Report

on the TeComp project training in using modern technologies

University of Novi Sad, March 20 – 23, 2022

In the period from March 20 to 22, 2022, the training given by the professors from Matej Bel University from Banska Bistrica, Slovakia. The training was implemented as part of the planned project activities of the Erasmus+ CBHE project "Strengthening Teaching Competences in Higher Education in Natural and Mathematical Sciences - TeComp" (598434-EPP-1-2018-1-RS-EPPKA2-CBHE-JP).

The contents of the workshop was provided by staff members of Matej Bel University in Banska Bystrica, Slovak Republic. With respect to the expertise of the providing institution the program was divided into instructions and practical guidance in mathematics, physics, computer science, biology and environmental science. The team of instructors consisted of 3 females (Dr. Trnkova, Dr. Turisova, Dr. Michalikova) and 3 males (Dr. Tomasik, Dr. Peregrym, Dr. Janis). The program took place partly in the lecture hall of University of Novi Sad, partly in natural areas of the university campus. As integral parts of the workshop round tables on the methodology of teaching STEM disciplines have been organized.

The presentations at the trainings took place according to the agenda given in the appendix of the report, in the premises of the Rectorate building in Novi Sad.

During the first day, after a welcome speech by vice-rector Đorđe Herceg, professors from Slovakia presented their university, its structure, the work of the Faculty of Natural Sciences, Matej Bel University in Banska Bistrica, gave an overview of the projects in which they participated and are participating, as well as an overview of their technical and human resources. At the end, a round table was held at which an overview of the achieved goals of the TeComp project and expectations for future work was made, as well as a discussion among partners on solving the shortcomings of the submitted financial documentation.

On the second day, lectures were held on improving the quality of teaching and encouraging the active participation of students in the teaching and learning process. The basic problems due to which students are not interested in teaching mathematics are highlighted, and suggestions are given for the application of modern methodological principles in the teaching of mathematics and computer science. After a

round table and discussions on the upcoming steps in improving the quality of teaching, a final agreement was reached on the additions to the financial documentation.

On the third day, the lectures were oriented to higher education teaching in the field of biology, numerous tools and applications were presented and presented for more successful mastering of materials from botany and zoology, and all trainees were trained to use the platform, which is a new tool for distance learning of botany and zoology.

Next day, biological subjects were introduced, which are taught within accredited study programs at the Faculty of Natural Sciences with an emphasis on botanical disciplines. Teachers provided their experience about the teaching methods, how students are motivated (field exercises, domestic and foreign excursions, work with live handicapped animals, etc.), how they are connected during their studies with the research grants or practical tasks arising from social needs.
Next talk was on Citizen science tools for distance learning of botanical cycle disciplines in the pandemic time and beyond. The experience was generalized, through developed protocol on example iNaturalist platform (https://www.inaturalist.org/) for effective using of citizen science tools not just for distance learning of botanical o zoological cycle disciplines in the pandemic time and beyond, but also for collecting of valuable data about plant distribution during this process.
The training topic was infinitesimal calculus belongs to the principal parts of the mathematical education at a university, too. The notion of a limit is mentioned to be crucial in most of the following areas, mainly mathematical analysis, but also probability and statistics. Any misunderstanding in these phases prevents further understanding, leads to formal education and failures. A way how the understanding of the limit notion can be made more accessible to high school graduates was presented.

Last day of the training is used for exchanging experience between teachers form Novi Sad and Gjirokaster. Presentation of the newly established Centre for the methodology of teaching mathematics, informatics, and natural sciences at Faculty of Sciences, University of Novi Sad (dr Zorana Lužanin) were implemented, while prof. Andreja Tepavčević sharied their experiences of organization of courses for young teaching staff at Department of Mathematics and Informatics, University of Novi Sad. They made an overview of their evaluations and experiences in online teaching and online student knowledge verification, forced by the pandemic out-brake.

The last activity was discussion of the plan of further cooperation and collaboration between the University of Novi Sad and University of Gjirokaster.

The attendance in particular days is provided in the following table.

Day	Serbia	Albania	Males	Females
20.3.	16	9	7	18
21.3.	17	9	8	18

22.3.	19	9	9	19
23.3.	6	9	6	9

Schedule of the Novi Sad workshop

Place: Amphiteatre in Rectorate Building University of Novi Sad, Dr Zorana Đinđića 1

March 20, 2022

13:00-14:45 **History and structure of the Matej Bel University in Banska Bystrica, educational methods, communication with and among staff members and students**

15:00-16:45 **Education of science subjects at the Faculty of Natural Sciences, review of the past national and international projects, technical and human resources in education, use of advanced technologies**

17:00-18:45 **Review of the achieved goals in TeComp project, expectations for the future**

