e-ducation in progress

Robotics in Schools

Course for Secondary School Teachers in Palma de Mallorca, Spain

The course contains 27 hours of guided tuition over 5 days and 2 introduction and closing days.
Target: Secondary School Teachers, who develop new teaching methodologies.
Below is the programme for Robotics for Schools.

General Objectives:
Technology and Robotics are not only part of the specialised area of engineering, but they are also fully integrated into everyday life in society. Many European schools now reflect the need to integrate these subjects into their curricula, such as: Technology, Computer Science and Programming/Coding. That are beginning to reappear, creating increasing demands upon teachers at all levels, from primary level education to upper secondary school and beyond.
Our proposed teaching methods for teachers are based on the fact that students live and see those abstract concepts into their practical day-to-day life (opening the doors of a supermarket, home vacuum cleaner, airplanes, pulleys, domestic robotics and domotics, etc.). Through this methodology, pupils can experiment and internalize these scientific principles and rules, and as well as becoming able to create their own developments.
Our methodology also support to enhance students' creativity, their teamwork capability and motivation.

Preliminary Programme - SECONDARY SCHOOL

1. DAY - WELCOMING & INTRODUCTION	
PROGRAMME	**Learning Objectives**
• Welcome of participants • Course Introduction (program, aims and objectives) • Brainstorming & Team building activities • Guided Tour to Palma de Mallorca	• Participants' presentation and the introduction of course topics • Sharing experiences and expectations • Team-building activities • Guided tour of the city

2. DAY - MINDSTORMS

Lego Mindstorms is a LEGO® Education resource used to teach students how to design and program their own robotic systems. It is the next educational step to Lego Wedo, with much more complex and attractive tools. They can also be asked to find possible solutions set by the teacher. The programming is based on mathematics and physics, creating a more practical and real learning thinking out-of-the-book. Furthermore, students enter into the sensor world and begin to have contacts with them, such as infrared, ultrasound, proximity, accelerometers, etc.

Mindstorms is used as educational activity all over the world and students can even participate at *"First Lego League"*, an international event where they are requested to compete with other students and explain their scientific work to demonstrate the utility of their ideas.

PROGRAMME	Learning Objectives
● Explanation of Mindstorms ● Knowledge of the material & tools ● Knowledge of the software ● Mindstorms in practice ● Introduction to "First Lego League"	Through this tool, students will develop the following Knowledge, Skills and Competences: ● **Science:** a) gear management; b) energy transfer; leverage; c) knowledge of pulley and clutch. ● **Technology:** a) 2D and 3D programming; b) comparing natural and mechanical phenomenon; c) use of complex softwares. ● **Engineering:** a) building, programming and trying the models; b) change the conduct of the model by modifying the mechanical system or adding a sensor that provides certain information. ● **Maths:** a) calculate using numbers with one or two decimal places; b) time in seconds and tenths of a second; c) measure in centimeters or inches; d) use of numbers to represent sounds, screenshots, distances, tilt values and other data. ● **Communication:** a) use technology to create and communicate ideas; b) use of visual elements to illustrate and represent the presentation; c) write a logical sequence of events. ● **Social Competence:** teamwork, goal-orientation, problem solving and strategic thinking.

3. DAY - ARDUINO

Arduino is an open-source hardware platform, based on analogical and digital inputs and outputs (a simple programming language). Through Arduino, students put in practice their science and technology theory by experimenting going beyond the possibility given by the use of computers and tablets. Using Arduino, students reinforce their critical thinking, collaboration skills and the ability to solve problems.

The school is the right place where to access to future technologies for the first time and where students can reinforce their science learning experience.

PROGRAMME	Learning Objectives
● Explanation of Arduino ● Knowledge of the material & tools ● Knowledge of the software	Through this tool, students will develop the following Knowledge, Skills and Competences: ● **Science:** a) gravity and speed functions; b) energy

• Explanation of different implemented projects • Arduino in practice	transfer; c) clutch and forces functions; d) scientific observation, comparison and thinking. • **Engineering:** a) programming a model; b) 2D and 3D interpretation; c) applying the movement principles and other physics phenomenon; d) to be able to use digital tools and electronic systems; e) acquiring basic engineering and electronic knowledge and skills; f) to be able to use electronic components to build prototypes. • **Technology:** a) using software to acquire information; b) to use technology for creating and communicating ideas; c) using all technological components to create ideas. • **Maths:** a) use of standard units; b) calculation using numbers with one or two decimal places; c) knowledge of the angles, degrees, rotations; d) analyzing changes in many different contexts; e) to be able to use axles of coordinated; f) to be able to know and use positive, negative and random numbers; g) time in seconds and tenths of a second. • **Communication:** a) to describe a logical sequence of events to create a story; b) to acquire technical vocabulary; c) capability to communicate ideas and opinions in the working group. • **Social Competence:** teamwork, goal-orientation, problem solving and strategic thinking.
4. DAY - VIDEOGAMES The participants will learn how to use a platform for the development of video-games designed for educating students. The platform allows to use icons intuitively, so that students can design their own scenarios, characters and game dynamics. The creation of video games involves the use of mathematics and aspects of physics that students will learn in an applicative and playful way. Thanks to the possibility to increase the level of complexity, students set their own objectives, making the game easier or more difficult. These video-games can be played online on the Web and open to everybody, even outside, as well as it can be played using different devices, such as tablets, phones or computers.	
PROGRAMME	**Learning objectives**
• Introduction to the platform • Technological knowledge of the platform • Knowledge of the software • Video-game designing	• **Science:** a) to discover gravity, velocities, energy transfer, friction, forces; b) to develop the ability to observe and investigate, as well as the capability to compare. • **Technology:** a) to become able to program simple models; b) to be able to interpret 2D and 3D illustrations and models; c) to apply the principles of movement in physics and others; to develop the ability to manage digital and technological tools. • **Engineering:** a) to generate ideas to find creative

	solutions. ● **Maths:** a) to use standard units; b) to be able to calculate also with decimals; c) to be able to estimate; d) to be able to use Axles of coordinated; to be able to know and use positive, negative and random numbers; d) to be able to use numbers to create sounds, distances and other data. ● **Communication:** a) to describe a logical sequence of events to create a story; b) to be able to write dialogues between characters for the story; c) to acquire technical vocabulary. ● **Social Competence:** teamwork, goal-orientation, problem solving and strategic thinking.
5. DAY - CLOSING DAY	
PROGRAMME	**Learning Objectives**
● Share ideas and debriefing ● Sharing best experiences ● Future project ideas ● Course Evaluation ● Delivery of the certifications	Let's share together our final thoughts and ideas about the course and possible future cooperation. During the previous days, participants will be busy to learn the new method. At the same time, it is important to share previous experiences and new ideas with the aim to create new potential cooperation. During the same day, participants will evaluate the course from different aspects and the final certificates will be delivered.