

# Taking a Learney Journey on the STEAM Train

## LTTA: SHORT-TERM STAFF TRAINING EVENTS

### "Thinking outside the box"

#### -training material-

#### **CONTENT**

15 guest, 3 host teachers will learn on how to use a modern approach to sciences focusing on solving problems with critical thinking and analytical skills. By adding the elements of art to STEM based thinking, educators enable students to use both sides of their brain to develop the best thinkers of tomorrow.

Course led by school's ICT/art teachers, Mrs. Laura Ene. Acquired competences to be validated on Europass Mobility Certificates

#### **METHODOLOGY**

- teamwork
- web 2.0 tools
- Project Based Learning
- hands-on/experiential learning,
- problem solving

#### **EXPECTED RESULTS**

a. Tangible

\*6 educational activities based on STEAM focused on Arts in English and translated in 5 other tongue (BG,HR,IT,RO, TK)

\*1 lesson plan based on STEAM focusing on Arts in English and translated in 5 other tongue (BG,HR,IT,RO, TK)

\*1 padlet with teachers work results

b.Intangible

\*developed skills of participating teachers

\*improved approach of teaching by involving STEAM study engaged, relevant, and connected to the real world

\*new competences, transforming them in design-thinkers and skillful communicators

#### **STEM vs.STEAM**

Overview of the apps

web 2.0 tools

\*3D Designing Tools

a. Printing 3D from our sketches

- <http://www.sketchup.com/>
- <https://www.tinkercad.com/>

b. Virtual tours, music/collaboration tools. Workshops on

- <https://www.bandlab.com/> <https://drumbit.app/>
- <http://www.vtility.net/> - virtual tour
- <http://www.makevt.com/> - virtual tour
- <http://graasp.eu/> Communicate, Collaborate, Build Engaging Learning Experiences

Geometric Art in nature/ human products

- Visits - Botanical garden/Museum of Contemporary Art
- Geometric Art - Bucharest
- Using Geometric Art in Industry (textile, furniture, publishing etc)
- Making Geometrical art products - flexagons origami-like puzzles <http://loki3.com/flex/index.html>

Programing Geometric Art

- Making geometric line art - simple drawing using pencil and colour expression and tools Bomomo, Happydaric, Thisissand, Weavesilk

- <http://bomomo.com/>
- <http://www.happydaric.com/lite-brite/>
- <http://thisissand.com/>
- <http://weavesilk.com/>
- Basic steps in programming language LOGO: from beginning to Geometrical Art

Creating Lesson Plans, Learning scenarios, and educational activities

Uploading materials on TwinSpace

Reflection of work. Evaluation of satisfaction. Certificates

## STEM vs. STEAM

Technology is driving transformation and innovation in all aspects of our lives. It is our duty, as educators, to keep up with it, so our students will benefit from it.

Computers, smartphones, and AI became part of our existence. The modern technology helped improve our education, daily activities, and much more. However, there remain certain soft skills a computer simply cannot replicate in the workplace: teamwork, cooperation, creativity and adaptation to change, emotions, etc. For the jobs of the future, “Proficiency in the arts will be particularly important to engineers and computer scientists in emerging industries, such as themed experiences, gaming, and simulation and training,” explains Ali P. Gordon, Ph.D., an associate professor in mechanical and aerospace engineering at the University of Central Florida. “Programmers and engineers are increasingly teamed up with artists to co-develop software, products, renderings and more.”

As a result, education professionals have developed the acronym STEAM (science, technology, engineering, art and math), leading many to assess STEM vs. STEAM, their merits, and their application in the professional sphere.

### What Is STEM?

**STEM-focused curricula aim to equip professionals with the skills and knowledge necessary to compete in a global economy across the disciplines of science, technology, engineering and math, as well as subspecialties such as statistics, biology, psychology, economics, agriculture and aeronautics.**

While STEM jobs contribute to advancing the economy through innovation, rapid technological changes continually create demand for new jobs within the STEM field, making some previously required skills and tasks obsolete. As such, STEM represents a dynamic set of fields, and it is important for students to gain subject-matter knowledge while also developing the flexibility and well-roundedness needed to adapt to changes as they occur.

### What Is STEAM?

These changes, as well as the growing emphasis on soft skills across industries and roles, are creating the need for curricula that integrate **STEM with the arts**. According to The Conversation, creative skills and knowledge of the arts, such as design, writing and history, help STEM employees solve problems in more innovative ways.

By integrating the arts into STEM, **STEAM-focused curricula incorporate the study of the humanities, language arts, dance, drama, music, visual arts, design, new media and more**. The 2019 LinkedIn report notes that creativity, persuasion and collaboration are the top three skills companies seek in prospective employees.

## What Is the Difference Between STEM and STEAM?

When looking at STEM vs. STEAM, the difference lies in the way they approach scientific concepts. STEM focuses explicitly on the hard scientific, technological, engineering or mathematical skills to drive progress or create a new concept. In STEAM curricula, per The Conversation, students leverage both hard and soft skills to solve problems.

For example, STEAM encourages collaboration to understand a STEM concept. By integrating concepts and practices of the arts, STEAM uses tools such as data visualization or fine art imagery to deepen one's understanding of science, math and technology. It is a out-of-the-box thinking is that leads to create new products using 3D printers or distill complicated data sets into easy-to-understand formats, such as infographics.

Digital STEAM. Teaching integrated science, arts and mathematics with digital devices focuses on pedagogical use of tablets in STEAM lessons, both in-class, science museum and outdoors settings.

This LTTA for teachers covers: apps covering different content and activities to support learning, communication and self-assessment, best practice approaches and practical examples for using mobile devices, tablets, laptops, and PCs in lessons and education, responsible and safe use of digital devices and new media, creating interactive materials for classroom use, designing, planning and writing sample units of work or lesson plans that deploy the digital devices and more.

- web 2.0 tools: 3D Designing Tools. Printing 3D. Virtual tours, music/collaboration tools
- Communicate, Collaborate, Build Engaging Learning Experiences
- Geometric Art in nature/ human products
- Using Geometric Art in Industry (textile, furniture, publishing etc). Making Geometrical art products
- Programming Geometric Art. Basic steps in programming language LOGO.

**The added value** of this training is that it offers app search/store possibilities, experience in the tablet/apps use exchange, innovation in methods and approaches while using the m-devices, and implementation of them into daily activities in teaching and learning.

The training event **methodology** - creating an output by working individually or in groups on a concrete product to be used in your own school, such as creating lesson plans, learning scenarios, and educational activities.

## Responsible and safe use of digital devices and new media

### - Brainstorming

# Basic steps in programming language LOGO: from beginning to Geometrical Art

## How to program geometrical art in programming language LOGO?

### BASIC

FD – forward

BK – backward

RT – right

LT – left

CS – clear screen

With each command must be number written, e.g. RT 90.

Example 1:

FD 50 RT 90

FD 50 RT 90

FD 50 RT 90

FD 50 RT 90

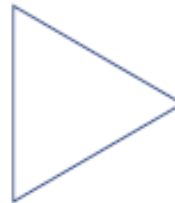


Example 2:

FD 50 RT 120

FD 50 RT 120

FD 50 RT 120



Example 3:

FD 50 RT 60

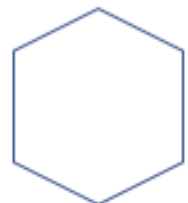
FD 50 RT 60

FD 50 RT 60

FD 50 RT 60

FD 50 RT 60

FD 50 RT 60



Turn left or right in regular shapes:  $360/\text{number of corners}$

Easier programming regular shapes with loop REPEAT:

Example 4: REPEAT 4[FD 50 RT 90]

– write it in Edall: TO SHAPE :N :D

CS

REPEAT :N[FD :D RT 360/:N]

END

- after File - Save and Exit run program with numbers :N (how many corner shape has) and :D (how long side of shape is) e.g. Shape 5 75

- try few times with different numbers

### EASY GEOMETRICAL ART

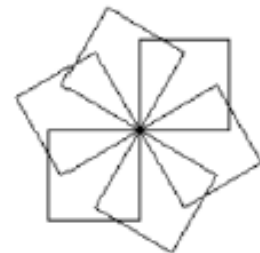
Task 1: Make a program according to rules:

- name of the program is ART1

- the basic shape is a square with side long 50

- there are a total of 6 squares properly arranged in a circle

- the squares touch at one common point, the starting point of the drawing



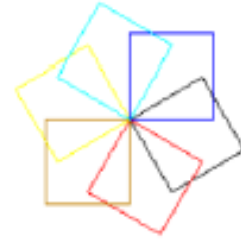
Solution:

```
TO ART1
```

```
CS
```

```
REPEAT 6[REPEAT 4[FD 50 RT 90] RT 360/6]
```

```
END
```



Task 2: Add some colour

- use command SETPC RANDOM number

- add this command in your ART1 program

```
TO ART1
```

```
CS
```

```
REPEAT 6[SETPC RANDOM 10 REPEAT 4[FD 50 RT 90] RT 360/6]
```

```
END
```

Task 3: BE CREATIVE 😊

- implement what have you learned and make beautiful creative geometrical art

Suggestions:

