> *Up2U is a portable, open, pedagogy-driven digital ecosystem built with the learning community in mind.*

we developed the Continuous Professional Development methodology (CPD)."

The CPD is split into three modules: teacher training by the national training team, introduction of Up2U by teachers to their students, and knowledge sharing from level 2 teachers to level 1 teachers. "By using this CPD methodology, we speed up in-depth adaptation to the Up2U ecosystem inside pilot schools," says Horváth.

Most of the pilot countries have already committed to running a national programme for the Up2U ecosystem after the project ends. Meanwhile, Israel and the UK have kick-started online education based on CPD methodology, and the first non-project partner pilot has started in Slovenia. "We have received interest from more European countries like Armenia and Finland to start pilots in their countries. We support these pilots with the Get Started! course, an online training course based on the CPD methodology," Horváth explains.

Up2U is scheduled for completion at the end of May 2020. The final phase of the project will focus on analysing the results of the pilots and implementing the sustainability plan for after the project's end.

UP2U

- Coordinated by GÉANT Vereniging in the Netherlands.
- Funded under H2020-LEIT-ICT.
- cordis.europa.eu/project/id/732049
- Project website: up2university.eu
- bit.ly/2Hc5h3J

Innovative technology-enhanced learning makes STEM fashionable

The NEWTON consortium has had enough of negative perceptions around science, technology, engineering and maths education. Over more than 3 years, they devised new teaching methodologies based on innovative solutions such as virtual reality and gamification to organise its return to favour.

Students across Europe are increasingly disengaged with science, even though its importance in the job market never ceases to grow. So how do we reverse this trend? For the consortium running the now-completed NEWTON (Networked Labs for Training in Sciences and Technologies for Information and Communication) project, the answer is clear – if anything can get students back onto the science train, it's technology-enhanced learning.

From March 2016 to August 2019, the project developed a set of new Technology-Enhanced Learning (TEL) mechanisms and built a platform targeting all stakeholders in education. Gabriel-Miro Muntean, Associate Professor with the School of Electronic Engineering at Dublin City University and NEWTON coordinator, discusses its results as well as future plans to increase its reach and further enhance its technology.

What type of learning gaps did you aim to close with this project?

Gabriel-Miro Muntean: The NEWTON project has designed, developed and deployed innovative solutions for TEL in science, technology, engineering and maths (STEM) education. These solutions address the global problem of decreasing interest in STEM subjects. Many students tend to consider these subjects as either boring or very difficult and eventually become disengaged from STEM topics, especially if they are struggling to understand certain complex concepts or have lower grades.

TEL solutions in general, and NEWTON approaches in particular, offer avenues to improve students' understanding of STEM subjects and increase their interest. We hope our solutions will not only play an important role in students' immediate education at primary, secondary

or tertiary levels, but also contribute decisively to their future career choice.

What would you say are the most innovative aspects of the NEWTON project, from a technological point of view?

The NEWTON project has designed multiple technology-rich solutions for adaptive multimedia and multiple sensorial media (mulsemedia) content delivery, virtual reality-enhanced learning, remote fabrication labs-based education, and gamification and personalisation-based teaching and learning.

These technologies are designed to be used as stand-alone or in conjunction with different pedagogical approaches. The project has also built an innovative Learning Management System called the NEWTON Technology-Enhanced Learning Platform (NEWTELP) which deploys the NEWTON project technologies and allows students and teachers to interact with content and courses in an innovative manner.

Could you tell us more about these pedagogical approaches you focused on?

These include self-directed, game-based and problem-based learning. Deployment in real-life pilots across Europe has demonstrated that all of them improve the learning process.

However, the best results in terms of increase in learner satisfaction were achieved when NEWTON's game-based learning was employed, especially in the pilots involving primary school students. The use of virtual reality and virtual labs to introduce the circuit of water in nature, teach students about animals living in forests or in oceans, or immerse them in a virtual experience on the surface of different planets of our solar system were particularly successful.

