

# ICT- The Educational Programs in Teaching Mathematics

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**Abstract** - The range of information and communication technology in teaching mathematics is unlimited. Despite numerous researches about the opportunities and application of the ICT in teaching mathematics and in the world, however, many aspects remain unexplored.

This research comes to knowledge that will be applicable to the educational practice. The findings will serve as motivation for more frequent use of the ICT in teaching mathematics from first to fifth grade as a mean for improving of the educational process.

Through application of the ICT in the educational programs in teaching mathematics the technological improved practice is investigated and discussed and it helps overcoming of the challenges that arise when trying to integrate the ICT in the educational curricula in mathematics. The biggest challenge are the findings about the possibilities of the application of the ICT in the educational programs in math from first to fifth grade as well as their dissemination, all aimed to improving of teaching mathematics from the first to the fifth grade.

The application of the most ICT in the educational programs of mathematics affects the training of the students for easier adoption of the mathematical concepts and the mathematical procedures and in the easier identification and resolving problem situations.

**Keywords** - ICT-educational programs, teaching mathematics, mathematical terms, mathematical procedures, problem situations.

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## 1. Introduction

The ICT educational programs provide a new framework that fosters improving of the teaching and learning practices in teaching mathematics. The positive results are the major benefit in terms of increased number of learning resources such as software and web pages. The students are motivated when the ICT is involved in the educational programs of the educational process because they encounter a wide variety of digital tools and resources. It is important to note that it is not just the mere presence of technology in relation to the stimulation of significant changes within the school but that the ICT education programs provide tools and content for practicing the abilities to transform data into knowledge that becomes a basic need for the information society.

## 2. Information and communication technology in education

Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. [11]

Most countries face challenges about using the Information and communication technology because it has the potential to transform teaching and learning processes. [10] To define information and communication technology (ICT, two other terms need first to be defined. Informatics (Computing Science) UNESCO defines informatics as the science dealing with the design, realization, evaluation, use, and maintenance of information processing systems, including hardware, software, organizational and human aspects, and the industrial, commercial, governmental and political implications of these. Informatics technology is defined as the technological applications (arti- facts) of informatics in society. Information and communication

technology, or ICT, is defined as the combination of informatics technology with other, related technologies, specifically communication technology. ICT will be used, applied, and integrated in activities of working and learning on the basis of conceptual understanding and methods of informatics. [11]

When the first computers made their entry into schools in the late 1970s, we used to speak about computers in education. With computers came printers, floppy disk drives, scanners and the first digital cameras. We began to use the term IT, or Information Technology, to describe computers and these various peripheral devices. Then the internet arrived together with computer networks, the World Wide Web, email and search engines. A new term entered the language – ICT. The term ICT, short for Information and Communication Technologies, embraces the many technologies that enable us to receive information and communicate or exchange information with others. You see what some of these many technologies (both devices and functions) are in Figure 1. [2]

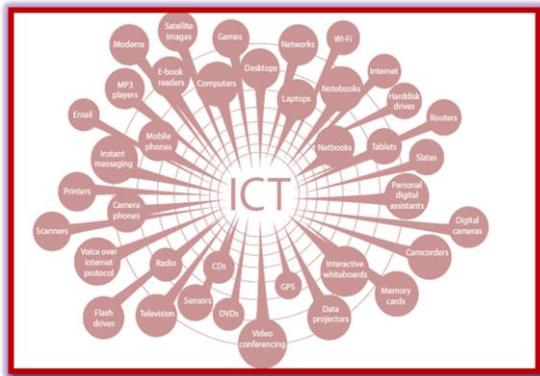


Figure 1. ICT comprise many technologies for capturing, interpreting, storing and transmitting information

### 2.1 Benefits of ICT

Many studies published in recent years also document the benefits of technology. Without regard to potential biases, those studies include the following:

- Students studying language arts in a multimedia environment gained more auditory, language, decoding-in-context, and story-composition skills than did students in a control group who did not use computers.
  - Students in the fifth grade and up who used a specific computer software product learned to solve multistep word problems more quickly than students in a control group who did not use them.
  - Students retained math skills longer after using commercially available mathematics software

than did students in a control group receiving traditional classroom instruction.

