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Understanding Fractions with Playing Digital Math Games: Case Study

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A B S T R A C T

In this research, based on the theoretical framework and previous studies, we have identified the features and characteristics of best practices, investigating the impact of digital games on learning fractional concepts and students' motivation for the subject of mathematics. Therefore, the purpose of this study is to present the influence and importance of digital games, but at the same time show that these games develop their skills and abilities for mathematical concepts, respectively for fractions. The methodology used for this study is a case study. However, as a research strategy for this study, mixed research, that is, quantitative and qualitative, has been chosen. The sample of the study is the student with the nickname "Lina" from the ninth grade of the primary and lower secondary school "Heronjtë e Lumës" from the village of Shkozë, municipality of Prizren. For the collection of quantitative data, a pre- and post-test was used, while for the collection of qualitative data, an observation log and a semi-structured interview were used. The results of this study showed that the use of digital games in understanding fractional concepts has been a great help to the student

Keywords:*Digital games, fractions, mathematics, students, understanding*

1. Introduction

The learning approach is a more global way and is gaining momentum nowadays. Modern learning tools are important and most preferred in the technological age. A modern education system uses technology to advance the education system. The increasing use of digital games and applied sciences in learning environments have affected both teaching and learning. Game-Based Learning (GBL) can be successfully used to enhance learning and teaching. Game-Based Learning simply means incorporating subject knowledge into games (Dadheech, 2019). Students' experiences with play environments are shaping their expectations of learning environments. Students prefer rich graphics and multitasking interfaces. They want tasks that are "fast, active, and exploratory, with information supplied in multiple forms in parallel." Students are also more engaged when a narrative story is present within the games. Narration is used to join the different tasks of the game into a coherent unit and to keep the students engaged as they work on the different tasks (Rupp, Gushta, Mislevy, & Shaffer, 2010). Digital games provide learning opportunities that engage students in interaction and help prepare them to participate in the globalized, technological environment and society of the 21st century (Coffey, 2017). The application of computer games in learning situations can not only improve the fun, but also promote children's learning motivation through the challenge of games to gain constant irritation (Call, Leaf, & Oppenheim-Leaf, 2012). The relationship between mathematics and games is often used as a tool to motivate students. Other researchers use games directly as tools for motivating students and increasing their participation. The researchers' studies describe how digital games can be used to foster a positive attitude in students about mathematics and learning in general. The studies focused on cases of underprivileged students who were offered a series of competitive games involving mathematical reasoning. Students learning occurs as they participate in the games, including their changing/discussing the rules of the games and discussing the strategies developed. Engaging in play can thus provide a meaningful context for students to study mathematics. In some cases, this engagement is motivated through a second learning experience (Mor, Winters, Cerulli, & Björk, 2006). With characteristics such as being interesting, exciting, and emotionally stimulating, and taking into account the joy of learning concepts in digital games, these computer games can be quite effective in increasing the level of motivation and emotional stimulation of students.

1.1 Problem Statement

In mathematics, fractions are one of the basic concepts that students have difficulty understanding. The most frequent problems among students in understanding fractions are:

a) students focus on counting the parts, giving priority to the number of parts and not the ratio between the part and the whole;

b) students confuse fractions with mixed numbers during comparison;

c) students have problems solving problems with fractions;

d) students have difficulties in comparing heterogeneous fractions;

e) students cannot successfully perform basic operations with fractions;

1.2 Purpose of Study

Mathematical competence is fast becoming an essential requirement in ever greater parts of work and everyday life. Thus, creating strategies for improving students' mathematics learning is a major goal of educational research. Therefore, this study highlights the importance of playing digital games in understanding one of the basic mathematical concepts, namely fractions.

2. Materials and Methods

Mathematics is an important subject in school education. The complexity of the act of thinking and learning, as well as the relatively difficult and abstract nature of mathematics makes teaching this subject more challenging compared to the theoretical and empirical sciences. Researchers consider overload in traditional practices, lack of modern teaching methods, lack of equipment and training tools, low cognitive stability, and affective factors as the main reasons for academic failure and lack of motivation among students (Natasha, Speer, Smith, & Aladar, 2010).

Therefore, we have tried in this study to study its effect on the understanding of mathematical concepts using digital mathematical games. The description of digital mathematical games related to fractions that were used in this research is presented as follows:

Game 1: Fraction Fraction – is one of the math games and the game is simple like a puzzle about adding and subtracting fractions. This game is based on the educational resources most needed by students in junior high school. The game is played by filling the spaces with the given fractions and waiting for the basic operations of addition and subtraction to give the correct result. The game is simply where you put the fraction in the right places and press the "Send" button to get the result (GooglePlay, 2022).

