

MAKER SCHOOLS

NEWSLETTER

JULY 2021

<http://makers-project.eu/>



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of the European Union

About the Project

3D technology is becoming cheaper and increasingly affordable. It will soon be available in many schools. 3D design and printing can benefit learning in all disciplines and enhance cross-curricular learning. Allowing students to co-create 3D designs can transform them from passive receivers of knowledge to active learners. Creating opportunities to combine Programming with 3D design can further strengthen the employability of students.

What do we want to achieve?

The project's overall objective is to enable the application of 3D design and printing in STEM education in secondary schools. We will provide teachers and students with learning/teaching resources on 3D design and printing, and on the application of the Python programming language in 3D design and creative explorations of 3D models. We will also seek to equip teachers with methodological and didactic guidance for the design and delivery of STEM education in the area of 3D technology.

Expected impact

With this project, we hope to raise awareness that 3D technology and its integration with Programming create many opportunities for improving the quality of curricular teaching and for delivering engaging and effective extracurricular STEM and STEAM (STEM and Arts) education.

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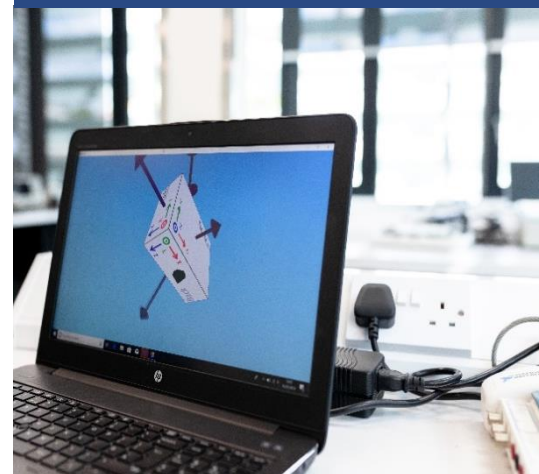
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MAKER SCHOOLS
3D Design for Education

Expected Outputs



Training Program: Introduction to 3D design and 3D printing

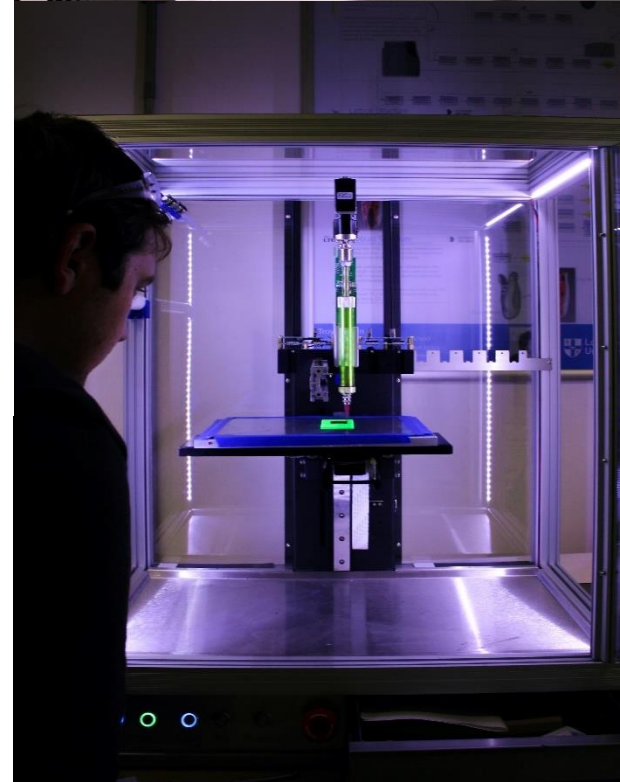
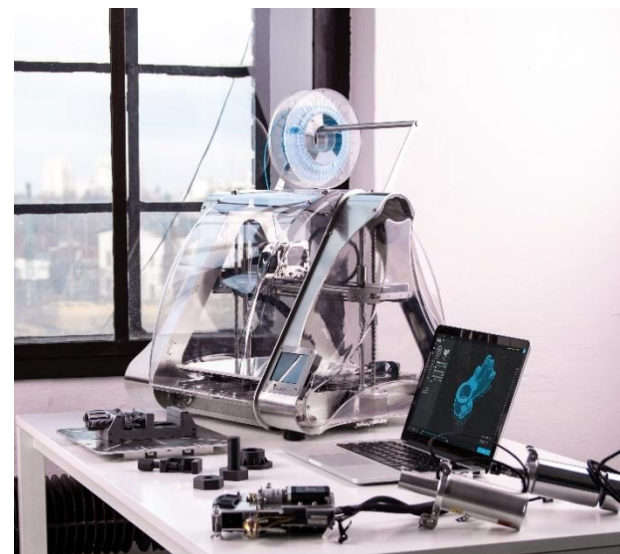
This training program will provide an overview of 3D design and printing technology, with step-by-step tutorials and sample hands-on exercises for applying the technology in the classroom. It can be used by teachers to design their own training, as well as by students who want to learn on their own.