- Students who used multimedia computer software showed less math anxiety and more frequently perceived the subject as relevant to everyday life than the students in a control group who did not use them.
- Students who learned algebra with computers did better on a series of tests than those who learned it through more traditional methods. Technology improves students' communication skills and the quality of their presentations and makes it easier for them to complete writing and editing assignments. [7]

### 3. ICT in mathematics

The briefing based on an analysis of available research about teachers' use of ICT in maths summarises the key findings and suggests resources for further reading. The availability of ICT has changed the nature of teaching and learning in maths. Calculators have become more advanced, allowing users to perform increasingly complex functions. A range of portable devices exist which allow pupils to collect data, and manipulate it using spreadsheets and databases. Multimedia software programs focus on specific units of study, bringing dynamic movement, sound and graphics to pupils' learning. Programmable toys or floor robots controlled by instructions in programming languages were one of the earliest applications of ICT to maths, and where used, were the cause of significant changes in maths teaching. The use of ICT in maths includes the effective use of calculators, production of charts and graphs, and work with geometrical shapes. The contribution that ICT can make to maths teaching in

- problem solving tasks
- practising of number skills
- exploring patterns and relationships.

There are many specific forms in which ICT may be used in maths teaching, including calculators, spreadsheets, databases and online, interactive resources. Certain benefits exist though, which are generic to the use of technology. To judge just how ICT may enhance teaching and learning in maths, it is necessary to examine the available research evidence. [5]

There are generally considered to be five major opportunities for children to use ICT in learning mathematics: learning from feedback; observing patterns and seeing connections; exploring data; teaching the computer, and developing visual imagery.

**Learning from feedback-** The computer often provides fast and reliable feedback which is non-judgemental and impartial. This can encourage children to make their own conjectures and to test out and modify their ideas.

**Observing patterns and seeing connections-** The speed of computers and calculators encourages children to explore a greater number of examples of mathematical problems. This supports their observation of patterns and the making and justifying of generalisations. The computer enables formula, tables of numbers and graphs to be linked readily. Changing one representation and seeing changes in the others helps children to understand the connections between them.

**Exploring data-** Computers enable children to work with real data which can be represented in a variety of ways. This supports interpretation and analysis.

**Teaching the computer-** When children design an algorithm to make a computer achieve a particular result, they have to express their commands unambiguously and in the correct order; this makes their thinking explicit as they refine their ideas. [12]

**Developing visual imagery-** Using a computer enables children to manipulate diagrams dynamically. This encourages them to predict the results and to visualise the geometry as they generate their own mental images. [4]

#### **4. Use of the ICT educational programs in teaching mathematics**

The modern teaching of mathematics requires a dynamic, diverse teaching to a greater extent tailored to the individual abilities and skills of the students. It involves a skillful combination of application of the modern teaching aids, methods, forms and sources of educational content of each lesson.

The application of the ICT education programs in teaching mathematics investigates and discusses the technological improved practice and helps overcoming the challenges that arise when trying to integrate the ICT educational curricula in mathematics. The biggest challenge are the findings of the application of the ICT educational programs in mathematics from the first to the fifth grade as well as their dissemination, all aimed at improving the teaching of mathematics from the first to the fifth grade. [13]

Starting from the wide range of possibilities of application of the ICT educational programs in mathematics, in this paper are set aside some of the activities that affect the application of the ICT educational programs in the teaching of mathematics from the first to the fifth grade.

The application of the ICT educational programs in teaching mathematics from the first to the fifth grade, while processing content of the topics of integers, geometry, problem solving and working with data affect the training of the students for easier adoption of the mathematical concepts and the mathematical procedures and on empowering the students to facilitate identifying and resolving problem situations.

The subject of this research is: Determining the impact of the implementation of the ICT educational programs in teaching mathematics from the first to the fifth grade on the training of the students for easier adoption of the mathematical concepts and procedures and easily identifying and resolving problem situations.

#### **5. Defining the basic terms of the case of study**

##### *ICT-educational programs*

According to Domazet and Grbic [8], there are several types of ICT educational programs:

- *Programs for setting and revising of the curricula-* When using these programs, the computer serves only as a place for exercise, a mean of revision of the content and allows the students to apply their knowledge to determine their abilities and to check the extent to which the content has already been studied.