Looking back, what do you consider as the most important outcomes of the project?

NEWTON has shown that by making use of TEL and especially of innovative technologies, we can raise the quality of the learner experience, increase satisfaction, improve the learning process and maintain or even improve learning outcomes.

Can you tell us more about the real-life validation? How did you proceed and with what results?

Validation was conducted across 20 primary, secondary and vocational schools as well as third-level education institutions, including schools with students with special learning requirements. It took place in six European countries – Czechia, Ireland, Italy, Romania, Slovakia and Spain – and involved three large-scale and 34 small-scale pilots. The pilots included diverse STEM disciplines ranging from earth science, geography and astronomy to programming and networking.

Our assessment of results followed a specifically designed toolkit. We targeted learning satisfaction, learning outcome, system performance and usability and involved over 1 500 students. The results are available in many scientific conference and journal publications and in a book.

Have you been following up on the project's results since its completion? Do you have any plans to further develop your methods and tools?

The NEWTON platform and third-level educational content are still being used at Dublin City University – Ireland, the National College of Ireland and the Slovak Technical University of Bratislava in Slovakia.

The primary level content has been made available to the next generation of students in Irish and Romanian primary schools which took part in the NEWTON project pilots.

Gabriel-Miro Muntean,
NEWTON Coordinator
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The use of virtual reality and virtual labs to introduce the circuit of water in nature, teach students about animals living in forests or in oceans, or immerse them in a virtual experience on the surface of different planets of our solar system were particularly successful.

They use the innovative NEWTON TEL methodology and content to complement their current education process.

Finally, selected NEWTON solutions will be used in collaboration with the coordinators of a business course at Dublin City University and with some secondary schools in the Basque Country. Some NEWTON partners are currently working on a new project proposal to enhance NEWTON solutions with collaborative learner support and social media integration capabilities.

What do you hope will be the long-term impact of NEWTON?

The results of the NEWTON project have impacted the life of the more than 1 500 students and teachers who directly participated in the pilots, along with many others since the end of the project. Our excellent results in terms of learning satisfaction and outcome may contribute to changing students' false impression that STEM subjects are difficult and/or boring, and hopefully they will help attract more of them to STEM careers.

NEWTON

- Coordinated by Dublin City University in Ireland.
- Funded under H2020-LEIT-ICT.
- cordis.europa.eu/project/id/688503
- Project website: newtonproject.eu
- bit.ly/2OKLyvV

DOIT: practical experiences for future innovators

In a digitalised world, the capacity to turn ideas into concrete innovation has become priceless. The DOIT toolbox aims to enable 6 to 16 year-olds to thrive in this new context.

A memorandum for entrepreneurial skills in the digital market will soon be circulated across Europe. Its goal? Ensuring that, in the future, young people with a creative mindset can turn their ideas into innovations, improving the lives of European citizens.

It's not just wishful thinking. The organisations behind this memorandum have been working together under the DOIT (Entrepreneurial skills for young social innovators in an open digital world. A European Initiative) project since October 2017, and they have a major trick up their sleeves: a toolbox providing open educational resources under an open licence.

"A more engaging and practice-based approach is needed to provide young learners with the mindset and skills they need to become innovative citizens. What we suggest is to empower them through collaborative work on creative solutions for societal issues," explains Sandra Schön, senior researcher at Salzburg Research and DOIT coordinator.

SHOWCASING THE DOIT TOOLBOX

The DOIT toolbox consists of an interactive city map with different 'buildings' or makerspaces. Each makerspace represents a different phase in the development process of a project and contains various materials. The 'wall of failures', for instance, is a training course that will help students in dealing with failures and setbacks during a project while remaining proud of themselves. The training materials cover all the steps of entrepreneurship, but first and foremost they push towards increased collaboration.

"This happens already in a growing number of makerspaces around Europe, where like-minded people get together and work on innovative projects using various