

# SEEJSD

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# The role of ICT tools in teaching mathematics

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## ABSTRACT

The rapid development of technology has made the availability of many ICT tools easy. In that way, their application in education became possible. So, various ICT tools began to be applied in the teaching process in many subjects and mathematics was no exception. In this paper we will state which ICT tools can be used in teaching mathematics. Then we will state the results of a research on the advantages of using ICT tools in teaching mathematics, conducted among students from the ninth grade in primary school "GoceDelchev" in Sveti Nikole. And finally, the conclusion about the advantages and disadvantages of using ICT tools will be given. In the conclusion we mainly point out that the application of ICT tools in teaching mathematics contributes to facilitating learning, increasing the desire to solve mathematical tasks, raise the teaching process to a higher level and also motivate students to work and learn more independently.

## CCS CONCEPTS

• Education • Mathematics

## KEYWORDS

ICT tools, technology, teaching process, mathematics

## 1 Introduction

Technology is essential for learning mathematics and many other subjects. She affects to achieved success and improves students' learning. The integration of technology into the teaching process in the classroom has attracted much attention in the recent years. Providing a rich learning environment and promoting social interaction as well as critical thinking skills are the reasons for the need to include technology in the classroom. The introduction of computers in mathematics education has brought with it optimism for enriching the teaching process by adding a new dimension in mathematics learning.

The traditional school system brings our students to a state of school saturation, a state of passivity and appeared of resistance to school and learning.

The work of the teacher do not decrease with the introduction of modern technologies, but on the contrary, their

role becomes even more significant and responsible. Teachers with a combination of traditional and modern approaches to the study of mathematics should allow students to experience mathematics as an interesting subject.

Mathematics education is as old as civilization. The need to facilitate learning, the need for more interesting teaching, the development of technology, the achievement of the general and specific goals of mathematics are some of the reasons that stated the need for the introduction of ICT tools in the teaching of mathematics.

In addition to the large number of ICT tools, these days software has been used a lot in the teaching process of the mathematics subjects in primary, secondary schools and universities, because visualization plays an important role especially in those subjects as we can see in [3]. In that direction was also created paper [8] where it is shown that MATLAB is a user-friendly programming language.

Many authors have examined whether students are interested in using information technology resources and whether they have habits of using them as we can see in paper [4].

An analysis to find easy resources for teaching mathematics online can be found in [10]. In [1] the authors want to determine whether online learning affects students' knowledge. The aim of [2] is to draw a conclusion which way of learning (classical way or online) gives better results in student achievement. A comparison of students' attitude between videoconferencing distance learning and traditional classroom environment learning was made in [6].

Application of modern digital technologies in teaching has changed teaching methods. The objective of [7] is to establish a methodology to improve and adapt curricula with the goal of enhancing digital competences of learners according to European standards and the needs of teaching at technical faculties.

E-learning or electronic learning is a modern way of transferring knowledge and skills electronically using software applications that allow 24/7 availability for use by a large number of users. E-learning acceptance and use for teaching staff in Higher Education Institutions are analyzed in [5]. In many papers we can find a demonstration of an e-learning application such as [9] where an e-learning application is developed with Adobe Captivate.

## **2 Overview of ICT tools that can be used in teaching mathematics**

The low interest in work of students, the need for more interesting teaching, the need to facilitate learning and the development of technology are some of the reasons for introducing ICT tools in the teaching of mathematics. The use of ICT tools and activities with them in the classroom in the mathematics subjects have a significant role. More important for ICT tools is that they develop greater abilities in students. This should be the aim of any applicable ICT tool in mathematics teaching.

We will list several ICT tools that can be used in teaching mathematics in the following:

### **SMART board**

SMART board is an interactive format of a board that reacts when something is entered by the users. Smart boards are also known as electronic whiteboards, interactive multimedia whiteboards or interactive whiteboards. They transform traditional teaching into interactive teaching that is specifically for modern society.

Smart boards affect better student motivation, easier learning and easier maintenance of their attention. With use of smart boards students become much richer in knowledge. The introduction of an interactive whiteboard in the classes makes the lectures and the learning process more attractive and meaningful. It allows teachers to be more creative in putting teaching materials.

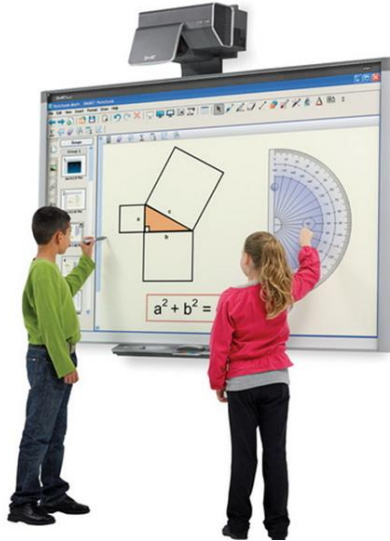


Figure 1. SMART board

Interactive whiteboards encourages active learning among students. Students ask more questions and take more notes than on regular whiteboards and smart boards contributes to more effective group activities. By using an interactive whiteboard, students can collaborate better in the classroom.

