efficient and effective, while enhancing students' research capabilities and their active role and participation in competitive learning, thereby fostering motivation to learn mathematics. The motivation gained by students using Quizwhizzer in the mathematics learning process ultimately enhances their understanding of the subject, leading to improved learning outcomes. This is supported by research from Septiani & Santi (2022), which found that the use of Quizwhizzer significantly influences student learning interests. Furthermore, previous research by Trias (2022) showed that students in the experimental class experienced a strong increase in academic achievement, while those in the control class saw relatively little improvement. Therefore, the use of Quizwhizzer as a learning tool is capable of addressing the most crucial aspect of learning: student motivation, which leads to satisfactory learning results. Given the issues described above, the researcher is interested in conducting a study titled "The Effectiveness of Interactive Quizwhizzer Games with a Deep Learning Approach to Improve the Understanding of Fractional Concepts for Fifth-Grade Elementary School Students."

METHOD

The type of research used in this study is experimental research, employing a one-group pretest-posttest design. The research population consists of fifth-grade students at SDN Sendangmulyo, while the sample includes students from class VA. The sample was selected using a purposive sampling technique. Data collection techniques involved tests, questionnaires, and documentation. The research instrument used was a set of pretest and posttest questions designed to measure students' conceptual understanding of fractional material.

The research hypothesis is that interactive Quizwhizzer games with a deep learning approach are effective in improving the understanding of fractional concepts among fifth-grade elementary school students. To test this, a parametric statistical test was conducted. First, the data had to fulfill the prerequisite analysis tests, namely normality and homogeneity tests. Subsequently, a paired sample t-test was performed to determine whether there was an influence from the implementation of the learning media. Finally, an N-Gain test was conducted to determine the extent of the media's effectiveness.

RESULTS

The research results discuss the test outcomes obtained during the study, including the normality test, homogeneity test, paired samples t-test, and N-Gain test.

a. Normalitas Test

SCHOLA
ISSN (Online): 2988-7100
Vol. 3, No. 2, November 2025, Page. 44-54
Available Online at journal.upgris.ac.id/index.php/imajiner

The normality test is used to determine whether the data before and after the treatment are normally distributed. A normality test is essential before conducting parametric statistical analysis. The results of the normality test are shown in the table below.

Table 1 Normalitas Test Result

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.209	22	.013	.915	22	.061
Posttest	.191	22	.037	.921	22	.078

a. Lilliefors Significance Correction

Based on the normality test results above, it can be seen that the students' score data for fractional material on the pretest and posttest obtained significance values of 0.61 and 0.78, respectively. Since these significance values are greater than 0.05 ($\alpha > 0.05$), it can be concluded that the pretest and posttest data for the students' fractional material scores are normally distributed. This means that the normality assumption is fulfilled for the students' score data.Thus, the normality assumption is satisfied for the students' learning outcomes. After ensuring that the fractional material score data are normally distributed, a homogeneity test can then be conducted to examine whether the variance of the two data groups is homogeneous or not.

b. Homogenitas Test

The homogeneity test is used to determine whether the two data groups—namely the pretest and posttest data—are homogeneous or not. The testing criterion stipulates that if the homogeneity test result shows a probability value greater than 0.05, the data are considered homogeneous. The results of the homogeneity test calculation for the fractional material score data are as follows.

Table 2 Homogenitas Test Result

Test of Homogeneity of Variances

nilai

Levene Statistic	df1	df2	Sig.
.007	1	42	.934

Based on the results of the homogeneity test on the pretest and posttest data of the students' fractional material scores, a significance value of 0.934 was obtained. This value is greater than 0.05 ($\alpha > 0.05$), indicating that the students' score data are homogeneously distributed.Thus, the homogeneity test results show that the pretest and posttest data for the students' fractional material scores possess similar variances, or that there are no significant differences in variance between the two groups. This allows for further statistical analysis, such as hypothesis testing, to determine whether there is a significant difference or improvement in student learning outcomes after the treatment was administered.

SCHOLA
ISSN (Online): 2988-7100
Vol. 3, No. 2, November 2025, Page. 44-54
Available Online at journal.upgris.ac.id/index.php/imajiner

c. Paired Sampel T Test

The hypothesis testing in this study utilizes a T-test with two variables, specifically the Paired Sample T-Test, to determine the extent of the effectiveness of Quizwhizzer game media on students' fractional material scores. The testing criteria for this study are as follows: if the tcount > t-table, then H_0 is rejected; if the t-count < t-table, then H_0 is accepted. The results of the hypothesis testing are as follows:

Table 3 Paired Sampel T Test Result

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1 nilai - kelas	78.500	6.525	.984	76.516	80.484	79.797	43	.000

Based on the results of the Paired Samples Test, which show a significance value (sig) of 0.00001—smaller than the significance level of 0.05—it can be concluded that there is a significant difference between the students' fractional material scores before and after the treatment. In the context of this study, this significant difference indicates the impact of implementing Quizwhizzer game media in mathematics learning.