- *Drills-* ways of exercising and establishing the knowledge or the ability and an opportunity to check. This program is easy to use; there is enough time to choose a response and many different ways are offered for exercising. The analysis of the responses allows immediate feedback in the form of a solution or an indication of a possible response.

- *Pedagogical games for determining the curricula-* using these programs, the students can see how much they have mastered of the curricular content. The questions contained in these programs are not textual but are enriched with interesting animation sequences, and an immediate notification of the results is received.

- *Programs for adoption of the curricula*

- *Didactic programs (tutorial)-* these programs provide the clearest picture of the classes using a computer. They are based on the principle- circle (information-question, answer- assessment). These programs represent interactive books that use the possibilities of CDs, DVDs, multimedia projectors, video cards and the Internet. By implementing these programs students do not need any previous knowledge because they have enough time to learn and solve the problems. These programs are tailored

for individual instruction, i.e. each student with their own pace of work can achieve the desired results.

- *Learning programs by discovering*

- *Computer encyclopedia*- these programs incorporate text, images, video and animations sound CD and DVD technology and offer information about a variety of topics and disciplines. Simple to use and affect the retention of attention as well as increasing the curiosity among students.

- *Microworlds*- programs that enable the students to actively manipulate with the physical characteristics and to reach the decision of the specified problem. [8]

### *Teaching mathematics*

In recent decades, several authors have emphasized the complex systemic nature of Didactics of Mathematics as a research field and its interrelations with different domains. In particular, the authors suggest distinguishing between Didactics of Mathematics defined as the scientific and scholarly field of research which aims to identify, characterize, and understand the phenomena and processes conditioning the teaching and learning of mathematics and Mathematics Education defined as the complex and heterogeneous social system which includes theory, development, and practice concerning teaching and learning mathematics. According to this definition, Mathematics Education includes Didactics of Mathematics as a subsystem. Such a distinction is fruitful because it highlights some distinguishing features of theoretical research in Didactics of Mathematics and their influence on Mathematics Education. [3] With the term teaching mathematics is marked a subject in which the education and the training are accomplished with the help of mathematics.[1] The content of the subject mathematics is derived from mathematical science based on certain criteria and the characteristics of adult learners. The math mediates the students to find out already known, already discovered mathematical knowledge. The process of teaching mathematics is a totality of the investigation and it is directed towards specific purpose activities of the teacher and the students, cognitive and permanently adopting a system of mathematical meanings, skills and habits, provided by the curriculum. [6] The educational process is conceived as a two-sided activity. On the one hand, it is the activity of the teacher in charge of the process, plans, determines the methodology of educational work, directing the activities of the students, their approaches to the teaching material, facilitates learning. On the other hand, it is the activity of the students expressed in the investment of some effort, knowledge, skills and habits. This twofold activity is reviewed and takes place in unity

because the activity of the teacher and the activities of the students are directed towards the same goal: realization of the objective of teaching mathematics. The process of teaching mathematics is a cognitive process in which students are introduced to the provided mathematical concepts, facts, generalizations, they perceive their properties. The main goal of a bi-partisan process is to develop student thinking and developing the correct mathematical concepts, mathematical procedures and resolving problem situations.

### **5.1 Type of the research**

According to the generality of the object of study, this research is actional, because through it is allowed acting with concrete solutions for improvement of the teaching practice.

According to the time (spatial) criterion of research this study is transversely as the educational phenomenon is examined at the same time in different places and in different educational institutions.

According to the content of point of view of the subject, the research is social, because it explores a phenomenon that occurs within the educational process as a social process.

According to the method of pedagogical research it is descriptive, because it is made describing the pedagogical phenomenon, introducing the characteristics of the phenomena, accessing, examining the connection of phenomena and their impact on the improvement of pedagogical practice.