Game 2: Fractions Challenge – this game encourages you to do fractions with this fun app for students. This game is one of the educational mental calculation games to learn and reinforce mathematical concepts, such as representing fractions, adding and subtracting with the same and different denominators, multiplying and dividing fractions, equivalent fractions, and reducing fractional numbers. This educational game can be played alone or in a group, as it features a multiplayer mode. The recommended age is for primary and lower secondary school students, 7 to 16 years old (GooglePlay, 2022).

Game 3: Fractions for Kids – is a game that has several modules about fractions. The first module shows the shaded part of the part of a whole by naming that fraction. The second module describes the comparison and equivalence of fractions in an illustrative way. The third module shows the picture divided into parts where the player has to identify the fraction according to the shaded parts. The fourth module describes finding the fractional part on the number line. The fifth module helps to match the value of the fraction by coloring the given part. The sixth module explains the addition of fractions in an illustrative way. The game also has some similar modules as shown above (GooglePlay, 2022).

Game 4: Slice Fractions – is a series of leveled math puzzles that require students to strategically cut and slice pieces of a whole, teaching them about fractions. Students will engage in rigorous fraction problem-solving. Slice Fractions reinforces many fraction concepts by challenging students to cut ice and rocks into different fractional parts so that the pieces fall and make a path for the Mastodon (GooglePlay, 2022).

Game 5: FeractionPlus – is a calculator that helps students calculate basic fraction operations. Students can perform addition, subtraction, multiplication, and division with fractions. In addition to regular and irregular fractions, the game also offers the possibility of performing actions with mixed numbers. Also, the unique interface is ideal for calculating fractions and automatically answers both fractional and decimal forms (GooglePlay, 2022).

3. Methodology

3.1 Design of Study

The case method was chosen for this study. The case method study enables us to closely examine the data within the specific context of this study. In most cases, as well as for this study, a case method was chosen to study in the context of a small geographical area and a very limited number of individuals as study subjects. Yin (1984) defines the case study method study "as an empirical investigation that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not visible, and in which multiple sources of evidence are used" (Yin, 1994). Also, as a research strategy for this study, mixed research, that is, quantitative and qualitative, has been chosen. The quantitative part of the research focuses on the quantification of data collection and analysis. Where Creswell (2003) describes quantitative research as using research strategies such as experiments and surveys and collecting data on predetermined instruments that provide statistical data. Whereas, he defines qualitative research as an investigative process to understand a social or human problem based on the construction of a complex, holistic picture, formed by words, reporting the detailed views of the informants and carried out in a natural environment (Creswell, 2003).

3.2 Participation

A case study was conducted with a student of the lower secondary school "Heronjtë e Lumës" from the village of Shkozë in the municipality of Prizren. The research participant was a ninth-grade student and the selection criterion was that she already knew the basic concepts of fractions taught earlier. The profile of the student presented an age of 14 and a rural residence. The nickname for student for this study is “Lina”.

3.3 Research Questions

1. What is the effect of playing digital games on the student's performance in understanding fractions?
2. What did the student experience while understanding fractions by playing digital math games?
3. Which fraction concepts did understand fractions by playing digital math games have the most effect on?

Hypothesis

H_1: The student achieved higher results in the post-test compared to the pre-test.

H_2: There are statistically significant differences in concepts in the recognition of fractions, expansion and simplification, comparison, operations, and problem-solving by playing digital mathematical games.

H_3: The student's perceptions were very positive about understanding fractions by playing digital math games.

H_4: There is a statistically significant correlation between digital mathematical games and the understanding of fractions.

3.4 Data Collection and Analysis

The data for this study were collected by a systematic process of collecting data from observations and measurements. The quantitative data collected will be expressed in numbers and graphs, and analyzed through statistical methods. Meanwhile, the qualitative data collected are expressed in words and analyzed through interpretations and categorizations. Since our aim is twofold where we have a mixed methods approach, we have collected both types of data. Quantitative data collection presents hypothesis testing and large-scale statistical data reporting. However, the purpose of qualitative data collection was to explore ideas, understand experiences and gain detailed knowledge in the specific context of the study.

