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TeaEdu4CT project Newsletter 1

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Dear newsletter subscribers,

It is time for the first of our TeaEdu4CT Newsletter! The October, 2019 has marked the start of the international project *Future Teachers Education: Computational Thinking and STEAM* (TeaEdu4CT).

The project aims to develop innovative educational approaches of Computational Thinking (CT) related to transdisciplinary and holistic STEAM perspectives for future teacher education. There is a pragmatic methodology to CT as an asset of tools, techniques and approaches developed, which would enable a seamless transition from the young child's unplugged type of activities to the comprehensive modelling and computer simulation activities of K-12 and early university students studying to become school teachers. With this first issue of the newsletter we start the series of "TeaEdu4CT Introduced", in which we will present to you the member institutions of the consortium involved in the project.

We hope that those interested in teacher education, STEAM and computational thinking will subscribe to our newsletters, will find them informative and useful. Enjoy the read!

Your TeaEdu4CT team

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1. About TeaEdu4ST project

Computational Thinking (CT), which is the focus of the project, is considered to be an integrative skill to be addressed within the described STEAM model. The emphasis is put on the primary role of computational models in modern research-oriented education. In order to develop, to implement, and to study computational models that include both technical and social aspects, students of today need to have skills such as decomposing and generalising skills and skills to automate, algorithmize, calculate, and design, necessary for solving problems in a highly digitised educational environment.

The project focuses on curriculum development activities for the education and training of future teachers. Future teachers are the main target group, which is involved in STEAM education,

particularly those, who are concerned with CT aspects and appropriate curriculum development, as well as future teachers of preschool institutions (kindergartens), primary schools, lower and upper secondary schools of various subjects including foreign languages, arts and humanities.

The project develops innovative educational approaches to practical STEAM education that are based on Computational Thinking (CT) as related to trans-disciplinary and holistic STEAM perspectives. We develop a pragmatic approach to CT as to a set of tools, techniques and approaches, which enable a seamless transition from the young child's unplugged type of activities to the comprehensive modelling and computer simulation activities of K-12 and early university students. Our research and implementation emphasises educational programs and curriculum enhancement for education of prospective teachers focusing on CT and STEAM content.

The main aspects of our approach are:

(1) CT is considered in conjunction with STE(A)M. STEAM is understood as a “developed” discipline encapsulating STEAM and a holistic view of school (and preschool) subjects as providing knowledge and skills for context-specific project and problem-based education;

(2) Curricula (ten modules, intellectual outputs to be developed in this project) will be based on a systematic and holistic view of CT and STEAM;

(3) To develop a multidimensional model for curriculum evolution: the longitudinal dimension (personal child development), the skills dimension (scientific thinking skills, CT skills, and contextual thinking skills), the contextual dimension (community, society, communication, management, entrepreneurship, culture, diversity, ethics);

(4) CT is positioned as an integrative skill set that links scientific and content-specific knowledge with contextual thinking skills, adding context-specific modelling skills (developing of models and simulations, including modelling of cyber-social systems);

(5) The philosophy is based on (A) a post-scientific tendency to merge scientific and technical knowledge with social and humanitarian knowledge with contextual knowledge as the most valued; (B) a pragmatist approach to education in terms of sharing community values and solving actual present day problems;

(6) The adapted TPACK framework for CT and STEAM is promoted to develop specific curriculum modules by project partners.

The objectives of the international project *Future Teachers Education: Computational Thinking and STEAM* :

- to improve future teachers' pedagogical skills and competencies, related to the teaching and learning of various aspects of CT;
- to develop a deeper understanding of CT in future teachers.

The methodology is based on an approach to develop and test a set of subject/educational environment specific educational modules, suitable for integration into future teacher education curricula. The motivation is based on the ongoing European reform of approaches to STEAM education and the importance of CT educational aspects related to it.

2. The Project Consortium Introduced

The project partners are a cluster of leading European institutions in computer science education, CT and STEAM education. Eight universities and two research centres are involved.

- The project leader, Vilnius University (Lithuania), in collaboration with all project members proposed the module design template and designed a project web page. Vilnius University will develop the initial project intellectual output (IO1) focusing on theoretical background for future teacher training in CT and STEM, including the state of arts and the best practice.
- Radboud University (Netherlands) will develop (a) a basic module providing core, disciplinary independent specific competences of CT; and (b) a module focusing on CT for STEM prospective teachers.
- Ankara University (Turkey) will develop (a) a module covering CT thinking aspects for pre-school education; (b) a module for teaching of CT for languages, arts and humanities prospective teachers.
- Paderborn University (Germany) develops a CT module for primary education prospective teachers.
- Vienna University of Technology (Austria) will develop a CT module for Informatics (Computing) prospective teachers.
- University of Turku (Finland) will develop a module of Educational environments for CT and STEM.
- KTH Royal Institute of Technology (Sweden) will develop a module for didactics and constructivists approaches to the teaching of CT skills.
- Tallinn University (Estonia) will develop a module on technological, pedagogical and instructional aspects of CT teaching.
- Other partners – CESIE (Italy) and CARDET (Cyprus) organisations are responsible for collaboration in developing and piloting of modules.

