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With this publication, the CD with all papers from the International Conference on Information Technology and Development of Education, ITRO 2017 is also published.

INTRODUCTION

The Technical Faculty "Mihajlo Pupin", Zrenjanin, of the University of Novi Sad, the Republic of Serbia organizes VIIIth International Scientific Professional Conference "Information Technologies and Development of Education 2017" (ITRO 2017). The Conference will be held on 22nd June 2017 at the Technical Faculty "Mihajlo Pupin" in Zrenjanin, Serbia.

The Conference "Information Technologies and Development of Education 2017" (ITRO 2017) is organized due to the needs to connect science, profession and education through topics and content concept, first of all concerning the teaching process as base of information society. The tendencies of developed countries are in accordance with the efforts of UNESCO to improve this area related to the needs of life and work in the XXIst century. It is necessary to assess the state, detect the problems and perspectives of the development of education by competent professionals and teachers as well as the influence of the development of education on the development of the society as a whole.

The central topic of the meeting is the model of dual education as base for creating good base for the development of industry. Thus, our aim is to gather the representative entities who are able constructively contribute to establishing link between the educational system and industry as follows: Chamber of Commerce of Serbia – Centre for Dual Education, Ministry of Education, Science and Technological Development, Union of Employers of Serbia, ZREPOK – Business Organization of Zrenjanin and Companies that run their business in the region, directors of grammar schools and secondary vocational school, members of the academic communities and other participants who are interested in the topics.

The main topics of the scientific professional conference are:

- Model of dual education
- Teaching based on the concept of entrepreneurship

Other thematic areas of the Conference:

- Theoretical and methodological questions of contemporary Pedagogy
- Digital didactics media
- Contemporary communication in teaching
- Curriculum of contemporary teaching
- Developing teaching
- E-learning
- Management in Education
- Teaching methods of natural and technical subjects
- Information-communication technologies

The Chairman of the Organizing Committee of the ITRO 2017 Prof. Dragana Glušac opened the Conference. The participants were addressed by the vice dean of the Technical Faculty »Mihajlo Pupin«, Prof. Dijana Karuović; provincial secretary for science, higher education and scientific Research prof. Zoran Milošević, and the vice-major of Zrenjanin Mr. Dusko Radisic.

There were total of 143 authors that took part at the Conference from 12 countries, 2 continents: 82 from the Republic of Serbia and 61 from foreign countries such as: Macedonia, Bulgaria, Slovakia, Austria, Cyprus, Albania, Hungary, Spain, Bosnia and Herzegovina, USA, Portugal.

The Proceedings of papers contains 60 papers and it has been published in the English language.

President of the Organizing Committee
Prof. dr Dragana Glusac

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CONTENTS

Increasing Motivation for Learning Mathematics Through Debate

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Abstract -The students' attitudes towards mathematics are not on high level. Usually, the students do not like mathematics very much and mathematics is not on a list of favorite subjects in the schools. Because of that, we are working on Erasmus+ project whose main goal is to approach the students with the beauty of mathematics. In the project MATHDebate - the Voice of Students - Searching Excellence in Math Education through Increasing the Motivation for Learning (2016-2018), where by using debate on mathematics problems and ICT methodology for learning, the students' mathematical skills and their abilities to solve practical problems will be enlarged. A project of this kind is an excellent opportunity for making arguments between minds, criticizing different opinions on some topic, all of it with one goal: achieving very good students' skills in mathematics.