- use Example 4

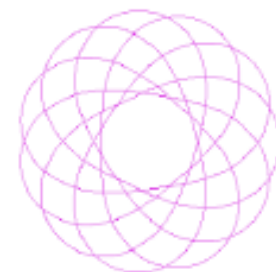
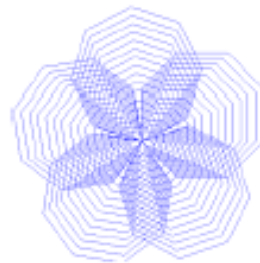
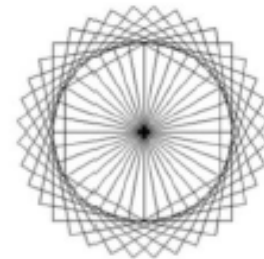
- use random colour

- use different number of shapes

- try to move shape before rotating it

- if you wish to add some circles, command is CIRCLE number

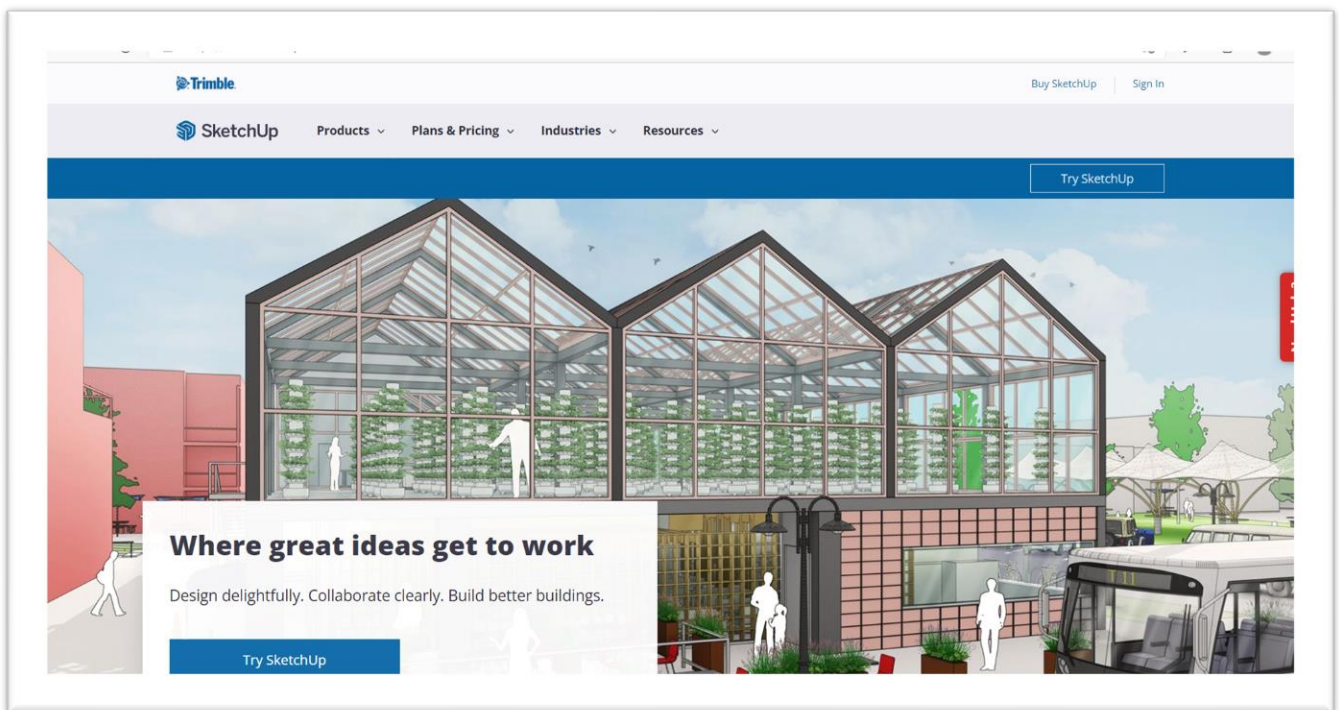
- upload best drawing you can into a Padlet



Try some examples from: <http://www.mathcats.com/gallery/15wordcontest.html>

# web 2.0 tools: 3D Designing Tools

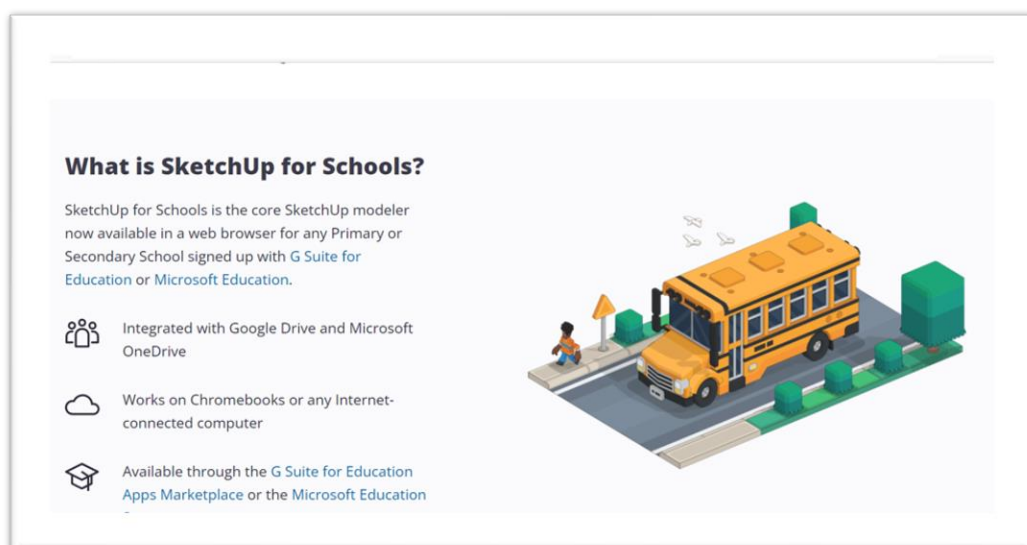
<http://www.sketchup.com/>



**SketchUp** is a 3D modeling computer program for a broad range of drawing and design applications- including architectural, interior design, industrial and product design, landscape architecture, civil and mechanical engineering, theater, film and video game development.

The program includes drawing layout functionality, surface rendering in different "styles", enables placement of its models within Google Earth.

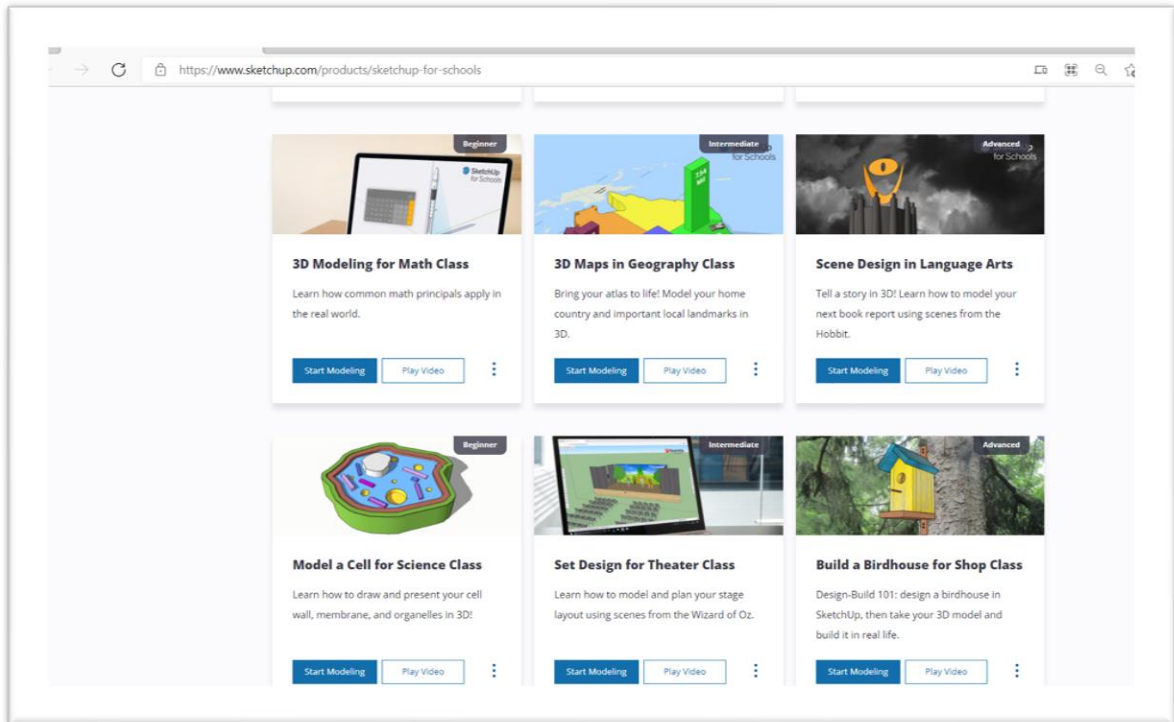
<https://www.sketchup.com/products/sketchup-for-schools>



The platform offers **3D for printing** from its sketches for different levels (beginner, intermediate or advanced). Here are some videos:

[Printing from SketchUp - Square One - YouTube](#)

[3D Modeling for Geometry Class \(Beginner\) - YouTube](#)