#### **Internet as an ICT tool**

The Internet as an ICT tool is applicable in every teaching subject and mathematics. Its application is seen through the use pages whose content is strictly related to the material being worked on, as well as Internet sites whose content is more of an entertaining nature - such as those that contain mathematical and logical games and mathematical jokes. Students may also be assigned research homework, for example an assignment that involves finding information on the Internet. Homework may include finding appropriate math passages, pictures of geometric objects, historical information related to mathematics, information about the lives and work of great mathematicians, etc.

#### **Digital textbooks**

Digital textbooks represent an electronic form of a traditional, printed textbook. Students can download a digital textbook or access it online on computers or on their phones.

Digital textbooks have started to be used more recently. The views of parents, students, teachers and professors about their use are divided. Some support their use and others point out that their use overloads students because they must read from a computer or some other device. However, the use of digital textbooks has been supported by the digital age in which we live now.

#### **E-learning**

E-learning is use for transferring knowledge and skills electronically using software applications 24/7. E-learning is often used to supplement mathematics instruction. When the term online learning is used, one often imagines a virtual classroom accessed by teachers and students from different locations.

#### **Educational software**

Educational software for teaching mathematics is software used to model, analyze or calculate numerical, symbolic or geometric data. It is a type of application software used to solve mathematical problems or study mathematics. One of the most used mathematical software in the teaching of mathematics is the GeoGebra software.

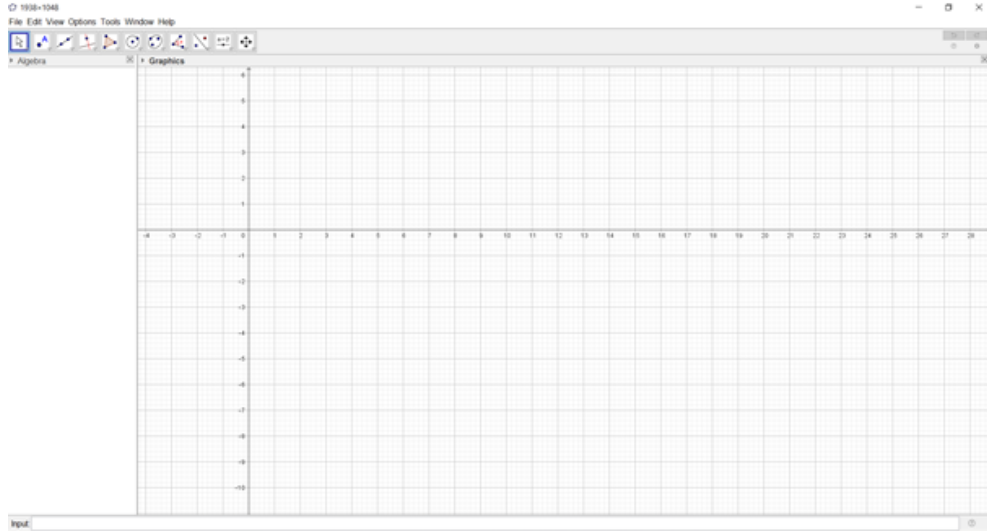


Figure 2. GeoGebra window

GeoGebra is a program for dynamic mathematics that combines geometry, algebra and analysis. Numerous teachers around the world have recognized the potential of the program and recognized that it is program that brings mathematical concepts closer to students. GeoGebra is a free software translated into more than fifty world languages, one of which is the Macedonian language.

GeoGebra software provides a simple representation of complex concepts, and thus a better understanding of them. In recent years, it stands out as a tool that teachers regularly include in their teaching and students easily accept it.

### 3. The dependence of students' success on the application of ICT tools in teaching mathematics

All the previously mentioned ICT tools make us to think and raise some questions that need to be answered. How much the computer is used in teaching? Are there positive effects of the application of ICT tools in teaching? How justified is the use of ICT in teaching and are the results and reactions positive?

For this purpose, a survey was made with which we can give a partial or complete answer to these questions.

To examine the impact and success of students from the application of ICT tools in teaching, a study was conducted in two classes of the ninth grade in primary school "Goce Delchev" in Sveti Nikole. A survey of students was made to determine how much and if there are any changes in the acquisition of knowledge with the application of ICT tools in the teaching of mathematics. The questionnaire of survey consisted of the following questions:

#### QUESTIONNAIRE

Question	Answer
1. Does using a computer make math class more interesting?	Yes/ no
2. Do I gain more knowledge when using ICT tools?	Yes/ no
3. Do I feel confident using ICT tools during the activities?	Yes/ no
4. Was I able to predict and say the correct answer after each activity when using the GeoGebra software?	Yes/ no
5. Does the use of ICT tools contribute to encouraging students to learn more independently?	Yes/ no
6. Do I manage to work independently and solve problems by applying an appropriate ICT tool?	Yes/ no



