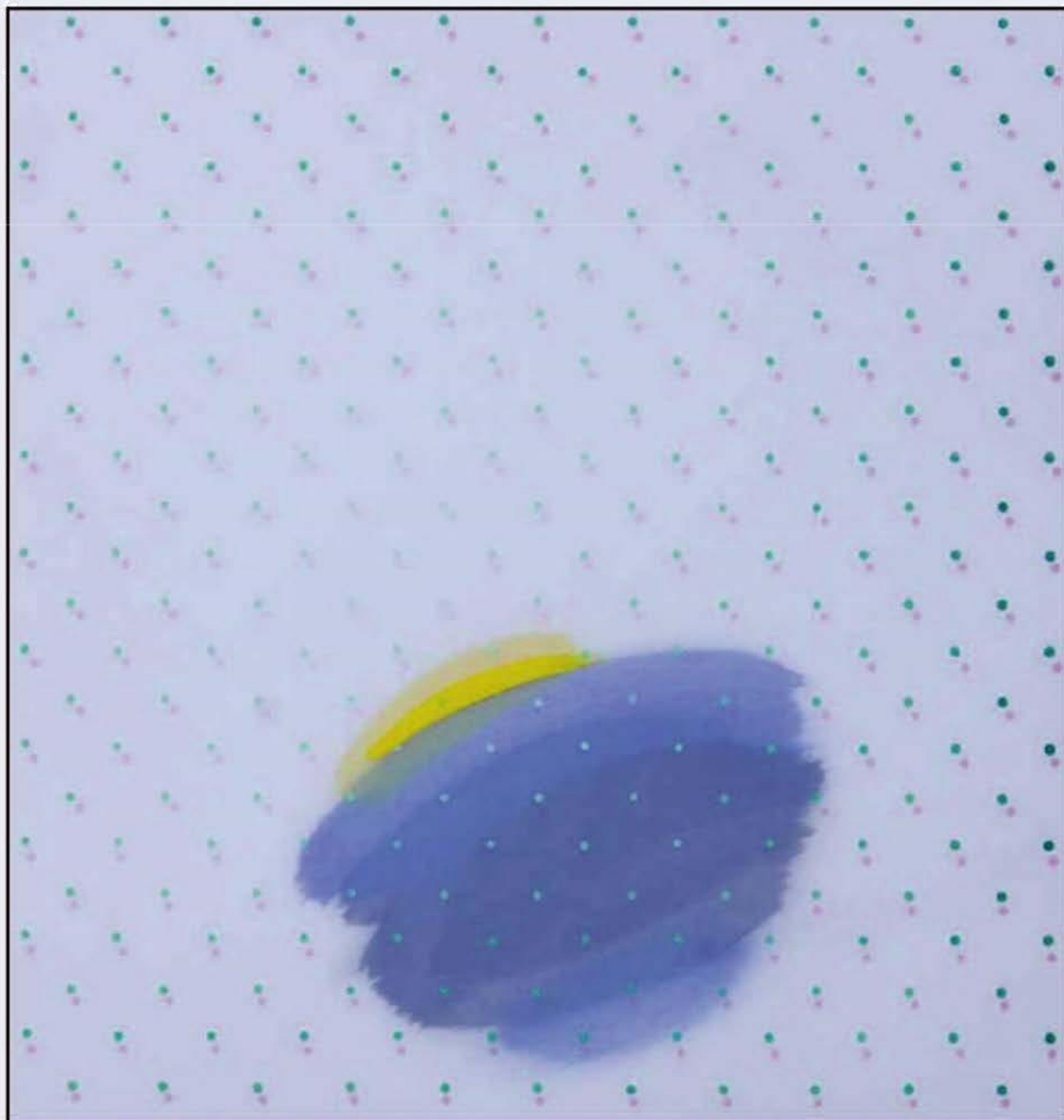


# SEEJSD

SOUTH EAST EUROPEAN JOURNAL OF SUSTAINABLE DEVELOPMENT

---

Vol. 6 (3/2022)



Skopje, North Macedonia



# SEEJSD

SOUTH EAST EUROPEAN JOURNAL OF SUSTAINABLE DEVELOPMENT

Vol.6 (1/2022)

**Editor in Chief:** Izet Zeqiri, PhD (Republic of North Macedonia)

## **Editors:**

Robert Pichler, PhD (Austria)  
Iraj Hashi, PhD (England)  
Ozcan Asilkan, PhD (Germany)  
Quirico Migheli, PhD (Italy)  
Iraj Hashi, PhD (England)  
Bujar Krasniqi, PhD (Republic of Kosovo)  
Fati Iseni, PhD (Republic of North Macedonia)  
Olga Popovska, PhD (Republic of North Macedonia)  
Bekim Fetaji, PhD (Republic of North Macedonia)