I. INTRODUCTION

In today complex society, learning and understanding mathematics and natural sciences has become necessary for full development of everyone. The mathematics is not popular subject between the students. Most students do not like math because they usually do not get the desired results. This usually lead to the anxiety and even phobia for the mathematics. Generally, they face up with conquering the basic mathematical concepts, but also, they could not use the mathematical knowledge in other sciences and in various practical situations. Although mathematics is so important and it is on a pedestal between the sciences, among pupils it is perceived as a difficult, abstract, boring and no practical subject, [1]. These students' attitudes towards mathematics are one of the reasons for low success of the students on all education levels. In many researches, [2], [3], [4], it is shown that the fear of mathematics is a factor for low success in mathematics. Generally, the students' attitudes towards mathematics and their success in mathematics are in positive correlation. A contribution in the study of attitudes toward mathematics was by Neale, who underlined that, "attitude plays a crucial role in learning mathematics and positive attitude toward mathematics is thought to play a key role in causing students to learn mathematics" [5]. Neale in [5] defined mathematical attitude as "a liking or disliking of mathematics, a tendency to engage in or avoid mathematical activity, a belief that one is good or bad at mathematics, and a belief that mathematics is useful or useless". In [9] it is observed that the concept of attitude includes at least three verbs: to think, to feel, and to behave. Thus, students' attitudes toward mathematics affect how well or how often they do it, and how much enjoyment they derive from it, [8]. All teachers, especially teachers of math, have struggled to create authentic student interest in the concepts learned in class. Students often go through the motions of the class period because they are required to do so without any genuine interest. This must be changed by considering adding any of these four suggestions into the classroom: taking problems from their real lives, using a creative approach, use pop culture, or by making math music videos. Awarding of the students' attitudes towards mathematics would be useful for the teachers.

At the beginning of each semester, attitude test could be applied to the students, so that teachers can identify the students who have negative attitude toward mathematics and can take required precautions. In order to make student active, to increase their motivation, and attitudes, mathematics should be associated with everyday life. Using concrete materials in learning

environments positively increases students' mathematics achievement and their attitudes towards mathematics. When students are satisfied with the activities in the learning environment, learning would be more permanent and meaningful. Therefore, this situation is important for students to have positive attitude. The improvement in attitudes is likely to be more significant when taking into consideration different environments, but the main contribution is determined in the class environment. Research on this topic has shown that teacher support regarding autonomy affected student motivation, among other aspects, [6, 7]. To overcome these phenomena, it is necessary, to develop new methods by the teachers, activities in which the students will be active in the realization of the teaching process. The classical approach in the teaching, creates a passive student, so the students must be encouraged to take a part in analysis of the mathematical curriculum. By the NCTM, "*Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*"

Students learn mathematics through the experiences that teachers provide.

- Teachers must know and understand deeply the mathematics they are teaching.
- There is no one "right way" to teach.
- Effective teaching requires deciding what aspects of a task to highlight, how to organize and orchestrate the work of students.
- Effective teaching requires continuing efforts to learn and improve. Teachers need to increase their knowledge about mathematics and pedagogy.

In the last period are realized many projects in which the main area of the research is the mathematical education. In that projects are elaborated many procedures for solving of some mathematical problems. There are many realized projects in order to increase the mathematical knowledge through solving math problems. But in none of the past projects there are not developed various methods of learning and teaching mathematics, and even more there is not developed an approach in which the student will actively participate in the teaching of mathematics in a way that alone will choose the method that would be delivered to the intended curriculum content.

II. MATHDEBATE - THE VOICE OF STUDENTS-SEARCHING EXCELLENCE IN MATH EDUCATION THROUGH INCREASING THE MOTIVATION FOR LEARNING

A. Description

Improving students' motivation to learn mathematics is crucial for many various reasons. At the EU level, the Education and Training 2020 strategy underlines the importance of providing efficient and equitable education of high quality in order to improve employability and allow Europe to retain a strong global position. To achieve this objective, continued attention must be paid to raising the level of basic skills such as literacy and numeracy (Council of the European Union, 2009).

In the last ten years all the schools in Macedonia and many other neighbor countries face with great difficulties to make students to like and learn Math. Although it is an essential subject for future career development of the students it is usually thought than Mathematics is very difficult, not interested and not connected with other subject area. The knowledge of the students is decreasing every year. This can be seen by PISA and TIMSS studies conducted in few schools in our country, and from low achievements on external examinations organized by State Examination center. When the students are in position to select their high school (after ninth grade), because of the fear of studying Mathematics they usually choose their vocation without any Mathematics in it, like low school, language schools, medical schools, arts, etc. The Technical and Science Universities are not popular and have lack of students. For example, there is none unemployed math teacher with very big percent of unemployment. The state Ministry of education made this question as a national priority and they made reforms to increase the level of Mathematics knowledge. Reducing the share of low-achieving students in mathematics is a priority in every European country, defined as one of the benchmarks for 2020. It also corresponds with one of the four strategic objectives for the European Council's framework: "Improving the quality and efficiency of education and training; acquiring key competences and making the level of education and training more attractive and efficient "(C119 of 28.5.2009). In efforts that the Ministry of education made to solve this problem, Mathematics was introduced as an obligatory subject for graduate students on the state graduate examinations. But this was not fulfilled because of strong negative debate by the students.

