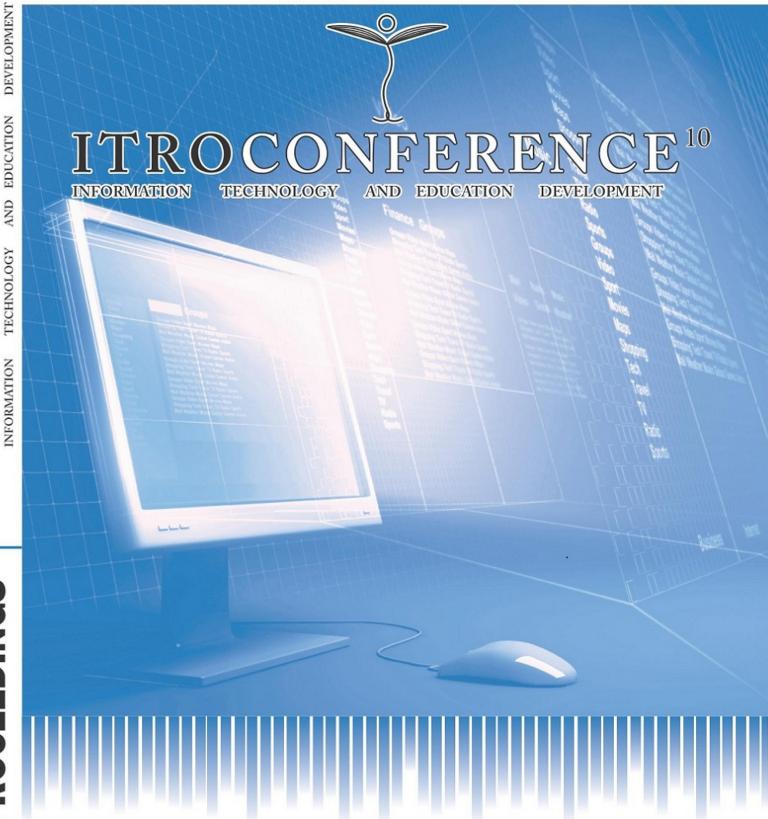


UNIVERSITY OF NOVI SAD TECHNICAL FACULTY "MIHAJLO PUPIN" ZRENJANIN





ZRENJANIN, June 2019



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With this publication, the CD with all papers from the International Conference on Information Technology and Development of Education, ITRO 2019 is also published.

INTRODUCTION

International Conference on Information Technology and Education Development (ITRO 2019), was held the jubilee tenth time. Since the very beginning, the conference has been connecting science, profession and experiences in education. Information technologies influence educational processes and student achievements. Contemporary topics relate to Interactive EBooks and electronic Teachers logbooks. Thematic fields of the conference are alined with general, but olso with national trends in education:

- Theoretic and methodology questions of contemporary pedagogy
- Digital didactics of media
- Modern communication in teaching
- Curriculum of contemporary teaching
- E-learning
- Education management
- Methodic questions of natural and technical sciences subject teaching
- Information and communication technologies
- Dual education.

The conference work was contributed by plenary lectures covering various aspects of ICT in education development:

- Digital transformation of educational system in Higher Education, Branko Perišić, Faculty of Technical Sciences, University of Novi Sad;
- Security issues of e-learning system, Igor Franc, E-security, Belgrade;
- From E to ES teacher logbooks, Žarko Mušicki, primary school "Žarko Zrenjanin", Novi Sad;
- Canvy, The Thrue Story of Mobile App, Marius Marcu, Politechnica University of Timisoara, Romania.

The Proceedings containes 59 articles based on research and scientific work in the field of information technologies in education.

The conference was financially supported by the Provincial Secretariat for Higher Education and Scientific Research, Novi Sad. The Technical Faculty "Mihajlo Pupin" has provided the necessary technical support.

The ITRO Organizing Committee would like to thank to the authors of articles, reviewers and participants in the Conference who have contributed to its tradition and successful realization.

