

## MODERN DIDACTIC TECHNOLOGIES IN MATHEMATICS EDUCATION

**Abstract:** This paper presents students' views on the application of modern didactic technologies in education. There are several technologies that are widely used in both mathematics and other school subjects. The application covers two groups and types: desktop and online format, focusing on some of their advantages and disadvantages. These didactic technologies may play a significant role in achieving the learning objectives of today's classroom.

**Keywords:** Interactive whiteboards, education, interactive methods, learning, presentation.

### Authors information:

**Krasimir Harizanov**  
Assistant Professor, PhD  
at Shumen university,  
Faculty Mathematics and  
Informatics, student,  
specialty Pedagogy of  
Mathematics and  
Informatics,  
✉ [kr.harizanov@abv.bg](mailto:kr.harizanov@abv.bg)  
🇵🇸 Bulgaria

**Stanislava Ivanova**  
Shumen university,  
Faculty Mathematics and  
Informatics, student,  
specialty Pedagogy of  
Mathematics and  
Informatics,  
✉ [stanislavkaaa123@gmail.com](mailto:stanislavkaaa123@gmail.com)  
🇵🇸 Bulgaria

**Radina Kenova**  
Shumen university,  
Faculty Mathematics and  
Informatics, student,  
specialty Pedagogy of  
Mathematics and  
Informatics,  
✉ [rkenova@abv.bg](mailto:rkenova@abv.bg)  
🇵🇸 Bulgaria

**Mirena Yaneva**  
Shumen university,  
Faculty Mathematics and  
Informatics, student,  
specialty Pedagogy of  
Mathematics and  
Informatics,  
✉ [mirenaqneva95@abv.bg](mailto:mirenaqneva95@abv.bg)  
🇵🇸 Bulgaria

**Djoshkun Salim**  
Shumen university,  
Faculty Mathematics and  
Informatics, student,  
specialty Pedagogy of  
Mathematics and  
Informatics,  
✉ [djoshkimsalim@abv.bg](mailto:djoshkimsalim@abv.bg)  
🇵🇸 Bulgaria

### Introduction

The application of modern didactic technologies and learning methods alters the traditional presentation of the educational content in an attractive and accessible way. The technological innovations in learning have proven their positive impact by many authors who identify students as more motivated and raising their interest in the learning process [10]. With the introduction of Information and Communication Technologies (ICT) in study rooms [9], other than Informatics and IT, a new opportunity was given to the teacher to break the classical model of teaching. Some of the popular innovative technologies that tutors implement in this integration process are interactive boards, multimedia projectors, electronic platforms, mobile computing, and more.

In Bulgarian schools, a lot of funds are constantly being invested in the modernization of the learning process [7]. Training courses are organized to help and develop teachers' skills to work with the various applications that are needed in their profession.

### Exposition

In recent years, the rapid development of hardware and software has created the conditions for discovering new opportunities for improving the learning process [1]. The use of ICT required the use of interactive learning methods [3] and created a new "interactive educational environment" [2].

We will now look at some of the common ICTs that would improve the quality of the math education process. Some of the examples presented are available through their online addresses or through pre-installation.

#### *Presentations*

These applications are among the most preferred among teachers, regardless of the subject they teach. Their learning does not require specialized qualification or training, and in practice their abilities fully meet the needs of the teachers. When rendering presentations as the main didactic material in Mathematics lessons [4, 5, 6], in most cases the PowerPoint application, standard for the MS Office package, is used. The main features of the application are related to drawing tables, figures (Fig.1), inserting images, sound and video, applying hyperlinks and animations to objects. This makes

it preferable when creating simple geometric objects and those that do not require parameterization when plotting them. The multilayer materials provide great help to the lecturer in the demonstration and visualization of the curriculum and are used as durable resources with multiple applicability.

As a good alternative to PowerPoint, you can use Prezi online applications or Google presentations. Their use is related for creating presentations that would be convenient to access on the Internet.

