



PROJECT TITLE:	Mathematics of the Future: Understanding and							
	Application of Mathematics with the help of Technology, FutureMath							
Programme:	Erasmus+							
Key Action:	Cooperation for innovation and the exchange of good practices							
Action Type:	Strategic Partnerships for higher education							
Ref. No.:	2020-1-RS01-KA203-065388							

Report on LTT

Prepared by UNS





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Co-funded by the Erasmus+ Programme of the European Union



Introduction

Training took place at Belgrade Metropolitan University, in Belgrade from March 17-20, 2022. There were 33 participants, face to face and on line. The participants were chosen according the application forms they needed to fulfill.

The participants were trained in STEAM methodology and technology, necessary for the implementation of pilot Calculus courses, in accordance to Agenda given in Appendix. They were introduced with already achieved project result of IO1, IO2 and IO3.

The participants were trained how to apply STEAM methodology and technology for distance and face to face learning.

During the training (at the beginning) Steering board meeting (UNS facilitating) took place. At the end future planning of work of IO4 were discussed and the selected lecture for piloting were determined.

Link for online participants https://us06web.zoom.us/i/82406951300?pwd=dmxIUVFIMDOyY2RmTHpCbERpeDYzdz09

The participants on the Training

BMU: Dragan Domazet, Rale Nikolić, Miroslava Raspopović, Aleksandra Stevanović, Emilija Kisić, MIlena Bogdanović, Milan Miloševic, Nemanja Zdravković, Vladimir Milićević UNS: Aleksandar Takači, Đurđica Takači, Dragan Mašulović, Mirjana Mikalački, Mirjana Brdar, Tatjana Došenović, Goran Radojev, Dušan Rakić, Ivana Stajner Papuga UPT: Bogdan Caruntu, Adina Juratoni

SIM: Biljana Jolevska Tuneska, Nikola Tuneski, Filip Nikolovski

GDU: Limonka Koceva Lazarova, Biljana Zlatanovska, Mileva Aleksandra, Mirjana Kocaleva, Martin Lukarevski, Vasko Kokalanov, Nataša Stojkovik, Marija Miteva, Marija Ljubenoska STEAM Teacher, future teachers: Valentina Kostić, Tanja Sekulić, Marina Jokić.

The presentations of the training

Introduction to STEAM methodology (SIM: Biljana Jolevska Tuneska) Interactive teaching materials (BMU: Miroslava Raspopović Milić) Knowledge assessment in STEAM context (UNS: Goran Radojev) FUTUREMATH Project results IO1, IO2 (UNS: Djurdjica Takači, Mirjana Mikalački)





Opportunities and challenges in introducing STEAM methods in university mathematics courses (UNS: Djurdjica Takači) Interactive teaching materials - Wolfram Mathematica Demonstrations (UPT: Bogdan Căruntu) How to design a STEAM lesson plan - Part 1 (GDU: Marija Miteva, Limonka Koceva Lazarova) Complex Number in STEAM context (UNS, Dragan Mašulović Derivative of 2 variable functions in STEAM context (UNS MIrjana Brdar) Directional derivatives (UNS Aleksanar Takači) Big O Notation (BMU Rale Nikolić) Indefinite integrals (UPT, Adina Juratoni) Exemplary lesson (GDU Marija Miteva) Differential Equations (GDU Biljana Zlatanovska) Application of Derivatives (GDU Natasa Stojkovik)

Collaborative group work

During the training the the participants worked in collaborative groups, analyzing lessons plans, brainstorming ideas for STEAM lesson plan design for IO4, discussions about future work on project results as well as the had used Studio time, at Metropolitan university for lesson video recording during LTT.

Future planning of work of IO4

At almost end of LTT the participants expressed their opinions that the presented results represent STEAM intervention for Calculus courses and that piloting lectures and testing will be organized in STEAM context. Some of the lecture will be face to face and some of them will be on line, depending on Covid19 situations at partners' institutions.

The teaching material prepared in the form of topics lectures' plan, or lectures, or films enriched with STEAM methodology adapted for new technology, with corresponding ways of checking knowledge represent the based for STEAM lectures.

The following lectures will be held:

- UNS: Directional derivatives, Gradient vector and applications of directional derivatives, Complex Functions and SageMath, Solving equations in SageMath, Combinatorics: Splitting the numbers into sum, variations with repetitions, permutations, Combinatorics: Variations without repetitions, combinations with and without repetitions, Partial derivatives, Applications of the derivatives, Max-min problems.
- **BMU:** Big O Notation, Classification in machine learning, Definite integrals solving in Java, Elliptic curve cryptography, Recurrence relations.
- **UPT:** Integrale improprii (Improper integral), Integrale duble (Double Integral), Integrale curbilinii (Line Integral), Numerical Solutions for Differential Equations Solutii numerice pentru ecuatii diferentiale.





• **GDU:** Mean value theorem, Optimization problems, Application in Business, Derivatives-Apple trees, Minimal distance, Minimazing material.

Results of LTT Evaluation



Years of work experience





"The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."





