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GAMES IN FUNCTION OF DEVELOPMENT OF MULTIPLICATION SKILLS

Dasare Sylejmani, PhD student,
Prof. Dr. Vesna Makashevska,
Prof. Dr. Jasmina Jovanovska
St. Cyril and st. Methodius University in Skopje (RN Macedonia)

Abstract. Learning multiplication from age 7-8 affects the teaching of mathematics, because mathematical operations are interrelated. Knowing the importance of learning multiplication, the greatest possible effort should be made, so that the students acquire the best knowledge and skills, and therefore it is preferable to use different methods and activities of learning and teaching. As one of the more effective methods, we single out play, which is one of the main reasons for this research. The purpose of this topic is to investigate the impact of computers games on the development of multiplication skills in children. Through this study, it is intended to understand how computers games, affect the improvement of the understanding and application of multiplication concepts in children. This research is a qualitative and quantitative research, because is experimental study to evaluate the impact of mathematical games on the development of multiplication skills in children and analysis of the collected data. The result suggests that the more games are used in the classroom, the more students' ability to learn satisfactorily and systematically increases.

Keywords: computers games; multiplication; skills; development; teaching

1. Introduction

Games can play a crucial role in the development of multiplication skills among students. Games provide an interactive and enjoyable learning experience, which can increase student engagement and motivation. By incorporating elements of competition, challenge, and rewards, games create a stimulating environment that encourages students to actively participate in practicing multiplication skills. Games offer opportunities for students to reinforce and practice multiplication facts in a meaningful context. Many multiplication games involve strategic thinking and decision-making. Students need to consider various approaches, evaluate options, and choose the most effective multiplication strategies to succeed in the game.

Games can help students memorize and recall multiplication facts more effectively. By repeatedly encountering the facts in different game situations, students strengthen their memory and retrieval abilities. The competitive nature of some games can also create a sense of urgency, further enhancing students' recall speed. Well-designed multiplication games can support the development of conceptual understanding. Games often provide visual representations or manipulatives that help students connect multiplication with real-life situations or other mathematical concepts. This aids in the comprehension of multiplication as repeated addition, scaling, or grouping. Games offer opportunities for students to apply multiplication skills in problem-solving contexts. Many multiplication games can be played in pairs or small groups, fostering collaboration and communication among students.

However, while there is early evidence to suggest the potential of games to improve students' mathematical skills, more in-depth research is needed to understand how and in what way the use of games can affect multiplication table learning in a school context. This research aims to address this gap in the field's literature by exploring the effects of using games on the development of students' multiplication skills in elementary grades.

2. Literature review

Children have different personalities, each unique, so teaching should adapt to their style or intelligence. According to (Adams 2001), regardless of the chosen method, the different learning styles, strengths, experiences, and perspectives of children must be taken into account. Various activities and games presented during learning play an important role in motivating students, offering them enjoyment and a desire to learn. Teachers are exploring methods to integrate games and game structures into formal learning environments (Alaswad & Nadolny 2015). Teachers should provide repeated opportunities for students to play games, showcasing mathematical ideas as students observe patterns, relationships, and new strategies. An educational professional must effectively evaluate students' academic development and the methods they use (Anwar & Sohail 2014).

Games provide parent-child interaction as well as opportunities for exploring ideas and more opportunities for communication and discussion that is normally available in the classroom. Games also help to stimulate the use of mathematical language, especially if this is pre-structured. It is important that Mathematics activities are enjoyable, both in order that the parents and children can relax while engaged in a mathematical activity, and so the motivation to continue will be high.

– Games are highly motivating because the child is actively participating and is in control.

– It involves immediate feedback and an element of competition.
– Games have well-defined limits and directions.
– Games are meaningful experiences, somewhere between concrete reality and the abstract world.
– Games can be used to consolidate class work or to encourage and enable a child to extend his or her skills.[1]

3. The significance of the games in mathematics

Multiplication is a main tool for many forms of math's such as algebra, calculus, equations and more. The ability to rehearse and understand multiplications up to and including 12 by the final year of primary school will enable your child to confidently and skillfully tackle the more complex mathematical subjects. It also helps them to familiarize and feel confident with the teachings presented to them as they progress through education. The ability to fully understand multiplication and have fluency and instant recall will boost your child's confidence in the subject. One of the first and basic mathematical knowledge of school children is the multiplication table. At the age of 8 to 10 each child has to learn by training step by step, or more scientifically, by using a behavioristic learning concept (Schön, Ebner, & Kothmeier 2012).

The use of games in the classroom has developed rapidly since the 1990s but has gained more attention recently as pedagogical methodologies have evolved. One of the benefits of using games is that they can be repeated endlessly, allowing players to learn from mistakes or practice learning through gameplay. Thus, this teaches players that failure is an opportunity to learn and move forward rather than an endpoint (McDonald 2017). Besides enjoyment, students gain cognitive and affective elements through problem-solving, decision-making, drawing conclusions, and collaborating with peers. Students not only learn the subject matter but also build their own personalities (Ahmada & Jaafarb 2012).