**Publisher: Mother Teresa University in Skopje, Republic of North Macedonia**

## **Editorial Board**

Alfonso Vargas Sanchez, PhD (Spain)    Nezir Kraki, PhD (France)  
M. M. Sulphrey, PhD (India)    Marc Hill, PhD (Austria)  
Andrea Maliqari, PhD (Albania)    Inge Hutter, PhD (Netherland)  
Gëzim Karapici, PhD (Albania)    Yavuz Emre Arslan, PhD (Turkey)  
Bujar Dugolli, PhD (Kosovo)    Ayhan Oral, PhD (Turkey)  
Sermin Senturan, PhD (Turkey)    Valentina Gogovska, PhD (North Macedonia)  
Mirko Perano, PhD (Italy)    Anton Stoilov, PhD (Bulgaria)  
Salvatore Rubino, PhD (Italy)    Qerim Lita, PhD (North Macedonia)  
Ruzhdi Sefa, PhD (Kosovo)    Mehmed Ganic, PhD (Bosnia and Hercegovina)  
Sani Demiri, PhD (North Macedonia)    Bashkim Ziberi, PhD (North Macedonia)  
Bujamin Bela, PhD (North Macedonia)    Mesut Idriz, PhD (Bosnia and Hercegovina)  
Kalman Mizsei, PhD (Hungary)    Zoran Trifunov, PhD (North Macedonia)  
Shaban Buza, PhD (Kosovo)    Aziz Pollozhani, PhD (North Macedonia)  
Fiona Todhri, PhD (Albania)

**South East European Journal of Sustainable Development**

**Managing Editors:**

Bekim Fetaji, PhD

Olga Popovska, PhD

ISSN (print) 2545-4463 **Technical Editing/Layout:** Korab Ballanca

ISSN (online) 2545-4471 **Editorial Office:** South East European

is published twice a year. Journal of Sustainable Development

**Account No.** 160016267778815

723019 - 45 **Mother Teresa University in Skopje,**

**Tax No.** 4080016561272 **Republic of North Macedonia**

Mirce Acev 4, VII floor, Skopje, North

**Bank:** Narodna Banka RM Macedonia

**Phone:** +389 2 3161 004

**E-mail:** seejsd@unt.edu.mk

**Web:** www.seejsd.unt.edu.mk

The publication of the Journal is supported by:



Ministry of Culture of Republic of North Macedonia

# The importance of IT technologies in education in pandemic time

Elena Karamazova Gelova

Faculty of Computer science, “Goce Delcev” University, Stip, R. N. Macedonia,  
elena.gelova@ugd.edu.mk

Mirjana Kocaleva

Faculty of Computer science, “Goce Delcev” University, Stip, R. N. Macedonia,  
mirjana.kocaleva@ugd.edu.mk

## ABSTRACT

The emergence of a pandemic is not something new in the world. There also have been pandemics in the past. The global covid 19 pandemics has been around for a long time. People all over the world are slowly adapting to the changes and lifestyles imposed by the Corona virus and after a year and a half of living with that virus they have accepted all the challenges and got used to the new way of life. In the paper we described the functioning of the educational process during the pandemic with Covid 19 virus, more precisely, an analysis of the way the classes we hold during the pandemic is given. Emphasis on the application of IT technologies for successful implementation of teaching and achieving excellent results from students is placed. Finally, a conclusion in which we want to emphasize the importance of the application of IT technologies in education during and after the end of the virus is given, in order to emphasize the advantages of their use. We achieve all this by comparing the educational process in a time of pandemic using IT tools and without IT technologies.

## CCS CONCEPTS

• Education • Mathematics • Teaching methodology

## KEYWORDS

education, learning, Covid 19, testing.

## 1 Introduction

The topic of pandemic became especially popular with the appearance of the Covid 19 virus in 2019, more precisely in 2020 in North Macedonia when a pandemic was officially declared worldwide. The high number of people infected and dying from this virus, so has made this pandemic one of the deadliest in world history. All of this has made the goal of much research in many areas, from 2020 to the present day, to be related to the virus Covid -19.

With the advent of the virus changes in life were inevitable. Changes have taken place in education, in the economy, in industry, in the social life of the people, in medicine and so on. People slowly accepted the new challenges and learned to live with them.

