

# 3D printing and creating – From users to makers



**Organising institution:** National Association of Educational Innovation and Inclusion in Schools (AENIE)

**Country:** Portugal

**Age:** 11-14 years old

**Key question:** How to use 3D printing and creating to develop computational thinking skills?

## **Objectives:**

The main goal of the general program for Digital Atelier is to help students develop computational thinking skills through 3D printing and creating

Other goals:

- to develop observation skills,
- to develop mathematical skills,
- to solve real life problems,
- to develop collaboration skills,
- to stimulate creativity and creation skills.

**Time:** 6 hours

## **Software and apps to be used:**

- Computational Thinking
- Abstract Thinking
- 3D printing
- 3D creating

**Brief presentation:** The main goal of this atelier will be to help students becoming creators by learning how to use TinkerCad platform and Simplify 3D software. As usual in our ateliers, students are going to be in the center of decisions since they are going to be the ones identifying the problems they want to solve. This way, the teacher will act only as a facilitator of the learning process.

1. The teacher will be in charge of stimulating their students motivation to learn as well as their curiosity.
2. The problems discussed can be related to students' daily life or something bigger that affects their city or region for example.
3. The students will work in groups of 3-4 elements in order to stimulate collaboration and the development of social skills. The teacher will help coordination and will guide the students through the different steps they will have to take.

## **Topics covered:**

- Computational Thinking
- Abstract Thinking
- Storytelling
- Writing skills

**Civic engagement:** Each classroom will work on subjects related to their own hometown. The limits to do this are only bound by the students' imagination. TinkerCad platform as well as Simplify 3D will be used in almost every task from the beginning until the end of the activities. They will learn how to create and improve their own objects. During those activities students and teachers will create documents/presentations reporting what happened and what they have learned.

#### **Materials needed:**

Computer/tablet to access TinkerCad platform and Simplify 3D software. There will be a short presentation of the materials in the beginning so the students learn the basics to operate alone

#### **Main inspirations taken from personal research:**

(using technology to help kids learn is essential nowadays; European Union is pushing technology into curricula more and more. 3D printing along with the maker movement is growing stronger day by day)

3D printing was invented in the late 20th century. By that time the process was expensive, took too long and left lots of waste material. It was not the best thing to do and it didn't offer a great answer to enhance creativity so it didn't fulfill most of the requirements to be used in a learning environment like a public school: cheap, open to everyone, user friendly, etc. More than ever, the process of learning making good use of the technology is being studied and applied. By using 3D printing and creating we are giving students the tools they need to face their daily life in the 21st century problems. We are giving them a possible answer to the problems each one of them face, something specific to their problems, not something somebody thought it would be good but far away from reality. This atelier is supposed to be something really close to those students' daily life, focused on their present needs.

**How do you plan to give voice to students to present or show their personal skills and knowledge?** Students are going to work in groups and each group is going to deliver a solution to one problem they have identified and wanted to solve. In the process they are going to learn how to create 3D objects and prepare them for printing.

The products each group will develop are going to allow us to prove what and how much they have learned.

**How do you collect information as the starting point of a Digital Atelier?** The recording of the process is going to be made by students and teachers. They can use videos, pictures and also some of the many steps they are going to walk through in the creation process. To understand how much each student knows about 3D printing and creating the teachers are going to ask them to perform a simple exercise on TinkerCad. Each teacher will write their own notes on this and use them later to understand the process of development that occurred to each student/group of students.

#### **Introducing students to the key question - the research begins:**

- First step will be to show them how a 3D object looks like in TinkerCad.
- Then we are going to walk them through a short tutorial.
- After that we are going to give them time to discuss which problem they want to try to solve.

#### **Experimental phase**

1. Action that unfolds the practical activity to clarify the question (experimental phase):
2. Active work of the students

3. Presentation of findings and results (visualisation of information): Model and step-by-step presentations, videos, pictures, talk about what was done and the difficulties they found along the process.
4. Analysis of results

### **Project/design phase - part 1**

1. Second action that unfolds the practical activity (project/design phase)
2. Active work of the students: Then they will be given time to create their solution on TinkerCad. When the solution is finally created they are going to learn how to prepare the .obj or .stl files on Simplify 3D. When they finish this phase they'll be ready to move on to the last phase of the atelier.
3. Presentation of findings and results (visualisation of information): Findings can be presented making use of Microsoft PowerPoint or other app on tablets.
4. Analysis of results:

### **Project/design phase - part 2**

1. Third action that unfolds the practical activity (project/design phase): When they learn how to use the TinkerCad platform they will be ready to learn how slicing works on Simplify 3D and how to prepare the object for printing.
2. Active work of the students: The last part of the digital atelier can be done altogether in the school computer room so everybody will be able to see the projects and learn with their colleagues. Here the students are going to tell their colleagues what was the problem they identified, how they found a solution to solve it and in what that solution consists/what it is (by showing the object they've created).
3. Presentation of findings and results (visualisation of information): Findings can be presented making use of Microsoft PowerPoint or other app on the tablets.
4. Analysis of results:

**Approach to a new software or a new app:** As the activity is developed the students will understand how important it is to be able to make proper use of 3D printing and creating skills to help them with their daily life problems.

3D printing and creating is something that's seeing a growth worldwide. Learning how to do it can be really useful in general but also to find a job in 7-12 years.

**Links between the Digital Atelier and real life of the students:** Every job nowadays uses technology. 3D printing and creating is being used more and more and students must learn how to use it to solve their daily life problems. Knowing how to create an object they need and can't find anywhere is something amazing. That's something unique and potentially lifechanging.

**How do you plan to evaluate knowledge and skills?** The evaluation process will be done by utilizing students' and teachers' own records and registries. Self-assessment will of course be really important.

**Conclusion:** This project is going to be developed by and with students and teachers. Students and teacher are going to be in the center of the activity and are responsible for recording the process steps in video and pictures but also to find a way of presenting the products of this digital atelier. Learning how to create and print things is something really important nowadays. It doesn't really matter to solely learn how to count and read. One must know what to do with it, how to use it, where it matters in real life. This is a great opportunity to cross official curricula with daily life learning.

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