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MATH'S GAMES AS A MECHANISM FOR SUCCESSFUL LEARNING IN ELEMENTARY CLASSES

Abstract: Experts of education and others with active participation in education believe that traditional ways of teaching are no longer beneficial to students. Researchers emphasize that certain students are not attracted to math's due to attractive teachers' instructions, but because math's is seen as a task rather than a problem to be solved. Researchers also agree on the statement that implementation of new teaching and learning trends is becoming a necessity. An increasing number of studies show that ninety-five percent of the teaching and learning that occurs through games is effective and quality-based learning. Games were and will always be considered favorite for children and when employed in the learning process, their effect is even greater. In North Macedonia, game-based learning in the subject of math's is merely researched. Therefore, this study aims at providing useful practices of game-based learning in math's classes. A mixed research design was used to investigate this problem. A group of 370 teachers (specifically 250 elementary school teachers and 120 elementary school mathematics teachers who teach mathematics in grade six or at least taught mathematics in grade six) across elementary schools in the whole territory of Republic of North Macedonia. Interview sessions were conducted with several state experts (Counsellors from the Bureau for Development of Education) involved in education problems in our country. It is the researchers hope that the results of this study will serve as a point of reflection, for both in-service and novice teachers to focus on qualitative education.

Keywords: Math's education, Game-based learning, Elementary classes

Introduction

When it comes to education in our state, specifically referring to education in elementary school, the first thing which comes across to our mind is the vast number of reforms which were implemented and are still being implemented with the aim to improve the educational process. Those very same reforms which refer to the teaching process itself, they do also refer to active methods of work where the focus of learning is transferred from the teacher to the student, learning with the student in the center.

Referring to math's classes in elementary schools, every elementary school teacher would agree with the following claim that the biggest enemy in math's classes are the feelings of fear and insecurity while solving a certain mathematical problem. Yet, the matter remains how to find an efficient way, to generate a mechanism which will yield feelings of relaxation and enjoyment during classes.

A such unique combined joint of building skills, motivation, socialization among students, and above all learning, is the game itself. Games aim to enhance learning in classes by fulfilling the gaps which an individual student can possess, yet prepare him for life by teaching him how to accomplish those basic state standards which are determined with the new program in our state.

Review of Literature

Although games have a distant past which overlaps with history of mankind as a constituting part of culture of all nations, but also as one of the most ancient forms of socio-humanitarian interaction, the history of games is completely newer in relation to those older evidences of life on the Earth. It is being practiced regardless the age, in all parts of the world. It does not only possess numerous mutual characteristics, but it also has a number of cultural elements which are stamped on their duration, originality, uniqueness and ubiquity. (Catalano, 2021)

Piaze and Vigotski regarded the child as an active creator of knowledge and understanding. Unlike Piaze, Vigotski depicted the significance of direct instructions in relation to those who know more than the process of learning itself. Vigotski claimed that learning is a result of social relations between the child and the other members of the society, in which, essentially, the child gains everything he needs in order to think and learn. According to Vigotski, teaching is the essence of learning. (Grijak, 2019)

Lena Damovska, author of the book "The Game and Learning", states that: "The game is a spontaneous, free activity which is conveyed without an external need. The necessity for playing games among children arises from the internal needs for activity. It has its own logic which differs from the external reality (as it is comprehended by the adults). In the process of playing games, the reality is processed in coordination with the children's experiences. While playing, the child accomplished everything which is impossible in the real world. Within the game, the child is "the master of the situation". The child creates his own imaginary world within the game, by acting in it, in the similar way as the adults act in the reality. The child's activity in the game is specific, and by many means it is creative as well. It is not only a mechanical copy of the environment, but it is also a reality seen with the eyes of the child and it is a specific type of transformation of the child's experience." (Damovska, 2021)

Games have a clear goal. The players know when and what under specific circumstances the game is over. Therefore, the whole time the motivation to reach the end is enormous and it maintains the concentration of the players in the game. Games are a combination of knowledge and luck. They can be focused in processes and problems. Players respect the appointed rules within them, but the end is always unpredictable. Each of the players can be a winner. The unpredictability of the result is motivating. The game always yields numerous emotions. The presence of emotions in the process of learning makes learning more durable. In fact, emotions which appear during the course of the game are positive and they make learning entertaining and fund. (Jankulovska, & Mickovska, 1997)

Contemporary math's teaching actualizes student's activity as a significant factor in his growth. Namely, a precondition for a successful teaching mathematics practice is the determination of activities which will enable a positive stimulation in the development of every child. Therefore, while teaching mathematics, practical things, independent and conscious activities ought to be employed. All of this actualizes student's role in the process of learning and successful accomplishment of teaching math's goals. The effectivity of the learning process is enormously conditioned by the willingness of the students for acquiring new knowledges, crafts and skills. In that point of view, it is especially necessary to pay attention to the creation of stimulative environment for learning math's. The teacher is required to make a blend of activities which will meet individual interests and needs for students' development. Arising from the contemporary approaches towards teaching, we shall recommend herein the employment of research activities and of course the game, as a teaching method. These activities in the contemporary teaching of mathematics provide an increased attention at students, because through games in spontaneous way they put effort and acquire knowledges, crafts and skills which are determined in the teaching goals. (Cajkovska and a group of authors, 2016)

Games are activities which are widely employed in the educational process among the students of elementary school, fore and foremost as a way of learning. With its characteristics and features the game has a particular use in the process of teaching mathematics, while learning and practicing. In order to be successfully accomplished, games should be well planned, organized, managed and conveyed by the teacher alone.

