V3: 08/08/2023

Universidad de La Laguna

Pythagoras

2021-1-RO01-KA220-HED-000032258

Funded by the European Union

2nd Progress Meeting

28th & 29th September, 2023

Universidad de La Laguna - Tenerife

	Thursday, 28th	Friday, 29th	Saturday, 30th
9:00 - 9:30	Welcome and coffee opening		
	Project Based Learning & Linking Mathematics to real life problems & examples	*ICT and Digital Skills & Visulization as active learning method*	
9:30 - 10:15	**Mini PBLs for pre-calculus course by HMU** *Evangelos Kokkinos (HMU)*	**Theoretical framework(s) for combining ICT and real life examples for teaching and learning mathematics** *Olga Timcenko (AAU)*	Visit to Teide National Park
10:15 - 11:00	**Designing an Agile and Sustainable Education Approach with Problem-Based Learning** *Babo Lurdes & Jorge Mendonça (P.PORTO)*	**Part 1: Example-generating tasks in a computer-aided assessment system** *Mats Brunström, Maria Fahlgren and* ***Mirela Vinerean-Bernhoff*** *(KAU)* **Part 2: The use of STACK/Moodle for the development of a system based on adapted feedback regarding the improvement of students' understanding level of mathematical notions** *Ana-Maria Acu,* ***Nicolae Constantinescu****, Augusta Ratiu,* ***Florin Sofonea****, Oana Ticleanu and Ioan Tincu (ULBS)*	
11:00 - 11: 30	Coffee break		
11:30 - 12:15	**Introducing miniPBL in mathematical subjects at STU in Bratislava, Slovakia** *Daniela Velichová & Jana Gabková (STU)*	**Teaching mathematical models around the SDG** *Diana Sosa, Israel García & Rodrigo Trujillo (ULL)*	
12:15 - 13:00	Invited talk	**Group work methodologies in Mathematics Education** Jennifer Dóniz (EVM)	
13:00 - 15:00	Lunch		
	Gamification		
15:00 - 15:45	**Gamifying online and hybrid mathematics education at university level** *Georgios Triantafyllidis (AAU)*	Coordination Project meeting	
15:45 - 16:00	Conclussions and review of the day	Update meeting with partners: P.PORTO, STU, KAA	
16:00 - 17:00	Update meeting with partners: ULL, HMU, AAU		
18:30 - 21.30	Cultural event (guided tour of La Laguna, UNESCO Heritage City) and dinner	Cultural event and dinner	

V2: 31/07/2023

Universidad de La Laguna

Pythagoras

2021-1-RO01-KA220-HED-000032258

Funded by the European Union

2nd Progress Meeting

28th & 29th September, 2023

Universidad de La Laguna - Tenerife

	Thursday, 28th		Friday, 29th	
9:00 - 9:30	Welcome and coffee opening			
	Project Based Learning & Linking Mathematics to real life problems & examples		*ICT and Digital Skills & Visulization as active learning method*	
9:30 - 10:15	**Mini PBLs for pre-calculus course by HMU** *Evangelos Kokkinos (HMU)*	**ABSTRACT:** We will present mini PBLs for the pre-calculus course. The goal is to give the students a real-life problem and solve it with the help of the mathematics of the pre-calculus course. We also want through these mini projects to make students aware of the goals of sustainable development.	**Theoretical framework(s) for combining ICT and real life examples for teaching and learning mathematics** *Olga Timcenko (AAU)*	**ABSTRACT:** It has been found that learners who do not have sufficient motivational factors may withdraw their voluntary efforts to learn. So, the biggest challenge remains: Identifying the appropriate motivators of the target audience and implementing the right mix. To solve this problem, the PYTHAGORAS approach employs the Self-determination Theory (SDT). SDT is concerned with the psychological needs behind motivation and the social conditions that foster these processes. SDT identifies two distinct types of motivation: intrinsic and extrinsic. Intrinsic motivators include the following: Acceptance, Curiosity, Autonomy, Competence / Skill Development, Order, Social Contact. Extrinsic motivators include: Badges, Points, Positive Feedback, Status/Grades/ Fame. In learning today, most gamification approaches involve extrinsic incentives, such as points, badges, and leaderboards. But the perfect learning gamification design should trigger learners' intrinsic type to motivate them to change their behaviour. Extrinsic motivators can attract learners to learning, but intrinsic motivators motivate them to stay committed and engaged throughout the learning process.