In this newsletter we would like to start with the brief introduction of two partner institutions: Vilnius University and Paderborn University (see in Announcement section).

Vilnius University (VU) is the project leader and coordinates the project. It is the largest university in Lithuania and one of the oldest establishments of higher education in Eastern Europe, it was founded in 1579. The university has 12 faculties, 7 institutes, 4 study and research centres, the most modern library, etc. Currently VU has over 3,750 academic staff and over 21,500 students. With its large scientific potential in terms of well-known researchers in STEAM-related disciplines, VU has a vision to make more active collaboration with the country's educational system through implementing scientific research and innovative teaching and learning methods in schools, e.g. problem-solving, IBL, RRI, to name a few. VU has previously coordinated a number of EU projects, including Eurostars (pen!6232 PEN), and has participated in a number of FP projects, such as BalticGrid, Baltic Grid Second Phase, EGIInSPIRE, VirtualLife, SkyScanner and Mascil. Two institutes are directly engaged in these project: Institute of Educational Science (ESI) and Institute of Data Science and Digital Technologies (DSDTI).

ESI finds itself within the faculty of Philosophy and is oriented towards the development of the modern education science. The priority areas include teaching and learning process, content, methods and teachers' education. ESI focuses on policy and management, the cultural and intercultural aspects and values of education.

DMSTI is subdivision of the faculty of Mathematics and Informatics and focuses on scientific research and experimental development. The most successful directions of DMSTI are automated reasoning methods for knowledge and agent-based logics, problems of technology enriched education and human interactions with computers, software engineering methods, cultural heritage in digital space.

Key persons of the project team have been working in higher education in the mathematics and informatics education field for many years. Their research interests focus on the technology enriched learning and teaching especially mathematics and engineering, also they are interested in application of learning science and professional development of mathematics and science teachers in primary and secondary schools, with special attention to the mathematics reasoning and cultural approaches. VU has very good contacts with Ministry of Education and Science of Lithuania and their satellite institutions on teacher education and developing of curricula: we are involved in various expert groups at the Ministry, run advisory seminars to policy makers, in particular to developers of higher education curricula, etc.

VU actively collaborates with the Ministry of Education and Science in terms of performing scientific research on STEAM-related topics while implementing large-scale EU-funded projects. VU also directly collaborates with a network of innovative schools in order to implement sound pedagogical methods and approaches to enhance learning quality and effectiveness, in STEAM subjects including. Research based experience of the partners from VU provides a rich background and VU scientists are experienced in implementing information and communication technologies and math-based approaches in school education and therefore complement project knowledge and competencies in this direction.

Vilnius University is responsible for the general management of the project. The project management is performed by the Management Team:

The Head of the Project – prof. Valentina Dagiėnė: valentina.dagiene at mif.vu.lt

(Overall project management, coordination of the IO implementation as well as teacher training activities and multiplier events)

Project administrator – Vincėta Juodkaitė: vincėta.juodkaite at fsf.vu.lt

(Project administration activities: agreements, reports, supporting documents for activities, general dissemination activities and etc.)

Project activities coordinator (implementation part) – Tatjana Bulajeva: tatjana.bulajeva fsf.vu.lt

(Day-to-day communication with partners regarding the IOs implementation, events organization, quality control and etc.)

Financial coordinator – Aleita Markevič: aleita.markevic at cr.vu.lt

(expertise in EU-funded projects, coordination of project finances)

Management Team will work closely together with National Agency. The team has well-established, valuable experience in international collaboration in the field of mathematics and informatics research, development and dissemination. Thus, they can rely on excellent local, regional and international connections to teachers and teacher educators, educational administrations, school authorities and Ministry of Education, Science and Sport. At the international level, they maintain contacts to numerous mathematics and informatics education researchers, teacher educators, European working groups (on Mathematics and technology, on teacher education, on schools), the European Schoolnet and the Bebras challenge on informatics and computational thinking networks (www.bebbras.org). Several team members have been involved in teacher education curricula development. We have been teaching prospective teacher students at mathematics and informatics from several countries (Spain, Croatia, Ukraine, and