This motivated us to make project about new methodology and create innovative ways of

teaching and learning Mathematics using modern technologies, and this also satisfies the European priority to "support the professional development of teachers as mediators of creativity and innovation; promote the incorporation of creativity and innovation at all levels of education and training". We want the teachers together with the Universities professors and associations that work on these topics to share their experiences and thoughts and develop new methodology for learning math skills though democratic process of choosing teaching methodology. Using this method, they will learn more, they will be more motivated, they will use modern technologies to study, and big percent of the students will like to continue with their education in the field of science and technology area. The project is focused on student-centered and problem-based active learning, and fostering critical thinking skills. The target group will be the students aged 11-15, i.e. in the last three years of the elementary schools. We believe that the implementation of our project will increase the underachievement in the basic skills of math, science and literacy through this new effective and innovative teaching method and make excellence in mathematics education. The project will be able to make a comparison with the topics, matter, and types of problems that students in different countries have and share the experience and knowledge with Math teachers from the selected countries (Macedonia, Bulgaria, Romania, Cyprus).

B. The MATHDebate Method

The MATHDebate method we are going to introduce in the framework of this project is innovative in several ways:

- the method uses very attractive way of learning mathematics where the students choose by themselves methodology of adopting the knowledge;
- the method uses latest technologies very close related to the technologies students are familiar in their everyday life, and we mean on the application of e-learning platform and android platform. We are very aware that the e-learning platforms are becoming increasingly sophisticated and showing potential as an effective way of improving the learning process. All of this will be adjusted to the needs and abilities of the local schools which are partner organizations in the project.
- putting the students (and not teachers) in the center of the learning process is something that is not used in our country, and we believe that it will have positive consequences on student's interest on mathematics. That is why we have the target group 11-15 because we expect that in near future the students will start to choose mathematics or other related to be a major study field.

Since the Ministry of education of Macedonia noticed that mathematics is a weak link in the education system, there have been done efforts to change things and some projects are carry out in this direction. This carry out projects are focused on developing teachers' skills and abilities for effective teaching of the subject, and also include changes in the curricula. This project would be complementary with them in a direction of improving mathematics knowledge and skills of students, and focusing mostly at students and their way of understanding mathematics.

C. Results of the MATHDebate Project

The main expected result from this project after its completion is gaining students' positive attitude towards mathematics. The students should realize very early in their life that mathematics is important subject in their education. The motivation for learning mathematics is expected to be increased, and this will gain better achievements of the students not only in mathematics, but also in science and other areas.

We also expect gaining better competence of the teachers involved in this project, since they will look on the teaching process from the point view of the students and have better understanding for it. This is the way they are going to upgrade their teaching skills. Also, they will learn about latest trends of teaching used in the region and wider. The teachers will meet different educational system in different countries, they will be in position to compare them and as a result make the best possible approach for the students.

The e-platform as an outcome of this project is the most valuable. It will have no restriction for all the interested parties. After finishing the project, it can be used by students and teachers from other schools from Europe. This will be one of the European added value of this project.

At the end, we must mention that all the participants will gain better linguistic and communication skills. Throw the work on this project, meeting different people and collaborate with them, they will appreciate the differences and become more open and tolerant to the changes that should occur in the process of education.

III. OUTCOMES IN THE MATHDEBATE

A. Analysis of teaching methodology

The main goal of this output is to gather good practices of various teaching methods and their implementation in the schools that participate in the project:

- to make a survey of math teaching methodology and other activities involving math
- to specify the new technologies and the methodologies in use
- to collect the best practices in each school participant in the project.

Based on the received information and experiences a list of good practices will be provided. This list will be uploaded on the e-platform and it will be visible for all interested parties.