10:15 - 11:00	**Designing an Agile and Sustainable Education Approach with Problem-Based Learning** *Babo Lurdes & Jorge Mendonça (P.PORTO)*	**ABSTRACT:** In this talk we explore how students perceive the use of PBL in addressing real-world problems aligned with the principles of Agile Education and Sustainable Development Goals.	**Part 1: Example-generating tasks in a computer-aided assessment system** *Mats Brunström, Maria Fahlgren and **Mirela Vinerean-Bernhoff** (KAU)* **Part 2: The use of STACK/Moodle for the development of a system based on adapted feedback regarding the improvement of students' understanding level of mathematical notions** *Ana-Maria Acu, **Nicolae Constantinescu**, Augusta Ratiu, **Florin Sofonea**, Oana Ticleanu and Ioan Tincu (ULBS)*	**ABSTRACT: Part 1:** In the first part of our talk, we will discuss the design of tasks and associated feedback utilizing the affordances provided by the combined use of GeoGebra and a computer-aided assessment (CAA) system. The presentation will focus on 'examplegenerating tasks', in which students are asked to provide examples of functions satisfying specific conditions. Researchers suggest example-generating tasks as a way to engage students actively in their development of deeper mathematical understanding (Watson & Mason, 2005). Since there are no general methods for solving these types of task, students have to be creative and develop solution strategies building on conceptual understanding rather than factual recall. This pedagogical approach has been adopted by researchers in the creation of novel types of task appropriate for CAA systems since it allows for automatic assessment of higher-order mathematical skills (Sangwin, 2003). We propose tentative principles on how tasks and associated feedback can be designed to encourage active learning. For example, we found occasions where it might be instructive to start by asking students to provide two examples fulfilling certain conditions, followed by adapted feedback including a request for a third example. As a theoretical lens, the notions of 'dimensions of possible variation' and associated 'ranges of permissible change' have been used. We will also discuss a specific type of example-generating task, adopted from Sangwin (2003), which consists of a sequence of prompts that progressively add more constraints. ***References:*** Sangwin, C. (2003). New opportunities for encouraging higher-level mathematical learning by creative use of emerging computer aided assessment. International Journal of Mathematical Education in Science and Technology, 34(6), 813−829. Watson, A., & Mason, J. (2005). Mathematics as a constructive activity: Learners generating examples. Routledge. **Part 2:** In the second part of the talk, we will shortly present examples from the third intellectual output of the Pythagoras - Erasmus+ partnership project for cooperation in higher education. One important aim of this part of the project is to combine the two types of digital technology - the digital mathematical system (DMS) GeoGebra and the computer-aided assessment (CAA) system STACK- to provide automated formative feedback. The purpose is to increase students' engagement and conceptual understanding in mathematics (Sangwin, 2003). The development of learning systems through IT technologies is a normal trend in high school and university education. From the activities undertaken with the students, a group of university teachers and researchers concluded certain limitations of such a system. In this sense, interaction models were developed to improve the degree of learning of mathematical notions through/even during also to the answer to certain sets of questions. Regarding this, was created a hardware infrastructure that includes a server type system, configured for massive requests, a customized version of Moodle/Stack has been installed, in order to adapt to the specific requirements of theproject and a logical structure that such interactions are necessary to meet, in the sense of joining each branch, an adapted feedback to predefined decisions set, which will be made to each student. And the steps for understanding, similarly how an individual consultation is carried out. ***References:*** Sangwin, C. (2003). New opportunities for encouraging higher level mathematical learning by creative use of emerging computer aided assessment. International Journal of Mathematical Education in Science and Technology, 34(6), 813−829.
11:00 - 11: 30	Coffee break			

11:30 - 12:15	**Introducing miniPBL in mathematical subjects at STU in Bratislava, Slovakia** *Daniela Velichová & Jana Gabková (STU)*	**ABSTRACT:** Presentation will bring information about developed miniPBL examples dealing with important environmental problems, in which simplified mathematical models can be used to show possible development with crucial impact on the Planet. Experience with 3 different ways used for introduction of this innovative teaching scenario will be analyzed and discussed. We will show how an applied problem can be developed from a small problem solved as miniPBL at bachelor level in Mathematics I, continuing in more advanced level to subject Mathematics 2, and developed further on to master level subject Statistical Analysis as Problem Solving with perspective to enlarge it into Project based approach at PhD. studies.	**Teaching mathematical models around the SDG** *Diana Sosa, Israel García & Rodrigo Trujillo (ULL)*	**ABSTRACT:** In this talk we present the exprience developed with students of last bachelor year of Mathemtics in the subject Modelization. Working on groups, centered on data from SDG, we have organized the task around PBL scheme, and someone spcially devoted to the Pythagoras model of mini-PBL. The use of TICS and real problems has been the center of the tasks and always promoting to pose the student in a more professional pont of view than an academic one.
12:15 - 13:00	Invited talk		**Group work methodologies in Mathematics Education** Jennifer Dóniz (EVM)	**ABSTRACT:** Group work methodologies in mathematics education harness the power of collaborative learning to enhance students' understanding of mathematical concepts, problem-solving skills, and communication abilities. This presentation explores various group work approaches, including Cooperative Learning, the Jigsaw Method, Think-Pair-Share, Peer Teaching, Collaborative Problem Solving, Group Projects, Role Play and Simulations, and Online Collaborative Tools. We delve into how these methodologies promote teamwork, critical thinking, and the application of mathematical concepts to real-world scenarios. The lecture also highlights the significance of providing clear guidelines, establishing roles, and fostering effective communication for successful implementation.
13:00 - 15:00	Lunch			
	Gamification			
15:00 - 15:45	**Gamifying online and hybrid mathematics education at university level** *Georgios Triantafyllidis (AAU)*	**ABSTRACT:** It has been found that learners who do not have sufficient motivational factors may withdraw their voluntary efforts to learn. So, the biggest challenge remains: Identifying the appropriate motivators of the target audience and implementing the right mix. To solve this problem, the PYTHAGORAS approach employs the Self-determination Theory (SDT). SDT is concerned with the psychological needs behind motivation and the social conditions that foster these processes. SDT identifies two distinct types of motivation: intrinsic and extrinsic. Intrinsic motivators include the following: Acceptance, Curiosity, Autonomy, Competence / Skill Development, Order, Social Contact. Extrinsic motivators include: Badges, Points, Positive Feedback, Status/Grades/ Fame. In learning today, most gamification approaches involve extrinsic incentives, such as points, badges, and leaderboards. But the perfect learning gamification design should trigger learners' intrinsic type to motivate them to change their behaviour. Extrinsic motivators can attract learners to learning, but intrinsic motivators motivate them to stay committed and engaged throughout the learning process.	Coordination Project meeting	