Uzbekistan). The team members worked at localisation (translation) of several mathematics and science computer programs for schools and teachers last years, they met the different cultural approaches and reasoning in mathematics. We are paying special attention on teacher education for social diversity: we have quite a big amount of children from very low social skills families and various risk families (about 20%). The team members are experts at Learning Technology Standards Observatory; Personalising Learning Workgroup; the Special Interest Group of Advanced Learning Technologies, Open Educational Resources, and Standards under the Asia-Pacific Society for Computers in Education. They have been researchers in a number of EU-funded projects e.g. iTEC, LSL, CCL, META-NORD, CALIBRATE, ASPECT, iCOPER, eQNet, INSPIRE, te@ch.us, Iguana, eTwinning, Safer Internet etc.

The project the Project Management Board with representatives from each partner (chaired by representative of Vilnius University) was established: meetings are held twice yearly to assess project progress, ensure meeting of deadlines, and recommend personnel changes, modifications to activities, budget reallocation if necessary. Also some urgent questions can be discussed online.

Project Management Board:

- Arnold Pears (KTH Royal Institute): pears at kth.se
- Erik Barendsen (Radboud): e.barendsen at cs.ru.nl
- Mart Laanpere (Tallinn): martl at tlu.ee
- Maria Solomou (CARDET): maria.solomou at cardet.org
- Gerald Futschek (TU Wien): futschek at ifs.tuwien.ac.at
- Yasemin Gulbahar (Ankara): yasemin.gulbahar.guven at ankara.edu.tr
- Mikko-Jussi Laakso (Turku): milaak at utu.fi
- CESIE Alessia Valenti: alessia.valeti at cesie.org
- Carsten Schulte (Paderborn): carsten.schulte at uni-paderborn.de
- Valentina Dagiene (Vilnius): valentina.dagiene at mif.vu.lt

3. TeaEdu4CT Project News and Latest Developments

The kick-off project meeting was organized by faculty of Philosophy of Vilnius University on 15-16 October 2019. It was the first out of 6 international meetings planned in the project. Other meetings will be organized in five partner countries.



Kick-off meeting at Vilnius University

(1st row from the left: Vida Jakutiene, Vincenta Juodkaite, Alessia Valenti, Tatjana Jevsikova, Yasemin Gulbahar, Valentina Dagiene, Tatjana Bulajeva, Jelena Mazaj; 2nd row from the left: Arūnas Poviliūnas, Peter Larsson, Mikko-Jussi Laakso, Claudia Tenberge, Erik Barendsen, Vladimiras Dolgopolas, Maria Salamou; top from the left: Phillip Prinzing, Carsten Schulte, Gerald Futschek, and Mart Laanpere.

The main goals of the kick-off meeting were to introduce and strengthen the multi-national and multi-disciplinary consortium team; to overview the project activities, to present, discuss and agree on operational plan, time schedule, work package coordination and activities planning of IO; to discuss in detail IO1 structure and framework and each partner responsibilities.

There were the main project management issues discussed: the appointment of persons to the Steering Committee and the Management group, the budget and financial management rules, the internal communication, quality assurance and main qualitative and quantitative indicators, a quality control plan and its implementation, the dissemination strategy of project results. There was the Consortium Partnership Agreement signed by the partner institutions involved in the project. After planning the activities for 2019-2020, there were operational working plans for development of intellectual project outputs (IO1-IO10) and meeting schedules discussed and agreed on.

The progress and the latest developments made since October

As VU has an overall coordination responsibility. It was agreed that all partners will contribute equally to the different activities and co-manage intellectual outputs. To facilitate this, dissemination and quality coordination is forwarded to partners/supported by partners. This arrangement keeps the workload manageable, while insuring that at the same time all partners are involved in overall project coordination. Decisions are made by majority vote and communicated to all partners using the created group Email address. The partners use Skype meetings, video conferences, project management software (Trello) and e-mails to formalise communication paths within the consortium as well.

It was agreed on dissemination strategy and project website to be developed within the website of the VU Philosophy faculty. It can be found at the following address:
<https://www.fsf.vu.lt/mokslas/projektai/tarptautiniai-projektai/erasmus?layout=edit&id=2720=future-teachers-education-computational-thinking-and-steam#documents>

There was the intellectual IO1 draft version completed by Vilnius university team. It was agreed on the final structure of the O1, which is important for the development of other intellectual project outputs (IO2-IO10).

There is a google drive arranged for internal communication of partners. It has the uploaded presentations, photos, documents, templates, drafts etc. there.

