





Erasmus+ KA1 Course

3D Printing and Robotics in Education



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Summary

3D printers are receiving a lot of interest in the educational space, and are frequently cited as a new catalyst for learning. Certainly, this revolutionary technology is helping teachers to reach a level of student engagement that is almost impossible to recreate from a textbook. 3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced cross-section of the object.

The emergence of additive manufacturing and 3D printing technologies is introducing industrial skills deficits and opportunities for new teaching practices in a range of subjects and educational settings. Applying 3D printing in education has a wide variety of important uses in primary and secondary schools, universities, libraries, technical colleges, and other educational settings. Engineering, chemistry, math, biology and architecture, just to name a few, all make use of 3D printers, but the real advantages lie in the development of imagination and creativity.

3D printing is one tool that helps students conceptualize and visualize their designs as they develop their work from the development stages of a sketch to the final product. Feeding students' creativity skills can help develop a passion for original thinking and creativity that can later be applied in business. 3D printing promotes students achievements and also prepares them for a university education. They develop the confidence that allows them to pursue challenging courses such as those in STEM fields. As students explore and grow their imaginations, it cultivates innovation where the student creates their own unique 3D projects that can help train others as well as solve problems.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than €10.

When designing, constructing, programming, and documenting the development of autonomous robots or robotics projects, students not only learn how technology works, but they also apply the skills and content knowledge learned in school in a meaningful and exciting way. Educational robotics is rich with opportunities to integrate not only STEM but also many other disciplines, including literacy, social studies, dance, music, and art, while giving students the opportunity to find ways to work together to foster collaboration skills, express themselves using the technological tool, problem-solve, and think critically and innovatively. Educational robotics is a learning tool that enhances students' learning experience through hands-on mind-on learning. Most importantly, educational robotics provides a fun and exciting learning environment because of its hands-on nature and the integration of technology.

The combination of 3D printing and Arduino can lead to results that have great benefits in all fields of education and at the same time it can trigger imagination and creativity of students, leading them to the future of education.

Purpose

This course aims to combine 3D printing and robotics in classroom in order to create significant educational tools that make an important impact in teaching. These tools, except from their use in teaching several subjects, can also become very important in waking up students' creativity and interest for the lesson!

Objectives

- Realize the philosophy behind 3D printing.
- Fire imagination.
- Instill spatial intelligence.
- Help students prepare for the future.
- Access the benefits of project-based learning through robotics.
- Discover the usefulness of Arduino in education.
- Boost computational thinking.
- Provide basic training on topics such as controls, automatisms, robots and programmable machines.
- Realize the benefits of the combination of 3D printing and robotics.
- Create educational artifacts with the use of technology.

Course Language

- English.
- Note: Participants must have at least a CEFR level B2 knowledge of English in order to be able to participate actively.

Target Groups

Teachers: primary, secondary, vocational, adult, special needs; - Teacher trainers; - Head teachers; Principals; Managers of schools

Methods & Tools

Lectures, exercises, discussions, teamwork, role-playing, study visits

Course Agenda

Day 1

- Introductory meeting, explanation of practical arrangements.
- Presentation of timetable.
- Presentations of participating Organizations.
- Icebreakers, Introduction to the Course.

Day 2

- Defining 3D printing. Benefits and applications.
- Different 3D printing technologies and the world of tomorrow.
- Creating 3D models.
- Exporting 3D design files.

Day 3

- Introduction to 3D printing technology: - Software and Hardware
- Materials, Designs, and Applications.
- Designing and creating solid digital models
- 3D Design principles
- Common terms and use of 3D design applications
- 3D printing in Education, A case study
- Cultural Activities: Guided tour to the Historical Center of Heraklion.
- Dinner in a traditional restaurant of the town.

Day 4

- Software support and computer simulations on science experiments.
- Introduction to the Arduino software and C++ coding language.
- Introduction to Arduino peripherals: working with dc motor, led, switch, ultrasonic, infrared and ldr sensors.

Day 5

- Software support and computer simulations on science experiments.
- Introduction to the Arduino software and C++ coding language.
- Making projects with the help of your own Arduino set (which our company will give to you).

Day 6

- Combining 3D printing with Arduino sets.
- Creating 3D Robots for educational purposes (Workshop).

Day 7

- Erasmus+ program : objectives, priorities, actions, forms, budget, tips for applicants.
- Planning follow up activities, dissemination and exploitation of learning outcomes.
- Course Evaluation.
- Certifications.



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