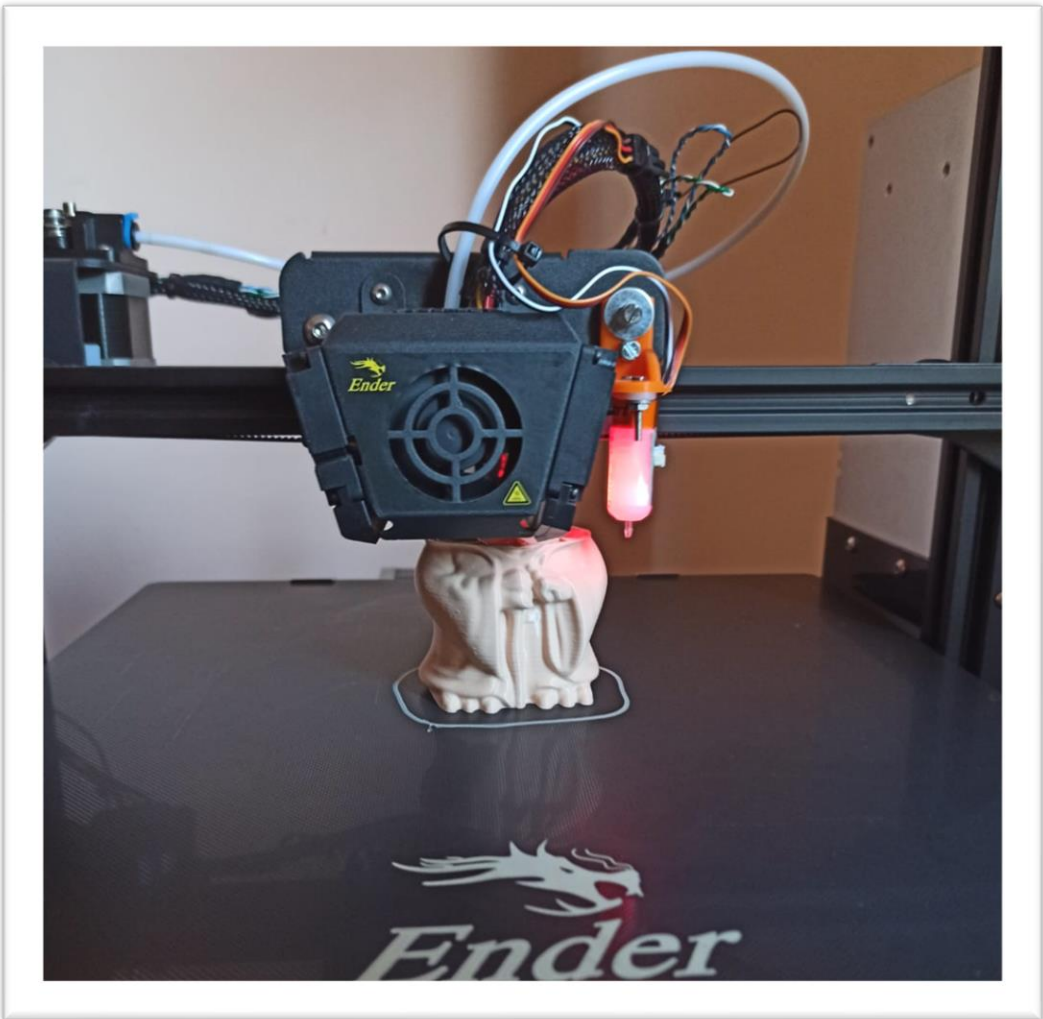
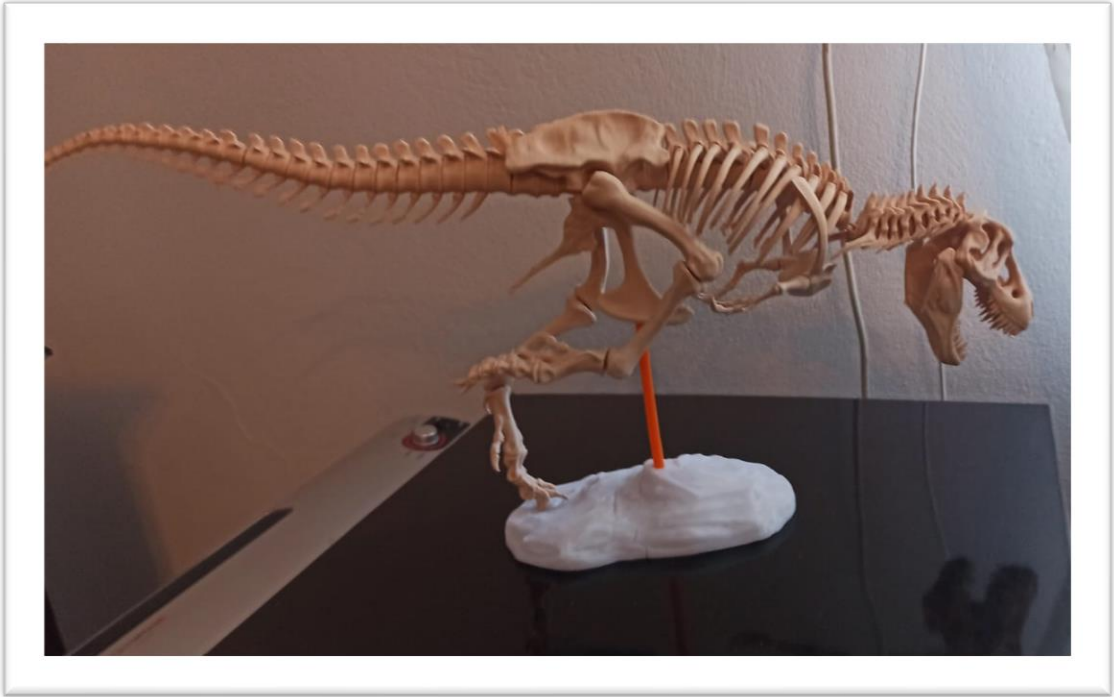


To start modelling, you will need to install the program.

There are also communities <https://blog.sketchup.com/> and <https://forums.sketchup.com/c/developers/12> to discuss your ideas.







