TeaEdu4CT project Newsletter 3
February 2021

Dear newsletter readers, subscribers and followers of TeaEdu4CT project,

Since the start of the international project *Future Teachers Education*: *Computational Thinking and STEAM* (TeaEdu4CT) *(Erasmus+ 2019-1-LT01-KA203-060767)* in October, 2019, the planned Project activities have been going on, in spite of the difficulties caused by announced in March, 2020 pandemic of COVID-19 and quarantine. In the light of this situation the adjustments have to be made due to transformations from face-to-face into distant learning formats in education.

The 3rd TeaEdu4CT project Newsletter will inform you about the progress made in the Project since July, 2020. We will continue with the series of "TeaEdu4CT Consortium Introduced", inform about the project news and latest developments.

Your TeaEdu4CT team

CONTENT

1. About the TeaEdu4CT Project
2. The Project Consortium Introduced (continued)
3. TeaEdu4CT Project News and Latest Developments
4. Partner Activities

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 digitized 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 importance of computational thinking can be illustrated by the attention given to it by researchers of today. Peter J. Denning and Matti Tedre in their book *Computational Thinking* (2019) (https://mitpress.mit.edu/books/computational-thinking) explain, that computational thinking (CT) is not a set of concepts for programming. They identify six dimensions of today's highly developed CT among which there is computing education.

The leader and coordinator of the TeaEdu4CT Project – prof. Valentina Dagienė presents the book to project partners during the online meeting.

The other evidence of the growing importance of computational skills development and education is the inclusion of questions testing computational skills in the PISA 2021 Mathematics assessment. While computer science itself is a broad domain, including aspects such as computer programming (coding), algorithm design, data science, cybersecurity, networking, machine learning, and robotics, all of these sub-fields rely on a deep conceptual understanding of computational thinking. That is why it was chosen for the PISA 2021 mathematics assessment. Computer science and computational thinking, when taught well, can prepare students to apply problem solving, creativity, and collaboration in all sorts of domains.

For more details on the inclusion of computational thinking in the PISA 2021 Mathematics assessment, click here (OECD, 2018).

2. The Project Consortium Introduced (continued)

The project partners are a cluster of leading European institutions in computer science education, CT and STEAM education. There are eight universities and two research centres involved in TeaEdu4CT project. In this Newsletter we would like to introduce to our readers and followers two of them.

2.1 KTH Royal Institute of Technology in Stockholm

KTH Royal Institute of Technology in Stockholm (Sweden) occupies a position as one of Europe's leading technical and engineering universities, as well as a key centre of intellectual talent and innovation. It is Sweden's largest technical research and teaching institution and

home to students, researchers and academic faculty from around the world. The research and education at KHT covers a wide area, including natural sciences and all branches of engineering, as well as architecture, industrial management, urban planning, history and philosophy. KTH is working with industry and society in the pursuit of sustainable solutions to some of humanity's greatest challenges: climate change, future energy supply, urbanisation and quality of life for the rapidly-growing elderly population. These challenges are being addressed with world leading, high-impact research and education in natural sciences and all branches of engineering, as well as in architecture, industrial management, urban planning, history and philosophy. KTH in 2019 was ranked 36 among the world's universities for engineering and technology, according to QS University Ranking. There are 5,178 employees, the equivalent of 3,572 full time positions, of which 1,332 are women and 2,240 are men.