These results support the conclusion that the use of Quizwhizzer media with a deep learning approach is effective in improving students' understanding of fractional concepts. Thus, this study provides empirical evidence that the integration of Quizwhizzer game media with a deep learning approach can enhance students' conceptual understanding of fractions in mathematics education. This serves as a strong foundation for recommending the use of such media in similar mathematics classrooms.

d. N Gain Test

The effectiveness of the Quizwhizzer media with a deep learning approach was analyzed using the N-Gain test. The N-Gain test is used to calculate the magnitude of the improvement between the pretest and posttest scores in fractional material. This improvement can be observed from the students' N-Gain acquisition as shown in the obtained table. The recapitulation of the N-Gain test results for the pretest and posttest scores on fractional material can be seen in Table 5.

Table 5 N-Gain Result

No.	Komponen	Hasil	
		Pretest	***Posttest***
1.	Jumlah peserta didik	22	22
2	Nilai rerata	75,91	84,09
3.	*Normalitas Gain*	**0,339**	
4.	Kategori	**Sedang**	

Based on the data, the normalized gain for the fractional material indicates that the learning outcomes of the fifth-grade students at SDN Sendangmulyo experienced

an improvement, as evidenced by the results of the pretest and posttest scores. The analysis of the students' normalized gain, with an average N-Gain score of 0.339, falls into the "medium" category.

Based on the series of tests conducted, it can be concluded that Quizwhizzer with a deep learning approach can improve the understanding of fractional concepts. Therefore, it can be stated that Quizwhizzer with a deep learning approach is effective in enhancing the conceptual understanding of fractions among fifth-grade elementary school students.

The results of the hypothesis testing indicate that Quizwhizzer, combined with a deep learning approach, is effective in improving the understanding of fractional concepts. The advantages of Quizwhizzer can be attributed to its gamification approach. Much like Quizizz, Quizwhizzer is designed with strong competitive gaming elements. Features such as leaderboards, avatars, music, and race or "Snakes and Ladders" game models create a dynamic and socially competitive learning environment. These elements serve as powerful extrinsic motivational triggers, encouraging students to participate actively and strive for the highest scores.

Furthermore, the effectiveness of Quizwhizzer media with a deep learning approach on conceptual understanding is also demonstrated through the results of the effect size calculation using the Cohen's d formula, which yielded a value of 2.12. As a game-based medium, Quizwhizzer is capable of creating a more interactive and enjoyable learning atmosphere that motivates students to be active in the learning process. This is reinforced by Piaget's Constructivist Learning Theory, which states that the learning process becomes more meaningful when students are actively involved in constructing their own knowledge.

This aligns with previous research, such as studies conducted by Umami (2023) and Agustina (2024), which show that Quizwhizzer can significantly improve students' understanding and interest in learning. Therefore, the results of this study strengthen the conclusion that Quizwhizzer is an effective medium to be implemented in mathematics instruction, particularly for fractional material at the elementary school level.

According to learning motivation theory, interactive media containing game elements can enhance intrinsic motivation, which in turn has a positive impact on the understanding of subject matter. This explains why the influence found in this study falls into the large category (Deci & Ryan, 2021). Furthermore, research by Dewi and Saputra (2021) also asserts that game-based learning creates a fun and challenging learning atmosphere, thereby encouraging students to participate actively. This active involvement is proven to contribute significantly to the students' success in comprehending instructional materials. Therefore, the effectiveness of Quizwhizzer in this study is inseparable from its contribution to students' learning motivation and engagement.

In addition to discussing the effectiveness of Quizwhizzer media, this study also addresses the deep learning approach. Quizwhizzer media is integrated within deep learning instruction, which encompasses three key aspects: mindful learning, meaningful learning, and joyful learning. Mindful learning plays a significant role in shaping students' reflective awareness of the material. Students become capable of recognizing what they understand, asking questions actively, and consciously involving themselves. This proves that the mindful learning approach is effective in building students' metacognition.

The implementation of meaningful learning allows students to relate instructional concepts to real-life situations, although some challenges remain. Joyful learning has been proven to increase motivation and active student participation. Varied learning

environments, such as learning outside the classroom or through games, enhance student interest. However, several obstacles, such as the dominance of certain group members and feelings of discomfort when performing in front of the class, still require attention.

Overall, the deep learning approach can exert a positive impact on mathematics learning in the fifth grade, particularly regarding students' understanding of fractional concepts. Students demonstrate the ability to understand material more holistically and applicably in topics linked to daily life, such as waste management.

These research findings are consistent with previous studies. Astuti's (2022) research found that problem-based learning, as a part of deep learning, is capable of enhancing critical thinking and problem-solving skills in elementary students—similar to the improvements in reflection and conceptual understanding found in this study. Additionally, Pratiwi and Mulyasa (2021) concluded that joyful learning strategies increase students' self-confidence and engagement in group and outdoor learning, aligning with these findings. However, this study provides an additional contribution by emphasizing the students' reflective process as evidence of metacognitive engagement and explicitly integrating the three aspects (mindful, meaningful, and joyful) to provide a more comprehensive picture of the learning model in primary education.