Training Program: Python for 3D printing and creative explorations of 3D models

This training program will provide tools, resources and support for combining Programming/Coding and 3D technology in extracurricular STEM education to achieve an engaging and effective learning in both fields. It can be used by teachers to design their own training, as well as by students who want to learn on their own.

Classroom Guide: Applying 3D Design, Printing and Programming in Learning Activities

This resource will provide guidance for teachers on organizing effective extracurricular STEM training focused on 3D design, printing and programming. It will provide help with building an effective learning environment, engaging students, and assessing their performance. It will also provide a structured guidance for teachers on how to develop new exercises and didactic materials for their students.



“The resources can be used by teachers to design their own training, as well as by students who want to learn on their own.”

Maker Schools Stakeholder Survey in Bulgaria

During February 2021, the Maker Schools project team in Bulgaria carried out an online survey to consult stakeholders about the project issues and planned outputs. More than 260 responses were received, 55% of which from students, 40% from teachers, and 5% from school administrators and directors. A remarkable 95% of the respondents suggested that the use of 3D technology at schools can improve learning. Although most of the respondents noted that their school does not avail of a 3D printer, the vast majority of them stated that they would be interested in participating in a training course focused on 3D technology (91% of the students, 93.2% of the teachers). There is a similarly keen interest in participating in a training focused on the application of programming languages in 3D design (74% of the students, 90% of the teachers). The results are all the more remarkable as the respondents are not necessarily experts in the STEM field.

Maker Schools Stakeholder Surveys in Turkey

In the period February-May 2021, an online survey was carried out in Turkey. Around 100 respondents were reached in both Mugla province and Manisa province, the majority of whom students. It is encouraging that a lot of teachers also provided feedback. Most of the respondents in Turkey have not participated in trainings on the MAKERS topics before and do not have access to 3D technology in their school. More than 75% do not know anything about 3D printing technologies. Yet there is clearly interest in the MAKERS topics, with more than 70% of the respondents stating that they would participate in training on 3D technology in the future. Most respondents suggest project-based learning and experiential learning as the most suitable forms of learning on the MAKERS topics. Collection of feedback is ongoing in Manisa province.

Maker Schools Stakeholder Survey in Greece

An online survey was organized in Greece in February 2021. There were 37 participants: 67% were teachers, 19% were school directors and 14% were experts on 3D technologies and programming. 70% stated that they do not have access to a 3D printer at school. 30% of the respondents are teachers with previous experience in 3D technologies from Crete and other regions of Greece interested in learning more and participating in new 3D projects. Regarding 3D software, 54% of the teachers have no previous experience and the rest are familiar with Tinkercad (30%), Autocad (12%) or other programs (14%). 78% of the respondents have had no experience with Python and 57% have had no experience with physical computing. It is encouraging that 97% of the participants stated that they are interested in participating in or organizing an extracurricular course on 3D technologies.