Please enter your degree of agreement with the above statement by entering an X in the blank field

		I agree Mostly	I agree in part	I do not agree
1.	Defined training goals have			
	been achieved	24	9	0
2.	The topics / contents provided			
	by the training have been			
	realized	32	1	0
3.	The training was held			
	according to the scheduled			
	agenda	25	8	0
4.	STEAM methodology is well			
	explained	25	8	0
5.	STEAM methodology is well			
	implemented in math contents	24	9	0

		I agree Mostly	I agree in part	I do not agree
6.	STEAM technology is well			
	explained	26	7	0
7.	STEAM technology is well			
	implemented in math contents	32	1	0
8.	Attending this training will			
	help me improve my own work	26	7	0
9.	The mode of presentation of			
	the facilitator is clear and			
	understandable	33	0	0
10.	Working conditions (space,			
	technical support) enabled the			
	successful implementation of			
	the training	25	8	0
11.	Trainers provide feedback on			
	participants' questions	25	8	0







12.	The entire organization			
	contributed to the successful			
	implementation of the training	26	7	0

Graph of all the answers



Appendix

1. Agenda of LTT

	Thursday, March 17, 2022
	10:30-11:00
10:30	Arrival of participants, Welcome from host
11:00	11:00-12:00
	Introduction to STEAM methodology
11:30	(SIM: Biljana Jolevska Tuneska)
12:00	12:00-13:00





	Interactive teaching materials
12:30	(BMU: Miroslava Raspopović Milić)
13.00	13:00-14:00
15.00	Knowledge assessment in STEAM context
13:30	(UNS: Goran Radojev)
14:00	14:00-15:00
1	Steering board meeting
14:30	(UNS facilitating)
	15:00-17:00
15:00 - 17:00	Studio time for lesson video recording
Link for online	https://us06web.zoom.us/j/82406951300?pwd=
participants	dmxIUVFIMDQyY2RmTHpCbERpeDYzdz09

	Friday, March 18, 2022
	9:45-10:00
	Arrival of participants
10:00	10:00-11:00
	FUTUREMATH Project results IO1, IO2
10:30	(UNS: Djurdjica Takači, Mirjana Mikalački)
	11:00-11:30
	Opportunities and challenges in introducing STEAM
	methods in university mathematics courses
11:00	(UNS: Djurdjica Takači)
	11:30-12:00
11:30	Coffee break
12:00	12:00-13:00
	Interactive teaching materials - Wolfram Mathematica
	Demonstrations
12:30	(UPT: Bogdan Căruntu)
13:00	13:00-14:00
	How to design a STEAM lesson plan - Part 1
	(GDU: Marija Miteva)
13:30	(GDU: Limonka Koceva Lazarova)
14:00	14:00-15:00
	Brainstorming ideas for STEAM lesson plan design for IO4
	- Part 2 (work in teams)
14:30	(Attendees GROUP WORK)
15:00 -	15:00-17:00
17:00	Studio time for lesson video recording
Link for	
online	https://us06web.zoom.us/j/82406951300?pwd=dmxIUVFI
participants	MDQyY2RmTHpCbERpeDYzdz09





	Saturday, March 19, 2022
	9:45-10:00
	Arrival of participants
10:00	10:00-12:00
10.00	Presentation of exemplary lessons from IO3 (lesson design, lesson
10:30	content, lesson activities, lesson assessment, lesson videos)
	Dragan Mašulović - Comlex Number in STEAM context
11:00	Aleksanar Takači-Mirjana Brdar - Derivative of 2 variable functions
	in STEAM context
	Rale Nikolić - Big O Notation
	Adina Juratoni: Indefinite integrals
	GDU: Exemplary lesson
	GDU Biljana Zlatanovska - Differential Equations
11:30	GDU Natasa Stojkovik - Application of Derivatives
	12:00-12:30
12:00	Coffee break
	12:30-15:00
	First session of developing STEAM lesson plan design in teams
12:30-15:00	*each team presents their lesson plans, (Attendees GROUP WORK)
	15:00-17:00
15:00 - 17:00	Studio time for lesson video recording
Link for online	
participants	Will be announced

	Sunday, March 20, 2022
	9:45-10:00
	Arrival of participants
10:00	10:00-11:00
	Brainstorming ideas for assessment and activities for developed lessons
	plans from previous day
10:30	(Attendees GROUP WORK)
	11:00-11:30
11:00	Coffee break
11:30	11:30-13:30
12:00	Second session of developing lesson activities and assessments in teams
12:30	*each team presents their activities and assessments
13:00	(Attendees GROUP WORK)
13:30	13:30-15:00
14:00	Future planning of work of IO4
14:30	(UNS facilitating)







	15:00-17:00
15:00 - 17:00	Studio time for lesson video recording
Link for online	
participants	Will be announced

2. Evaluation

5	Trainir	ng evalua	tion												
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		YearExp		-			•			Ĩ.					
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22	f	2	MA	M	M	M	M	M	M	M	M	M	M	M	M
24	f	2	MA	p	p	P	p	p	P	p	M	P	M	P	p
25	m	2	MA	M	M	M	M	M	M	M	M	M	M	M	M
26	m	2	MA	M	M	M	M	M	M	M	M	M	M	M	M
27	f	1	S	M	M	M	M	M	M	P	M	M	M	M	M
28	m	3	MA	P	P	M	P	P	P	M	M	P	M	P	P
29	f	2	MA	м	м	м	м	м	м	M	м	м	M	м	м
30	f	3	MA	м	м	м	M	м	м	M	M	м	M	м	м
31	f	3	MA	P	P	м	P	P	P	M	M	P	M	P	P
32	f	3	MA	м	м	M	M	м	м	M	M	M	M	M	M
33	m	3	MA	M	м	M	M	Ρ	М	M	M	M	M	м	М
34	f	3	S	Р	P	M	P	м	Р	P	M	P	M	Р	Ρ
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