### **5.2 Purpose and objectives of the research**

Mathematics, to most, is a complex and difficult subject. The tendency for most students is to consider the subject as one that is boring, thus, creating lack of interest in the topics being discussed. This poses a great challenge for teachers and educators, especially in the primary and intermediate levels, wherein a good study habit and a firm grasp of basic concepts should be developed. Research indicates that computer technology can help support learning, and that it is especially useful in developing the higher order skills of critical thinking, analysis, and scientific inquiry. [9]

The purpose of this research is to determine the impact of the implementation of the ICT educational programs in teaching mathematics from the first to the fifth grade on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

The purpose of the research is concretized through the following tasks:

○ Through the teachers' thinking

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content by topic integers on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content by topic geometric shapes on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content by topic solving problems on the training of students for easier adoption of mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content by topic work with data on training students for easier adoption of the mathematical concepts and the mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the implementation of the ICT educational programs for revision and determination of the curricula in teaching mathematics from the first to the fifth grade on training students for easier adoption of mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the implementation of the ICT educational programs for adopting the curricula in teaching mathematics from the first to the fifth grade on training students for easier adoption of mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the implementation of the ICT educational programs for learning through discovery in mathematics from the first to the fifth grade on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

○ Through observation of the classes in mathematics

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content on topic integers on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content on topic geometric shapes on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content on topic solving problems of the training of students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

- to determine the impact of the application of the ICT educational programs in teaching mathematics from the first to the fifth grade in processing of the content on topic work with data on training students for easier adoption of the mathematical concepts and mathematical procedures and easier identifying and resolving problem situations.

### 5.3 Hypothesis

#### General hypothesis

The application of the ICT educational programs in teaching mathematics from the first to the fifth grade affects the training of the students for easier adoption of the mathematical concepts and procedures for easy identifying and resolving problem situations.

#### Special hypothesis

○ By the use of the ICT educational programs in teaching mathematics from the first to the fifth grade the students will be able to facilitate the adoption of the mathematical concepts.

○ By the use of the ICT educational programs in teaching mathematics from the first to the fifth grade the students will be able to facilitate the adoption of the mathematical procedures.

○ By the application of the ICT educational programs in teaching mathematics from the first to the fifth grade the students will be able to easily identify and resolve the problem situations in teaching mathematics.

#### 5.4 Procedures and instruments

In this research are used the following procedures:

- surveys of the teachers, through which we get their opinion about the impact of the application of the ICT educational programs in mathematics from the first to the fifth grade in the processing of the content on topic integers, geometry, problem solving and working with data,

- surveillance, which allows direct monitoring of the classes which use ICT educational programs in teaching mathematics from the first to the fifth grade in the processing of the content on topic integers, geometry, problem solving and working with data.

In this research are used the following instruments:

- Formalized questionnaire, intended for teachers who use ICT educational programs in teaching mathematics. The questionnaire is composed of two tables which are filled according to the degree of the influence. The ranking using 1, 2, 3 and 4 indicate:

- No impact- 1
- Impact of poor intensity- 2
- An impact with a strong intensity- 3
- An impact with the strongest intensity- 4

These indicators do not indicate any priorities or hierarchies.

- Checklist, designed to observe the classes that use the ICT educational programs in teaching mathematics. With indicators + and – is marked the existence or nonexistence of activities using ICT educational programs in the adoption of the content of these educational topics in mathematics.

#### 5.5 Sample of the research

The research was conducted in sixteen primary schools in the country. The population of this research consists of 242 primary teachers surveyed about their views of the use of ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic integers, geometry, problem solving and working with data.

The samples of observation were the classes which use the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic integers, geometry, problem solving and working with data, covering 80 lessons from the first to the fifth grade and it includes four lessons for each topic separately, with twenty teachers.

#### 6. Processing of research results

In processing of the research data is taken care for the quantitative and qualitative aspects of the research subject.

The quantitative data processing consists of tabulation of the data and calculation of the frequency, percentage and arithmetic mean and, for all the categories of questions from the questionnaire.

The qualitative processing of the survey data is based on the process of analyzing the frequency, percentage and mean of data and analysis of data obtained from observing classes.

The statistical processing of the data, as a research method is used for direct editing of the data in SPSS, and the program Microsoft excel, thus enabling tabular and graphic shaping of the processed data.