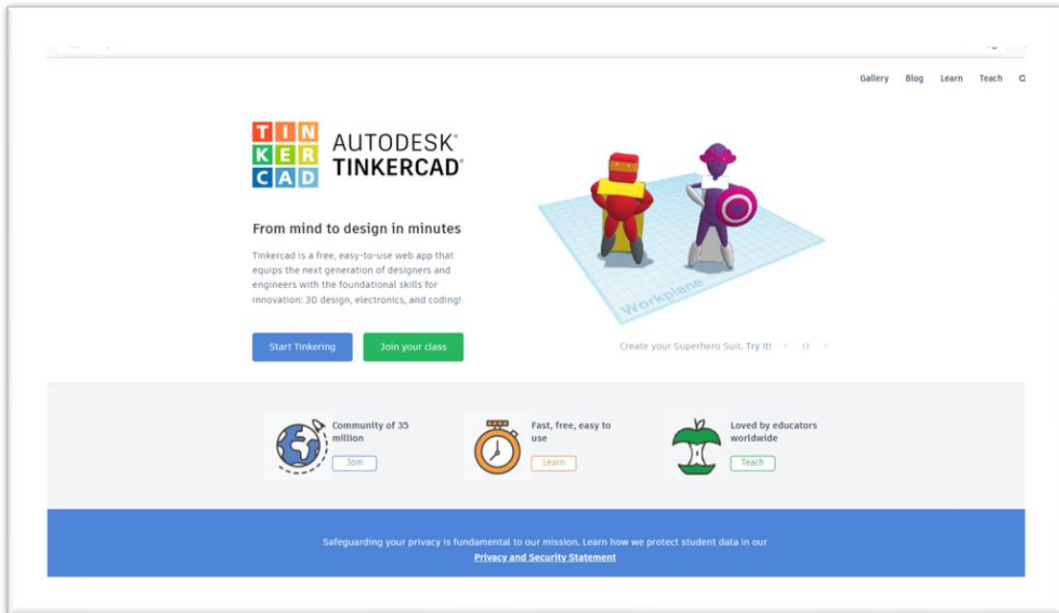




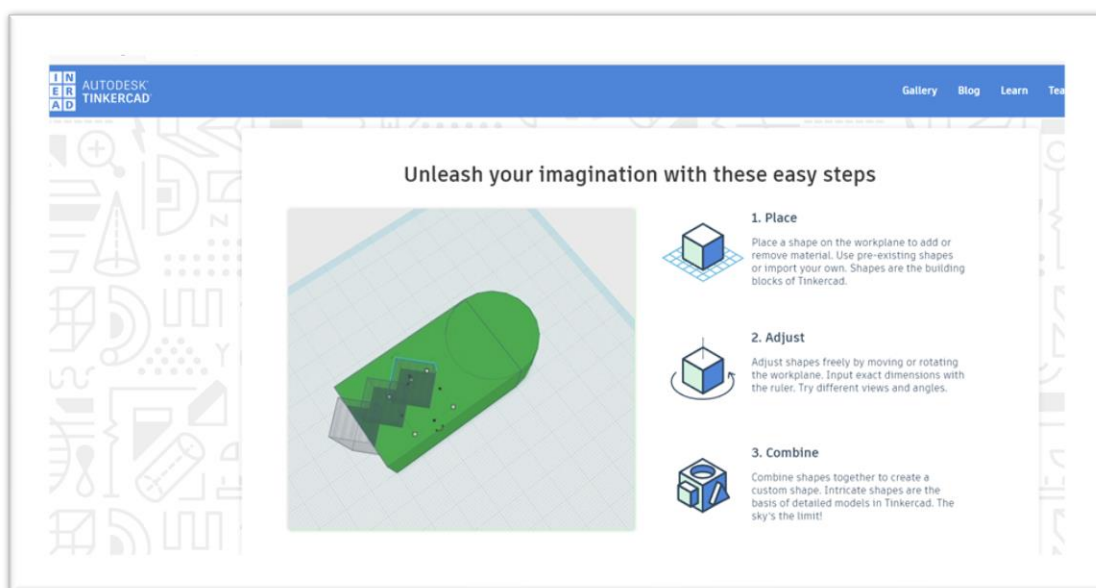
# TINKERCAD

<https://www.tinkercad.com/>

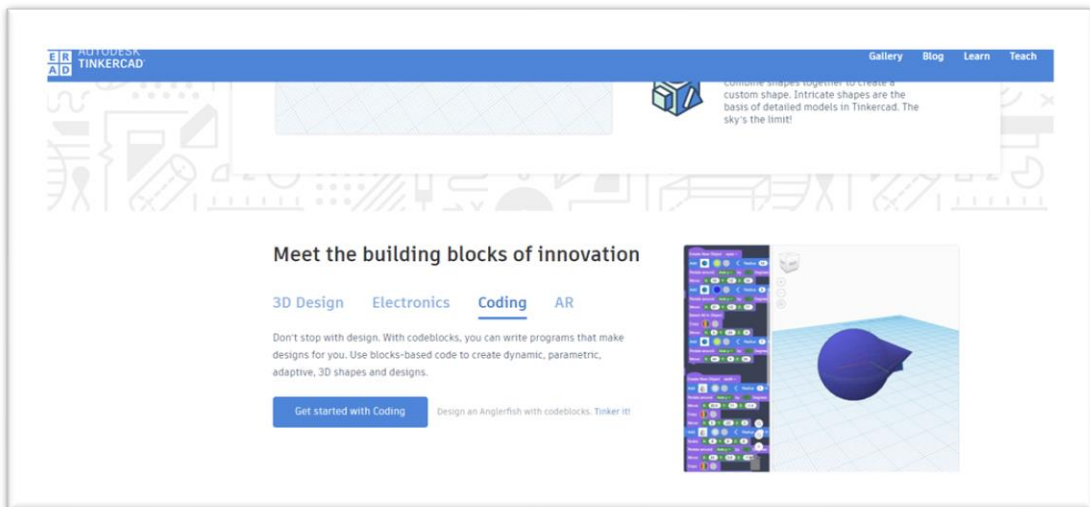
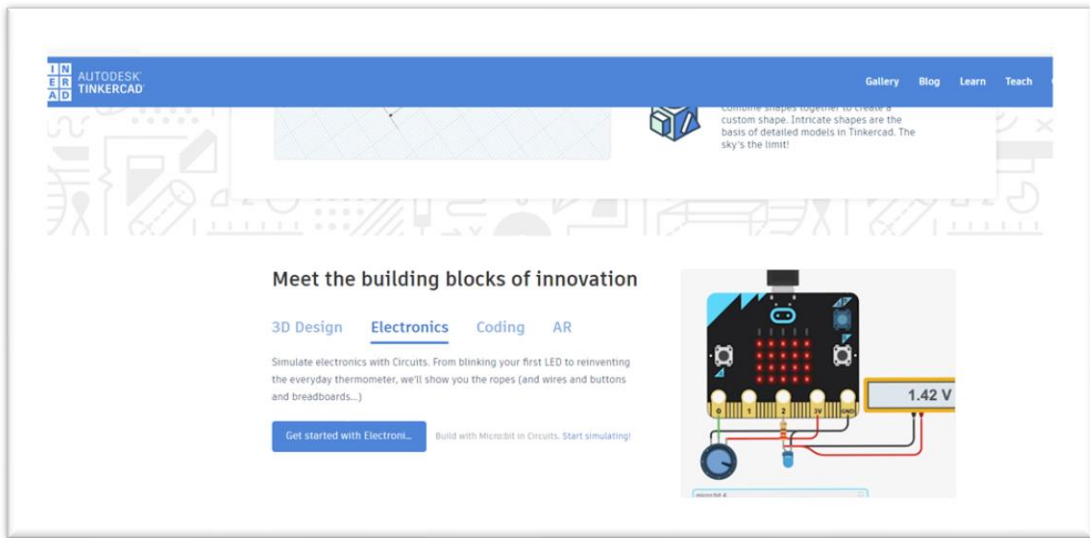
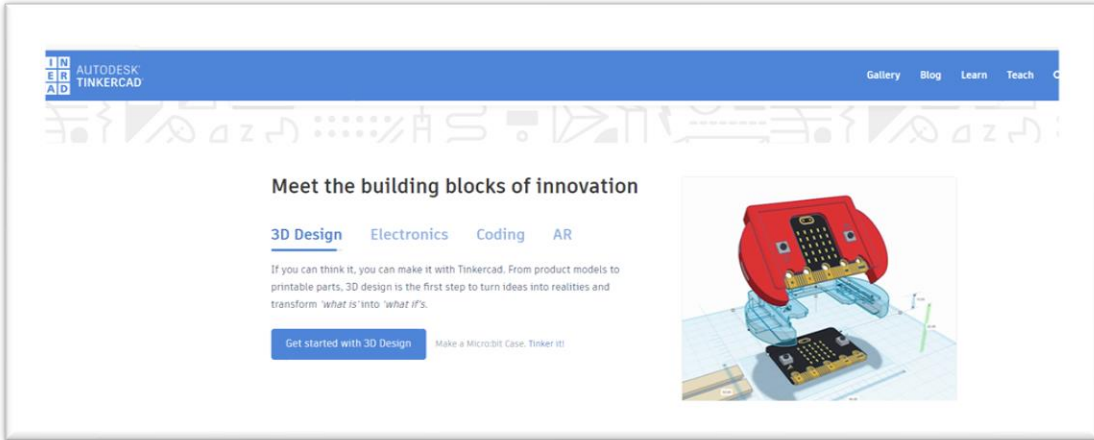
Tinkercad is a free, easy-to-use web app that equips the next generation of designers and engineers with the foundational skills for innovation: 3D design, electronics, and coding.

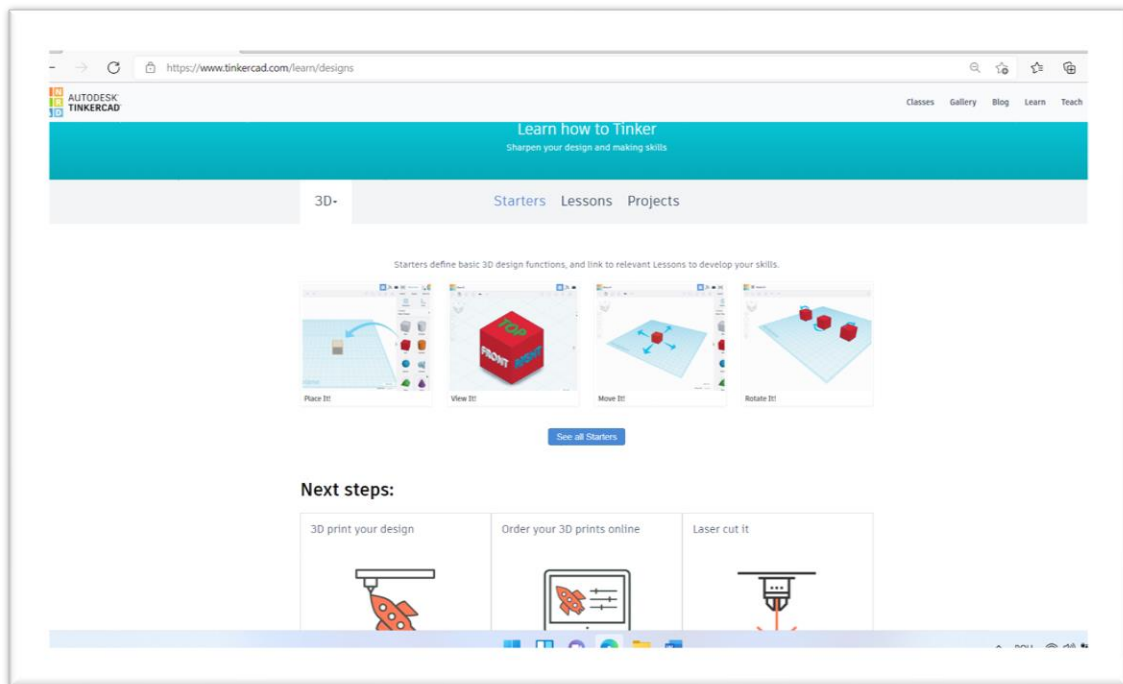
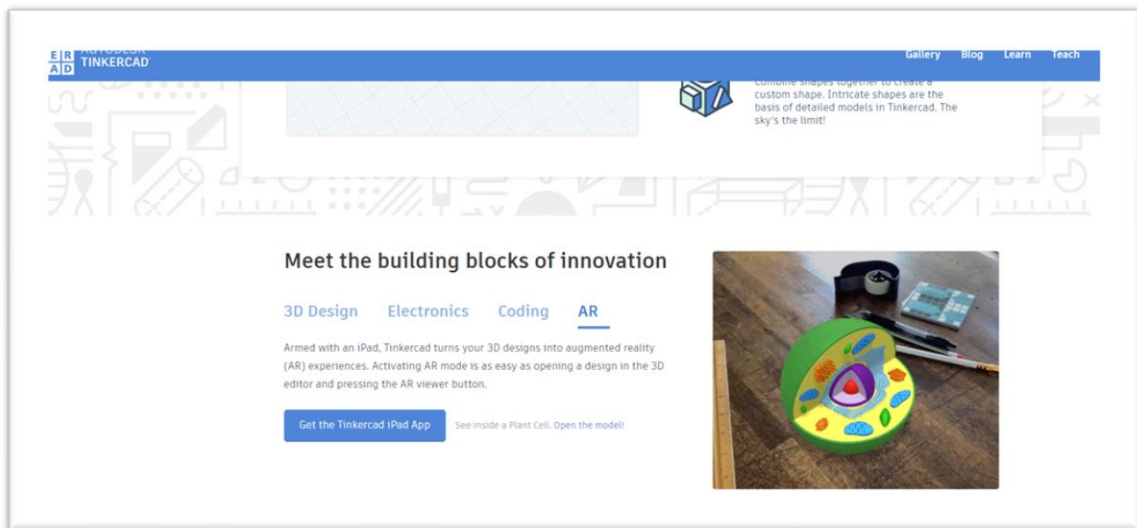