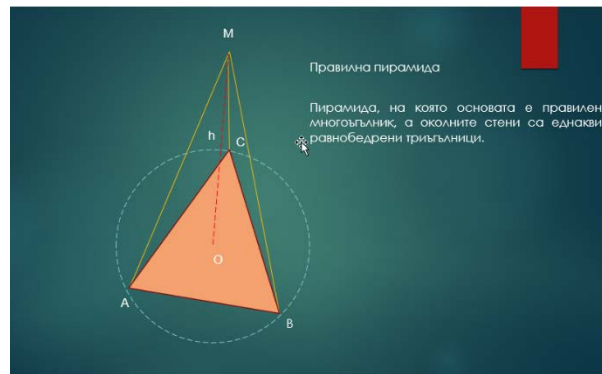


Fig. 1 Task Example presented through PowerPoint

#### GeoGebra

One application with an easy and convenient way to draw geometric drawings is the GeoGebra

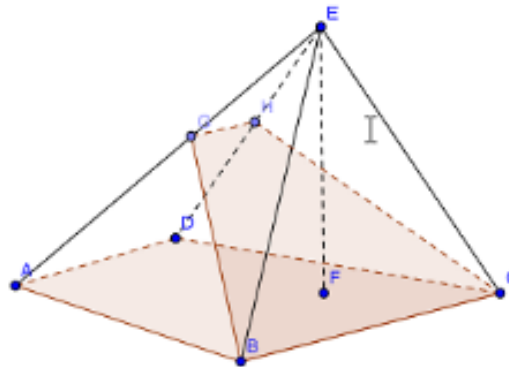


Fig. 2 Drawing example created by GeoGebra

application. This software "can ease the teacher's work by saving time and giving the material a preview" [4] in high school and junior high school. It is light, dynamic [8], and very useful in creating precise drawings (Figure 2) and their analysis. Tool selection is very large, helping to draw a variety of 2D and 3D shapes from different geometry areas. Real-time changes can be tracked related to the characteristics and shape of the objects. The product can be downloaded free of charge from its official site or used online. The application could also be used by the pupils themselves.

#### Interactive boards

This relatively new technology has entered education and has been widely used in almost all learning disciplines. Interactive lessons are visualized through a multimedia projector on a whiteboard or an interactive board with the corresponding software [12, 13]. Many authors [11] explore the application of this technology and how it influences the quality of training. Depending on the interactive board model, the possibilities are more or less, but for the most part, the teacher can focus on text, image or other object. The widespread models have an electronic tag, through which the

element management in the lesson becomes an interactive and curious way for students. Similar to the paint drawing tools known by Paint, it is possible to illustrate or demonstrate mathematical tasks that require it.

It should be in mind that when developing lessons outside the computer room, the same version of the software should be used and at a screen resolution close to that of the projector.



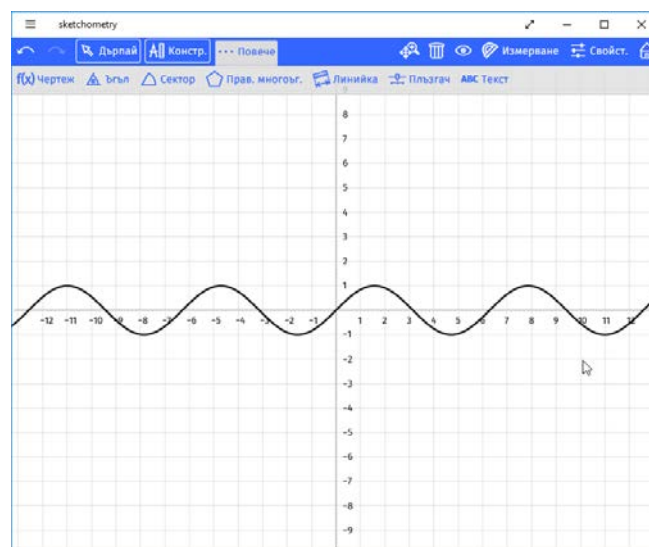
*Fig. 3 An example of an interactive board*