Education with the proclamation of the world pandemic had to undergo immediate changes. The changes that needed to be made were big. In higher education, both professors and students knew that they had to adapt to the newly created working conditions, to accept the reality and to think from the first day and find the best solution for a successful education.

A lot of research has been done and is still doing to see the advantages and disadvantages in the educational process during the Covid-19 pandemic. In University “Goce Delcev”– Stip according to Coronavirus disease (COVID-19) situation all the process of teaching and testing are performed online using Microsoft team’s platform. In [7] the authors statistically analyze the results of the first and second partial exam for the subject Mathematics for the students from different academic year: one from academic year when the exams was performed in a classroom, the second one from academic year when the e-testing using Moodle 2 platform

was introduced and the third one from academic year when the testing was online.

In order to determine whether online learning affects students' knowledge, in [1] are given statistically analyze for the results of the first and second partial exam for the subject Mathematics for the students from first academic year from Faculty of Natural and Technical science at University "Goce Delcev"– Stip, where: the first exam was taken when the exams were performed in a classroom and the second one when the testing was online (via Microsoft Teams). Mathematics as strict and rational science discipline plays an important role in the education process. Every interruption in the continuous process of teaching and learning could provoke many negative consequences for the students. In [10] authors are considering some possibilities for adapting in these new conditions when the students and teachers cannot be in the classrooms. The main aim of this paper is to analyze easy online ways and resources for teaching and learning mathematics. The importance of mathematics as a science is a guile. This is also seen in the fact that it has been the subject of research in many papers. In [8] there is an explanation for solving problems in the field of mathematics, solved in the Matlab programming language. The goal of that paper is to show that Matlab is a user-friendly programming language, so it is easy to use. Commands are invoked in a very simple way with a simple syntax, where in comparison with other programming languages; they require detailed knowledge of the language itself.

Attempts to introduce changes in traditional ways of learning existed even before the outbreak of the Covid - 19 pandemic. Videoconferencing uses audio and video telecommunications to bring people at different sites together when travel is not an option. Videoconferencing is used to bridge the distance gap between various sites, to stimulate collaboration, support and enhance student or staff communication and to enable flexible quality learning and accessibility with minimal costs. The aim of [6] is to evaluate the potentials of videoconferencing distance learning and to understand student perceptions and their satisfaction with this kind of education. Also, a comparison of students' attitude between videoconferencing distance learning and traditional classroom environment learning is made. The results showed that this form of distance education can be accepted equally good as traditional methods of teaching. Also, in the past decade a growing number of institutions started applying the e-learning concept through web-based learning systems to change the traditional learning environment and monitor the students' educational needs. The lack of electronic materials both hardware and software in Macedonia primary education force the teachers to actively engage in the process of creating and developing their own educational applications. [9] demonstrates a successful e-learning application developed with Adobe Captivate, which is a powerful tool for creating interactive applications. The e-learning application is based on SCORM, and it was evaluated by the students of VII grade primary school as well as with their teachers and parents. The evaluation showed that the e-learning application has accomplished its goal and it can be a foundation for developing similar application in all schools in the Republic of Macedonia even before the onset of the Covid - 19 pandemic. The more important is the acceptance of new technologies in education also in the past. So, authors in [5] use a modified Unified Theory of Acceptance and Use of Technology (UTAUT) as the research methodology. The purpose of [5] is understanding teaching staff acceptance and use e-Learning system (ELC) and investigating the influence of seven determinants (four UTAUT determinants, 2 additional determinants and one personal "self-confidence" determinant).

Paper that explores education during a pandemic is also [2]. The aim of [2] is to draw a conclusion which way of learning gives better results in student achievement.

In addition to IT technologies in times of pandemics, it is important to introduce different learning methods such as: visual learning, verbal, physical, logical, and so on are also important to apply when studying some mathematical topics. In [3] authors want to see how and how many of the learning methods as: visual learning, aural, verbal, physical, logical, social, and personal learning are used in the study of information subjects. All these methods are important because each one is good in its own way and has a big impact on the student, because it uses different parts of the brain. [4] examines the habits and competences of IT students in the use of information technology resources. The survey includes 650 students from seven different higher education institutions in various countries in the region. The paper investigates which information technology tools, online applications, and offline programs are being used. The paper also aims to highlight the amount of time that students spend online and how much they participate in communicating online. The goal of [4] is to assess what the opportunities provided by the Internet have been used for in terms of learning and

development.