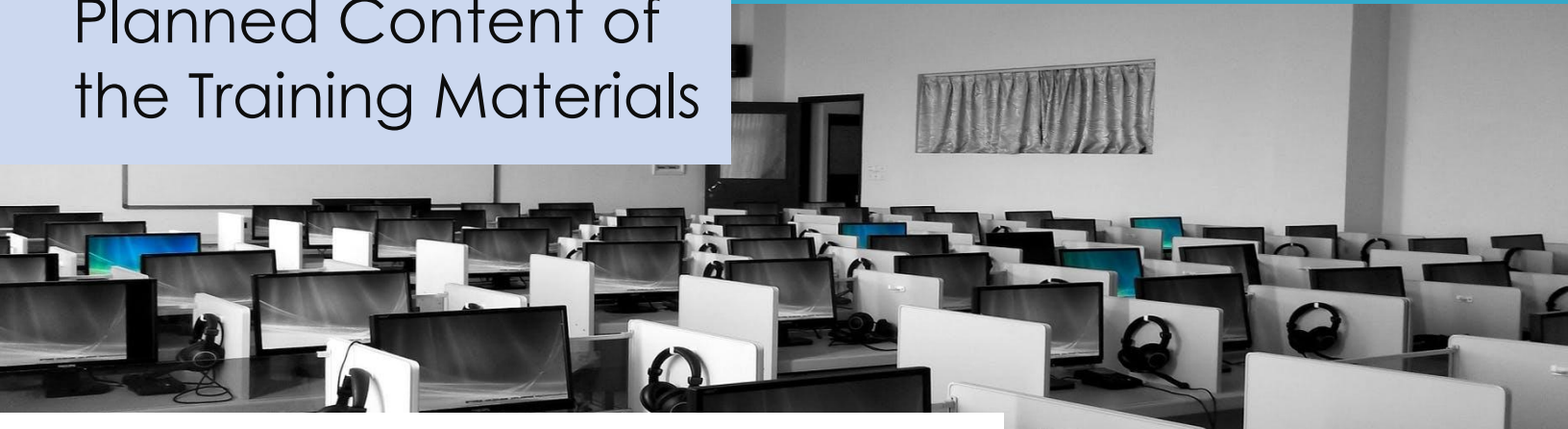
The bottom line: MAKER SCHOOLS topics are worth exploring

The survey results demonstrate the relevance of the MAKER SCHOOLS project in Bulgarian, Greek and Turkish schools. The planned outputs are likely to have substantial impact. They are also innovative in that there is currently insufficient knowledge and awareness of this technology and the existing software.

Among the school disciplines that the stakeholders believe would most benefit from the application of 3D design and printing are Mathematics, the Physical Sciences (Physics, Chemistry, Biology, Geography, Geology), Engineering, Computer Science/ Informatics, the Arts/Applied Arts and Architecture/Interior Design.



Planned Content of the Training Materials



Training Program: Introduction to 3D design and 3D printing

- Design of 3D Models Using Fusion 360
 - Main features of Fusion 360
 - Sketches as the basis in 3D modeling
 - Creating a 3D model
 - Editing a 3D model
 - Creating assembled joints – assemblies
 - Other features of Fusion 360
- Technologies, Materials and Applications of 3D Printing
 - 3D printing technologies
 - Materials used in 3D printing
 - Main stages in 3D modeling and printing
 - Software products for creating 3D models
 - Layer Separation Software (G-code conversion)

Training Program: Python for 3D printing and creative explorations of 3D models

Using Python to Enable Creative Exploration of 3D Models

- Introduction: Getting to know Micro:bit
- Measuring Time - First Steps in Python using Micro:bit. LEDs and Buttons.
- Fill the Screen - Wireless Communication among Micro:bit boards
- Battleship - Deepen your Knowledge in Python and Micro:bit
- Quiz Game – Advanced topics in Python with Micro:bit.
- Introduction to Raspberry PICO

Using Python for Procedural 3D Content Generation for 3D Printing

- OpenSCAD
- SolidPython: wrapper

Objectives of Training Program: Introduction to 3D design and 3D printing

- Support beginners in their first steps with 3D technology
- Provide step-by-step tutorials and sample hands-on exercises for applying the technology in the classroom.