There were templates, necessary for the project IOs implementation activities, developed. Partners from five partner institutions have met at the Doctoral Consortium in Druskininkai, Lithuania during the 1st week of December 2019: prof. Gerald Futschek (Austria), Dr. Mikko-Ville Apiola (Finland), prof. Erik Barendsen (Netherlands), Maya Lust (Estonia), prof. Valentina Dagiene and dr. Tatjana Jevsikova (Lithuania). After active discussions on a template form, length and structure, it was decided to offer for final discussion at the next meeting the developed two template draft versions: 1) for a short (one-page) description/presentation of a module to be developed; 2) for a detailed development of the module content (amounting to 10-20 pages, including pictures, schemas, etc.). Both the versions were sent to the Consortium partners and were revised and improved taking into consideration the suggestions received. It was agreed that draft versions of Outputs (O1-O10) should be discussed in partner groups and be ready by the middle of March. They should be submitted to a Google drive and be presented for discussion in the next meeting at the Paderborn University on 24-25 March, 2020.

4. Announcement

The 2nd international project consortium meeting will be hosted by Paderborn University (Germany) on **the 24th -25th of March, 2020.**

The main objectives of this meeting – to present the final framework of modules. To discuss development and design of all ten IOs (intermedia results), to recognise and analyse common parts, to foreseen further works, to discuss coordination of IOs, financial and management issues, dissemination, quality assurance.

Paderborn University (German: *Universität Paderborn*) is located in the city of Paderborn, which is over 1,200 years old. It is a part of one of the major growing regions in Germany with successful high-tech companies and facilities.

Paderborn University is one of the fourteen public research universities in the state of [North Rhine-Westphalia](#) in [Germany](#). It was founded in 1972 and 20,308 students were enrolled at the university in the winter semester 2016/2017. Five faculties offer a broad range of courses in the arts and humanities, in business studies and natural sciences, and engineering. The university offers 62 different degree study programs. (https://www.uni-paderborn.de/fileadmin/presse-kommunikation/Paderborn_in_profile_March_2017.pdf)

Paderborn University positions itself as the University for the Information Society. It has a strong foundation in computer science, its applications, giving attention to IT development in a growing number of disciplines. It aims at contribution to the scientific and technical development of the information society, at the same time it is critically reflecting these developments by taking into account the history, norms and values of the contemporary society. The University Closely Collaborates with the Heinz Nixdorf Institute, Paderborn Center for Parallel Computing and two Fraunhofer Institutes for research in Computer Science, Mathematics, Electrical Engineering and Quantum Photonics.

Paderborn University is a young and thriving university that conducts excellent research within five key research areas. A wide range of research activities in all faculties are performed with a high level of interdisciplinarity and internationality. Paderborn University is embedded in an innovative and dynamic business environment in the region of Ostwestfalen-Lippe, which engenders numerous cross-sector collaborations with benefits for researchers and the regional economy. It emphasizes interdisciplinarity, as complex scientific challenges, which require collaboration of complementary disciplines. One example is the close link between computer science and engineering, generating common solutions with exploitation potential and real added value in the mechanical-electrical engineering fields. Together with basic research in the natural sciences such collaborations form an essential basis for shaping the modern information society. Similarly, the analysis and exploration of cultural and economic developments and changes in the information and knowledge society also require interdisciplinary approaches. These questions are addressed in cultural and social sciences as well as economics and have an impact on teacher training and vocational education. The international office of Paderborn University is interconnected with over 140 partner universities worldwide and offers exchange programs.

In 2006, the computer science program was ranked among the top 3 programs in the most comprehensive and detailed ranking of German universities by the Centre for Higher Education Development (CHE) and the German weekly news magazine *Die Zeit*. In the same year, the university was ranked among the leading institutions in terms of gaining research funds in the areas of electrical engineering, computer science and systems engineering by the German Research Foundation. In 2018, the academic ranking of world universities, popularly known as "Shanghai rankings", placed the Paderborn University in the ranking bracket 50-75 among mathematics departments worldwide (more information can be found at <https://www.uni-paderborn.de/en/>).

Contact person at Paderborn University: Prof. Dr. Carsten Schulte, Faculty for Computer Science, Electrical Engineering and Mathematics. Fürstenallee 11, 33102 Paderborn. Phone +49 (0) 5251-60.6343 E-Mail: carsten.schulte@upb.de

5. Partner Activities

The main task of each partner during October 2019 and March 2020 is to develop draft versions of IOs in order to discuss them during the meeting at Paderborn. Partners should rethink the framework and description proposed initially in the project.

All partners are asked to provide detailed information about their modules (as an example look at O1):

<https://www.fsf.vu.lt/mokslas/projektai/tarptautiniai-projektai/erasmus?layout=edit&id=2720=future-teachers-education-computational-thinking-and-steam#modules>

