Pythagoras : *Erasmus+ Partnership project for cooperation in higher education*

2021-1-RO01-KA220-HED-000032258

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Pythagoras

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Erasmus+ Partnership project for cooperation in higher education - Key Action 2

LUCIAN BLAGA UNIVERSITY of SIBIU

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The project will run between:
01.02.2022 – 31.01.2025

KARLSTADS UNIVERSITET, Karlstad, Sweden, www.kau.se

SLOVENSKÁ TECHNICKÁ UNIVERZITA V BRATISLAVE, Bratislava, Slovakia, www.stuba.sk

UNIVERSIDAD DE LA LAGUNA, La Laguna Tenerife, Canarias, Spain, www.ull.es

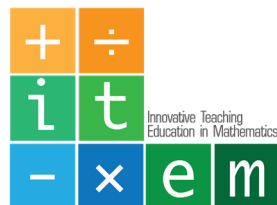AALBORG UNIVERSITET, Aalborg, Denmark, www.aau.dk

INSTITUTO POLITECNICO DO PORTO, Porto, Portugal, www.ipp.pt

ECOSISTEMAS VIRTUALES Y MODULARES SL, Santa Cruz de Tenerife, Canarias, Spain, www.evm.net

ELLINIKO MESOGEIAKO PANEPISTIMIO, Heraklion, Crete, Greece, www.hmu.gr

Innovative Teaching Education in Mathematics

Aims

The project will address the role of mathematics within STEM education and examine how it might be advanced through three approaches:

(1) Improving mathematics teaching and learning, by helping teachers and students to enhance digital skills and by linking the subject to real life problems and examples.

(2) Making mathematics teaching and learning (in face to face, online, and blended form) more interactive by using gamification.

(3) Support the fundamental knowledge with the introduction of an online and open access course in pre-Calculus available to any stakeholder;

These approaches contribute to the goal of making mathematics education compatible for blended teaching and learning (by introducing automated and frequent assessments, online games along teaching mathematics, visualizations, and micro-credentials).

At the end, project PYTHAGORAS approaches will be ready to be applied in any STEM module or degree.

Objectives

The objective of PYTHAGORAS project is to contribute to the improvement of how mathematics courses are taught (leveraging the digital tools whose importance and impact was demonstrated by COVID-19 imposed online teaching) and develop policies that will make their learning more inclusive, efficient, enjoyable and real.

PYTHAGORAS is a proposition to the future of the Higher Education from teaching within large lecture rooms to a more personalized teaching & learning approach.

All project outcomes and activities will be tailored to address the prerequisites of the partner institutions for their new undergraduate students regarding their fundamental mathematics background. These perquisites will be checked from all aspects:

(1) mathematical content

(2) mathematical processes

(3) views about the nature of mathematics

(4) personal characteristics of students & teachers (personal – and academic ones)

Results and outcomes

Project intellectual outputs:

IO1. Toolbox for teachers on Education for Sustainable Development (ESD);

IO2. Learning scenarios and guide for gamifying online and hybrid mathematics education at university level;

IO3. An online and open access pre-Calculus course (MOOC) in English;

Project activities:

(1) Train the Trainers how to teach ICT tools & Learning analytics for students at risk (summer school for trainers);

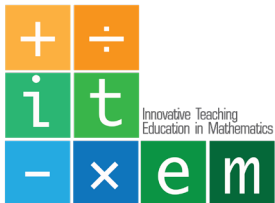(2) Teaching & learning mathematics (summer school for students).

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Intellectual output 1

IO1 - Toolbox for teachers on Education for Sustainable Development (ESD)

Leading Organization: University of La Laguna Spain (ULL)

All other partner institutions will support the leading organization during the realization of the Intellectual Output

Start date: 01.04.2022; End date: 01.12.2024.

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Innovative Teaching
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Content of IO1

❑ **Providing teaching staff with pedagogical tools adapted to the reality of teaching**, not only to address the crisis generated by COVID19, but also the now irremediable need to maintain the use of ICT in teaching, a fundamental element of the 21st century competences that are desirable in our future graduates.

❑ **It address the demands of UNESCO**, which urges the educational community to ensure Education for Sustainable Development (ESD) in which all students "acquire the knowledge and skills necessary to promote sustainable development and the adoption of sustainable lifestyles, human rights, gender equality, the promotion of a culture of peace and non-violence, global citizenship and the appreciation of cultural diversity and the contribution of culture to sustainable development" (UNESCO, 2015, p.20)

Structure of IO1

1.1 Toolbox for implementing key teaching-learning strategies for environmental, citizenship and sustainability education.

1.1.1. Tool 1: Education for sustainable development. Teachers will be equipped with the necessary tools to carry out an ESD approach, with the aim of having their students disseminate this approach in the future development of their professions.

1.1.2. Tool 2: ICT and ESD Technological tools. We will provide teachers with the technological tools that promote a sustainable construction of learning. This tool is addressed for teachers of university mathematics subjects who wish to introduce ICT in an effective and integrated way in their classrooms and activities.

