

# Effective Use Of Computer Games In Elementary Mathematics Lessons

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**Abstract** – Teaching is the main task of education. One of the challenges facing education is how to teach it. Researchers express different opinions about teaching methods. To date, a number of measures have been taken to organize lessons on the basis of digital technologies, their use in the teaching process, and suggestions and recommendations have been made. Are the proposed methods effective in teaching. No, of course, any method and tool used in teaching should be applied to the situation. The use of computer games in education is developing significantly today. Computer games provide an opportunity to engage, monitor and evaluate students in a non-traditional way. But are elementary school teachers ready for it? What is the desire to use it? Does this give the desired result? Which phase of the lesson gives the best results? This study was conducted to find answers to the following questions. The study was conducted in three phases: computer games were used to explain a new topic, reinforce a new topic, and test students' knowledge. The article analyzes the stages of learning, describes the use of computer games by students and the effectiveness of the knowledge gained.

**Key words:** computer games, education, lesson stage, efficiency, teaching effectiveness.

## I. Introduction

In the modern information age, the introduction of new approaches to education, the use of various innovative technologies in the classroom, the new spirit of education, increasing students' interest in learning are important factors in educating them as full-fledged adults. Therefore, one of the urgent tasks before us is to provide young people with high modern knowledge and education so that they can grow up to be highly spiritual, thoughtful and far-sighted people.

Bringing new modern knowledge to young people, raising the level of knowledge to a higher level using innovative methods requires a great deal of skill and hard work from teaching. A teacher cannot control today's students without using modern methods of teaching science.

It is necessary to increase the interest of students in the lesson, to motivate them to learn, to find answers to questions such as what to do, how to do, when to do it effectively. Computers help in situations such as engaging, directing, monitoring, and evaluating students in the classroom. The use of computers in the classroom allows for a mobile, individual and differentiated learning process. The computer serves as a tool for the development of the child, the formation of qualitatively new practical knowledge and skills.

A distinctive feature of the use of computers in the primary grades is that computer-based teaching aids are interactive and have the ability to “respond” and “interact” with student and teacher actions. Computers can be used at all stages of the learning process: explaining new material, strengthening knowledge, skills and abilities, repetition, control, etc. Computers can be used as a teacher, manager, assistant, object for the student. .

The introduction of computer technology into the curriculum is becoming an integral part of the study of many school subjects, which serves to improve teaching methods, develop interdisciplinary links, improve the quality of student knowledge.

## **II. Literature review**

Elementary students are distinguished by their sharpness of mind, brightness, and ability to quickly enter new situations. They can easily adapt to any activity, especially games. Therefore, it is advisable to use computer games in the classroom.

The learning process involves key steps such as acquiring, consolidating, diagnosing, and monitoring new knowledge and skills. One of the didactic methods used to consolidate, diagnose and monitor knowledge is the use of game-based teaching methods. Computer games do not replace ordinary games, but complement them, enriching the pedagogical process with new possibilities.

The use of computer games is justified only if it is aimed at achieving a certain pedagogical result, that is, if it has a positive effect on the child's thinking, emotions, memory, his cognitive, motivational and psychomotor activities. It is very important that the teacher has a clear idea of the didactic purpose of the applied game programs.

There are a number of requirements that need to be considered in order for computer games to have a positive didactic effect and improve the quality of education:

- games should be time-saving and focused on solving specific educational problems;
- be appropriate to the age and level of the student;
- must be manageable, ie the game must not be out of control;
- encourage participants and encourage their active participation;
- be an educator and follower of the student;
- Conditions must be created for proper use and application.

The following computer games should be introduced in the educational process:

- giving new knowledge to the student;
- strengthening the past;
- Supervisor of students;
- memory enhancer;

- motivating;
- controller;
- appraiser;
- designed to work individually and as a team.

### III. Analysis

The most important goal of the game is to develop skills, necessary traits, qualities, abilities and habits. The use of games as a method of teaching leads to a more comfortable environment in the classroom, increasing students' self-awareness, freedom of expression and interest in reading. Games develop students' creative thinking, teach them to work independently and make independent decisions. Games increase students' intelligence, strengthen their memory, teach and motivate them. Games improve the atmosphere between students by bringing them closer together.

In the game, the process of experimenting with the action of the game is more important than the result. Play differs from other teaching methods in that the material is presented in an invisible way and encourages learning.