#### 7. Analysis and interpretation of the results from the research

Considering the possibilities of the application of the ICT educational programs in teaching mathematics, the results from the research are presented and interpreted in the following way:

- Application of the ICT educational programs in teaching mathematics from the first to the fifth grade has an influence on:

- Training the students for easier adoption of the mathematical concepts;
- Training the students for easier adoption of the mathematical procedures;
- Training the students for identifying and resolving problem situations in teaching mathematics;

- Simultaneously is made an analysis and interpretation of the results obtained by monitoring the classes that used ICT educational programs in teaching mathematics from first to fifth grade during processing the content on the topics integers, geometry, problem solving and working with data and results obtained from the survey of teachers using ICT educational programs in mathematics from the first to the fifth grade processing content of the topics integers, geometry, problem solving and working with data.

#### Training the students for easier adoption of the mathematical concepts

The results from the survey of the teachers using ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on the topics integers, geometry, problem solving and working with data are presented in Table 1.

Table 1. Results from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for adoption of the mathematical concepts				
	1 no impact/ %	2 impact with low intensity/ %	3 impact with high intensity/ %	4 impact with strongest intensity/ %	$\bar{X}$
Integers	4 (2%)	29 (12%)	97 (40%)	112 (46%)	3,3
Geometry forms	2 (1%)	21 (9%)	108 (45%)	111 (46%)	3,4
Problems solving	2 (1%)	42 (17%)	96 (40%)	102 (42%)	3,2
Work with data	10 (4%)	31 (13%)	84 (35%)	117 (48%)	3,3

According to the opinions of the teachers:

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic natural numbers affected with strong intensity the training of the students for acquiring the math concepts.
- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic geometric shapes influenced with strong intensity the training of the students for acquiring the math concepts.
- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic solving problems affected the intensity of training of the students for acquiring the math concepts.
- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic work with data affected the intensity of the training of the students for acquiring the math concepts.

According to the results obtained from the monitoring performed in classes that use the ICT educational programs in teaching mathematics from the first to the fifth grade while processing content on the topics integers, geometry, problem solving and working with data, during all monitored classes was noted the existence of training of the students for acquiring math concepts, which means that by the use of the ICT educational programs in teaching mathematics from the first to the fifth grade the students are trained for acquiring the mathematical concepts.

The results from the survey of the teachers using different ICT educational programs in teaching mathematics from the first to the fifth grade are presented in Table 2.

Table 2. Results from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for adoption of the mathematical concepts				
	1 No impact/ %	2 Impact with low intensity/ %	3 Impact with high intensity/ %	4 Impact with strongest intensity/ %	$\bar{X}$
Prorams for review and assesment of the curricula	0 (0%)	51 (21%)	105 (43%)	86 (36%)	3
Programs for acquiring of the curricula	3 (1%)	44 (18%)	115 (48%)	80 (33%)	3,1
Programs for learning by discovering	2 (1%)	51 (21%)	106 (44%)	118 (49%)	3,1

According to the opinions of the teachers:

- the use of the educational programs for review and assesment of the curricula in teaching mathematics from the first to the fifth grade influences the intensity of the students' training for acquiring the math concepts.
- the use of the educational programs for acquiring of the curricula in teaching mathematics from the first to the fifth grade influences the intensity of the students training for acquiring the math concepts.
- the use of the educational programs for learning through discovery in teaching mathematics from the first to the fifth grade influences the intensity of the students' training for acquiring the math concepts.

According to these data we come to the realization that by using the ICT educational programs in teaching mathematics from the first to the fifth grade, while processing content on the topics of integers, geometry, problem solving and working with data, the students are trained for easier adoption of the mathematical concepts.

According to the results obtained from the observation of the classes and the teachers' survey, confirmed is the specific hypothesis which states: By using the ICT educational programs in teaching mathematics from the first to the fifth grade the students will be able to facilitate the adoption of mathematical concepts.

### Training the students for acquiring the mathematical procedures

The results from the survey of the teachers using the ICT educational programs in teaching mathematics from the first to the fifth grade in the processing of the content on the topics integers, geometry, problem solving and working with data are presented in Table 3.