Tinkercad is a free-of-charge, online 3D modeling program that runs in a web browser. Since it became available in 2011 it has become a popular platform for creating models for 3D printing as well as an entry-level introduction to constructive solid geometry in schools.



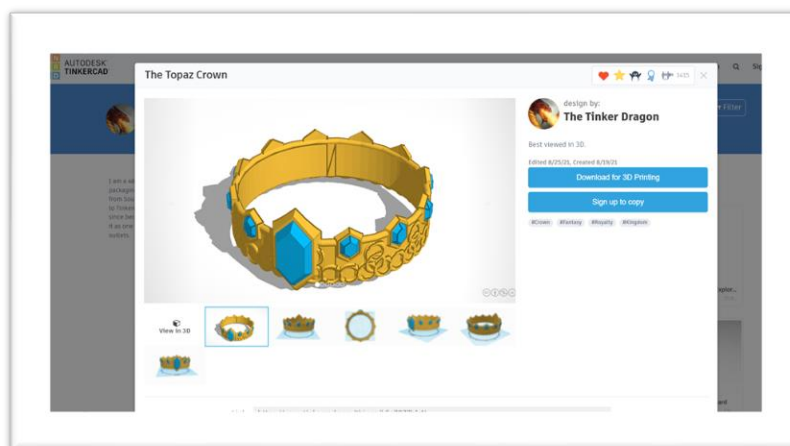
Tinkercad uses a simplified constructive solid geometry method of constructing models. A design is made up of primitive shapes that are either "solid" or "hole". Combining solids and holes together, new shapes can be created, which in turn can be assigned the property of solid or hole. In addition to the standard library of primitive shapes, a user can create custom shape generators using a built-in JavaScript editor.





It offers free 3D Printing samples.

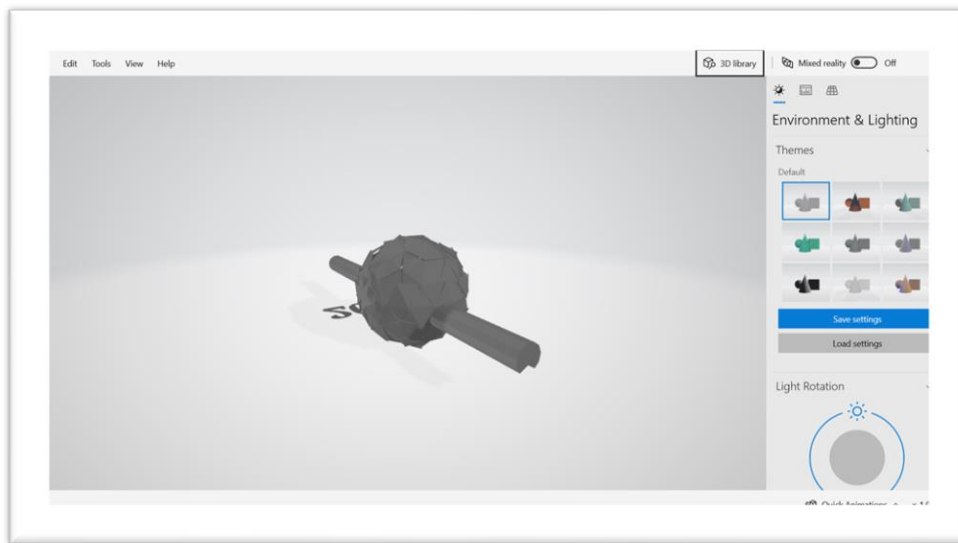
Shapes can be imported in three formats: STL and OBJ for 3D, and 2-dimensional SVG shapes for extruding into 3D shapes. Tinkercad exports models in STL or OBJ formats, ready for 3D printing.



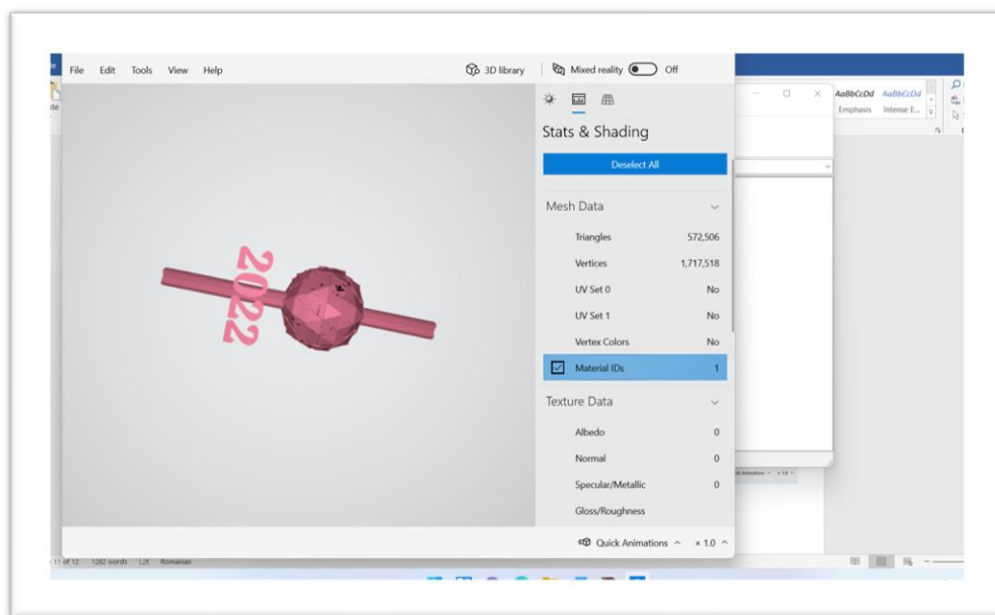
To download the 3D printing, you need to create an account.

<https://www.tinkercad.com/things/38GPH8eL3sP>

Press the button Donload for 3D Printing. An archive will be downloaded, it a file obj.mtl (you need to install .mtl previously ), and a 3D Object file tinkercad.obj opened by the help of 3D Viewer. You can edit it, then use it.