For the collection of quantitative data and the evaluation of achievement results after the intervention applied in this study, pre and post-tests were used. Tests are compiled to determine their relevance and suitability for the objective of the study. To determine whether playing digital math games had any effect on the student's performance, she conducted a pre-test at the beginning of the study and a post-test after the digital game intervention. To analyze pre and post-test data for student performance, both descriptive and inferential statistics were used to generate meaningful information from the raw data. Descriptive statistics included percentage, mean, standard deviation, etc. For the analysis of the study data, a t-test was used to determine if there was any significant difference between the pre and post-test in the participants. Also, to determine if there is any relationship worth highlighting between playing digital games and understanding fractions, it was analyzed with Pearson's correlation. SPSS software for social sciences was used for all statistical analyses.

On the other hand, a checklist and a semi-structured interview were used to collect qualitative data. The checklist served to investigate what the participant experienced while playing digital games and to express her motivation in understanding fractions. However, the interview allowed us to understand the deepest experiences of the student “Lina” about the games she had played. These qualitative data were analyzed and interpreted through the narrative process, which provided valuable insights into the complexity of mathematical digital games, feelings, and experiences of the student "Lina".

3.5 Procedure

The study was conducted in eight teaching hours for 2 weeks in the first semester of the 2022/2023 school year. Before the study, the objectives of the games and the flow of the study were presented to the student. She was provided with a tablet to play and understand the games, this was also possible to take home. Then, in the first week of the experiment, the student “Lina” completed the pre-test. The test assessed the student's achievement performance for the knowledge she had in understanding fractions, which she had previously learned. During the entire time of playing the digital games “Lina” was observed with a checklist. However, at the end of the study, she performed a post-test to see the effect or failure of playing digital games on the understanding of fractions. The study was concluded with the interview we conducted with the student “Lina”, who recounted her experiences with playing digital games to better understand fractional concepts.

4. Results

The results of this research show that learning based on digital mathematical games had an impact on the performance of the student “Lina” in understanding fractions. This study evaluated the difference in the post-test and whether there is any difference between the test results of the student

who played digital math games and the ones who used the traditional way of understanding fractions in the pre-test. Furthermore, the study also investigated the perception of the student "Lina" and whether there is a significant difference between the traditional approach to understanding fractions and playing digital games for fraction concepts.

To answer the questions and hypotheses of our study, the means and standard deviations of the results of the two tests for the teaching method (digital game-based learning vs. traditional learning) were used for the quantitative data of the pre and post-test results. and t-test and ANOVA test were used to identify any significant difference between the two tests, and Pearson correlation was performed to ascertain what correlation exists between the concepts of playing mathematical digital games.

The test results are distributed proportionally between the fractional concepts divided into sections. The recognition of fractional concepts section is rated with a maximum of 11 points, the expansion and simplification section with 12 points, the fraction comparison section with 11 points, the fraction operations section with 33 points, and the fraction problem-solving section with 33 points. Below we analyze the results before and after the test:

Table 1. Pre and post-test results

Concept	Test	Max	Mean	Standard deviation	Percentage
Recognition of fractions	Pre-test	11,0	10,5	,35	4,55
	Post-test	11,0	11,0		
Expanding and simplifying fractions	Pre-test	12,0	3,0	2,12	50,00
	Post-test	12,0	6,0		
Comparing fractions	Pre-test	11,0	3,0	2,83	57,14
	Post-test	11,0	7,0		
Operations with fractions	Pre-test	33,0	12,0	5,66	40,00
	Post-test	33,0	20,0		
Solving problems with fractions	Pre-test	33,0	15,0	4,24	28,57
	Post-test	33,0	21,0		

The results of the table above show that the student "Lina" achieved higher results in the post-test compared to the pre-test by 0.5 points or 4.55% for the concepts of knowledge of fractions. Also, the post-test results show that they are higher by 3.0 points or 50.00% for the concepts of expansion and simplification of fractions. In the post-test, "Lina" achieved 4.0 points or 57.14% more points compared to the pre-test for the concepts of comparing fractions. After the intervention with digital mathematical computer games, the student was more successful in the post-test for 8.0 points or 40.00% for the concepts of operations with fractions. Also, the post-test results show that the student "Lina" has more 6.0 points or 28.57% while playing digital mathematical games compared to the pre-test without the intervention of games in the concepts of solving problems with fractions. In general, the student "Lina" achieved better results in the post-test for 21.5 points or 33.08% compared to the pre-test for all the fractional concepts discussed above.