## Research methodology

Successful education is the basis for the overall development of a country, i.e., for the normal and smooth functioning of the whole world. Therefore, after a week of declaring an epidemic, online teaching has already started in all Universities in North Macedonia. So, it was at the University Goce Delchev Stip. Quality education was the main goal of all employees at the University. The preparation, organization and learning of the novelties were major in that period. Therefore, during that period, numerous trainings were organized for the professors to use the Microsoft Teams platform, after it was accepted as a platform through which the educational process will take place. Then trainings for using the Moodle platform were organized, which were mainly focused on learning the possibilities for creating electronic tests on the Moodle and online conducting exams and colloquia.

Electronic boards were available at our university for successful realization of the teaching in the subjects in which it is needed. The software needed to teach some of the subjects was previously procured and now were available to professors.

There were also preparations for the students. Most of them had a computer and internet at home. Very few didn't have. But we as a university tried to provide them with what is most needed to attend online classes. We achieved this through cooperation between students and professors aimed at providing conditions for attending the classes for all students. Students at some of the university's faculties who had problems installing and using the Microsoft Teams IT tool also received help in the process of installing the platform and using it. The assistance consisted in organizing and maintaining trainings available to all interested students.

In the introductory classes, the professors emphasized the importance of this IT tool (Microsoft Teams) and tried to instill hope among students that quality education will not be lacking even now. They managed to show it with the first classes held online. This was confirmed by the students and their results in the subjects of the faculties where they study, because the results in the academic year in which the even semester was online were very similar to the results in the academic year 2019/2020 in which the odd semester was with physical presence.

## 2 Main results

In math teaching, in addition to the basic IT tools such as computer, Internet, Microsoft Teams, electronic board - wide screen design tablet, e-learning, electronic scripts and task collections - publications from our university, educational software mostly GeoGebra and other online materials available on the Internet related to the mathematical topics which being studied were used.

All these IT tools are equally important for the smooth functioning of the mathematics teaching process. Some of these tools were used before the pandemic of Covid 19, but the significance of their use before and during the pandemic is the aim of this research and will be outlined below.

Students from the technical faculties at the University Goce Delchev Shtip were included in our research. With this research we wanted to see the importance of IT tools in the educational process in mathematics subjects, then we wanted to see if it is enough to use only one or two IT tools in the educational process, and do we have more benefits from using more IT tools. As conclusion, in one semester that took place online we made some challenges for the students.

At first, we decided to suggest students to download the appropriate material from Moodle platform for the relevant e-learning courses, and one week to teach independently without holding a class through Microsoft Teams and without using of an electronic board, without using of educational software, without a recommendation for other literature.

Students agreed with our suggestion. Next week when the classes were online, at the very beginning there were immediate reactions from the students that the learning was difficult because they encountered many ambiguities in solving the tasks and encountered difficulties in requesting additional learning material.

To really make sure that students are telling the truth before the start of the new material presentation that

follows that week, we gave them a test with five tasks from the topic they were supposed to master the previous week. There were 24 students, but only one student solved all tasks correctly. The results are given in Table 1.

**Table 1 Results from test 1**

Variables	Number
<b>Group</b>	24
<b>Age</b>	
18-21	17
other	7
<b>Gender</b>	
F	8
M	16
<b>Tasks</b>	
first task correctly solved	18
second task correctly solved	6
third task correctly solved	5
fourth task correctly solved	6
fifth task correctly solved	10

From Table 1 we can see that only first task is solved correctly from more than half students (75%). Around 25% solved correctly the second, third and fourth task and  $\approx 42\%$  solved correctly the fifth task. The results are bad. 37.5% is the overall average of correctly solved tasks.

With an extra class we held the provided teaching material for that week. After two weeks, we gave the same students a new challenge. We held an online class through the Microsoft Times, without using the electronic board, just by reviewing previously typed tasks in word and a recommendation to use GeoGebra software as assistance in solving tasks.

Again, next week we conducted a test with five tasks from the topic that was taught the previous week and the results are presented in the following table (Table 2).

**Table 2 Results from test 2**

Variables	Number
<b>Group</b>	24
<b>Age</b>	
18-21	17
other	7



<b>Gender</b>	
F	8
M	16
<b>Tasks</b>	
first task correctly solved	24
second task correctly solved	15
third task correctly solved	12
fourth task correctly solved	6
fifth task correctly solved	11

From Table 2 we can see that the results are better than the previous test (test 1), but again they are not satisfactory. 56.67% is the overall average of correctly solved tasks. Here, we can see that the first task was correctly solved by all the students, fourth task was correctly solved by 25% and the others were correctly solved by around 52.8% of the students.