Important elements which lead to a successful accomplishment of games during math's classes in elementary school are: the selection of the game based on the content, the rules of the game, the instructions on how to play the game, its course and duration, teacher's role, the selection of groups, the place where it will take place and many others.

Methods

In order to study this problem and prove the statement that the employment of games contributes to the process of teaching mathematics in elementary schools, a mixed research design was used. The sample is consisted of a group of 370 teachers, out of which 120 are mathematics teachers who teach or taught math's to students of grade six, and the remaining 250 teachers are elementary school teachers which teach from first up to fifth grade in elementary schools in the whole territory of Republic of North Macedonia. The research was conducted from May to June in 2022.

These 370 teachers who work in various environments, with different work experiences answered the following claim: The mathematics teacher considers that the employment of games contributes to the class of learning mathematics in elementary school classes.

The teachers chose from among five answered which were offered to them, according to the scale of Linkert.1 – I fully disagree, 2 – I don't agree, 3. I partially agree, 4. I agree, 5. I fully agree.

In order to determine the importance of differences among the groups-teachers based on their work experience, a one-way analysis of variant was used (ANOVA). The differences in the arithmetic means of respondents from different places of work (city-rural) were calculated using a t-test of independent samples.

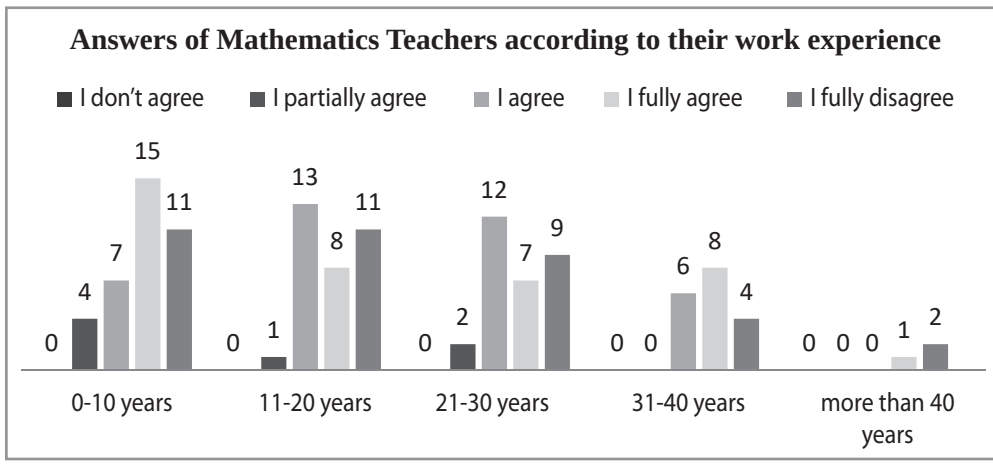
In addition to this research, interviews were conducted with experts of this particular field (5 counsellors from the Bureau for Development of Education), and 3 other counsellors of elementary school teaching and two counsellors for teaching mathematics.

Results and Discussion

Results of Mathematics Teachers

Histogram 1

The mathematics teachers regard that the employment of games contributes the process of teaching mathematics in elementary school.



The majority of teachers, 37 of them (30.8%) have work experience of up to 10 years, 33 of them (27.5%) have work experience of 11 to 20 years, 30 (25%) have work experience of 21 to 30 years, 18 of them (15%) have work experience of 31-40 years and only 2 of them (1,7%) have work experience of more than 40 years. Their answers are presented on the histogram 1.

Table 1
Analysis of variant

ANOVA Summary					
Source	**Degrees of Freedom DF**	**Sum of Squares SS**	**Mean Square MS**	**F-Stat**	**P-Value**
Between Groups	4	152.56	38.14	1.7873	0.171
Within Groups	20	426.7958	21.3398		
Total:	24	579.3558			

From the conducted analysis of the variant, we can conclude that there is no statistically important difference between the teachers with different work experience in the viewpoint of the claim. The mathematics teachers consider that the use of games contributes to the teaching of mathematics in elementary school.

The value of the ratio f is 1,7873, P-value is 0,171. The result is not significant when p <.05.

From the total number of mathematics teachers, 43% of them work in villages, while 57% of them work in the cities.