Game-based learning is valued as a promising tool to facilitate active student participation and engaged learning (Chen, Liao, Cheng, Yeh, & Chan, 2012). When playing games, students often feel more confident than in daily lessons, as games are natural for them, and they usually enjoy them. Regarding mathematics, incorrect solutions are not considered mistakes but rather a natural part of the game (Vondrová & Šilhánová 2013). According to (Oldfield 1991), games are also valuable for encouraging social skills, stimulating mathematical discussion, helping develop mathematical understanding, creating strategies, learning new concepts, reinforcing skills and concepts, and aiding logic. Children freely choose to participate and enjoy playing. Many students consider mathematics to be a tedious and boring subject; therefore, using games to teach mathematical lessons makes math more enjoyable for students. When the topic is interesting, students are more willing to study. Additionally, games that allow

classroom competition motivate students to study as they want to perform well and stand out among others1).

When playing games, students often feel more confident than in daily lessons, as games are natural for them, and they usually enjoy them. Regarding mathematics, incorrect solutions are not considered mistakes but rather a natural part of the game (Vondrová & Šilhánová 2013). Games alone are not sufficient for learning, but there are elements within games that can be activated within an educational context to enhance the learning process (O'Neil, Wainess, & Baker 2005). Games can be used as a supportive tool to complement traditional teaching methods to improve students' learning experience while teaching other skills such as rule-following, adaptability, problem-solving, interaction, critical thinking, creativity, teamwork, and good sportsmanship.

4. Research methodology

Defining the problem is the lack of implementation of games in the subject of mathematics. In contemporary educational practices, a notable void persists in the integration of gaming methodologies within the realm of mathematics instruction. Despite the recognized effectiveness of games in fostering engagement, enhancing problem-solving skills, and promoting deeper conceptual understanding across various subjects, their utilization remains conspicuously scarce in mathematics pedagogy.

4.1. Purpose of the topic

The purpose of this topic is to investigate the impact of games on the development of multiplication skills in children. This study is intended to examine how mathematical games, focused on multiplication, affect the improvement of the understanding and application of multiplication concepts in children.

4.2. The research questions

Based on the purpose of this research, the following research questions can be found:

– How does the game affect the development of multiplication skills?

– What are the effects of games on the development of children's multiplication skills?

– What is the long-term retention rate of multiplication skills acquired through gaming interventions?

– What are the attitudes and motivations of students towards using games as a tool for learning multiplication?

4.3. Secondary questions

The defined questions have prompted additional secondary questions:

– Can games increase children's interest and concentration in multiplication?

– Can games help improve cognitive and problem-solving skills in the

context of multiplication?

– How does the use of games affect the way children learn and use multiplication concepts in real situations?

4.4. Variables

These are the variables of our research, which will serve as the basis for analyzing and understanding the research problem.

– Games – independent variable.

– Learning the multiplication table – dependent variable.

4.5. Hypothesis

– Games have a positive impact on the development of children's multiplication skills.

Hypothesis rationale: Games provide a fun and interactive way for children to practice and develop their multiplication skills. By playing games that involve math activities, such as solving multiplication problems, using multiplication tables, or building mathematical models, children can improve their understanding and application of multiplication concepts.

How does play affect the development of multiplication skills?

Null Hypothesis (H0): There is no significant difference in the development of multiplication skills between children who engage in play-based learning activities and those who do not.

Alternative Hypothesis (H1): Children who engage in play-based learning activities will demonstrate greater improvement in multiplication skills compared to those who do not engage in such activities.

What are the effects of games on the development of children's multiplication skills?

Null Hypothesis (H0): There is no significant difference in the development of children's multiplication skills between those who participate in game-based learning interventions and those who do not.

Alternative Hypothesis (H1): Children who participate in game-based learning interventions will exhibit superior development of multiplication skills compared to those who do not participate in such interventions.

What is the long-term retention rate of multiplication skills acquired through gaming interventions?

Null Hypothesis (H0): There is no significant difference in the long-term retention rate of multiplication skills between individuals who have acquired these skills through gaming interventions and those who have not.

Alternative Hypothesis (H1): Individuals who have acquired multiplication skills through gaming interventions will demonstrate higher long-term retention rates compared to those who have not participated in such interventions.

What are the attitudes and motivations of students towards using games as a tool for learning multiplication?

Null Hypothesis (H0): There is no significant difference in the attitudes and motivations of students towards using games as a tool for learning multiplication compared to traditional teaching methods.

Alternative Hypothesis (H1): Students will exhibit more positive attitudes and motivations towards using games as a tool for learning multiplication compared to traditional teaching methods.

5. Methodology

This research is a qualitative and quantitative research, because is experimental study to evaluate the impact of mathematical multiplication games on the development of multiplication skills in children and analysis of the collected data. Qualitative research aims to explore and understand complex phenomena by examining the subjective experiences, perspectives, and meanings attributed by individuals or groups. Quantitative research involves the systematic collection and analysis of numerical data to test hypotheses, identify patterns, and establish relationships between variables.

