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International Journal of Curriculum and Instruction 15(1) (2022) 98–105

IJCI
International Journal of Curriculum and Instruction

The effect of play-based learning methods on math learning of sixth-grade elementary students

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Abstract

In the 21st Century, it has become more difficult for teachers to attract students to the curriculum due to many factors that entertain students. Hence, teachers need to think about teaching methods that indirectly motivate students to learn. Moreover, this need is more felt in mathematics because it requires the constant creation of new cognitive structures. Therefore, one of the effective teaching methods for this demand is teaching with the help of various games. For this purpose, the present study investigated the effect of play-based learning methods on math learning in sixth-grade students. This research is quantitative. The results of this study were collected from experiments on control and experimental groups. The statistical population, at first, all male students in the sixth grade of primary school in the city of Karaj were considered for the academic year 2021-2022. Then, by cluster sampling, it was reduced to one school and finally, randomly, to two classes of 30 people. The control group was trained by the usual method of the teacher`s explaining and then solving the book's exercises. The training of the experimental group was done by the simulation game of bank and supermarket space. In this method, students calculated discount percentages during their play and learned lesson points. In the end, the same tests were taken from both control and experimental groups and the average scores of students in both groups were obtained. The mean for the control group was equal to 10.06 and for the experimental group, equal to 15.23. The results of research data showed that the game-based teaching method has a positive effect on students' math learning compared to teaching by teacher's lecture.

Keywords: Math learning, play-based teaching methods, traditional teaching method

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1. Introduction

1.1. Research problem

One of the challenges in education is that in the education process, methods used that are not up-to-date, attractive, and does not promote deeper learning. There are several factors involved in students' learning and academic achievement, one of them is the teaching method. In the 21st century, the active teaching method may play a role in motivating, improving performance and academic achievement. However, due to

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inadequate resources, this teaching method is not used (Moalemi, 2019). Therefore, selective teaching methods of teachers must activate and dynamic students in their learning process to move towards learning themselves. One of the promising ways to achieve active participation of students in learning activities and increase their motivation is play-based learning.

Game-based learning enhances active learning and participation by providing students with the opportunity to solve problems in the context of play (Vankúš, 2021). In fact, some games and activities enhance children's learning more than any other book. Because games provide consistent feedback on student performance, they can be used to review knowledge and skills learned by students (Moalemi, 2019). According to research, courses such as experimental science, social studies, and literature have the flexibility to apply multiple teaching methods simultaneously and simply. However, the current presentation of mathematics in many elementary school classes relies on sequential descriptions of math concepts, followed by repetitive exercises and exercises to master specific content. This rigid structure makes math students see it as a chore to be completed, not a puzzle to be discovered (White and McCoy, 2019). Mathematics is one of the most important basic courses in the course of study, which unfortunately most students have difficulty with. Given that, mathematics is one of the subjects that is prerequisite for other subjects. Students' low scores in this subject leads to their failure in other subjects, which in turn makes them bored of Lessons and school. Actually, teachers should look for ways to make this lesson attractive to students (Moradi and Maleki, 2015).

As a result, one of the most fascinating ways to learn is to teach math through play. This combination teaching method introduces students to math topics in the form of games and indirectly strengthens students' math skills. From another point of view, because the teaching methods used in schools are based on memory and only strengthen the memorization aspect of students, the vacancy of such teaching methods is strongly felt (Esmaili Gojar and Partners, 2017). For example, Vankúš (2021) stated that in the field of mathematics, appropriate games have been identified that promote mathematical achievements in various fields, such as problem-solving, algebra skills, strategic, reasoning skills, geometry, arithmetic skills, and facilitate critical thinking. In other words, moving away from inflexible teaching methods such as lecturing and problem solving can not only help change students' attitudes toward mathematics but can also change the way they look at themselves. Therefore, it is better for students to succeed in learning through exploratory, participatory and challenging processes (White and McCoy, 2019).

1.2. Literature review

In recent past, the need for revision of traditional teaching methods and the use of new and active methods of student-centered learning has been felt by educational systems.

Recent research findings as well as new theoretical perspectives place great emphasis on the involvement of play in the teaching-learning process and students' cognitive, metacognitive and emotional involvement (Zanganeh and Khodamoradi, 2017). Some of the researches done are:

Dashteh, and Asgarpoor (2016) in their article entitled «Comparison of problem-solving teaching method with lecture teaching method on academic achievement of high school male students in mathematics» acknowledged that the mean scores of students who were trained in problem-solving were significantly higher than those who were trained in lecturing.

Zanganeh, and Khodamoradi (2017) in a survey under the title «The impact of teaching method based on «cooperative assignments» on students' mathematics learning and retention in ninth grade» said that teaching based on participatory homework has a positive effect on students' learning and memorization in mathematics. Besides that, the use of participatory homework in teaching is more effective in students' learning and memorization in mathematics than conventional teaching.

Sahebzadeh, and partners (2015) in their article under the title «Evaluation of the effectiveness of participatory teaching-learning methods of elementary school mathematics teaching in academic achievement, improving logical thinking, increasing students 'desire to study and teachers' job satisfaction» noted that the use and implementation of mathematics teaching methods based on participatory teaching in classrooms, compared to the use of traditional teaching methods for teaching mathematics has a significant effect on students' strengthening logical thinking skills, academic achievement, and desire for Education.

Findings by Chizary and Farhangi (2017) under the title «Efficiency of educational games on mathematics learning of students at second grade of primary school» stated that educational games affect the motivation and math learning of second-grade elementary students and increase their IQ.