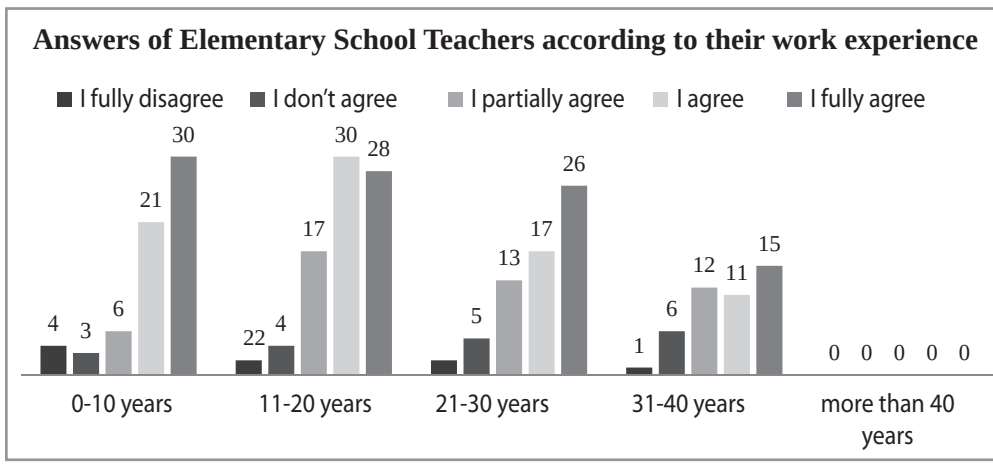
The *t*-value is 0.5904, the *p*-value is .285609. The result is *not* significant at $p < .05$.

The differences between arithmetical environments of the respondents from a different place of work in terms of the claim: The mathematical teacher considers that the employment of games contributes to the process of learning mathematics in elementary school classes. The t-test shows that there is not a statistically significant difference (t=-0.59, p=0.286).

Results from Elementary School Teachers

Histogram 2

The elementary school mathematical teachers think that the use of the game contributes to the process of teaching mathematics in elementary school classes.



The majority of elementary school teachers, specifically 81 of them (32.4%) have a work experience of 11-20 years, 64 (25.6) have a work experience of 0-11 years, 60 (24%) have a work experience of 21 to 30 years, 45 (18%) have a work experience of 31-40 years. The answers of teachers are shown on table 2.

Table 2
Analysis of variance

ANOVA Summary					
Source	**Degrees of Freedom DF**	**Sum of Squares SS**	**Mean Square MS**	**F-Stat**	**P-Value**
Between Groups	4	769.84	192.46	2.1935	0.1066
Within Groups	20	1754.8022	87.7401		
Total:	24	2524.6422			

From the conducted analysis of variant, we can conclude that there is no statistically significant difference among the teachers with different work experience in the viewpoint of the claim that the employment of games is a good opportunity to improve learning mathematics in the elementary school classes.

The value of the ratio f is 2,193. P-value is 0,106. The result is not significant at p <.05

From the total number of elementary school teachers 39% of them work in villages, while 61% of them work in cities.

The *t*-value is 0.76882. The *p*-value is .232045. The result is not significant at $p < .05$.

The differences between the arithmetical environments among the respondents of various places of work in the viewpoint of the claim: The employment of games is a good opportunity in learning mathematics in elementary school classes, t-test shows that there is no statistically significant difference (t=-0.768, p=0.232).

From the data obtained from the counsellors from the Bureau for Development of Education, we can conclude that on the claim: The employment of games contributes to learning mathematics in elementary school classes, we have these results: three of them totally agree with this claim, one counsellor agrees, and the other partially agrees.

Conclusion

- From the obtained results from the mathematics teachers from the conducted analysis of variant, we can conclude that there is not a statistically significant difference between the teachers with different work experience regarding the claim. The value of the ratio f is 1,7873, P-value is 0,171. In addition to this the differences between the arithmetical environments at the respondents from different places of work in terms of the claim, the t-test showed that there is not a statistically significant difference. The *t*-value is 0.5904. The *p*-value is .285609.

  The mathematics teachers consider that the employment of games contributes to the process of learning mathematics in elementary school classes.
- From the obtained results of elementary school teachers from the conducted analysis of variant, it can be concluded that there is not a statistically significant difference between the teachers with different work experience in the viewpoint of the claim. The value of the ratio f is 2,193, the P-value is 0,106. In addition to this, at the elementary school teachers as well, the differences between the arithmetical environments at the respondents from different places of work, in terms of the claim, according to the t-test it was shown that there is not a statistically significant difference (t=-0,768, p=0.232).

  The elementary school teachers consider that the employment of games contributes to the process of learning mathematics in elementary school classes.

- Likewise, three counsellors stated that they fully agreed on the claim, one counsellor agrees and the other one partially agrees,

  From this we conclude that games contribute to the process of learning mathematics and that they should have a central place in teaching mathematics, because with games students are more active, socialized and interested, above all they learn through games.

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DISTANCE LEARNING

Abstract: Challenges in education are present in everyday practice and they depend on several factors that directly affect its course. For more than two years, humanity has been facing a global pandemic that has accelerated the process of online learning, as well as the process of creating digital learning content. This paper is focused on the problems that have arisen and still arise from distance teaching, in primary and secondary education, but also the advantages that this type of teaching has. In the paper examples from the teachers will be illustrated and their observations on the teaching process during the lessons in which the Macedonian language is taught will be stated. Namely, the paper will show the way of connecting the most important elements