Computer games are important not only for the development of intelligence, but also for the development of their motor skills, more precisely, the coordination of movement and vision, and the formation of coordination of the joint activities of motion analyzers. A child's desire to play, or "game motivation," as psychologists say, helps a child acquire the knowledge that computer games bring. The child gradually develops an interest in their content, not in a new and unusual form. Game motivation naturally turns into curiosity, an interest in the content of a task, which is based on the formation of important structures such as cognitive motivation, arbitrary memory, and attention.

The idea that many educators and scholars are reluctant to use computer games in class and even in extracurricular activities argues about the negative consequences of their use. Others offer frequent access to computer games and sometimes overestimate their capabilities. I think that computer games should be used in the learning process in accordance with medical requirements, in a timely manner, in the right place (that is, at the right stage of the lesson) and in the right amount.

Bourgonjon, J., De Grove, F., De Smet, C., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Kebritchi, M. (2010). Schrader, P. G., Zheng, D. and Young, M. (2006). An, Yunjo and Haynes, Linda and D'Alaba, Adriana and Chumni, Francis. (2016). Aleksich, Velko and Ivanovich, Mirjana. (2014). conducted research. In addition, officials involved in the sale, distribution, promotion and advertising of computer games have published articles on their websites about the importance of computer games.

Research has shown that there is not enough information about the use of computer games in a particular field, specifically at what stage of elementary school mathematics. To determine at what stage of the lesson the use of computer games is effective, we conducted this study as follows:

- The desire of primary school mathematics teachers to use computer games in teaching subjects?
- To determine the effectiveness of the use of computer games in primary school mathematics?

- At what stages of the lesson to determine the effectiveness of the use of computer games in mathematics lessons in primary school?

The use of computer games in the lesson is used in the following stages of the lesson:

- in describing a new topic;
- in strengthening the new theme;
- Homework and assignments (stage of determining the level of mastery of students).

In order to determine the results of the study, a survey of teachers was organized. In determining the effectiveness of students 'learning, the results of homework and observation of students' activity in the classroom were identified. The level of ICT availability in secondary schools was based on data from a previous study [17]. Taking into account the computer literacy of teachers (previous research), the use of computer games in the classroom was explained before the lesson.

In the teaching of lessons through computer games on math topics listed on the sites "mathplayground.com", "splashlearn.com", "commonsense.org" and "vseigru.net" Computer games such as Stolbicom were used.

The classes selected in the study were divided into two groups. The number of students in 7 experimental groups was 210, in 7 control groups - 212. Supervision was carried out in the form of traditional lessons in group lessons, as usual. In the experimental groups, the lessons were conducted in a specially prepared room using computer games.

Phase 1.

control group:

Explaining a new topic is done through explanations.

to the experimental group:

The new topic will be explained by playing computer literacy games.

Phase 2.

control group:

In reinforcing a new topic, students reinforce a new topic through questions and answers and assignments.

to the experimental group:

Reinforcement of a new theme is reinforced by playing games independently and using themed game puzzles.

Step 3.

control group:

Tests are given to determine and develop students' level of mastery of the topic.

to the experimental group:

Test games are given to determine and develop students' mastery through computer games.

To determine the results of the first stage, a survey was conducted on the use of computer games in teaching mathematics.

Survey results:

1. Do you use computer games in your lessons?

Answers: - 14% do not have teachers; Eighty-six percent of teachers said they use it sometimes.

2. At what stage of the lesson do you use computer games?

Answers: - 7% of teachers explain the new topic; 14% per minute of rest; 64% of teachers reinforce a new topic; 14% of teachers said they would not use it at all.

3. What ICT tools do you use in the lessons?

Answers: - 86% of teachers use computers, including 29% with video projectors and 57% with televisions; 14 percent of teachers said none of them.

4. What computer games do you use in lessons?

Answers: - 71% of teachers play literacy games, of which 14% play science games; 14 percent of teachers said they did not use computer games.

5. When do you use computer games?

Answers: - 57% of teachers attend open classes and seminars; 14% of teachers have a computer; 14% of teachers are almost harkun; 14% responded close to the comments that they do not use.

6. What is your level of computer skills?

Answers: - 79% of teachers are secondary; 7% are excellent teachers; 14% gave close answers to the statement that they do not know.

7. What technical tools are needed to effectively organize lessons?

Answers: - 93% of teachers use computers, 78% of them use video projectors, televisions, printers, scanners; 14% of teachers answered that they need a computer, electronic board, video projector, TV, microphone, speaker, video camera.

8. What computer games are needed in mathematics lessons?

Answers: - 71% of teachers teach games; 22% of teachers reinforce and supervise the lessons taught; 7% of teachers responded positively to the statement that no computer game is needed.

9. Do you use online or offline games?

Answers: - 64% of teachers are offline; 21% of teachers use both; 14% of teachers said they did not use it.

