

NEW TIMES DEMAND NEW EDUCATIONAL APPROACHES

Today, we're living on the cusp of a new industrial revolution, coined the Fourth Industrial Revolution (IR4). This should be the trigger to make schools change and offer new educational contexts to our students, giving them the opportunity to acquire the skills to face the challenges of IR4

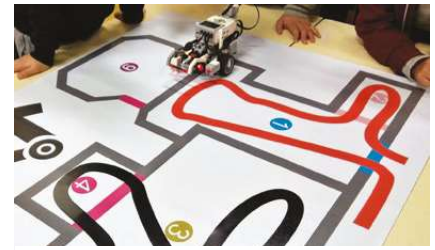
STORY BY Marco Neves



Teacher working together with students, assembling a robot during Robotics and Programming Club activities



Students programming LEGO robots and applying maths contents to solve the challenges



Students working collaboratively to solve problems related with a robot that has to go around the Batalha Monastery. An example of cross-curricular content related to history and robotics

Outside schools, new technologies are coming to life everyday. If we pay some attention and look around, we can see: artificial intelligence, 3D printing, robotics, big data, Internet of Things (IoT), virtual reality, genomics, mobile computing, augmented reality, smart cities, and more. And it's quite difficult to foresee, in a short period of time, the new coming ones. In the meantime, what's happening inside schools? Almost the same strategies, the same processes, the same contexts, and the same learning spaces we had in the previous industrial revolutions.

Futurist Gerd Leonhard says that "Humanity will change more in the next 20 years than it has in the last 300 years" and "we may be the last generation that knows what offline means". And do schools still want to be 'offline' from this new reality? A reality where the changes and impacts of this arise at a dizzying speed.

How is it possible to live in the 21st century and still observe situations where instead of trying to perceive what's best to empower students, it's only being considered what's less positive about their performance? We need to develop new learning contexts to change this status quo.

New educational challenges

Regarding some of the skills referred to in literature, we usually find reference to the four Cs (creativity, collaboration, critical thinking, and communication). In my opinion, one C is missing in this context: C stands for curiosity.

But we know that it's not easy to create the right contexts to be able to provide the facilitators that help both teachers and students develop these Cs.

Nowadays, there are different initiatives (both national and European) that give us the technical background support regarding

this – lots of them are related to digital technologies such as coding.

But they lack when it comes to collaboration and to communication. They're great in providing the context for developing critical thinking, complex problem solving as well as creativity, but it's difficult to prepare the ground to engage students and teachers in communicating and collaborating.

In my school, we try to provide the necessary contexts to give students the opportunity to develop these skills. We have a Robotics and Programming Club bit.ly/craeb (this year it was considered one of the best three in Portugal), and we encourage and help students to take part in initiatives such as 'Code Week' and 'Apps For Good', Astro PI, and CanSat.

But to be able to close the circle around all the Cs, the eTwinning project (etwinning.net) is clearly the best

pedagogical environment as it embraces all the conditions to enhance all the educational power that allows our students to develop not only 'technical skills' but also the so-called 'soft skills'. These skills are nowadays considered so important to make sure we have flexible and adaptable professionals in a world where we're not sure what the so-called 'future jobs' will be.

eTwinning project - MORE

The main goal of MORE was to enhance knowledge in STEM by building apps, programming robots and Arduinos, and prepare students for the new demands regarding both technical issues and soft skills.

The aim of MORE was to spread knowledge among national networks of teachers who are specialised in specific subjects. The objective was to increase students' participation in learning and to help them be better prepared for their future jobs.

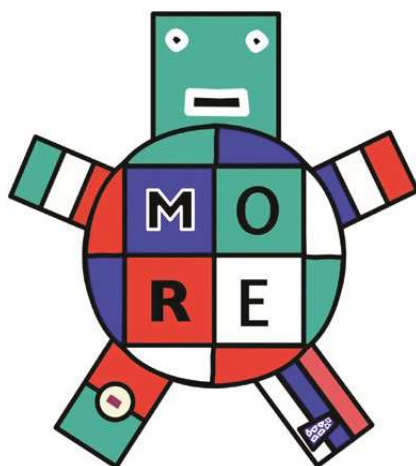
There were four schools involved: Portugal, Italy, France, and Slovenia. Each school was responsible for one area:

- Portugal (Agrupamento de Escolas da Batalha): apps development
- Italy (I.I.S. "N. Pellegrini", Sassari (SS)): robotics building and programming
- France (Lycée Saint Cricq, Pau): developing and programming Arduino projects
- Slovenia (OŠ Preska, Medvode Eslovénia): worked as a beta tester of all the products developed during the project.

All the partners shared their knowledge and expertise in order to:

- Increase the development of devices to record scientific experiments
- Build digital devices to help younger students practise mathematical notions
- Produce Learning Objects (educational resources) related to mathematics and science
- Produce educational games with devices like robots and microcontrollers.

A team within the project was responsible for monitoring the evolution of the project and for evaluating its quality



and impact. They created checklist sheets to register all this information. A survey was applied to evaluate each mobile resource, and interviews with some of the participants were also recorded. Additionally, the main impacts of the project were registered regarding how all the participants improved their competences in different areas. The learning objects produced during the project are available on the project's web page.

Concerning the activities, educational games for mobile devices were created for kindergartens and primary schools, such as an animal quiz, multiplication exercises, temperature, volume, length, area units conversions, and usual geometric figures surface calculations.

Students also created electronic systems controlled by Arduino boards to measure soil humidity and temperature, air temperature for plants, and to measure the sound level in a classroom. Other activities were related to LEGO Mindstorm robots, such as a football field with an automatic scoreboard (controlled by sensors and Arduino boards), where the robots were control by smartphones.

In order to transfer knowledge to the partners of the project about their specific subject, students created tutorials using videos, slide shows, photos and written documents. All these materials were shared and are available for further use on the project's Twinspace page (helloworld.cc/2JPZAaU).

As a result of participation on the project, students acquired new skills and

competences not only related directly to the technologies but also and mainly to those that are more difficult to address, such as: coordinating with others, communication, creativity, and critical thinking. In this project, we can state that the traditional notion of 'teacher' and 'student' was taken to a higher level because teachers and students have taught other students and teachers, and we've all learned with each other.

Just a conclusion

Within a framework based on the development of 'multi cross-subjects' projects, STEAM can play a very important role by acting as an anchor to the development of projects that can embrace all types of subjects. Using this methodology, schools are creating meaningful contexts for students to be prepared and aware of the 'unknown impacts' of IR4. Amongst all this 'unknown', one thing we know: our students need to be very adaptable, flexible, creative, lifelong learners, and tremendously curious. "Change won't wait for us: business leaders, educators and governments all need to be proactive in up-skilling and retraining people so everyone can benefit from the Fourth Industrial Revolution," says Alex Gray in *The 10 skills you need to thrive in the Fourth Industrial Revolution* (helloworld.cc/2KymDrV). So, we have the obligation to create the models and contexts to allow it to happen, otherwise we'll have a generation with a skills shortage for the new demands of the labour market, and that will become a big problem to society. (HW)

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