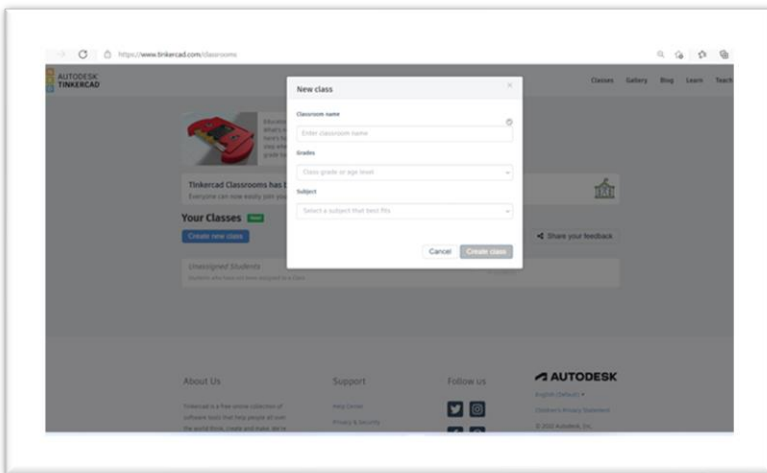
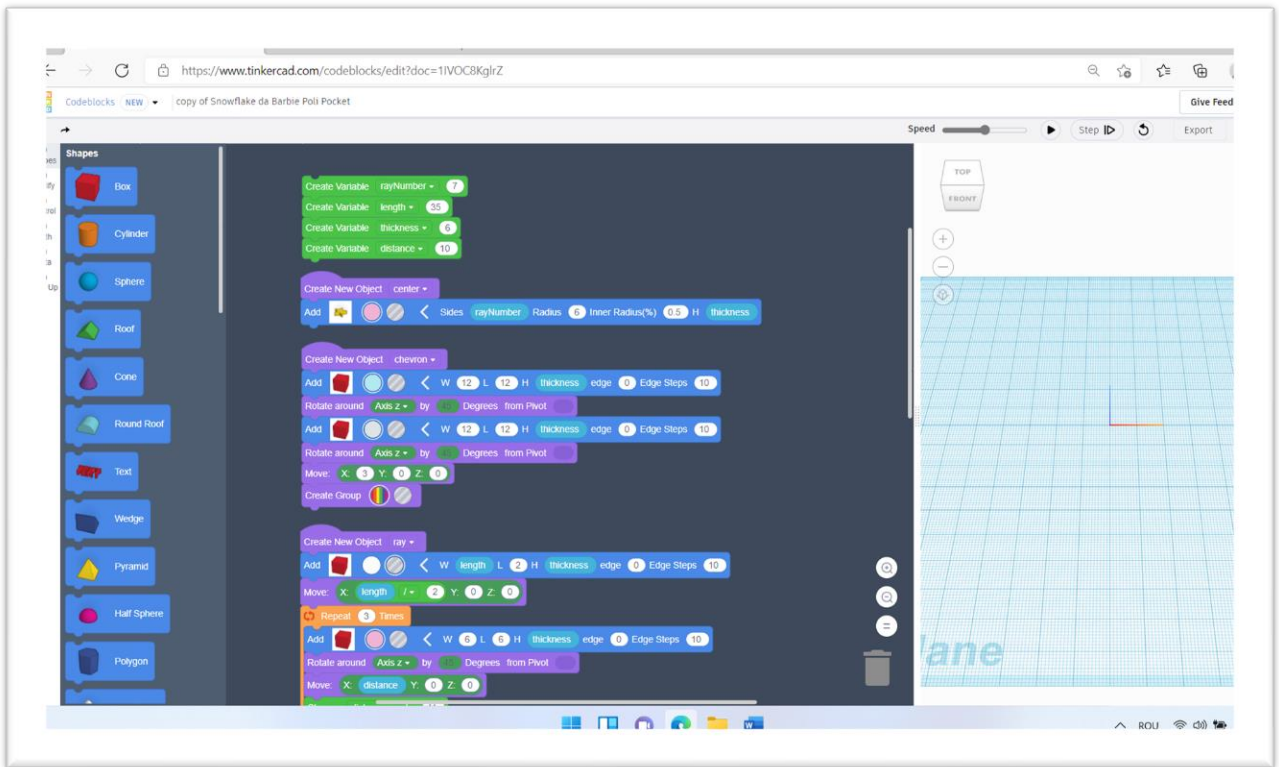
Tinkercad also includes a feature to export 3D models to Minecraft Java Edition, and also offers the ability to design structures using Lego bricks.



It offers free coding samples:

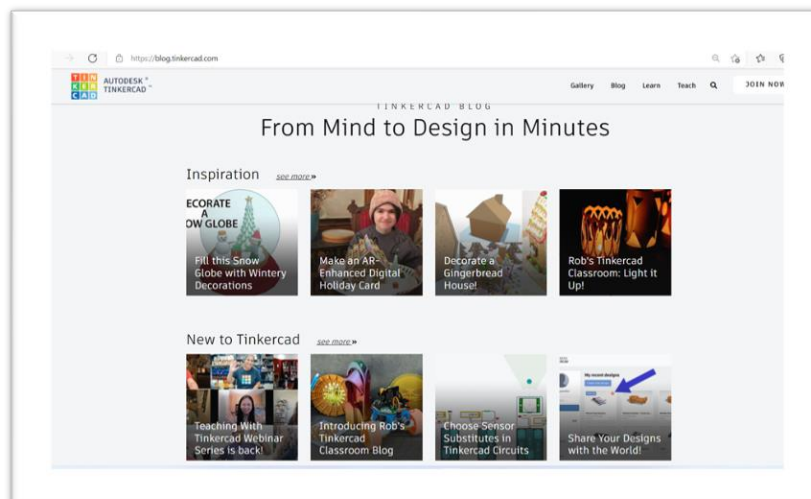
SNOWFLAKE <https://www.tinkercad.com/codeblocks/gCyyP4FV36E-snowflake-da-barbie-poli-pocket>

<https://www.tinkercad.com/codeblocks/edit?doc=1IVOC8KglrZ>



You can create your class

When needed, it offers support <https://blog.tinkercad.com/>



# LESSON PLANS & LEARNING ACTIVITIES:

## Start Simulating

Let's learn how to test a circuit design with the simulator!

Click the Start Simulation Button

### Instructions

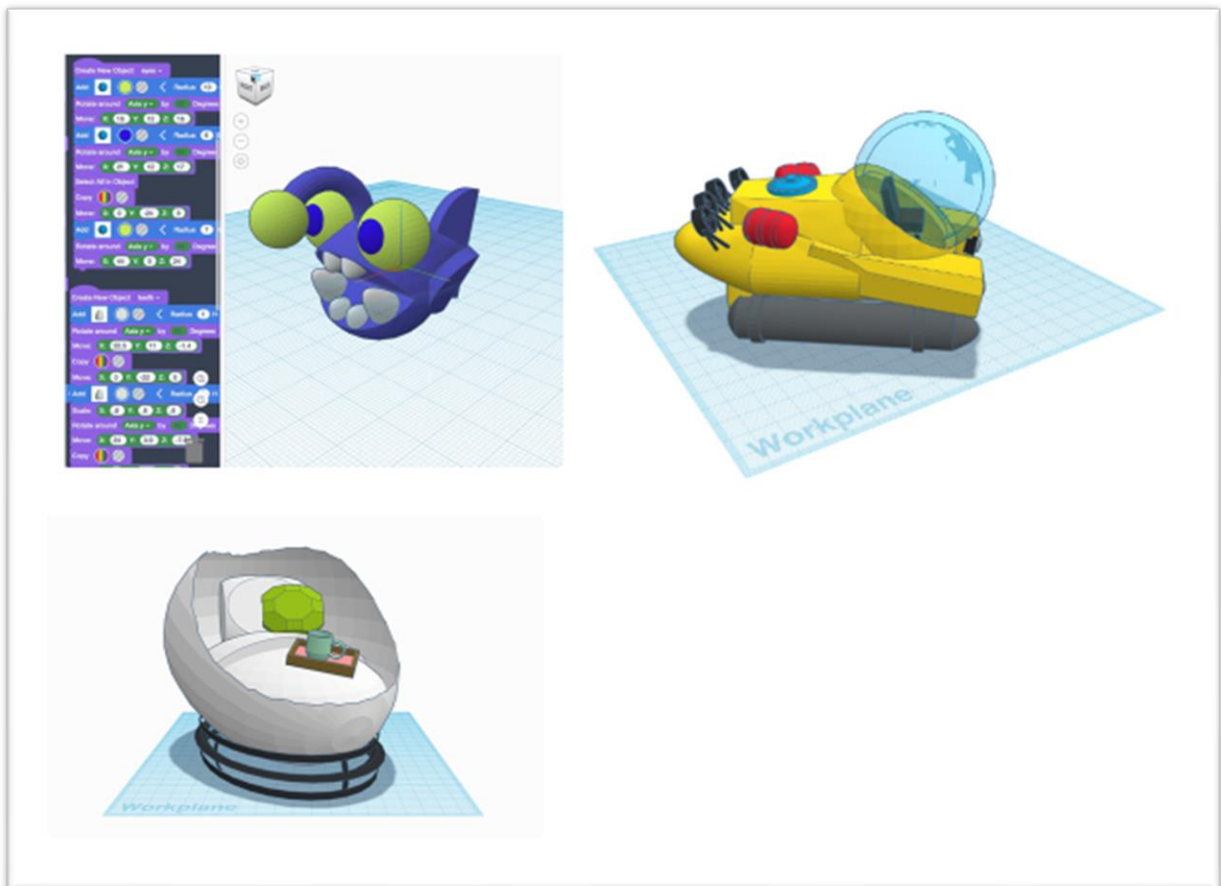
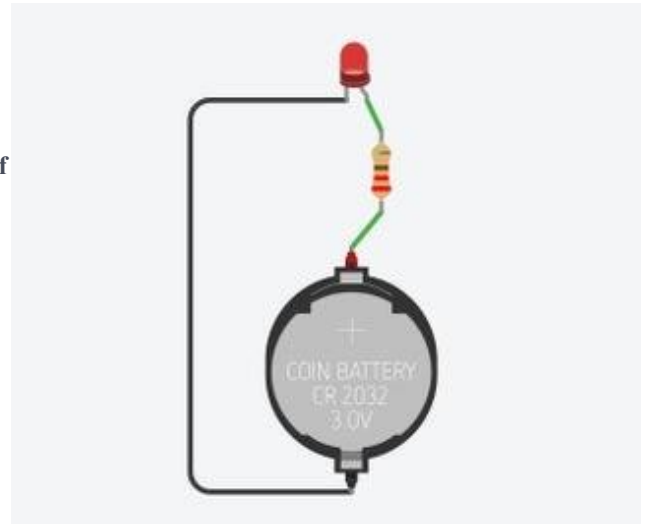
1. Click on the Start simulator button located at the right of the toolbar.
2. Continue to the next step

▶ Start Simulation



Congratulations - you simulated your first circuit!

- Use the simulator to test your circuit design at any time.
  - If you want to simulate other pre-made designs, check out the Starter Circuits, which you can find by clicking the "+ Components" button and then selecting the "Starters" tab.
- Continue onto the next lesson to learn how to edit component properties in Circuits.