B. Developing of MATHDebate method and e-platform

This output will be an interactive e-platform as methodology for teaching mathematics for students between age 11-15.

Students will have opportunity to suggest new teaching methodology, based on their experience. This will be a unique chance for them to be a part of the process of learning math as a teacher. It will help them to have positive attitude towards Mathematics. There will be debates in real time between the pupils in each of partner schools, and between the pupils of the partner schools involved in this project.

Communication on the e-platform between the students besides math skills will also develop their literacy skills, ICT skills, critical thinking skills, cultural skills.

C. Guidelines and Guidebook of MATHDebate method

The guidelines and guidebook will include ideas for new teaching methodologies proposed by students. It will also help them to develop their competences for using ICT tools in a new and innovative manner.

As objectives of the Guidelines for students and teachers we expect that students would meet some goals like:

- mathematics becoming an interesting subject;
- discussions on mathematics as everyday routine;
- having greater curiosity and motive to learn mathematics;
- promoting journalistic articles on mathematics written by students;
- Development of training courses for teachers for using the MATHDebate method, as a new method for increasing the motivation for learning Mathematics;

Teachers are important part of this project. They should adopt their teaching to the new demands of everyday life, and to the demands of the students. Their key role is to help students to increase their level of knowledge in an interesting way. To achieve this goal, they should collaborate with the students on every possible level. Mathematics should be presented in modern way, with a connection to the real-life problems.

The benefit from this project should be wide, and not only for the teachers and schools of the involved partners. As the students starts to like Mathematics since they chose the methodology of teaching Mathematics will be part of their future life and career development.

IV. THE EXPECTED IMPACT OF THE PROJECT

The expected impact includes following aspects:

Impact on the participants:

- listening directly students' voices teachers will easily recognize which is the appropriate method for leading the lesson;
- promoting problem-based math learning;
- increasing usage of Communication and Technology - based methodologies for learning math and providing more attractive way for math education and for holding-up students' attention;
- Strengthening professional profiles of math teachers through improving competences in an innovative approach for teaching math with more effective teaching methods;
- increasing opportunities for professional development of math teachers;
- increasing level of promoting access to and learning through Open Educational Resources (OER);
- increasing motivation and satisfaction in teachers every day work;
- increasing capacity and professionalism to work at EU/international level, in international projects, etc.

- Impact on the participating organizations
- Participating organizations will be enabled to create and develop innovative approaches to addressing their target groups, by providing innovative approach to teaching math according to students' individual needs and expectations; use of ICT-based methodologies; increased access to and learning through Open Educational Resources; new and improved practices to look after the needs of disadvantaged group of students, especially those who have problems in acquiring the matter in Mathematics and need more than just classical lecture of math;
- By implementing the new skills and methodologies, participating schools directly change and modernize the teaching process. Being a part of large teams they will share their latest learned experiences and best practices with their colleagues and will help them to improve their own teaching methodology. The Universities will be preparing the future math teachers to be able to use modern approaches (skills and Math Debate methodology) in the future teaching process, which is very important for sustainability of the MATHDebate method.

The project has many impacts to target groups. Students as a main target group will achieve:

- increased knowledge of mathematics with teaching and learning through the innovative approach;
- opportunity to learn math in an interactive manner with effective methods and techniques of work;
- students will choose themselves the way in which the teaching process will be realized;
- students will be responsible for their own achievements;
- the level of motivation for learning math will be increased which will contribute in increasing students' knowledge;
- increased access to ICT, free software and open educational resources;
- increased access to the online platform with mathematical tasks, method which will facilitate the learning process;
- increased possibilities to communicate with other students from different countries or other participating country through the online platform or Online classes to get additional information and custom programs, tools etc.
- increased level of digital competence, especially regarding OER and online platform;
- more positive attitude about school education and the role of education in the future career;

Also, the other persons involved in educational process (parents, relatives) will:

- encouraging their children to use interactive methods for learning math, also including OER and online platforms;
- increased interest in career counseling at scientific European standards;
- increased access to information and tools to help them to assist the children to make adequate career decisions and career plans;

The school managers and decision makers will have:

- higher achievement in education;
- higher reputation.

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