Regards until the next ITRO Conference,

Chairman of the Organizing Committee

Jelena Stojanov

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SCIENTIFIC PAPERS

Modernization of Mathematics Education by Using Educational E-platforms

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Abstract - Mathematics is not popular subject among students because in the most of cases the teachers use traditional methods and complex approach in the presentation of the content. On the other side, we are living in digital era when the computers and smart phones are included in all spheres in the life. The challenge of the modern educational process is to include the multimedia and interactive materials. The educational e-platforms for studying mathematics are helping teachers and students at the same time. The teachers can analyze the students' success after every lesson and can adapt the materials for their needs, students can communicate with the other students and teacher. However, there is a lack of such materials especially in our and the neighbor countries. The main aim of this paper is to analyze the situation about such educational e-platforms for studying mathematics in Macedonia and neighbored region.

I. INTRODUCTION

Well-known fact is that mathematics is essential subject in the students' educational process, meaning that achieving math knowledge is crucial for correct and easy studying of the other subjects, and more of that, it is crucial for dealing with different everyday situations. However, also wellknown fact is that students usually do not find math easy for studying and understanding. The number of students that need help in achieving math knowledge and doing math tasks is significant bigger than the number of talented students and those who can do math without help. We believe that each math teacher makes efforts to introduce math material in a way convenient for the students' age and gives all to contribute in overcoming students' difficulties in the process of learning math. We can face-up with different new methods regarding math-teaching methodology developed in order to improve the above-mentioned situation with the students' attitude toward mathematics. Different papers for presentations and different ways and tools for visualization in the classroom used before the digital era are changing and nowadays we can see different e-technologies in the classrooms, in order students to understand math easily (for example, see [1]). However, the implementation of these e-tools in the process of school learning, in Macedonia and neighborhood is not going so fast.

The development of the technologies nowadays could change the habits of the students and the teachers in the schools. The digital era is emerging so the books and handbooks in the schools could be substitute with new modern materials in electronic form: videos, quizzes, tutorials, interactive tools etc. Can the learning platforms be a started point to do revolution in the education and learning process? Obviously, yes. The learning platforms can change the traditional meaning of the words "study" and "learning". Such e-learning platforms have more consequences that are positive [2]:

- Increased motivation because the elearning platforms offer more visible and dynamic contents;
- Socialization because the students communicate with other students by using the tools in the e-platform like forums, chats, virtual classrooms.
- Students develop more technological skills, which is essential in these days of digital era.
- Students learn how to manage all the information and time needed for some activities.
- Students learn how to be more responsible and how to estimate their own knowledge by using of the electronic test, quizzes, contextualized problems.

There are many examples of e-platforms for elearning mathematics in the USA and Europe, but most of them are not open sources. There are some mathematical platforms for e- learning of the specific contents especially in the higher education, [3]. In this paper is concluded that the e-platforms are making mathematical learning more interesting, meaningful and applicable to the learners beyond the classroom knowledge. Also, in [4] is consider the Genie 3 platform. After researching, the authors concluded that the use of such kind of platforms increased the students' engagement personalization, capturing students' fostering deep learning, and minimizing cognitive load, which leads to improved engagement, and ultimately better educational outcomes.

II. SITUATION IN MACEDONIA AND THE NEIGHBOUR COUNTRIES

Besides all these positive aspects for using of the electronic platforms for e-learning, the situation in Macedonia is not satisfactory. The conducted research in 2011, [5] and [6], shows that there are few e-platforms such [7] which offer e-learning of mathematics, but most of them are not active now. Other e-platforms active at the moment in Macedonia like [8], [9], [10] and [11] offer mathematical lessons in electronic version, tests and lesson plans for the teachers, but they don't offer videos, tutorials, interactive contents which will enable possibilities for communication, explanation and finding solutions of the problems through debates and forums. In [12] we can see only few videos (about 15 until now, available via the YouTube channel [13]), for certain math problems, with explanations, some of them for secondary school students and the other for university students. These videos cover very little percentage from the math material and problems that students are facing-up. Furthermore, there are no videos for students in primary school. On [14] we can see few video explanations for the problems regarding operations with numbers and power calculations, which is also very little percentage of the math material in primary school. In [15] is shown the impact of the video lectures in increasing the students' interest in the process of learning mathematics, but there are no available video lectures.