Tinkercad Learning example:

CREATE YOUR OWN AVATAR <https://lessonplan.prd.tinkercad.com/assets/2021-04-29T16/edc72c23.pdf>



# APPS TO CREATE ONLINE MUSIC



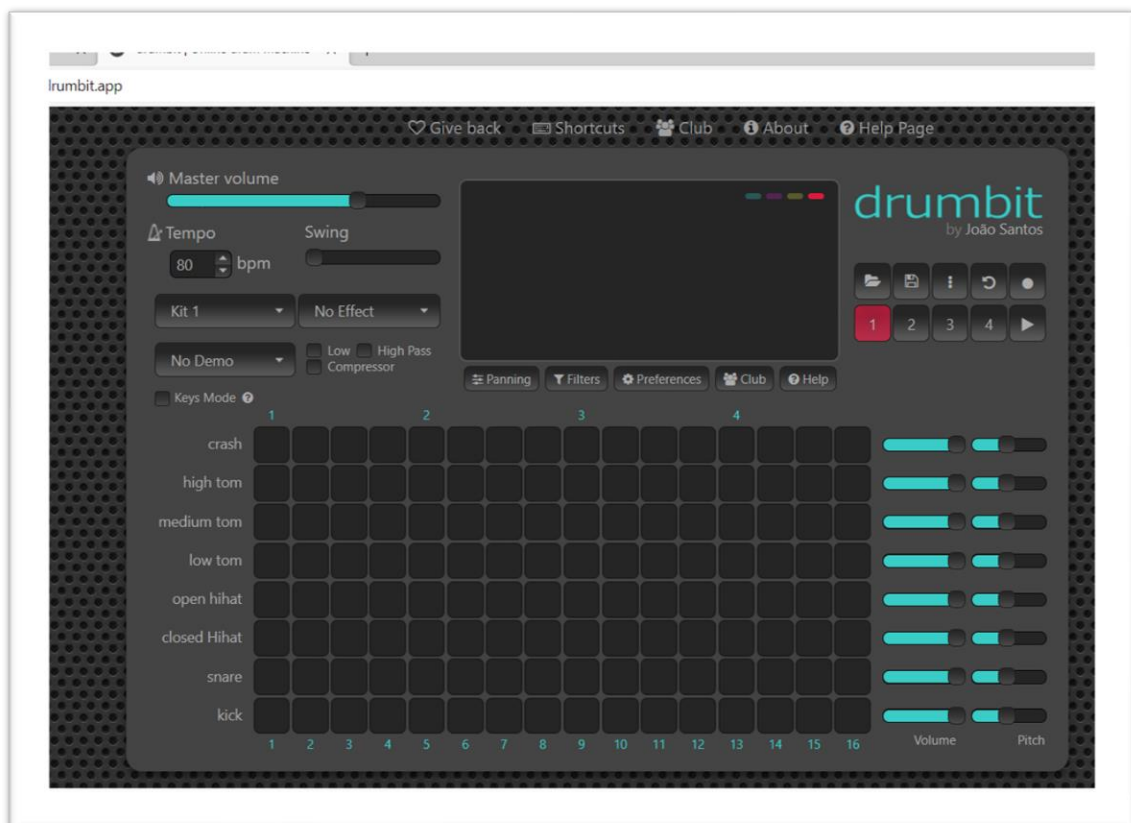
<https://drumbit.app/>

A very easy to use drum machine

It is a web based drum machine, made with HTML5 and it is compatible with all modern browsers. It aims to be a very easy to use drum machine, offering means to put together a drum beat very quickly and in a very intuitive way.

With drumbit you can choose from various drum kits, apply filters and room effects, change individual volume and pitch of the samples in a track and control the left-right distribution through panning. When you're done creating your amazing drum pattern you can save it for later editing or record it as an audio file.

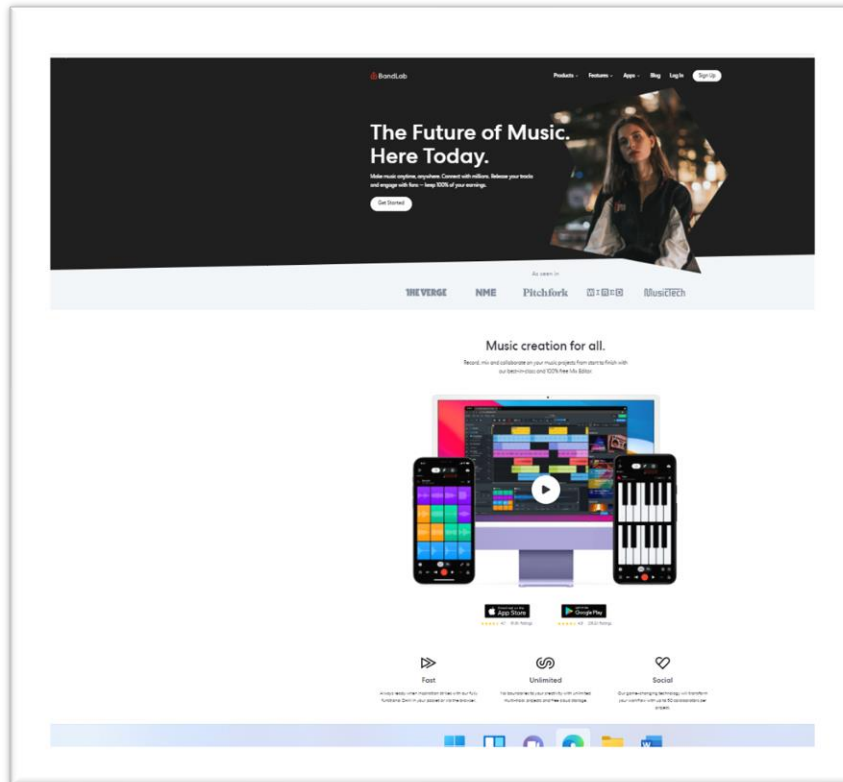
You can share your patterns with other users on drumbit Club, join the drumbit Facebook Group or get news about the latest developments of drumbit subscribing the Newsletter.



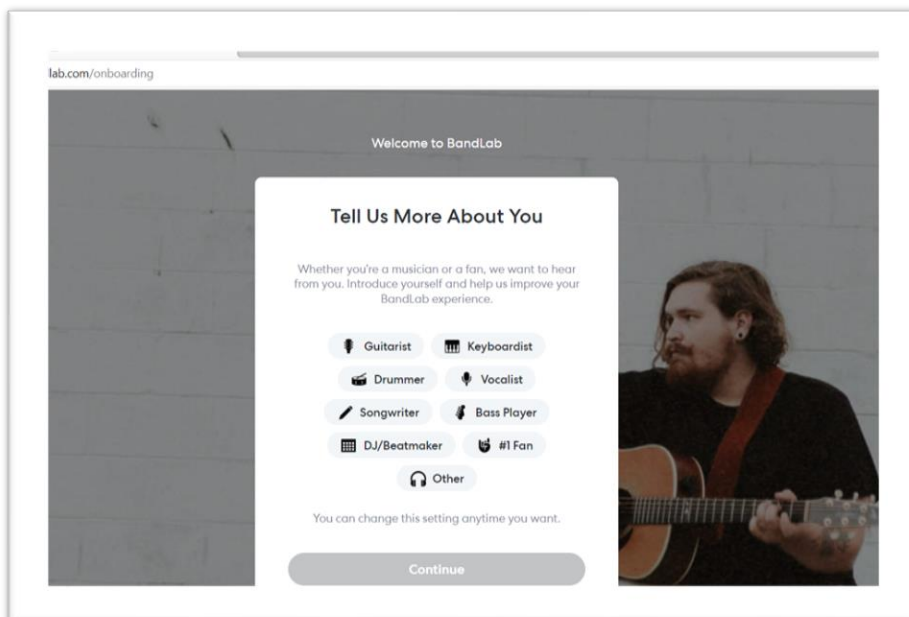


<https://www.bandlab.com/>

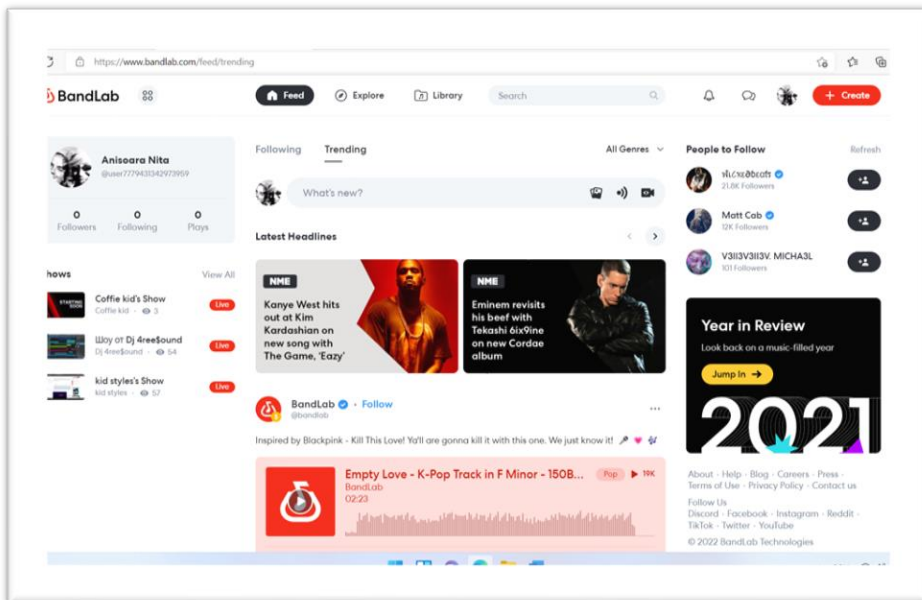
BandLab – a free online Cloud Digital Audio Workstation (DAW) tool for creating music and collaborating with other musicians. It works in a browser or with a standalone app.[21] Bandlab includes BandLab Albums, a digital distribution tool for musicians, allowing them to also create exclusive content for listeners such as demo tracks and behind-the-scenes videos. The tool also includes BandLab Live, a livestreaming feature.