The KHT Department of Learning in Engineering Sciences is a world-leading research environment, which is focusing on improvement of learning in STEM at all levels, from pre-school to post university studies and life-long learning. Research clusters within the department actively pursue research into teaching and teacher education in the STEM disciplines. Major research contributions from the department in the last decade include, development of online and digital learning, policy development in leadership and organisation and global competencies, and STEAM education for the future of Europe. More information about KHT research and research areas can be found at: www.kth.se/larande/forskningsomraden

Arnold Pears is a Professor of Technical Science Education at the KTH Royal Institute of Technology in Stockholm, Sweden. He also holds a professorship in Computer Science specialising in Computing Education Research at Uppsala University. Professor Pears has very extensive experience in the area addressed by the TeaEdu4CT project, and has published widely in both Computer Science Education and Computational Thinking in compulsory school education as well as Engineering Education Research. He currently serves as the Vice President for Publications of the IEEE Education Society and has received multiple awards for his research and development activities. Google scholar metrics for Professor Pears accessed in March, 2019 lists his H-index as 17, with over 1400 citations of his work, including 46 journal articles and 97 refereed conference papers. Professor Pears and his team bring to the project a strong track record of research into the teaching of computational thinking in culturally appropriate ways as well as research methods and teaching materials development expertise.

KTH Royal Institute of Technology project team are developing a module (**M9)** for Didactics and constructivists approaches to the teaching of CT skills (*Using Constructivism, and Project and Challenge Driven Pedagogy for learning CT*).

2.2 Vienna University of Technology (Austria) - TU Wien

TU Wien (Austria), one more project partner, is located in the heart of Europe, in a cosmopolitan city of great cultural diversity. For more than 200 years, TU Wien has been a place of research, teaching and learning in the service of progress. The Vienna University of Technology (TU Wien) was founded in 1815 as Imperial-Royal Polytechnic Institute, it was the first University of Technology within present-day German-speaking Europe. Today the university finds high international and domestic recognition in teaching, as well as in research, and is a highly esteemed partner of innovation oriented enterprises. With its eight faculties - Mathematics and Geo-information, Physics, Technical Chemistry, Informatics, Civil Engineering, Architecture and Regional Planning, Mechanical Engineering and Business

Science, Electrical Engineering and Information Technology – the TU Wien covers the classic engineering disciplines. Today TU Wien is among the most successful technical universities in Europe and is Austria's largest scientific-technical research and educational institution. The University has 5072 employees including scientific and non-scientific staff. TU Wien combines basic and applied research and research-oriented teaching at the highest level. TU Wien has evolved into an open academic institution where discussions can happen, opinions can be voiced and arguments will be heard (https://www.tuwien.at/en/)

Information Systems Engineering Institute of Vienna University of Technology, which is actively involved in this project, provides foundational and advanced techniques, algorithms, design and engineering approaches to model complete lifecycles of data-intensive and distributed information systems. Such information systems play a crucial role in many forms of organizations, and act as a facilitator and enabler for the digitalization of personal and social spaces. As such, information systems of today have become the underlying "operating system" of our society. Typical activities in the lifecycle of information systems are fundamental requirements elicitation as well as analysis and design of systems, their implementation, as well as subsequent execution and maintenance activities. It is important to mention, that information systems engineering is not limited to technologies and methodological approaches, it also comprises technical solutions, as well as social and business related implications of information systems. Therefore, information systems engineering can also act as an interface between computer science and other research disciplines (technical and non-technical) as well as business related activities. Although these tasks of the institute are more technically oriented, there is a group of scientists steadily working on Informatics education and particularly Informatics teacher education.

Dr. Gerald Futschek is Professor and Senior Researcher in Computer Science as well as in Informatics Education. His current position is head of the Institute of Information Systems Engineering. His main research interest is Informatics education at school level and at university level as well. He has published more than 100 scientific papers, mostly on Informatics education. Gerald Futschek and his team (Philipp Prinzinger, Matthias Rausch, Ulrike Schäfer, Merve Sen) are developing Module **6:** *CT for Informatics (computing) prospective teachers: specific features, approaches and practical solutions.* The COVID-19 pandemic problems inspired the University of Wien team to design a game teaching the simulation skills, showing how simulation and computational thinking can be employed and lead to real problem solving.