A statistical t-test was used to compare the means from playing the digital game and from not playing the digital game for fraction concepts. We present the results of the t-test as follows:

Table 2. One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Recognition of fractions	43,000	1	,015	10,7500	7,573	13,927
Expanding and simplifying fractions	3,000	1	,205	4,5000	-14,559	23,559
Comparing fractions	2,500	1	,242	5,0000	-20,412	30,412
Operations with fractions	4,000	1	,156	16,0000	-34,825	66,825
Solving problems with fractions	6,000	1	,105	18,0000	-20,119	56,119
Total	5,047	1	,125	54,2500	-82,342	190,842

The above table was used for hypothesis testing to determine if in this treatment there is an effect of interest in the student "Lina", from the analyzed results of playing digital mathematical games. Furthermore, the t-test results show that there is no difference in the knowledge of fractional concepts by playing digital games with a significance of .015 which is lower than .005. However, we have statistically significant differences in the concepts of expansion and simplification of fractions with a significance of .205, in the concepts of comparison of fractions with a significance of .242, in the concepts of operations with fractions with a significance of .156, and in the concepts of solving problems with a significance of .105. These values show that there are differences in the averages before and after the tests, i.e., before and after playing digital math games for the student "Lina". These differences are in favor of treating the plan with the digital math game in understanding fractional concepts in general.

To understand if there is any relationship between the variables of playing digital mathematical games and the understanding of fractions, we analyzed using Person's correlation. We present the Pearson correlation diagram as follows:

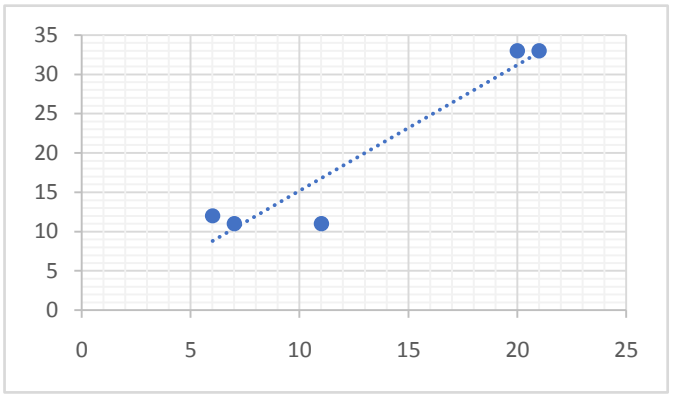

Figure 1. Pearson Correlation

Pearson correlation with the coefficient value of .957 we are noticing that we have a positive and almost perfect correlation and that we can say that playing digital mathematical games has a direct relation to the understanding of fractions. This means that the more we play digital games, the more successful our understanding of fractional concepts will be.

On the other hand, the repeated measures ANOVA test was used to illustrate the main and interaction effects on the variables with a significance level of .05. The results of the ANOVA test are presented as follows:

Table 3. Anova: Single Factor

Groups	Count	Sum	Average	Variance
Recognition of fractions	2	22	11	,0
Expanding and simplifying fractions	2	18	9	18
Comparing fractions	2	18	9	8
Operations with fractions	2	53	26,5	84,5
Solving problems with fractions	2	54	27	72
Total	2	165	82,5	612,5

Table 4. ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7966	5	1593,2	12.02415	0.004412	4.387374
Within Groups	795	6	132.5			
Total	8761	11				

The ANOVA test results are showing that the means are 9.0, 9.0, 22.0, 26.5, 27.0, and 82.5. The difference between the largest average and the smallest average is about 132.5. Likewise, the significant value is .004, which means that it is less than the confidence level defined by .05. As a result, we can say that the differences between some averages are statistically significant for fractional concepts using digital math games.

The checklist in this study determines the student's experiences, attitudes, feelings, and behaviors while playing digital math games. Below we present the checklist indicators developed for further analysis:

Table 5. Checklist

Statement	Always	Sometimes	Never
Pay attention in class	✓		
Motivated for learning	✓		
Encourage critical thinking		✓	
Increase engagement	✓		
Knowledge recall		✓	
Prompt Feedback		✓	
The satisfaction of completing tasks	✓		
Stimulated the imagination		✓	
Learning by Playing	✓		
Helped to solve problems		✓	
Integrative approach			✓
Social interaction		✓	

Development of skills and abilities	✓

The results from the checklist show that the student “Lina” always paid attention in class while playing digital math games. Also, she was always motivated to learn, however, we sometimes noticed that digital games encouraged critical thinking. On the other hand, digital games have always increased her engagement in lessons and have sometimes helped her recall knowledge of fraction concepts. Digital games have sometimes helped the learner in getting instant feedback. However, these games have always helped her in completing tasks with pleasure. Sometimes digital games have stimulated her imagination and helped her solve problems. But digital math games have always been about learning through play. Digital games have in most cases also brought social interaction to the student “Lina” with her classmates. Through the game, the student sometimes developed her skills and abilities to solve different problems. However, in these digital games, it has never been observed that they have an integrative approach with other subjects. In other words, the use of the checklist in this study was effective in supporting the learning of the student “Lina” in direct observation while playing digital games.