10. At what stage of the lesson is it better to use computer games?

Answers: - 79% of teachers suggested that students strengthen their knowledge and test their knowledge, 14% of teachers suggested that it can be used at all stages when equipped with a computer; 7% of teachers said that it was difficult to answer.

The results are shown in Table 1:

Table 1. Questionnaire answers of teachers.

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	Positive Answers	Satisfactory Answers	Bad Answers
1-Question	0	86	14
2-Question	0	85	14
3-Question	86	0	14
4-Question	14	71	14
5-Question	14	71	14

6-Question	7	79	14
7-Question	14	93	0
8-Question	22	71	7
9-Question	21	64	14
10-Question	14	79	7
Total: Average	19%	70%	11%

Phase 2 In order to reinforce the new topic and determine the effectiveness of the lesson, each group was given 10 assignments on the topic. The status of the assignment is shown in Table 2.

Table 2. An indicator of the performance of students in the task of strengthening a new topic.

Groups	Number of students	Number of completed tasks / percent								Time allotted for training (for every 1 class / total)	Time spent checking assignments (average / total for each class)
		Number of students who completed tasks 0-4		Number of students who completed tasks 5-6		Number of students who completed tasks 7-8		Number of students who completed tasks 9-10			
Experimental group	210	19	9%	84	40%	92	44%	15	7%	10/70 minutes	0/0 minutes
Control group	212	22	10%	79	37%	87	41%	24	11%	10/70 minutes	12/84 minutes

Table 3. An indicator of students' mastery of tasks to strengthen a new topic.

Groups	Number of students	Assimilation rate / percentage / error			
		2 prices	3 prices	4 prices	5 prices
Experimental group	210	19 / 9% / 0%	84 / 40% / 0%	92 / 44% / 0%	15 / 7% / 0%
Control group	212	27 / 13% / 0%	81 / 38% / 6%	83 / 39% / 8%	21 / 10% / 12,5%

To determine the level of error of students was calculated by determining the level of merit of students who completed the task 9-10 with 5 marks, students who completed 7-8 tasks with 4 marks, students who completed 5-6 tasks with 3 marks. (Students with a grade of 2 have an error of zero, because the results themselves are incorrect). This is deducted from the number of students who completed the task, the number of students who deserve a grade. That is, for example, the number of students who received 5 grades in the control group was 21, and the number of students who passed 5 grades (9-10) was 24. So,  $24 - 21 = 3$ . It means that 3 students

made a mistake. Now the number of students who made a mistake in the calculation of the error is multiplied by 100%, divided by the number of tasks performed by the multiplier.

$$\text{Error} = 3 * 100\% / 24 = 12.5\%$$

This means that 12.5% of students who passed 5 grades (9-10) made a mistake. (more precisely, unworthy of 5 marks)

Stage 3 The results of the test tasks given to determine and develop the level of mastery of the topic by students.

Table 4. An indicator of the completion of tasks to determine the level of mastery of the topic by students.

Groups	Number of students	Number of completed tasks / percent								Time allotted for training (for every 1 class / total)	Time spent on checking assignments (average total for class)
		Number of students who completed tasks 0-10		Number of students who completed tasks 11-14		Number of students who completed tasks 15-17		Number of students who completed tasks 18-20			
Experimental group	210	10	5%	74	35%	94	45%	32	15%	10/70 minutes	0/0 min
Control group	212	12	6%	85	40%	93	44%	22	10%	10/70 minutes	13/98 m

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Groups	Number of students	Assimilation rate / percentage / error			
		2 prices	3 prices	4 prices	5 prices
Experimental group	210	13 / 6% / 0%	78 / 37% / 4%	91 / 43% / 7,5%	28 / 14% / 12,5%
Control group	212	16 / 8% / 0%	89 / 42% / 5%	88 / 41% / 8,5%	19 / 9% / 13,5%

Analysis.

The results of Phase 1 show that the teachers' computer literacy is satisfactory, but there are not enough facilities for them to use computer games in the classroom. Therefore, the use of computer games in the classroom is not sufficiently established.

The results of Phase 2 (Table 2) showed that the differences between the number of tasks performed by the students of the experimental group and the students of the control group were very small (Diagram 1). In the performance of the tasks given in the computer game in the experimental group, the Reinforcement Department does not allow tasks to be misspelled. As a result, the students of the experimental group will not have errors in the results of the task, that

is, the error will be zero. After checking the results of the task of the control group, it was found that there were errors in the answers of the control group students (Table 3). The errors are shown in Figure 2.

Figure 1. Reinforcement of a new topic by students in the experiment and control group is an indicator of the completion of tasks.