Bahrami, and partners (2012) in their article entitled «A comparison of the effectiveness of game-based and traditional teaching on learning and retention of first-grade math concepts» have concluded that considering the better performance of the experimental group than the control group in terms of memorization, it can be understood that the use of educational games in teaching elementary mathematics concepts in the first grade can be significantly useful and efficient.

White and McCoy (2019) in a survey under the title «Effects of game-based learning on attitude and achievement in elementary mathematics» acknowledged that due to the involvement of play in the process of learning math, students' attitudes toward both lessons and math in general improved, and also the level of positive work ethic, teamwork and commitment in students increased.

Finally, from the results of the mentioned researches, it can be concluded that different types of games have a positive effect on learning mathematics.

1.3. Research purpose

The purpose of this study is to investigate the effect of educational games on students' performance in mathematics; Specifically, to determine the level of learning of sixth-grade students when games are used in the math learning process. Due to the importance of games in the learning process, in most cases, the performance of the age group of 10 to 12 years in the face of educational games has not been addressed. Therefore, the existence and conduct of research on the performance results of this group of students are also of great importance. Accordingly, in the present study, the following questions have been examined:

Q1: How effective are dramatic teaching and play-based learning methods in sixth-grade math?

Q2: Does using math games increase students' motivation and interest in learning?

To provide answers to these questions, the research has the following structure. First, the research method and research findings are presented. Finally, it discusses the results and suggests ideas for future use on the subject.

2. Method

The present study is quantitative in nature. The collected materials have been obtained from two types of field and library methods. The library method has been used to study various sources to design learning activities and then compile the research text. Also, the field method has been used to prepare the training methods and also to conduct exams. Available data were collected from experiments on control and experimental groups. The statistical population, at first, all male students in the sixth grade of primary school in the city of Karaj were considered for the academic year 2021-2022. Then, by cluster sampling, it was reduced to one school and finally, randomly, to two classes of 30 pupils. None of the classes had students with a range of disorders. For both groups, the same subject matter (ratio, proportion, and discount) was selected. It should be noted that the environmental conditions of both groups are explained equally.

2.1. The control group teaching method

The control group was trained by the usual method of the teacher`s explaining and then solving the exercises in the book. In two selected sessions, the teacher explained the content of the lesson orally and then, in the second session, solved the exercises in the book.

2.2. The Experimental group teaching method

The training of the experimental group was done by the simulation game of bank and supermarket space. In other words, in the first session, the teacher, in order to connect the lesson content with daily life, started teaching with a story of buying clothes that went to several shops and was faced with different percentages of discounts. Then, students were asked to calculate the discount percentages mentioned in the story. For the second session, counterfeit money, items with the initial amount of money along with a percentage discount were provided. For this method, students received money from the bank during their games, calculated the percentage of discounts on supermarket goods, and learned additional lesson points.

In the end, the same tests were taken from both control and experimental groups and the average scores of students in both groups were obtained.

3. Results

A comparison of statistics and the average of the obtained data are presented in Table 1. Based on the research and also, according to the obtained results, it is understood that the methods of dramatic teaching and play-based learning have a positive effect on students' learning. On the other hand, using this teaching method increases students' motivation and interest in learning.

Table 1. Comparison of the results of the control and experimental groups through the mean of the tests

Groups	Number	Sum of class points	Mean
Control	30	302	10.06
Experimental	30	457	15.23

Table 1 shows the sum and average scores obtained from the control and experimental groups. Comparing the results of these two groups shows that the average score of the experimental group in the final test is higher than the control group.

Q1: How effective are dramatic teaching and play-based learning methods in sixth-grade math?

Findings about Q1: According to the results as well as the average scores, it can be concluded that combining math learning with educational games increases students' learning levels. Therefore, the use of dramatic teaching and play-based learning methods has a positive effect on the mathematical learning of sixth-grade students.

Q2: Does using math games increase students' motivation and interest in learning?

Findings about Q2: According to the students' feedback, it was perceived that their level of interest in learning has increased.

4. Discussion and Conclusions

In the 21st Century, where students are able to create new cognitive structures very quickly in their minds and also, they can easily access a wealth of information through modern technologies, teaching method such as lecturing is not responsive anymore. As a result, teachers must use play-based teaching methods to both make the lesson appealing to students and strengthen their motor skills. On the other hand, this need is felt more in some courses like mathematics, because it doesn't have the simple learning flexibility and motivation to learn spontaneously as other courses. Therefore, teachers have to use games and performances in their educational content.

According to the results of this study, students who had learned through the method of teaching mixed with play, had better results than students who learned through the method of teaching lectures in math tests. Thus, as a final point, considering that today's students' leisure time is spent more on playing, teachers should also understand the importance of teaching methods and use a variety of games, including physical, computer games, and so on to make the learning process attractive and easy.

Therefore, it is suggested that teachers combine their teaching methods with games and entertainment. For instance, teachers can combine sports and math courses and teach students math through games and sports. Also, teachers can simulate daily life with simple games for students and teach math with these games. Since physical games have been used in this research, and also considering the development of computer games, it is better to measure the impact of these games on the mathematical learning of sixth-grade students, too.

5. Recommendations

Due to the results of this research that educational games have positive effects on students' math learning, it is suggested that:

1. As much as possible, teachers should use educational games such as board games in their teaching process.

2. It is not always necessary to have a lot of equipment; teachers can design simple games to speed up the learning process.

3. Curriculum planners can change the content of textbooks according to educational games so that textbooks have more flexibility.

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Conflicts of Interest: The author declares no conflict of interest.