Theoretically, the results of this study support the Deep Learning theory by Caine and Caine (1994), which emphasizes the importance of emotional connection, contextual relevance, and high cognitive engagement—all of which are manifested in mindful, meaningful, and joyful learning. Mindful learning aligns with Ellen Langer's (1989) concept of mindfulness and active engagement in thinking. Meaningful learning reinforces Ausubel's (1968) theory regarding the importance of anchoring new material to existing knowledge, as evidenced by the students' ability to connect concepts with real-world experiences. Meanwhile, joyful learning supports Seligman's (2002) view in positive psychology, which states that a positive emotional atmosphere enhances motivation and academic achievement, proven by students who felt happy becoming more active and collaborative.

Thus, this research validates the deep learning approach as a holistic model that improves the quality of learning across cognitive, affective, and social aspects. Nevertheless, several challenges were identified, particularly regarding group work dynamics within meaningful and joyful learning. Some students complained about passive or dominant group members and felt uncomfortable when required to present in front of the class. This indicates a need for more balanced and fair group management by teachers to ensure equitable participation. A follow-up to these findings is the importance of more structured teacher intervention in facilitating group work, perhaps by assigning clear roles to each member and practicing presentation skills in a more supportive environment.

Additionally, teachers identified differences in student learning readiness and time constraints as significant challenges. Therefore, flexible yet structured lesson planning is essential to accommodate diverse student needs. The limitations of this study include the relatively small sample size (22 students) in a single elementary school, which may limit the generalizability of the results to a broader context.

CONCLUSION

This study concludes that the use of Quizwhizzer, integrated with a deep learning approach, is proven effective in enhancing the conceptual understanding of fractions among fifth-grade elementary school students. This effectiveness is attributed to the fact that Quizwhizzer-assisted games within a deep learning framework guide students to solve problems by first mastering the underlying concepts and addressing all indicators of

conceptual understanding. These findings are supported by data analysis using the paired sample t-test, which yielded a significance value (2-tailed) lower than the alpha level (0.000 < 0.05), indicating that the approach is statistically significant. Consequently, the use of a deep learning approach in mathematics instruction can successfully improve students' ability to understand fractional concepts.

ACKNOWLEDGEMENT

The author would like to express their sincere gratitude to Prof. Dr. Ahmad Buchori, M.Pd., for his invaluable guidance and supervision throughout the research process. Furthermore, the author extends their heartfelt thanks to their family and fellow students for their continuous support, encouragement, and motivation.

REFERENCES

Aledya, V. (2019). Kemampuan pemahaman konsep matematika pada siswa. *May, 0–7*.

Diana, P., Marethi, I., & Pamungkas, A. S. (2020). Kemampuan pemahaman konsep matematis siswa: ditinjau dari kategori kecemasan matematik. *SJME (Supremum Journal of Mathematics Education)*, *4*(1), 24-32.

Faijah, N., Nuryadi, N., & Marhaeni, N. H. (2022). Students' responses to quizwhizzer educational game to strengthen mathematical concept understanding ability. *Journal Of Education And Teaching Learning (JETL)*, *4*(2), 94-104.

Hermawan, M. R., & Suharto, Y. (2025). Pemanfaatan Aplikasi Quizwhizzer untuk Menumbuhkan Minat Belajar Siswa pada Model Pembelajaran Berbasis Permainan. *Journal of Language Literature and Arts*, *5*(2), 140-149.

Islami, S. M., & Rachmawati, T. K. (2025). Pengembangan media pembelajaran game edukasi berbantuan genially terhadap kemampuan pemahaman konsep matematis siswa. *Papanda Journal of Mathematics and Science Research*, *4*(2), 284-300.

Isnaini, L. I. L., Winata, N. T., & Kohar, D. (2025). Penggunaan Game Edukasi Quizwhizzer dalam Pembelajaran Bahasa Indonesia di Kelas VII. *Triangulasi: Jurnal Pendidikan Kebahasaan, Kesastraan, Dan Pembelajaran*, *5*(1), 52-60.

Karima, U. L., Rahmawati, A., & Rohmatin, D. N. (2024). Pengembangan media pembelajaran operasi aljabar berbasis articulate storyline berbantuan quizwhizzer untuk mendukung pemahaman konsep. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *7*(2), 323-336.

Mailani, E., Rarastika, N., Jannah, M., Heriani, N. A., & Zendrato, W. E. (2025). Pemanfaatan Strategi *Deep learning* untuk Meningkatkan Pemahaman Konsep Matematika Dasar Siswa Sekolah Dasar: Studi Literatur. *Jurnal Intelek Insan Cendikia*, *2*(6), 12349-12355.

Ulfainna, N., Mulk, M. T., Nurizza, A., Satriani, S., Abira, A., & Madjid, T. (2025). Efektivitas media puzzle dalam meningkatkan pemahaman konsep pecahan matematika pada siswa sekolah dasar. *Jurnal Ilmiah Pendidikan Dasar (JIPDAS)*, *5*(1), 540-548.

Yulianty, N. (2019). Kemampuan pemahaman konsep matematika siswa dengan pendekatan pembelajaran matematika realistik. *Jurnal Pendidikan Matematika Raflesia*, *4*(1), 60-65..