IoT, Big Data and AI: Innovating STEM Teaching Through Strengthening Teacher Professionalisation

Teacher Training & School Collaboration Programme in the Czech Republic, Hungary, Poland & Slovakia
September to December 2021

Overview

Background

Our societies face a technological revolution where IoT, Big Data, and AI provide solutions that tackle global challenges, including climate change, food security or pandemic outbreaks.

Although STEM (Science, Technology, Engineering & Mathematics) skills are crucial for driving innovations and are in high demand in the workforce, the European Commission predicted already for 2020 that Europe faces *"a shortage of around 756,000 ICT professionals by 2020, with a lack of synergy between educational systems and the requirements of the labour market"*.

To stimulate students' curiosity in STEM subjects and to prepare for possible future professional career paths, teaching and learning STEM must start at an early education level and be embedded in real-life scenarios. Teacher training and teacher professionalisation are indispensable in this process: Only by providing quality education and by using a variety of formal, informal and non-formal innovative educational tools, teachers will be able to provide students relevant opportunities to build their digital skills and to apply their gained knowledge in daily life and a larger real-world context.

Funded under the [International Visegrad Fund](#), this project focuses on building teachers' pedagogical capacity and digital competence in the four Visegrad countries Czech Republic, Hungary, Poland and Slovakia. The cross-country collaborations will also lead to the establishment of a peer-to-peer learning and school network.

About the Project

The project ['IoT, Big Data and AI: Innovating STEM Teaching through Strengthening Teacher Professionalisation'](#) is a 4-month long hands-on training programme for teachers on IoT, Big Data & AI-related teaching in secondary schools: on a pedagogical, curriculum & technical level.

Schools of participating teachers are provided with cutting-edge technological equipment that allows them to monitor and analyse environmental and climate change through joint data collection, such as air temperature, rain rate, humidity, solar and UV radiation, etc.. A common technical platform connects all schools and enables an interactive teaching & learning environment that transcends borders and allows teachers to discuss, jointly explore and identify areas for collaboration.

The project not only offers experiential teaching & learning opportunities for STEM subjects; it also allows cross-fertilisation across other subjects (e.g., English, Ethics, Geography, Social Sciences, etc.)

Objectives

By integrating IoT technology and enriching daily curricula & extracurricular activities, the project will support teachers to:
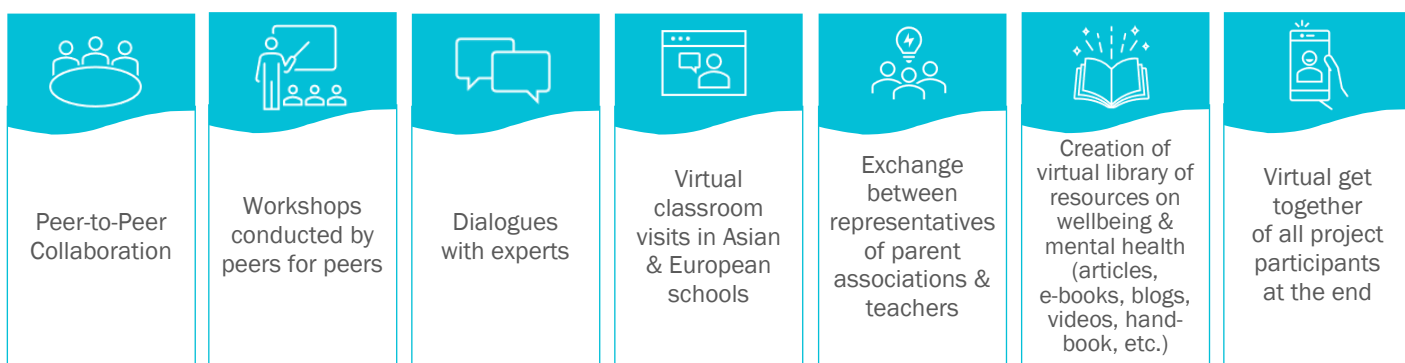
- Build pedagogical expertise & digital competence
- Explore and create 21st century teaching & learning settings in their own classrooms
- Collaborate with other teachers in V4 countries through peer-to-peer exchanges
- Train their students in innovation & entrepreneurial skills, as well as soft & intercultural skills such as global citizenship, critical thinking & creativity.