#### *Sketchometry*

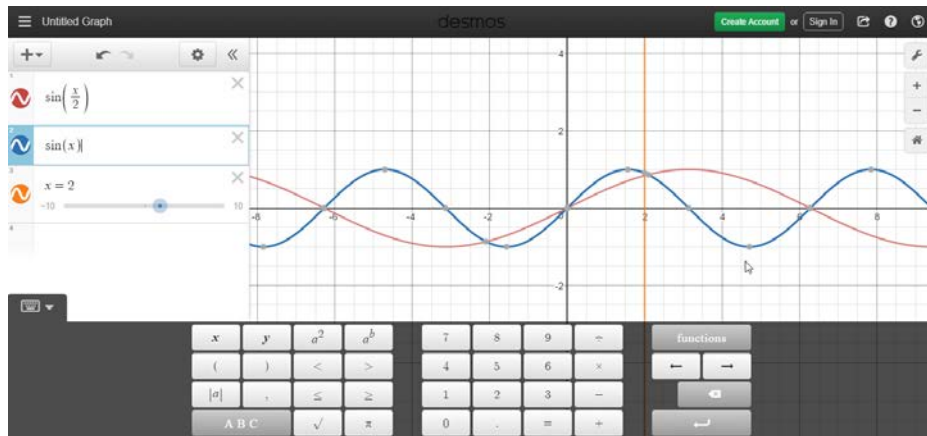
This free installation app is available to all Windows users over 8.1 version, and there are mobile versions also. The specification of this product is that it is specialized for drawing geometry tasks. The tools available for the application allows you to create shapes, angles, text, feature visualization, a measurement line, and define the different features of the objects. The application has two modes "Construct" and "Pull" to move a drawn objects or construct them. The drawing area could be either rectangles or coordinate system, depending on the type of the task. The interface of the application has the ability to be visualized in Bulgarian.

#### *Online apps*

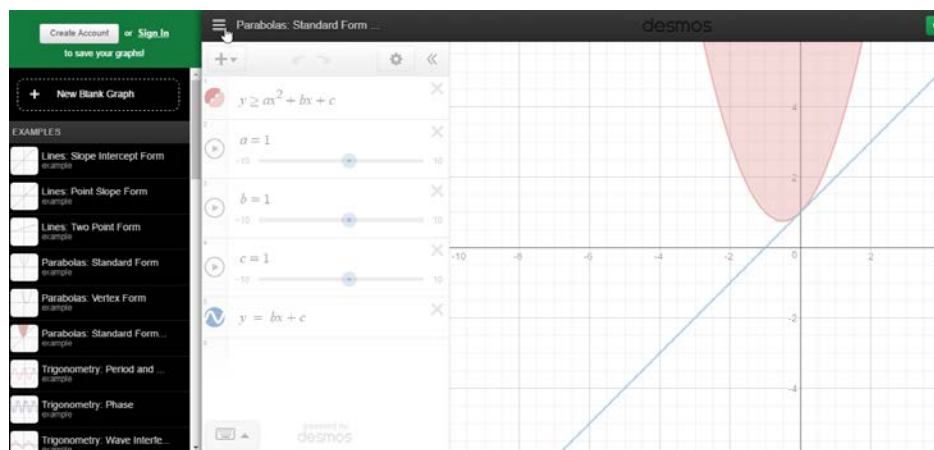
Just like desktop applications, and those online, they have their place in the preparation and



*Fig. 4 Graph of function drawn in Sketchometry*



*Fig. 5 Example of a function preview*



*Fig. 6 Insert a drawing from a library*

implementation of the class. We will now look at some of them that could be fully used by both teachers and pupils. The first one is an online calculator published at <https://www.desmos.com/calculator>. The application has a large set of trigonometric and statistically built-in functions, whose presentation is visualized graphically.

In real time, the function values can be changed (Figure 5), tracing their variation and analyzing the results that are obtained. Another option is to use a ready-made library of drawings (Figure 6) embedded in the online platform. Each drawing has parameters and values that are drawn and can be used as a template or for demonstration in practical tasks.

The Mathway platform, published at <https://www.mathway.com>, has a large database of various algebraic, statistical, trigonometric and other features that makes it widely applicable. Each visualization starts with a selection of a computational category, then the digital keyboard indicates the desired function (Figure 7). The next step is to visualize fields to be filled in and to move to the calculation of the results (Figure 8). Viewed online applications do not have a user interface in Bulgarian.



Fig. 7 Entering Values



Fig. 8 Calculating Values

### Conclusion

The above conclusions follow that information and communication technologies can be used in situations to improve the quality and learning of learning outcomes.

Modern didactic technologies in learning will play an increasingly important role in the educational process. The great potential they have can be used to set goals, tasks, and stimulate active participation of students in the learning process.

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