7. I enjoy learning mathematics much more using an ICT tool?	Yes/ no
8. Is it good to use ICT tools more often in mathematics classes?	Yes/ no
9. Am I familiar with using GeoGebra software?	Yes/ no
10. Do I master the material more easily using the GeoGebra software?	Yes/ no
11. Does the use of ICT tools contribute to raising the educational process to a higher level?	Yes/ no

28 students were examined, and the results are given in Figure 3:

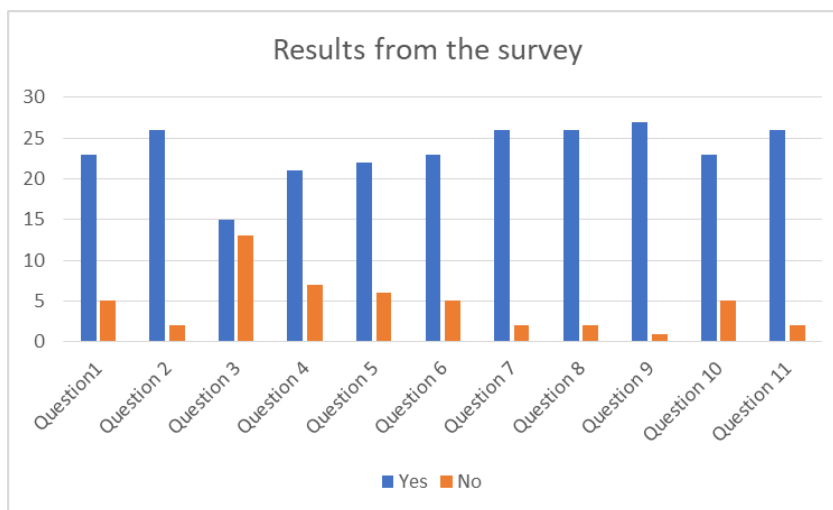


Figure 3. Results from the survey

The results as we can see from figure 3, show that students generally gave positive feedback about using ICT tools in teaching mathematics. However, some of the students stated that they do not feel confident when working with ICT tools in class and at home.

From the research mentioned above as well as from our experience of using ICT tools in teaching we can single out the following advantages and disadvantages related to their use:

**Advantages:**

- Students acquire digital and audiovisual literacy. It helps students develop digital and audiovisual skills for the future.
- Students are encouraged to participate actively in class.
- The motivation, curiosity and opportunities for experimentation among students increases.
- Class time is used more efficiently. More new things are learned in a shorter time.
- Students with special needs have access to essential material and special ICT tools that they can use for their educational needs.
- ICT enables students and teachers to access learning resources and materials.

**Disadvantages:**

- A certain level of understanding is necessary to use a large part of ICT tools. If teachers and professors are not trained and don't know how to use them properly, it can be a big problem.
- Technical problems may occur when using ICT tools.
- Students may be exposed to information overload, when ICT tools are used in learning.
- Some of the ICT tools can be expensive.
- The use of technology in the classroom can be distracting for students.

- Unreliable information is everywhere, that is, not everything published on the internet is always correct.

#### 4. Attitudes of students and teachers about the use of ICT tools in teaching mathematics

Teachers are key in embracing the new digital environment in schools and universities. It is therefore of great importance to have trained teachers who are able to use ICT in education in a way that will lead to changes from old to new learning paradigms.

Teachers' use of ICT in the classroom depends on a number of factors: availability and access to funds, school support, training in the use of ICT and teachers' personal attitudes towards teaching and learning. If applied effectively, ICT tools can play a significant role in supporting teaching during the teaching process. Recommendations for the use of ICT by teachers at different levels of education are similar to those of students. In general, students report that they are significantly encouraged to use ICT in the classroom as well as for additional activities at home. Some teachers agree that using computers in teaching is good, but we should not overemphasize their value. They also agree that if schools are not using ICT tools, they are not preparing young people for future where technology dominates and is represented everywhere. Most of teachers believe that the best way to use ICT tools is to combine them with traditional teaching. The teachers' experience showed that if ICT tools are not used, teaching is not seen as oriented teaching for future. Students have generally positive attitudes towards technology and are interested in much introduction of technology in the educational process. They are also interested in using much more technology at home.

#### 5. Conclusion

The conclusion is more than clear. This research gives us a clear picture of the importance of ICT tools and the importance of combining more IT tools during the teaching mathematics.

From the above we can conclude that the use of information technologies, that is ICT tools, in the learning process can definitely be one of the most influential factors for acquiring new knowledge. Information and communication technologies facilitate the individualization of the teaching process, increase creativity in work and productivity in classes.

The application of ICT tools in teaching mathematics contributes to facilitating learning, raise the teaching process to a higher level, increasing the desire to solve mathematical tasks, motivate students to work and learn more independently and most importantly to love mathematics.

The impact that ICT tools has in educational institutions is so great so we can conclude that school life without ICT tools is impossible for people who have already used them.

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