Through an in-depth analysis and evaluation of the project's activities, the project also aims to provide general recommendations to policy makers and educators on how to strengthen teacher professionalisation in V4 countries.

Programme Elements

The programme consists of a variety of activity formats that encourage formal, informal and non-formal education opportunities and include diverse education tools.

Peer-to-Peer Collaboration	Workshops conducted by peers for peers	Dialogues with experts	Virtual classroom visits in Asian & European schools	Exchange between representatives of parent associations & teachers	Creation of virtual library of resources on wellbeing & mental health (articles, e-books, blogs, videos, hand-book, etc.)	Virtual get together of all project participants at the end

Activity 1: Modules on "IoT, Big Data and AI for Innovating STEM Teaching"

The main output of this project is a 4-month long Teacher Professionalisation Programme, which consists of three components:

1) 6 Teaching Modules on IoT, Big Data and AI; complemented by
2) 5 Technical Training Sessions
3) 3 Thematic Training Sessions.

Each of the 6 Teaching Modules will address one specific issue linked to the environmental data collection and evaluation (e.g. pollution, natural hazards, etc.). In this process, teachers will learn how to practically integrate IoT in their teaching practices as well as enhance their pedagogical capacities to teach 21st century skills. Furthermore, individual and team assignments will be given to the teachers and their students for further exploration and to deepen their understanding and confidence in using the IoT tools.

Teaching Modules on IoT, Big Data and AI

As the basis for the Teacher Professionalisation Programme, each participating school will be equipped with an IoT Weather Station to be able to join a number collaborative activities. The weather station will capture environmental data on the school compound, including temperature, relative humidity, barometric pressure, rain rate and total, solar radiation, UV index, wind speed and wind direction.

The environmental data generated by all participating schools will then be compiled by one virtual platform to create an ecosystem of environmental data for joint analysis and reflection.

Technical Training Session

The integration of Internet of Things (IoT) technologies in our daily environment is a new concept, especially in education. Therefore, it is important to conduct adequate and relevant technical training sessions for teacher participants to be able to use new tech tools to innovate existing learning settings and to support their students in achieving deep learning goals for STEM subjects. Hence, complementing the Teaching Modules, technical training sessions will be conducted for participating teachers on how to use the IoT/weather station equipment and, in general, to enhance their knowledge and digital competence for implementing IoT and AI-driven projects' activities.

Thematic Training

Training sessions by education & thematic experts on Education for Sustainable Development, with a focus on environmental and climate change education as well as 21st century skills development, will further enrich the Training Programme. These thematic trainings will support the learning partnership in a technology rich environment. This training is open for both teachers and their students.

Each participant - teachers and students - will receive a certificate after the project.

Activity 2: Virtual Peer-to-Peer Exchange and Knowledge Building Sessions

Throughout the project's implementation, at least 2 virtual meetings are planned to bring together all participating teachers, including their students, for a peer-to-peer exchange and knowledge building & sharing. These virtual sessions of about 2,5 hours each will include various meeting formats, with a focus on interactive engagement of all participants (e.g. speed-dating, polls and small-group discussions) and collaborative elements (e.g. visual, virtual brainstorming). In addition, we intend to invite for each session experts from V4 countries, to provide a keynote as food for thought. Coordinated and conducted by teachers for their peers, these sessions are an opportunity for informal and non-formal group learning.

Activity 3: Webpage on "IoT, Big Data and AI: Innovating STEM Teaching in V4 Countries through Strengthening Teacher Professionalisation"

A dedicated webpage will document the process and development of all activities under the project. It will

1) present participating schools & teachers, as well as testimonies by students
2) showcase the environmental data collection & analysis

3) be a repository for thematic resources on IoT, Big Data, AI in teaching & learning and ESD
4) highlight the feedback by teachers & students.

The webpage will serve as the main communication tool for all partners to promote their work and to reach out to larger audiences. It will be crosslinked with all schools' websites and connected with the IoT@School Exploratory virtual platform where the live data of the project can be tracked.