During the interview, the student “Lina” said that "Playing digital math games can be used anytime and anywhere, and digital games allow understanding fractions while having fun". She emphasized that the use of technology and accompanying digital games in explaining fractional concepts are contributing to an easier understanding of these topics. The student emphasized that "I remember the information I had learned more easily thanks to the digital game and it helped me better understand the lesson actively". She shares her experience that through digital games about fractions, she was able to understand fractional wholes and compare fractions more easily, as the game helped her visualize abstract terms. In her own words, she shared, "I could not express my feelings and I am very happy that I managed to complete all the levels of these digital math games". Also, she showed that supporting the learning process, especially the subject of mathematics with digital games, is creating a more appropriate connection in solving students' problems. Another response was that she said "Actually, these digital games were important for my perspective in understanding fractions and I will use these games in the future". The student recommends that digital games should be used to treat other concepts, not only fractions but why not in other subjects besides mathematics.

5. Discussions

Students often develop misconceptions about concepts in math, including fractions. It is important to help them overcome these misconceptions. Digital math games feature cleverly designed tasks that challenge students to identify fractions represented by visual patterns. These games will push students toward mastery and develop their all-around mathematical acumen. Therefore, this study aimed to analyze the importance of the influence of playing digital mathematical games on the understanding of one of the basic mathematical concepts, such as fractions. To achieve this goal, we developed a case study with the student “Lina” to examine the impact of digital games on the understanding of fractions.

The results of our study are parallel to the findings of the study conducted by Gaggi, Ciraulo, and Casagrande (2018), where pre-tests conducted in a primary school in Italy showed a good acceptance of the game, that is, the children liked to play the game and they wanted to play again. Furthermore, the researchers point out that they did not need to give any explanation to the children before the game session, therefore the game, both in its story and in its graphics, is correctly targeted. Even if the tests only lasted a few days, in a very short time visible improvements in the children's learning were recorded, after the tests have shown that the game can influence the graphic representation used by the children to describe fractions. For these reasons, the researchers argue that more intensive and wider use of the game can support learning and in particular the concepts of fractions in primary schools (Gaggi, Ciraulo, & Casagrande, 2018). Therefore, our results in the study show that the post-test scores playing digital games are higher compared to the pre-test. So, with this evidence, we are proving our hypothesis that the student achieved higher results in the post-test compared to the pre-test. Also, from the general results, we notice that the student has 21.5 points more compared to before the test. From this, we can also answer the research question that the effect of playing digital games on the student's performance in understanding fractions affected 33.08%. In other words, learning activities through digital games inspired the student's engagement and success in learning more about fraction concepts.

Our findings are consistent with the study conducted by Lee (2008), where he described that the topic of comparing fraction sizes is an important aspect of the New Zealand fractions curriculum, which was explored with the Fraction Brick Game. The game builds a storyline of a boy who has to build a staircase made of fractional bricks to reach home. In this game, fraction bricks are used to represent the differentiation of fractions. The game was found to increase in difficulty, as the game progressed and requires more complex strategies. They were tested with 8th-grade students and got an impression of how the game can be further improved to better improve the process of learning fractions (Lee, 2008). Therefore, the results of our study show that the student “Lina” had higher results in the concepts of expansion and simplification of fractions with a difference of 50.00% in favor of the post-test. Likewise, in the concepts of comparing fractions, we have a difference of 57.14% in favor of playing digital games. In fraction operations concepts we have a 40.00% increase in understanding by integrating digital games compared to not using them. And in solving problems, we have a difference of 28.57% more in the post-test results compared to the pre-test. However, we do not have any big difference in the recognition of fractional concepts, where this difference is only 4.55%. Therefore, from these results we can answer the research question that playing digital games had a greater effect on the concepts of comparing fractions, expanding and simplifying fractions, fraction operations, and solving problems with fractions, while this effect was a little weak in the recognition of fractional concepts. This is also proven by the results of the t-test and the ANOVA test with a significant significance of .004, which shows that we encountered statistically significant differences in the recognition of fraction concepts, comparison of fractions, expansion and simplification of fractions, operations of fractions and solving fraction problems by playing digital computer games. Consequently, the digital games had many benefits in understanding fractional concepts to help the cognitive development of the student “Lina”.