1.1.3 Tool 3: Mini- PBL for ESD. The recommended teaching model for ESD is the project-based methodology. We consider that a transitional tool for students and teachers to incorporate this methodology in the classroom is through small projects in depth and extension oriented to contexts of Education for Sustainable Development (ESD), which we call mini-PBL.

Structure of IO1

❑ Workshops 1.2- Focusing the Toolbox on "on risk" students. We call students "at risk" those students enrolled in STEM studies, taking mathematics subjects and who, for various reasons and due to different factors, have difficulties passing these subjects and, consequently, the risk of abandonment and failure, not only in the matter but in the studies it develops.

❑ 1.3- Creation of the pre-university on-line and open course: The arrival of the first-year student to the university system is generally traumatic. Skills and ability to adapt to change become the keys to immediate success, as first months are critical.

❑ 1.4- Pilot testing and Improvement of the task package based on the evaluation results.

Intellectual output 2

IO2 - Learning scenarios and guide for gamifying online and hybrid mathematics education at university level

Leading Organization: Aalborg University Denmark (AAU)

AAU will collaborate towards identifying the requirements for selecting successful initiatives with all member institutions.

Start date: 01.01.2023; End date: 01.03.2024.

Content of IO2

❑ Gaming elements have been applied in education in order to increase student motivation and engagement with the learning material.

❑ Gamification could help support student motivation and engagement with mathematical activities. However, initiatives on gamifying mathematics and STEM courses in HE are still scarce. In this result, the consortium will investigate successful applications of gamification in online mathematics with the aim to identify opportunities and challenges.

Structure of IO2

R2.T1 State-of-the-art report on gamification tools for online and hybrid mathematics in higher education In this task, a study of the existing conditions in the gamification domain will be conducted, with a focus on environments and tools utilized in mathematics education.

R2.T2 Learning scenarios for gamifying online and hybrid mathematics education. This task relates to the development of the digital course material itself. The ADDIE (Analyze, Design, Develop, Implement, Evaluate) methodology will be applied to develop this module.

R2.T3 A teacher guide on applying gamification on online and hybrid mathematics education. This activity consists in developing a practical printable PDF guide targeted at teaching staff.

R2.T4 Evaluation and adaptation of the learning scenarios. Feedback from students and teachers will be collected with both quantitative (questionnaires) and qualitative (interviews, observations) methods in order to better adapt the learning scenarios to teachers' and students' needs.

Intellectual output 3

IO3 - An online and open access Precalculus Course (MOOC) in English

Leading Organization: Karlstad University Sweden (KAU)

KAU will closely collaborate with LBUS in the realization of the output. All the other partners are helping towards identifying the requirements for selecting successful initiatives.

Start date: 11.01.2023; End date: 01.01.2025

Content of IO3

❑ Construction of an online package of tasks with automatic feedback for pre-Calculus and Calculus 1 courses. The focus of the tasks is on the fundamentals of Calculus (functions, differential Calculus in one variable and applications of derivatives).

❑ In the construction of the tasks we use a combination of a dynamic mathematics software (DMS) and a computer-aided assessment (CAA) system. The focus is on the design of tasks with automated feedback of high quality so as to students' engagement and conceptual understanding in mathematics.

❑ The tasks are implemented in the CAA STACK and some of them use for visualization the DMS GeoGebra. Both STACK and GeoGebra are free of charge. STACK is accessible via MOODLE.

Structure of IO3

❑ Train the Trainers on how to use the online task package - one online webinar with both lectures and workshops (Responsible Partner: KAU & LBUS)

❑ Test the task package: Two schools are planned in Tenerife and in Chania as face to face events. Students are going to work intensively with the task packages.

❑ Evaluation of the tasks: through questionnaires and interviews on both teachers and students.

❑ Improvement of the task package: based on the evaluation results.

Target groups

Direct users

- at local, regional and national level:
HEIs, academics and teachers, researchers, HEIs students and graduates in each of project universities and other institutions selected/identified through the project life;
- at EU level:
HEIs, academics and teachers, researchers, HEIs students and graduates in other European countries.

Secondary users

- learning services providers, teachers, researchers, learners and students from any level and general public.

On the basis of this target audience identification project results will be disseminated according to a dissemination and communication strategy concentrated on disseminating the results of the project to a wide range of existing or potential users and stakeholders.

Impact

The expected impact of the project at the local and regional level will be:
- increase availability of easy-accessible, high-quality, free-of-charge tools and methods for all, teachers and students
- increase the number of teachers adopting innovative practices around digital education
- greater sensitivity to education challenges
- increase active commitment of local and regional communities in initiatives in favor of new digital skills.

The expected impact of the project at the national and European level will be:
- increase in the competences of the HEIs and their staff active in the field of mathematics
- improvement of the level of information related with innovative practices in education, such as gamification, assessment software, problem based learning or Education in Sustainable Development
- reinforced interaction between practice, research and policy in the field of mathematics and innovation
- greater exchange of innovative practices in the field education
- greater transnational cooperation between organizations
- foster European cooperation across different countries of Europe.

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Thank you!