18:45-19:30 **Reviewing of financial documentation – UNS and UNIKG**

March 21, 2022

9:00-10:45 Some good practices for students instruction (Dr. Boris Tomášik)
Abstract: *Lectures are arguably among the least effective means of teaching, as students stay rather passive. I will review some techniques and approaches, established in the literature, which lead to student activity and thus potentially increase the efficiency of instruction. Among examples, used in our case in physics teaching are: flipped classroom, peer instruction, just-in-time teaching. I will also comment on their applicability for online teaching in case of suspension of the in-person classes. Finally, outreach activities on particle physics will be described, both in in-person and online editions.*

11:00-12:45 Problems in mathematics university teaching (Dr. Vladimír Janiš)
Abstract: ***A lot of university students fail in their first year at the examination on different mathematical subjects. In some years, the percentage of failures approaches or even exceeds one half of the student population. We try to address the reasons of***

this state and suggest ways how to make the transition from the high school system to the university system more fluent for the students.

12:45-14:00 Lunch break

14:00-15:45 Strengthening of the competencies of students at the department of computer science (Dr. Alžbeta Michalíková)
Abstract: *Computer science belongs to the subjects with the most active research. In the first part of the lecture, we will present the students' possibilities to study at the department of computer sciences. We will mention special laboratories and seminars which could students attend at this department. Then, as an example, we will look at the way how is teaching the subject – Fuzzy Sets. Fuzzy Sets are special structures that work with vague terms of ordinary speech. Together with Neural Networks and Evolutionary Algorithms, they belong to Soft Computing methods, which represent different ways how to model and solve the problems of current world.*

16:00-17:30 **Reviewing of financial documentation – UB, UGJ and UNIKO**

19:00- Dinner at the restaurant Macchiato Kuca, Željeznička 10

March 22, 2022

9:00-10:45 Round table: Problems in university education of mathematics, physics and computer science

11:00-12:45 **Teaching of the biological subjects, their connection to research and practice (Dr. Ingrid Turisová)**
Abstract: *During the lecture, biological subjects will be introduced, which are taught within accredited study programs at the Faculty of Natural Sciences with an emphasis on botanical disciplines. We will talk about how the teaching takes place, how students are motivated (field exercises, domestic and foreign excursions, work with live handicapped animals, etc.), how they are connected during their studies with our research grants or practical tasks arising from social needs.*

12:45-14:00 Lunch break

14:00-15:45 Citizen science tools for distance learning of botanical cycle disciplines in the pandemic time and beyond (Dr. Mykyta Peregrym)
Abstract: *Every country and even every university have been looking for optimal ways for their epidemic situation according to country restriction rules. We have generalized this experience, as well as it has been developed a protocol on example iNaturalist platform (https://www.inaturalist.org/) for effective using of citizen science tools not just for distance learning of botanical o zoological cycle disciplines in the pandemic time and beyond, but also for collecting of valuable data about plant distribution during this process.*

16:00-18:30 Excursion to the Petrovaradin Fortress

March 23, 2022

9:00-9:45 Palynology – Use today to know the past (Dr. Katarína Trnková)
Abstract: *Palynology and its use in the reconstruction of environmental conditions in the past, paleolimnological research focused to climatic evolution of the Central Europe in post glacial period.*

10:00-10:45 Microbial Ecology of Water and Soil (Dr. Katarína Trnková)
Abstract: *Ecology and taxonomy of free living amoebae, new emerging pathogens, the study of the macro ecological patterns of host and parasite biodiversity, relationships among parasites, hosts and their environments by the modern molecular methods, the detection of microbial biofilms in man-made water environments.*

11:00-12:45 Round table: Problems in university education of biology, nature conservation and environmental sciences

12:45-14:00 Lunch break

14:00-15:00 Soft introduction to infinitesimal calculus (Dr. Vladimír Janiš)
Abstract: ***Infinitesimal calculus belongs to the principal parts of the mathematical education at a university. The notion of a limit is crucial in most following areas, mainly mathematical analysis, but also probability and statistics. Any***

misunderstanding in these phases prevents further understanding, leads to formal education and failures. We present a way how the understanding of the limit notion can be made more accessible to high school graduates.

15:00-19:00 Visit to Fruska gora monasteries (Jazak and Vrdnik

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March 24, 2022

9:00-10:00 Presentation of the newly established Centre for the methodology of teaching mathematics, informatics, and natural sciences at Faculty of Sciences, University of Novi Sad (dr Zorana Lužanin)

10:00-11:00 Sharing of experiences of organization of courses for young teaching staff at Department of Mathematics and Informatics, University of Novi Sad (dr Andreja Tepavčević)

11:00-12:00 Sharing experiences about online teaching and online student knowledge verification

12:00-13:00 Lunch break

13:00-14:15 Discussion of the plan of further cooperation of the University of Novi Sad and University of Gjirokastra