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ITEM: KA2 ERASMUS PROJECT

INNOVATIVE TEACHING EDUCATION IN MATHEMATICS - ITEM

Project reference number: 598587-EPP-1-2018-EL-EPPKA2-CBHE-JP - ENV2

Scope of the project

Links with real life & applications, could be established if mathematics will be taught through real life stories and technology achievements. Mathematics is recognized as essential and indispensable for addressing the major challenges in science, technology and society: High Performance Computing, Big Data, Quantum Computing, Financial Mathematics and Biomathematics to name a few.

Europe has recently realized that Mathematics is a vital part of the European research and innovation landscape, and the awareness of the importance of building students mathematics skills has risen. Teaching mathematics is a challenge not only for Europe but also for countries in Europe's neighbourhood. This is the reason why the ITEM project focuses on Mathematics education.

The ITEM consortium has surveyed the work that has been done to fulfil the project's objectives and found that beyond some bibliographic research papers and few reports from the European Commission, no other similar project has been submitted to attempt to address Mathematics Education in the frame of any Erasmus+ call for the Higher Education. Considering the importance Mathematics has on addressing modern society challenges and facing youth employability, the ITEM project will have a strong impact on Universities, on educators, on students and on the market world in general.

The project is based on experience gained at CTU, where as a result of implementing methodological changes in the way Math courses are being taught, a dramatic reduction in failure rates was recorded: roughly from 50% to 20%. Discussions with CTU's staff unveiled the methodological changes to the teaching process that are responsible for this change.

The ITEM project will exploit the skills & experiences of European Partners in modern teaching methods (offline and online), to assist the Partner Countries improving the way that mathematics is taught in the consortium HEIs; and thus helping them to produce better employable graduates, prepared to advance technology in their countries. We also strongly believe that the acquired knowledge & experiences that will be gained during the project will assist the participated Programme Countries partners to improve & optimize their mathematics teaching strategies & tools. Mathematics & Statistics is a primary National priority of all the participated Partner countries (Israel, Kosovo*, and Uzbekistan).

The main purpose of this Erasmus project is to implement these methodological changes in HEIs in three regions: Western Balkans, Israel and Uzbekistan and in two other Programme Countries institutions: Greece and FYROM (a.k.a test sites).

Objectives

1. Improve students math level of first year Computer Science and Electrical Engineering students
2. Reduce failure rate in math courses
3. To demonstrate to the students that math is relevant to the program they have chosen to study

4. Improve students confidence in their ability to learn math

The ITEM project plans to develop and test innovative learning & teaching tools, new methodologies and approaches (learning outcomes and ICT based practices) towards building and enhancing students' mathematics skills. In particular the ITEM project will

(1) link 1st year mathematics modules (Linear Algebra and Calculus I) with real life problems from Engineering, Computer Science, Robotics, Artificial Intelligence, Machine Learning, Biology, Medicine, Data Analysis, Finance and Sports to help students realize the potential and the necessity for developing their mathematics skills;

(2) assist mathematics teachers in adopting new teaching approaches & strategies e.g., Problem Based Learning (PBL) and Project Oriented Based Learning (POPBL) techniques during their lectures and make the latter more interactive and stimulating to the students;

(3)train teachers and students (via workshops) to use dynamic learning tools e.g. mobile phones to visualize & simulate real life problems during and beyond lecture time;

(4) develop software to monitor and asses students' progress in mathematics (Personalized Oriented Education);

(5) develop software that will track students' performance and engagement (e.g. analysis of Moodle usage) to early identify students who might have problems in their studies and offer suitable assistance;

(6) build students confidence in their mathematics skills and

(7) develop material (manual, video lectures, recording the training sessions/workshops) that will help training math teachers in HEIs and provide guidance to students for effectively studying mathematics. All these products will be freely accessed (protected by common license policy) through project's educational platform (MOODLE) by any stakeholder during and beyond the project's lifetime.

The ITEM consortium will involve the Mathematicians, Physicists, Engineers, Biologists and Educators that will collaborate to implement its objectives. This will have an impact not only on how mathematics is being taught but also on how other important courses should be designed and presented to the students e.g. STEM courses.

We also would like to expand the work done by CTU in two main ways:

1. Provide assistance to students who find it difficult to keep with the class's pace

2. Package and automate many of the methodological changes to help other HEIs (especially those who lack sufficient manpower and/or monitory resources) implement these changes easily and inexpensively.

In this project we will tackle two central math courses in the first year of studies:

1. Calculus 1 (single-variable calculus: differentiation and integration), and,

2. The first course in Linear Algebra (up to eigenvalues, eigenvectors and SVD).

A Rough Timeline

15 November 2018: Project starts

November 2018-April 2019: Preparation phase

May 2019 – April 2020: Development phase

January 2020 – August 2021: Implementing alpha phase in three HEI: one in Uzbekistan, one in Kosovo and one in Israel

July 2020 – October 2020: Preparing for full implementation

September 2020 – June 2021: Full implementation in all tests sites

July 2021 – October 2021: Finalize project, conclusions, dissemination

Project consortium