Table 3. Results obtained from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for acquiring the mathematical procedures				
	1 No impact/ %	2 Impact with low intensity/ %	3 Impact with high intensity/ %	4 Impact with strongest intensity/ %	$\bar{X}$
Integers	6 (2%)	48 (20%)	109 (45%)	79 (33%)	3,1
Geometry forms	8 (3%)	31 (13%)	101 (42%)	102 (42%)	3,2
Problems solving	6 (2%)	56 (23%)	80 (33%)	100 (41%)	3,1
Work with data	6 (2%)	30 (12%)	105 (43%)	101 (42%)	3,2

According to the opinions of the teachers:

- the use of the ICT educational programs in teaching mathematics from first to fifth grade while processing the content on topic natural numbers is affected by high intensity the training of the students for acquiring the mathematical procedures.

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic geometric shapes influenced by high intensity on the training of the students for acquiring the mathematical procedures.

- the use of the ICT educational programs in teaching mathematics from first to fifth grade while processing the content on topic solving problems affected by high intensity on the training of the students for acquiring the mathematical procedures.

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the contents on the topic work with data influences the high intensity on the students training for acquiring the mathematical procedures.

According to the results obtained from the performed monitoring in the classes which use the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on the topics integers, geometry, problem solving and working with data, all monitored classes showed the existence of students' training for acquiring the math concepts.

The results from the survey of the teachers who use different ICT- educational programs in teaching mathematics from the first to the fifth grade are presented in Table 4.

Table 4. Results from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for acquiring the mathematical procedures				
	1 No impact/ %	2 Impact with low intensity/ %	3 Impact with high intensity/ %	4 Impact with strongest intensity/ %	$\bar{X}$
Prorams for reviw and assesment of the curricula	5 (2%)	54 (22%)	107 (44%)	76 (31%)	3,3
Programs for acquiring of the curricula	0 (0%)	44 (18%)	139 (57%)	59 (24%)	3,2
Programs for learning by discovering	10 (4%)	36 (15%)	114 (47%)	82 (34%)	3,3

According to the opinions of the teachers:

- the use of the educational programs for review and assessment of the curricula in teaching mathematics from the first to the fifth grade influences the high intensity on the students training for acquiring the mathematical procedures.

- the use of the educational programs for aquiring of the educational content in teaching mathematics from the first to the fifth grade influences the high intensity on the students training for acquiring the mathematical procedures.

- the use of the educational programs for learning through discovery in teaching mathematics from the first to the fifth grade influences the high intensity of the students' training for acquiring the mathematical procedures.

According to these data we come to the realization that the use of the ICT educational programs in teaching mathematics from the first to the fifth grade, while processing the content on the topics integers, geometry, problem solving and working with data, train the students for easier adoption of the mathematical concepts.

According to the results obtained from the observation of the classes and the teachers, the specific hypothesis is confirmed: By using the ICT educational programs in teaching mathematics from the first to the fifth grade the students will be able to facilitate the adoption of the mathematical procedures.

### Training the students for identifying and resolving problem situations

The results from the survey of the teachers using ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on the topics integers, geometry, problem solving and working with data are presented in Table 5.

Table 5. Results from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for perceiving and solving prolem situations				
	1 No impact/ %	2 Impact with low intensity/ %	3 Impact with high intensity/ %	4 Impact with strongest intensity/ %	$\bar{x}$
Integers	0 (0%)	24 (10%)	129 (53%)	89 (37%)	3,3
Geometry forms	3 (1%)	31 (13%)	126 (52%)	82 (34%)	3,2
Problems solving	3 (1%)	19 (8%)	115 (48%)	105 (43%)	3,3
Work with data	4 (2%)	19 (8%)	117 (48%)	102 (42%)	3,3

According to the opinions of the teachers

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic natural numbers affected by the strong intensity on the training of the students for identifying and resolving problem situations in teaching mathematics.

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic geometric shapes influenced by high intensity on the training of the students for identifying and resolving problem situations in teaching mathematics.

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic solving problems affected the high intensity on training students for identifying and resolving problem situations in teaching mathematics.

- the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on topic working with data affects the high intensity on the students training for identifying and resolving problem situations in teaching mathematics.

According to the results obtained from the monitoring performed in classes which use ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on the topics integers, geometry, problem solving and working with data, all monitored classes noted the existence of students training for acquiring the math concepts.