5.1. Research sample

The research sample consists of two groups drawn from the population of second-grade students in the municipality of Lipjan, Kosovo. Specifically, the sample includes two classes (20 students) assigned to the experimental group and two classes (20 students) assigned to the control group, ensuring balanced representation for comparison

Population: Second grade students in the municipality of Lipjan, Kosovo.

Sample: Two classes of 20 students – experimental group, and two classes of 20 students – control group.

5.2. Instruments

The instruments used in this research are designed to measure students' mathematical skills. They include assessments conducted before and after the intervention to evaluate progress and effectiveness.

Pre-Assessment: times Tables Test, problem-Solving Exercises, and real-Life Application Questions.

Post-Assessment: similar to the pre-assessment, include times tables, problem-solving exercises, and real-life application questions; we use the same or similar questions to maintain consistency for direct comparison.

6. Results

The results of the study provide insights into the impact of the intervention on students' mathematical performance and problem-solving skills.

Duration: 1 month.

Frequency: 3 sessions per week, each lasting 40 minutes.

Games Used: A variety of multiplication-focused games such as:

multiplication Bingo (helps with speed and accuracy), interactive Multiplication Puzzles (engaging visual aids for problem-solving) and domino (promotes teamwork and learning by doing).

Identification of experimental group and control group: Two groups of participants were identified, one group that played multiplication math games and a control group that had no interaction with multiplication math games. Identification of multiplication math games: We determine the specific games to be used in the experimental group.

6.1. Data Analysis

The following section presents the data analysis, highlighting the pre-and post-test scores for both the experimental and control groups.

Pre- and Post-Test Scores

Experimental Group:

– Pre-Test Average Score: 60%.

– Post-Test Average Score: 85%.

– Average Score Improvement: 25%.

Control Group:

– Pre-Test Average Score: 62%.

– Post-Test Average Score: 75%.

– Average Score Improvement: 13%.

A paired t-test shows that the improvement in the experimental group was statistically significant ($p < 0.05$), indicating that the use of games led to a greater improvement in multiplication skills compared to traditional methods. Cohen's d analysis shows a large effect size ($d = 0.8$) in the experimental group, meaning the intervention had a substantial impact on the development of multiplication skills.

The Pearson correlation coefficient ($r = 0.772$) shows a very strong positive relationship between the function of mathematical games in learning the multiplication table by students. A correlation of this magnitude indicates that as teachers increase the incorporation of games into learning, students' performance improves significantly.

The p-value (Sig. = 0.000) indicates that the result is highly statistically significant ($p < 0.05$), meaning that there is a very low probability that this association is due to chance. In this case, the association between using mathematical games and improved learning is robust and likely to be meaningful in practical applications, supporting the use of such strategies in the classroom.

Cooperative gameplay allows students to share strategies, discuss solutions, and explain their thinking, promoting mathematical discourse and the sharing of different perspectives. Through repeated exposure and application of multiplication concepts in various game scenarios, students develop fluency and automaticity in recalling multiplication facts.

The participation of students in the experimental class and the positive qualities of the games: The students were very active during the one-month implementation of the games in the classroom. Besides playing, they also learned, as well as the materials they completed after the game, they did it systematically or step by step. The games are shown to be a positive success in the experimental class, significantly raising the results of mathematical learning from the control class. The students of the experimental class were very motivated, you could see in their faces that they were looking forward to playing, they had a lot of fun, and they were ready to face the challenges. The games were usually played in groups and this encouraged cooperation among students, as well as healthy competition among themselves. This made learning more dynamic, as well as raising social values among them. The immediate reactions when they lost the game or a part of it, made the students understand that we learn from mistakes, and this helped them to more easily overcome the challenges presented by the word tasks.

Conclusions and summary

Games can add a certain level of excitement to the classroom. Even though students are thinking, working, and exploring mathematical concepts, it all feels like play. Math games break up the day-to-day routine, which motivates students to pay attention and stay on task longer. When kids are having fun, they are more likely to stick with it and be motivated to work through any challenges they face.

As evidenced by the Pearson correlation coefficient the use of mathematical games has a significant positive impact on students' abilities to learn the multiplication table. This result suggests that the more games are used in the classroom, the more students' ability to learn satisfactorily and systematically increases. Mathematical games not only increase academic performance, but also increase students' motivation and engagement in learning. Engaged learners benefit from a more interactive and collaborative experience, making the learning process more enjoyable.

NOTES

1. (ORIM, 2011).

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✉ **Mrs. Dasare Sylejmani, Phd student**
ORCID iD: 0009-0005-2339-9741

✉ **Prof. Dr. Vesna Makashevska**
ORCID iD: 0009-0006-2505-8147

✉ **Prof. Dr. Jasmina Jovanovska**
ORCID iD: 0009-0003-9055-5519
Faculty of Pedagogy
St. Cyril and st. Methodius University in Skopje
Skopje, RN Macedonia
E-mail: dasara.sylejmani@uni-pr.edu
E-mail: vesna.makasevska@gmail.com
E-mail: jasmina.armenska@gmail.com