Therefore, at the end for the next learned topic according to the curriculum, we worked it out with an electronic board, with solving the tasks during the classes and with a recommendation for appropriate literature for the learning material. Third test was conducted, and the results obtained from this test are given in Table 3:

**Table 3 Results from test 3**

<b>Variables</b>	<b>Number</b>
<b>Group</b>	24
<b>Age</b>	
18-21	17
other	7
<b>Gender</b>	
F	8
M	16
<b>Tasks</b>	
first task correctly solved	20
second task correctly solved	19
third task correctly solved	17
fourth task correctly solved	13
fifth task correctly solved	21

From Table 3 we can conclude that all the tasks were correctly solved by more than half students and that the overall average of correctly solved tasks is 75%. So according to results presented in Table 3, we can conclude that with the use of more than two IT technologies results were brilliant and students and professors were

satisfied.

### 3 Conclusion

The conclusion is more than clear. The research gave us a clear picture of the importance of IT tools. But not only that, but also the importance of combining more IT tools during the teaching process and even suggesting their expansion and use after the learning process. This is especially important in conditions like now, pandemic conditions, when the classroom, chalk and blackboard are not allowed.

From the research we confirmed that the most important role in the teaching of mathematical subjects has the blackboard, even if it is electronic. But even that is not sufficient for the normal functioning of the educational process. Only with a board without Microsoft Teams students would do nothing. Only with blackboard and Microsoft Teams students would achieve some results, but with inclusion of educational software the result would be better.

So, education in a pandemic must be aided by IT tools. IT tools would be better to remain as an integral part of the educational process even after the pandemic is over. Only in this way students will get the necessary knowledge and will be ready for the further challenges that life brings to them.

### REFERENCES

- [1] Kocaleva Mirjana, Stojanova Aleksandra, Stojkovic Natasa, Koceva Lazarova Limonka, Zlatanovska Biljana (2021), Changes in the teaching and learning caused of the COVID-19 pandemic, South East European Journal of Sustainable Development, 5 (2). pp. 67-76. ISSN 2545-4471
- [2] Karamazova Elena, Kocaleva Mirjana, Kertakova Marija (2021), Statistical Analysis of Student Achievement Using Different Ways of Learning, South East European Journal of Sustainable Development, 5 (1). ISSN 2545-4471
- [3] Kocaleva Mirjana, Stojanova Aleksandra, Zlatanovska Biljana, Stojkovic Natasa (2021) Примена на различни методи на учење на информатичките предмети, ФИЛКО - Зборник на трудови од Петта меѓународна научна конференција за филологија, култура и образование. pp. 163-168. ISSN 978-608-244-308-9
- [4] Karuovic Dijana, Tasic Ivan, Vidacek Hains Violeta, Glusac, Dragana and Namestovski, Zolt and Szabo, Csaba and Kocaleva, Mirjana and Milanov, Dusanka (2020) Students' habits and competencies for creating virtual learning environments, Computer Applications in Engineering Education. pp. 1-19. ISSN 1099-0542
- [5] Kocaleva Mirjana, Stojanovic Igor, Zdravev Zoran (2015) Model of e-learning acceptance and use for teaching staff in Higher Education Institutions, International Journal of Modern Education and Computer Science (IJMECS), 7 (4). pp. 23-31. ISSN 2075-017X
- [6] Stojanova Aleksandra, Kocaleva Mirjana, Koceska Natasa, Koceski Saso (2019) Video-conferencing distance learning, In: 2-nd International Scientific Conference MILCON'19, 12 Nov 2019, Skopje, Macedonia.
- [7] Kocaleva Mirjana, Stojanova Aleksandra, Stojkovic Natasa, Koceva Lazarova Limonka, Zlatanovska Biljana (2021) COVID-19 model of learning – advantages and disadvantages. In: 4th TSD Conference, 18 Dec 2020, Skopje, Macedonia.
- [8] Stojanova, Aleksandra and Zlatanovska, Biljana and Kocaleva, Mirjana and Rendzova, Dobrila and Stojkovic, Natasa and Bikov, Dusan (2019) Using of MatLab in the Mathematical Education. In: ITRO 2019, June 27, 2019, Zrenjanin, Republic of Serbia.
- [9] Delipetrev, Blagoj and Pupinoska Gogova, Marija and Kocaleva, Mirjana and Stojanova, Aleksandra (2016) E-learning application for the primary school students. In: ITRO 2016, 10 June 2016, Zrenjanin, Serbia.
- [10] Koceva Lazarova Limonka, Miteva Marija, Zenku Teuta (2020) Teaching and Learning Mathematics during COVID period, In: XI International Conference of Information Technology and Development of Education ITRO 2020, 30 Oct 2020, Republic of Serbia.