The results from the survey of the teachers using ICT educational programs in teaching mathematics from the first to the fifth grade while processing the content on the topics integers, geometry, problem solving and working with data are presented in Table 6.

Table 6. Results from the conducted survey

Survey	ICT-EDUCATIONAL PROGRAMS				
	Training the students for perceiving and solving prolem situations				
	1 No impact/ %	2 Impact with low intensity/ %	3 Impact with high intensity/ %	4 Impact with strongest intensity/ %	$\bar{x}$
Prorams for reviw and assesment of the curricula	4 (2%)	30 (12%)	107 (44%)	101 (42%)	3,3
Programs for acquiring of the curricula	0 (0%)	41 (17%)	112 (46%)	89 (37%)	3,2
Programs for learning by discovering	0 (0%)	25 (10%)	115 (48%)	102 (42%)	3,3

According to the opinions of the teachers

- the use of educational programs for adopting and assesment of the curricula in teaching mathematics from the first to the fifth grade influences the high intensity on the students training for identifying and resolving problem situations in teaching mathematics.

- the use of the educational programs for adopting the curricula in mathematics from the first to the fifth grade influences the high intensity on the students training for identifying and resolving problem situations in teaching mathematics.

- the use of the educational programs in teaching mathematics from the first to the fifth grade influences the intensity on training students for identifying and resolving problem situations in teaching mathematics.

According to these data we come to realization that using ICT educational programs in mathematics from I to V grade, while processing content of the topics integers, geometry, problem solving and working with data, enable students for easier adoption of mathematical concepts.

According to the results obtained from the observation of classes and teachers' survey, confirming the specific hypothesis which states: By applying ICT educational programs in teaching mathematics from the first to the fifth grade students will be able to easily identify and resolve problem situations in teaching mathematics.

By accepting the special hypothesis is also accepted the general hypothesis which states:

The application of the ICT educational programs in teaching mathematics from the first to the fifth grade affects the training of students for easier adoption of the mathematical concepts and procedures and easy identifying and resolving problem situations.

## 8. Conclusion

Starting from the results of the survey and according to the acceptance of the specific hypotheses, we accept the general hypothesis which states:

The application of the ICT educational programs in teaching mathematics from the first to the fifth grade affects the training of the students for easier adoption of the mathematical concepts and procedures and easily identifying and resolving problem situations.

In this study, it was found to be effective in education and educational practice and will serve as an incentive for frequent use of the ICT educational programs in teaching mathematics from the first to the fifth grade as a mean to improve the educational process.

According to the results obtained from the monitoring performed in classes which use ICT educational programs in teaching mathematics from the first to the fifth grade, when processing the content on the topics integers, geometry, problem solving and working with data the students are often trained for easier adoption of the mathematical concepts, to facilitate identifying and resolving problem situations in teaching mathematics. When processing content by topic integers, students are empowered for easier adoption of mathematical procedures, while processing content of the topics geometric shapes, problem solving and working with data often students are trained for easier adoption of the mathematical procedures.

According to the opinions of teachers, the use of the ICT educational programs in teaching mathematics from the first to the fifth grade while processing content on the topics integers, geometry, problem solving and working with data influences the high intensity on the students training for easier adoption of the mathematical procedures, easier identifying and resolving problem situations in teaching mathematics

When processing the content on the topics of natural numbers, geometric shapes and solving problems influences the high intensity on the students' training for easier adoption of mathematical procedures, while processing content on topic working with data affects the intensity on training students for easier adoption mathematical procedures.

According to opinions of the teachers, the application of the ICT educational programs for replication and determining of the curriculum, the use of ICT educational programs for adopting the curriculum, the use of ICT educational programs for learning through discovery in mathematics from the first to the fifth grade influences the high intensity on training students for easier adoption of mathematical

concepts and procedures and the training of students for easier identifying and resolving problem situations in teaching mathematics.

The analysis and interpretation of the results of this research come to a series of conclusions that will contribute to improving teaching mathematics from the first to the fifth grade. By applying ICT educational programs in teaching mathematics, while processing content on the topics integers, geometry, problem solving and working with data, enables students to facilitate the adoption of mathematical concepts and procedures and easily identifying and resolving problem situations in math.

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