Activity 4: Handbook for Teachers on "Use of IoT tools to Innovate STEM Teaching"

The project will conclude with the production of a Handbook on the '*Use of IoT tools to innovate STEM Teaching'.* It will be a joint collaboration between all project partners and participating teachers. Capturing their experiences throughout the project, it will include concrete lessons learnt and guidelines on pedagogical, curriculum & technical related matters based on practical examples. Specifically, the handbook will focus on:

1) The process of the project's implementation
2) Tangible & intangible results achieved through the project's activities
3) Step-by-step guidelines on how to use IoT tools to teach & learn STEM subjects
4) Student testimonies on their practical experiences
5) References to latest research on teacher professionalisation
6) Insights on digital transformation of teaching & learning environments through IoT tools in schools in V4countries
7) Messages from education experts/policy makers in V4 countries

The Handbook will serve as a useful reference for all interested teachers to implement similar activities and support them to innovate their teaching environment for STEM subjects. It will also inform education policy makers about innovation in STEM teaching & learning in V4 countries.

Project Timeline

May - Aug 2021	Sep 2021	Oct – Nov 2021	Dec 2021
Outreach & Awareness Selection of Participants Preparations	Technical Trainings & Thematic Sessions	Thematic Sessions & Implementation of Joint School Activities	Handbook Production Evaluation & Reporting

Sustainability & Future Actions

- Participating schools can continue the activity beyond the project period and intensify their learning and collaboration.

- Insights and findings from this project will be recorded and documented. These multi-media materials will be useful and accessible to teachers across V4 and beyond. The resources will guide & support interested schools to implement similar activities in their own schools, if wished.

- With the support of the Asia-Europe Foundation (ASEF) and ScienceScope Ltd, results of this project can be presented and showcased at relevant education policy meetings, e.g. the ASEM Education Ministers' Meeting or UNESCO conferences, or at international EdTech conferences, to promote the activity and to share lessons learnt on innovation in education environments with a larger audience.

Participants

20 Schools and up to 60 Secondary school teachers selected through an Open Call across the V4 region.

Both teachers from STEM and other subjects will be able to integrate the project's modules in their daily curriculum or to run them as extracurricular activities.

Interested in Joining this Project?

If you would like to participate in this School collaboration, please contact the coordinator directly.

Project Coordinator

Mr Adam STEPINSKI
Teacher
Copernicus Upper-Secondary School in Tarnobrzeg Poland

Partner Schools

Mr Milan CHALUPNÍK
Teacher & Headmaster
Kladno Škola, Seč, okres Chrudim, Czech Republic

Dr Andrea Molnarne LASZLO
Teacher
Márton Bálint Primary and Secondary School, Hungary

Ms Jana VIDOVÁ
Teacher
Obchodná akadémia Roznava, Slovakia

Mr Pavol TRUBAC
Teacher
Spojena Skola, Slovakia

Supported by

-
- Visegrad Fund
-
-

The Visegrad Fund is an international donor organization, established in 2000 by the governments of the Visegrad Group countries—Czechia, Hungary, Poland and Slovakia to promote regional cooperation in the Visegrad region (V4) as well as between the V4 region and other countries, especially in the Western Balkans and Eastern Partnership regions. The Fund does so by awarding €8 million through grants, scholarships and artist residencies provided annually by equal contributions of all the V4 countries. Other donor countries (Canada, Germany, the Netherlands, South Korea, Sweden, Switzerland, the United States) have provided another €10 million through various grant schemes run by the Fund since 2012. https://www.visegradfund.org/

Coordinating & partnering schools

In Collaboration with

The Asia-Europe Foundation (ASEF) is an intergovernmental not-for-profit organisation located in Singapore. Founded in 1997, it is the only institution of the Asia-Europe Meeting (ASEM). ASEF's mission is to promote understanding, strengthen relationships and facilitate cooperation among the people, institutions and organisations of Asia and Europe. ASEF enhances dialogue, enables exchanges and encourages collaboration across the thematic areas of culture, education, governance, sustainable development, economy, public health and media. www.ASEF.org

ScienceScope Ltd is based at Downside School near Bath, in the south west of the United Kingdom. With a focus on developing research projects on Education Technology, the company has been awarded grant funding to develop these projects in multiple countries from around the world including the UK, Singapore and the UAE. They have partnered with a wide range of academic & government partners including the University of Bath and the University of Glasgow in the United Kingdom, the Singapore Infocom and Media Development Authority (IMDA) and the National Institute for Education Singapore.
https://sciencescope.uk/