Objectives of Training Program: Python for 3D printing and creative explorations of 3D models

Using Python to Enable Creative Exploration of 3D Models

- Support beginners in their first steps with Python
- Promote creativity – reuse 3D models in repositories with appropriate micro-controller/single board computer

Using Python for Procedural 3D Content Generation for 3D Printing

- Learn to use more advanced Python features
- Geometry modeling – link to mathematics

Stakeholder Event in Greece

The Maker Schools Stakeholder Workshop was organized by the Directorate of Secondary Education of Chania. It took place online on the 1st of March 2021. The event was also promoted by the school advisor of informatics (region of Crete).

40 secondary school teachers took part in the event – teachers with no experience in 3D Design and 3D printing, and teachers that have already implemented 3D projects and activities and need to further develop in this field. In Chania only one secondary school has experience in using 3D printers.

Nikos Anastasakis, head of the Laboratory Centre for Physical Sciences of Chania, presented projects ideas such as how 3D printing can be used to create objects that can be used in Physical Science Laboratories.

ManolisKiagias introduced physical computing and presented the new Raspberry Pi Pico, a new tiny and cheap microcontroller board that can be used in school physical computing projects.

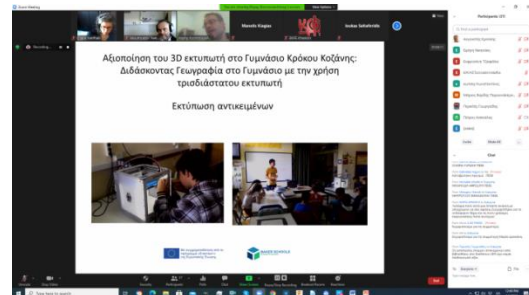
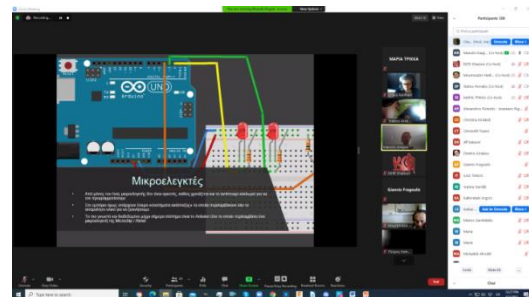
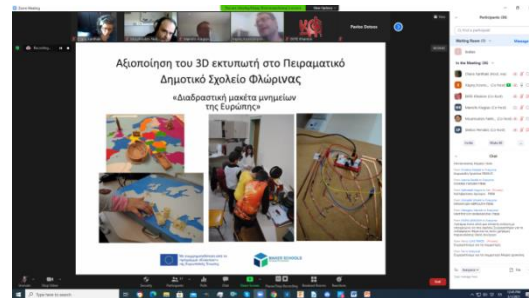
CharalambosKoutsourelakis presented a selection of school projects using 3D Design and 3D printing.

CharaXanthaki presented the MAKER SCHOOLS project (objectives, partnership and outputs). She presented three categories of school projects that could be supported by the MAKER SCHOOLS educational material and the technologies:

- 3D Design using software CAD tools such as Fusion360, Tinkercad
- 3D Design using a computer programming language such as Python, Openscad, Tinkercad
- 3D Design and physical computing such as Raspberry Pi Pico, Microbit.

She also explained how the MAKER SCHOOLS project is going to foster cooperation between schools, at the National and European level using the eTwinning platform. She presented the eTwinning platform and how to start a school cooperation using eTwinning.

The participating teachers showed strong interest in the MAKER SCHOOLS project. Many of them expressed interest in participating in a course introducing 3D design and 3D printing technologies before trying to do this in the classroom. Important feedback regarding the contents of the training program was collected.



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<https://makers-project.eu/>

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