Moodle Platform is used by some universities in Macedonia, but this e-platform has not been made adaptive for primary or secondary schools in Macedonia. It is necessary to find and construct e-platform, which will be in some way substitution of the math teachers when the students are not at schools. This e-platform will enable students to do their homework and projects without asking help from their parents or taking tutoring.

In Serbia the situation about mathematical eplatforms is better than in Macedonia. In [16] it is shown that the level of available e-materials for mathematics education in Serbian language, designed by GeoGebra Centre Belgrade are different and it depends from the age of the students. In Serbia, the level of such materials for kindergartens is low, the materials for primary schools are at satisfying level, but materials for high school, undergraduate and applications of mathematics are large-scaled. The Moodle platform is used in Serbia also at higher levels of

the education. There is many e- platforms in Serbia, which are not free for using such [17], some of them offer private classes like [18] and [19]. The most of e-platforms contain only materials such lessons, tests and plans [20], but some of them have video tutorials [21], [22] and [23].

In Croatia, the situation related to the electronic educational platforms is similar as the situation in Serbia and much better than the situation in Macedonia. In the last few years in Croatia has started a project Skole 2.0 which was funded in high percent by the European Union. This project is implemented in collaboration with CARNet together with its partners Samsung, HP, Microsoft. The main goal of this project is to make the classroom in Croatian' schools as "future classrooms". That means that the students in a close future can go to the schools without heavy bags full of books and other printed materials. The tablet or computer will be enough to satisfy all their needs, because everything will be in electronic version. The project covers many school subjects, but the teachers have many remarks about not enough innovative approach for mathematical materials.

There are many e-platforms which offer mathematical materials in electronic form for the students in primary and secondary schools and the lesson plans for their teacher, but without videos, forums and quizzes. In [25] which is developed for Android, iOS and Windows and in [26], [27] are presented such kind of materials.

[28] is an educational e-platform for mathematics developed in Croatia in English language aimed to the students in primary schools. This e-platform offers videos and classification of the materials depending of the mathematical area (algebra, geometry) and the grade.

Also, there are many other applications developed in Croatia which are many popular among the students all over the world such as [29], which help the students to solve the mathematical problems when they must do their homework alone, without teacher's help. But this application is only solver of the mathematical problems. It does not contain more possibilities like the educational platforms. However, it can be concluded that the situation in Croatia is much better than in the other neighbor countries. They have much support of the EU in the part of education, especially for its modernization by including of computers and other digital technologies.

In Slovenia, also there are many educational mathematical platforms. Slovenia like EU member disposes with financial support for this kind of activities. [30], [31], [32], [33], [34] and many others offer videos, instructions, games and tests for students in primary and secondary schools. [35], [36] are only web sites for private lessons and instructions. [37] is Android application with video instructions and exercises in mathematics for young students in primary school. Slovenia disposes with plenty of this kind of educational mathematical platforms for students in primary and secondary schools, but not for the students at the faculty level.

III. MACEDONIAN STUDENTS' NEEDS AND OPINIONS ABOUT EDUCATIONAL PLATFORMS

In order to analyze the real situation in our country, we have proceeded a questionnaire for the students in our University who mathematics as a course at the faculty. The questionnaire consists of ten questions, which refer to the use of educational e-platforms in the process of teaching mathematics. 89 students from different faculties (58,4% from Faculty of computer sciences 28,5% from Faculty of technology and 13,1% from Faculty of Educational Sciences) at our University responded the questionnaire. The sample was chosen arbitrary but taking into account that the students at the Faculty of computer sciences studying the most mathematics in their studies, after that the students at the Faculty of technology who studying mathematics in only two subjects in the first year and the students of Faculty of educational sciences who studied mathematics least, only in one subject in the first year of the faculty.

At the first question: How often do you need additional help to explain specific mathematical concepts?, the most of the students 52% said that very often they need additional help for studying mathematics and only 13% said that rarely used additional help after the classes at faculty. That shows that the lectures and exercises at the faculty are not enough for most of the students. Therefore, they need additional tutoring or some other instructions in order to obtain the necessary knowledge to pass the exam and to apply in other sciences. Considering that nowadays we are living in digital era, we appoint the next question: Do you use computer technology for further explanation of mathematical concepts? On that question 40% responded that they use computer technology very often, 36% used it rarely. The next question in the questionnaire was: What do you usually use to get additional explanations for some mathematical concepts? The answers are given on the next pie graph and shows that most of the students do not use electronic platforms. They usually get to use Youtube tutorials where they are watching video instructions and classes and Mathematical forums where can communicate with other students and professors.