The findings of the current study regarding the effect of digital games on the understanding of fractions and the sustainability of mathematics learning are consistent with another research. The results of our study from the checklist show that the student “Lina” after playing digital math games was more careful in class, she was also always motivated and sometimes had encouragement in higher critical thinking. Also, the student has engaged more and has always completed the tasks with satisfaction. She sometimes had the recall of knowledge and immediate reactions, as well as the stimulation of the imagination. The results from the checklist show that the student has learned a lot about fractional concepts while playing and it has sometimes helped her to help solve problems, social interaction, and development. skills ability. However, the results from the checklist show that the digital games did not help the student with an integrative approach. So, from these results, we can also answer the research question that the student “Lina” has experienced motivation, satisfaction, commitment, reaction, help, stimulation, encouragement, interaction, and development of skills by playing digital mathematical games. In this regard, it is emphasized that computer games are one of the most powerful motivational tools and an aid to learning mathematics. Therefore, we can say that educational computer games are a new method to create an environment suitable for active learning since not only students will be able to learn the material with pleasure and without fatigue, but also they will be able to understand abstract concepts well in an electronic environment (Lowrie & Jorgensen, 2011; Natasha, Speer, Smith, & Aladar, 2010; Kebritchi, 2010).

From the results of our study from the interview, we received very positive answers from the student “Lina” about digital computer games that are used in understanding fractional concepts. Among other things, she emphasized that digital games allow the understanding of fractions while having fun, and contribute to an easier understanding of these topics. Also, she confesses that the information she learned was easier to remember thanks to the game and that she was very happy that she managed to complete all the levels of these digital math games. The student states that indeed, these digital games were important for her perspective in understanding fractions and indicates that she will use these games in the future. Even from the results of the study Sun and other authors (2021) identified a significant effect on the learning activities of students and perceptions towards mathematics in the context of digital games in primary education (Sun, Ruokamo, Siklander, Lic, & Devlind, 2021). As a result of this, we can also answer the research question that the student's perceptions were very positive regarding the understanding of fractions by playing digital mathematical games. So, it is important to develop effective methods for increasing students' motivation for mathematics and improving their understanding of knowledge.

Some researchers also believe that there is no clear causal relationship between student achievement in mathematics and the use of computer games (Shafie, Wan, & Wan, 2010). However, our study is contrary to the study conducted by Shafie, Wan, and Wan (2010), as the results of our study show that there is a positive and almost perfect correlation between digital math games and the understanding of fractions. The results of the Pearson correlation from our study have a coefficient value of .957 which shows that we can also prove our hypothesis that this relationship is strong and that there is a statistically significant correlation between digital mathematical games and the understanding of fractions. This connection to digital games and understanding of fractional concepts is well suited to reaping the full range of benefits of a digital game-based learning context.

6. Conclusion

The method of solving fraction concepts always involves the practical approach that requires theory-based solutions to mathematical problems. In the same way, critical and constructive thinking are the most important components needed in the process of solving problems related to fractions. The use of digital games in understanding fraction concepts has been a great help to the student “Lina”, where these games were used to support the ability of mental reasoning in the process of solving fractions to achieve a deeper understanding of these concepts. Our findings show that playing digital games had a positive effect on the student's performance and the effect was observed in the knowledge of fraction concepts, comparison of fractions, expansion and simplification of fractions, operations of fractions, and solving problems with fractions. Also, our findings show that student n achieved higher results in the post-test compared to the pre-test, namely while playing digital math games. On the other hand, it was observed that digital mathematical games influenced the acquisition of positive perceptions by the student “Lina” during the understanding of fractions and she experienced additional motivation when solving problems related to fractions. Also, the findings of the study show that there is a positive and almost perfect correlation between digital math games and an understanding of fractions.

As noted by the findings in this study, the use of digital math games had a high impact on student achievement around fraction concepts. Therefore, we can say that the use of digital mathematical games in this research has served as a supporting process to supplement contemporary teaching methods and strategies, thus promoting a clearer understanding of the concept of fractions by students.

In other words, it is clear that traditional classrooms with one-sided teacher lectures and teacher-centered classrooms are no longer sufficient to satisfy students' need to learn, but digital games are a didactic tool as the new trend nowadays, especially from the acceleration of digital learning influenced by the outbreak of COVID-19.

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