Diagram 2. Reinforcement of a new topic by students of the experiment and control group is an indicator of errors in the performance of tasks.

After checking the tasks, the results are shown in Figure 3.

Figure 3. Reinforcement of a new topic by students of the experimental and control groups is an indicator of mastery of tasks.

At this stage, students are given the same amount of time. When checking the results, the experimental group is checked as soon as the computer writes it down, and it was found that the control group takes a lot of time when checked by the teacher (Table 2).

Phase 2 We find the efficiency and arithmetic mean in the experimental and control groups using the following formula. In this case, we define the arithmetic mean of the mastering grades in the experimental and control groups as X (experiment) and Y (control), respectively.

Arithmetic mean values:

Efficiency indicator:



From these values, it can be seen that the indicators in the experimental group are 0.8% higher than in the control group.

The results of Phase 3 (Table 4) showed that the differences between the number of tasks performed by the students of the experimental group and the students of the control group were very small (Diagram 4). After checking the results of the task, it was found that the answers of students of both groups (experiment and control) were incorrect (Table 5). The errors are shown in Figure 5 as follows. As both groups have test assignments, the result will be determined after all assignments have been completed or after the allotted time has elapsed. When the students' results (Table 5) were re-analyzed after receiving the test results, the following became clear. (Diagram 6)

Figure 4. Determining the level of mastery of students in the experimental and control groups is an indicator of the completion of tasks

Figure 5. Determining the level of mastery of students in the experimental and control groups is an indicator of errors in the performance of tasks

Figure 3. Reinforcement of a new topic by students of the experimental and control groups is an indicator of mastery of tasks.

Phase 3 We find the efficiency and arithmetic mean in the experimental and control groups using the above formula. In this case, we define the arithmetic mean of the mastering grades in the experimental and control groups as X1 (experiment) and Y1 (control), respectively.

Arithmetic mean values:

Efficiency indicator:

From these values, it can be seen that the indicators in the experimental group are 3.2% higher than in the control group.

According to the results of the study, in the 2nd stage (strengthening of a new topic) the experimental group was found to be 0.8% higher than the control group, and in the 3rd stage (student mastering and testing) the experimental group was found to be 3.2% higher than the control group. It's not that big. In other words, the research process did not significantly affect students' academic achievement.

Students were given the same amount of time at this stage. When checking the results, the experimental group is checked by a computer, and a lot of time is lost because the control group is checked by the teacher (Table 5).

#### **IV. Discussion**

Computer games can be used at different stages of a lesson, depending on the student's grade, subject type, lesson type, lesson topic, lesson goal, and content. A number of computer games have been developed that are effective in teaching mathematics, taking into account the age characteristics of primary school students. According to experts, the main types of human activity are formed in three forms: work, play and study. They are all interconnected. It is noted that the laws of formation of children's mental activity on the basis of school textbooks are incorporated into play activities.

Some literary sources claim that play has a negative effect on children's learning [Yu.S.Ponomareva, M.Kebritchi, Groves, Christopher L. Groves and Craig A. Anderson]. In fact, it is not.

Choosing and using games that meet the didactic requirements of the lesson will have a positive impact on student learning.

The use of games in education teaches children to use the mouse and keyboard correctly. Fun and exciting games increase computer and digital literacy. Through play, students gain basic skills such as problem solving, analytical thinking, collaboration and creativity, improve communication skills, and increase ethics and a sense of responsibility. The main advantage of games that allow students to get used to the digital world is that learning is intuitive. The use of computer games in education allows students to gain self-confidence and learn to use technology to their advantage. A student who has mastered the game will quickly understand the digital barriers of any game and try to solve problems.

For students, games are more like entertainment than a teaching method, although games define rules, goals, and competition, resulting in a sense of success and meeting educational goals. interactive experiences emerge. The player who performs well in the game is rewarded, and thus teaches the player to work towards the goal by choosing certain actions. Game-based learning encourages students to think about real-life learning experiences. Learning through play increases student engagement and increases overall motivation in the classroom.

There are many benefits to using computer games in teaching. Games have been found to be more interesting than traditional forms of learning. Games not only develop students' cognitive abilities, but also increase their cognitive activity. Through information and learning in games, games provide a certain amount of information in several stages. The game improves meta cognition, that is, the ability to think independently. Strong metocognition helps to develop

academic skills and helps the teacher to learn about the strengths and weaknesses of students, which in turn leads to increased academic effectiveness.