3. TeaEdu4CT Project News and Latest Developments

From September of 2020 till February of 2021 the main activities of the project were focused on the reviewing and evaluation of the quality of completed ten project modules. The Review stage consisted of internal evaluation (self-assessment and peer review), which were conducted by project partners, and external quality evaluation, which was conducted by foreign experts, members of Advisory Board. All the modules (IOs 1-10) have successfully gone through the external evaluation by Advisory Board experts, following the dates marked in the project time line. Each module has been evaluated by two external experts.

In November, 2020 the project progress was positively evaluated by Lithuanian Education Exchanges Support Foundation (EESF), which is a national agency entrusted with administration of ERASMUS+ and LLL programmes.

Upon the completion of Review stage, all project partners have presented the summarized results of the received feedback during the online TeaEdu4CT project partner meeting held on January 27, 2021. In the discussions there was the overall satisfaction with the quality of received external evaluation reviews expressed. It was mentioned that reviews were constructive, presented good remarks, recommendations and insights for improving (the English language and terminology used in the modules, the logical structure, visualisation of some modules, etc.) of modules. It was noted that the issue of the longevity of the external (Internet) resources used for the module practical implementation is important and has to be considered when improving the modules.

The glimpse from the 8th TeaEdu4CT project online meeting, February 24, 2021.

During the discussion of the approaching piloting of the modules, which is planned to be conducted in spring semester of 2021 in all project partner countries, there was the concern of partners, regarding the difficulties of piloting in spring, expressed. Each module has to be piloted in two project partner institutions for pre-service student groups of 20-30 students. We do hope that the unfavourable COVID -19 pandemic situation of today in project partner countries will be better in spring, hopefully, it might be much better in autumn, so then the autumn semester might be seen as more suitable for module piloting, otherwise all the piloting will have to be implemented in a distant mode. It is good news, that modules are undergoing the last improvements, and are ready for translation into national languages of the partner countries and ready for piloting.

During the 8th online meeting on February 24, 2021 there was much attention given to the discussion of the dissemination of the TeaEdu4CT project activities and results in partner countries. It was agreed to use all dissemination tools and resources.

The developed Dissemination Plan of TeaEdu4CT project is aimed to reach: a) the short-term goals (increasing the visibility of the project results through reaching different stakeholder groups: teacher unions, school subject teachers' and university teachers' associations, in-service teachers and school leaders) and b) the long term goals of dissemination (including presentations of reports and papers at national and international conferences, scholarly publications and use of social media).

5. Partner Activities

In 2020 the group of project partners presented the TeaEdu4CT project and the modules (IOs 1-10) in a round table discussion *Challenging Future Teachers Education by focussing on Computational Thinking with integrated STEAM* at online International Conference on Informatics in School: Situation, Evaluation and Problems ISSEP, 2020 conference organized by Tallinn University (for more information see https://www.ISSEP2020.tlu.ee).

It is important to use the national conferences organized in partner countries for dissemination of the TeaEdu4CT project activities and results in partner countries. So there was a virtual booth, dedicated to the TeaEdu4CT project, organised at the Swedish *the Frontiers in Education* (FIE 2020) online conference held on 22-25 October, 2020 (for information see https://app.hopin.to/events/fie2020/expo). It is a major international conference focusing on education innovations and research in engineering and computing education.

The project partners have decided to use the coming conferences for dissemination purposes. It is planned to disseminate project activities and events in the following conferences of this year of 2021:

1) The 26th annual conference on *Innovation and Technology in Computer Science Education* (ITiCSE). ITiCSE 2021 will be hosted by Paderborn University in Paderborn, Germany, between June the 26th and July the 1st, 2021 (https://iticse.acm.org/);

2) ESERA (*European Science Education and Research Association*) 2021 online conference will be organized by the University of Minho, Braga, Portugal (30 August - 3 September, 2021) (https://www.esera.org/33-conference/830-esera-conference-2021-praga-portugal);

3) CTE-STEM 2021: *Fifth APSCE International Conference on Computational Thinking and STEM Education*, June2-4, 2021 (https://cte-stem2021.nie.edu.sg/) in Singapore.