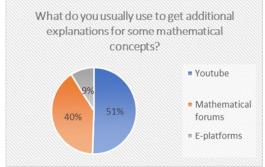


Figure 1. Pie of the answers

For the students, computer tools for geometrical drawings, constructions and graph plotting are unknown. Even 91% do not use the possibilities of these computer tools, which are very helpful during solving of the posted mathematical problems.

Also, they very rarely used online applications to check the acquired mathematical knowledge. Even 82% answered that rarely or never used online tests to assess their mathematical knowledge.

The last two questions in the questionnaire were:

- Do you think that in Macedonia there is a lack of material in Macedonian language in electronic form for studying mathematics?
- Do you think there is a need for creation of an electronic platform that will offer videos, images and texts for better explanation of the mathematical concepts?

The answers are given to the next two pies:

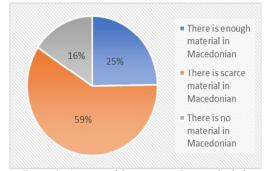


Figure 2: Answers of the question: Do you think that in Macedonia there is a lack of material in Macedonian language in electronic form for studying mathematics?

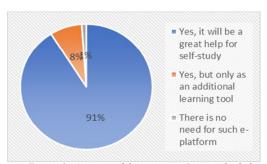


Figure 3: Answers of the question: Do you think there is a need for creation of an electronic platform that will offer videos, images and texts for better explanation of the mathematical concepts?

From graphical presentation in Figure 2 it can be seen that very high percent 75% of the students have answered that there is not enough material in Macedonian for studying mathematics, even 59% percent of them thought that the electronic mathematical material in Macedonian is poor. It is obvious that there is a need of development and preparation of mathematical material in electronic form in their native language. There is a great need to create an electronic platform. Although 91% of the students think that the existence of educational mathematical e-platform will be wonderful help for self-study. 8% said that it will be helpful as an additional tool.

Also, with ANOVA analysis (Table 1) we have concluded that the students' opinion about neediness of educational e-platform not depends of the faculty on which they study. Almost all of them would be grateful if they have possibility to study, discuss and communicate in such e-platform.

TABLE 1. ANOVA RESULTS

ANOVA						
Source of					P-	
Variation	SS	df	MS	F	value	F crit
Between						
Groups	0.047	2	0.023	0.572	0.566	3.107
Within						
Groups	3.352	83	0.040			
Total	3.3983	85				

That shows that development of the educational e-platforms, especially for mathematics is necessary for students' requirements independently of the type of their studies. The specific and complex nature of the mathematics as a science look for such helpful tool for the students, who use the computer and digital technology in their everyday lives. On this way they can study mathematics at their homes after the classes without taking tutoring. The educational e-

platforms will contain video tutorials for the students who miss class for some reason. It will contain forums for debates, discussions and finding help for some problems. The quizzes and test will be included for checking of their knowledge. Also, it can be included some tool for geometric illustrations and constructions. In one sentence, the e-platform will be the place where everything which is necessary for studying of some mathematical material will be accessible for every student.

IV. CONCLUSION

From the conducted analysis it can be concluded that the situation with existence of educational e-platforms at the Balkan, especially in Macedonia is not on high level. The countries which are part of EU have many opportunities for developing of such educational platforms and on that way, they can extend the barriers in the educational process. The worst is the situation in Macedonia. The students have demands for increasing of the computer and mobile use for educational goals. They need such educational eplatforms, not only for mathematics, but for the other subjects because in nowadays when everything is available on internet, the students can study alone, but only if the material is prepared in proper form. The students say they do not have enough material in electronic form and that the existence of an electronic platform for studying mathematics is needed. The possibilities of that kind of platform are huge. Everything that is needed is to include our students at the Faculty of computer science to use their knowledge and to develop such software solution for all students' good. The neighbor countries are excellent examples for that how the things should be appointed.

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