Students' knowledge is strengthened during the game. As the positivity of a lesson increases, so does its content. Games improve cognitive functions such as memory and thinking, and solve problems with brain function. The decision-making processes required for the game provide students with cognitive exercises ranging from simple decisions to complex strategies.

Students who excel in games are able to solve problems confidently, excel in critical thinking, and cope with challenges. Games strengthen memory better than reading a book, which improves creativity and decision-making skills, stimulates cognitive development, and facilitates individual learning.

Game-based learning plays an important role in teaching by offering students the opportunity to collaborate, communicate, interact, and work in a team. Strategy-based games improve brain function, inspire children to learn new things, develop skills, and establish emotional connections to explore a topic. The instant feedback feature after the game gives you an idea of how to improve performance. Combining learning goals with the curriculum gives a whole new look to the learning process.

Computer games have become a favorite pastime of all students today. Many computer games are used in education today. Researchers have argued that these games have a design, a comprehensiveness, and the ability to influence the mood. The literature has different interpretations of the effects of computer games on student learning.

The use of computer games in education leads to:

Increases memory:

The student plays games on the topic and remembers the information (objects) in it. Continues the game based on previous (memory) information during the game. Games primarily serve the student's memory. In this way, games teach students to remember and work on information they have seen and heard before.

Teaches strategic thinking:

Many games teach students to count, think logically, use them correctly in all game situations, move forward in the game, and achieve high results. Games also allow students to work on their imagination and solve problems independently. Games help to develop the ability to manage a situation independently, using a strategic approach to each situation.

Coordinates hand and eye:

Most games are designed to be controlled using a keyboard, mouse, or touch screen. Teaches the student to control the game on the screen and focus on a specific task at the same time.

Increases motivation:

Basically, games have incentives after each stage. This gives the student a general motivation to play. Encourages students to pay attention to the rules of the game, complete each stage correctly, and move on to the next stage. In short, it increases students' motivation to read and teaches them to learn by playing games.

Teaches teamwork:

In team games, students play in groups. Group play in the classroom teaches students to collaborate. In group games, the student pays attention to each member of the group. Helps his

team during the game. These games help students develop community work and self-management skills.

Teaches to compete:

When games are played in front of a team, the student sees the other players as opponents. When players play against each other, they try to overtake their opponents. Games teach students not to lag behind their peers, but to compete.

Prevents depression:

Students will be supervised throughout the class and given a variety of assignments and questions. Some students may not be able to complete assignments on time. This can lead to depression. This can lead to a negative attitude towards the learning environment. The use of games in the acquisition and reinforcement stages of the lessons leads to a positive attitude towards learning. Prevents student depression.

Increases attention:

Games require students to pay attention to the details of the game. Because games can be colorful and fast, students need to be alert and attentive throughout the game. Throughout the game, intelligence teaches students to pay attention to what is being taught in the classroom and what is happening in the classroom.

Provides new knowledge:

Each game provides a certain amount of knowledge. By playing different types of games, the student learns different things from them. The more different games are used in the lesson, the more new knowledge the students will acquire.

Teaches you to draw the right conclusions from mistakes:

When a student plays a new game, he inevitably does not know the game, makes mistakes, guesses. However, the student learns the game quickly and masters the information in it. In subsequent attempts, he tries not to repeat the mistakes he made.

### Findings

As a result of observations and questionnaires conducted during the research, the desire of science teachers to use games in teaching lessons was identified.

The effectiveness of students' learning in the use of computer games in the classroom was determined. The analysis of the results collected information on the use of computer games at what stage of the lesson.

### Achievements

In the process of teaching computer games in primary school mathematics lessons, the following achievements were made: the interest of students increased; all students were able to attend and all were assessed; instant completion of students' assignments (saving time).

## V. Conclusion

There are some shortcomings in the use of computer games in education: overindulgence of students in the game, loss of class control; inability to use a computer (student and teacher); unbalanced internet and electricity; Lack of methodology for using computer games in lessons.

The results of this study suggest that professional development in the introduction of computer games should change the attitude of mathematics teachers towards computer games. It

is necessary to prepare computer games in the national Uzbek language for primary school on the basis of didactic principles. It is necessary to develop a method of using computer games in the classroom and prepare guidelines for this. The Ministry of Public Education of Uzbekistan should reorganize the standards of primary mathematics education by integrating computer games into the curriculum and provide conditions for its practical application.

Any learning discipline can become an intense form of play if the teacher has mastered the style of play and turned it into a regular activity. Games are used by many school teachers. Thus, these computer games allow students to increase their interest in knowledge, to present, apply and consolidate knowledge in a brighter form and in a more comfortable environment. In this sense, computer games can be seen as an effective way to teach and educate students.

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