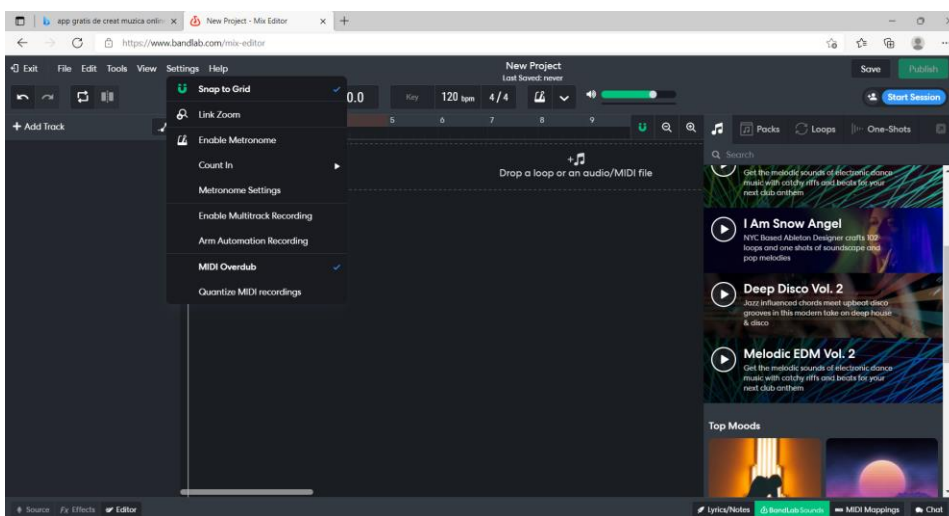
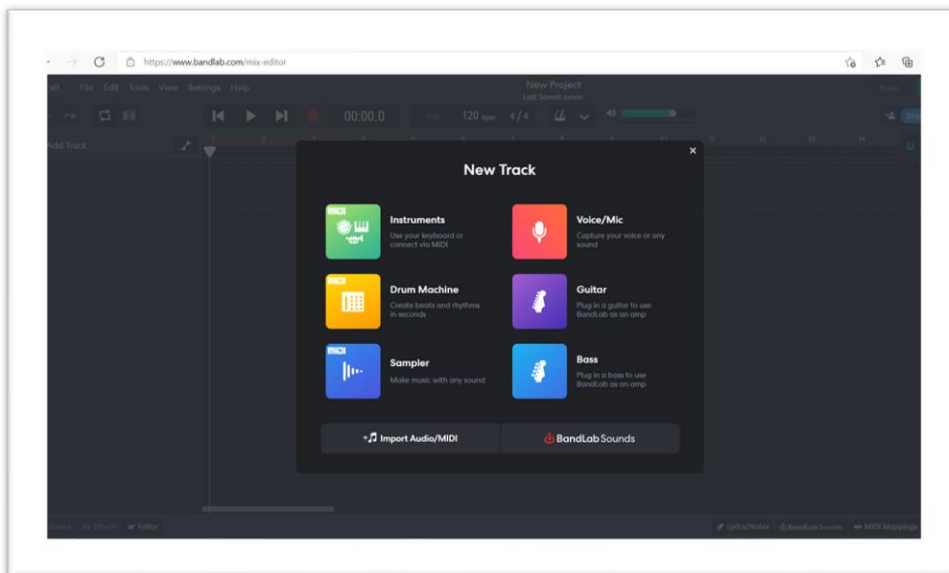
Create an account. Follow the easy steps. Create your music.



Click the red button **+Create**



Choose New Track



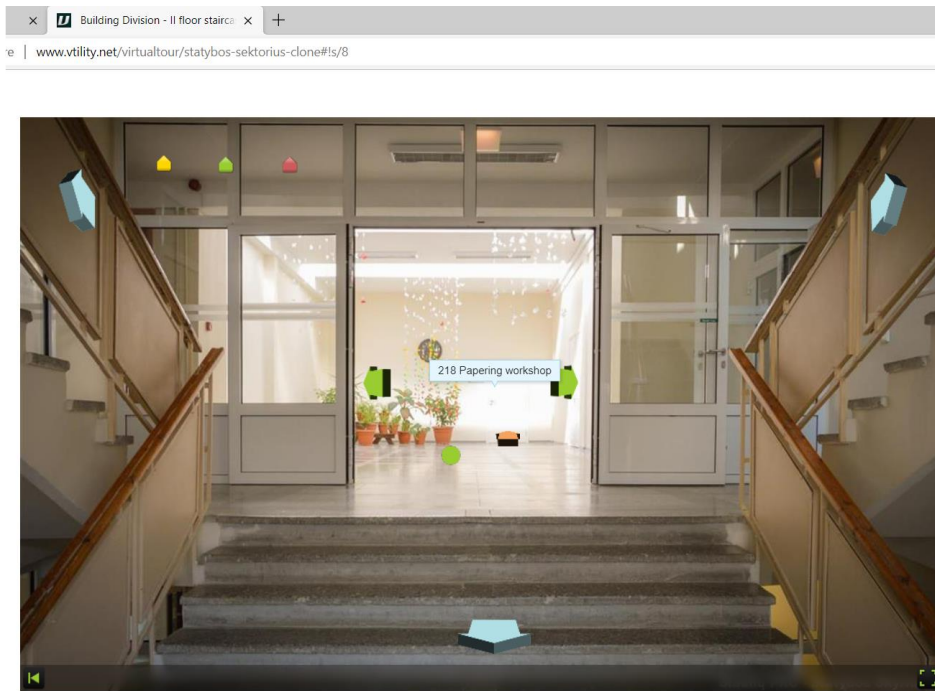
Good luck creating your music!

# Creating your virtual tour

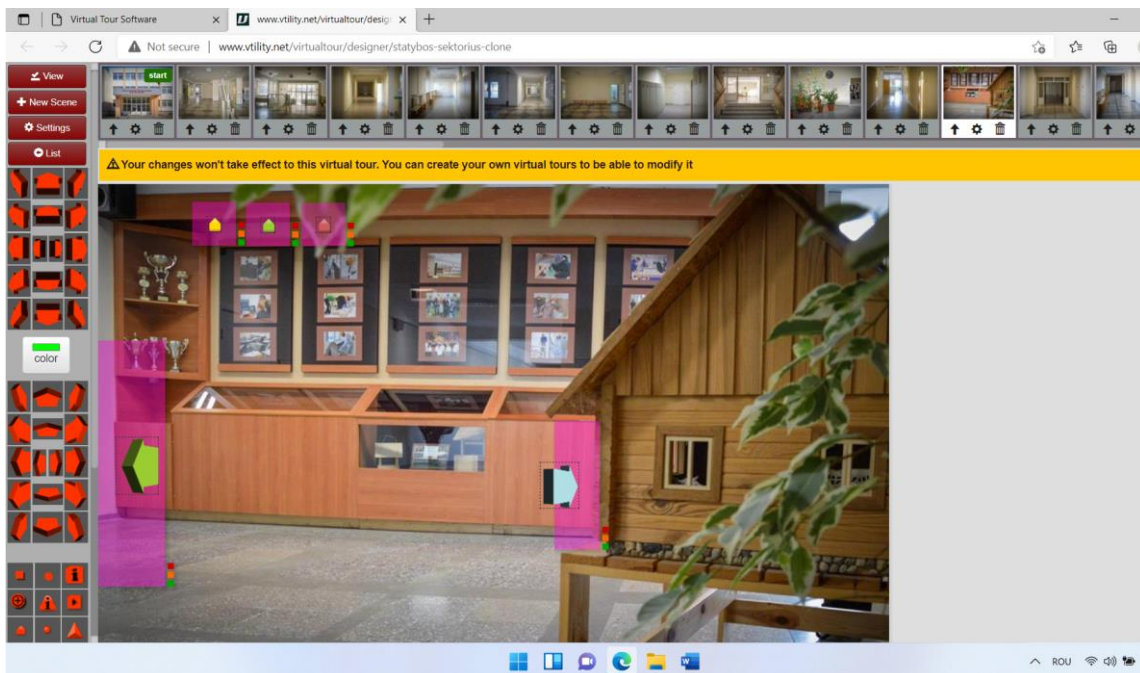
<http://www.vtivity.net/>

Vtivity is an online virtual tour software for creating online virtual tours. You can design your virtual tours online, for education without any special equipment or software packages. This app offers virtual tours on mobile and tablet friendly and based on cloud.

In order to use the app, you need to have pictures of your school, and upload them to create your virtual tour. Follow the steps given. Add the arrows.



The virtual tour of a school frame by frame:



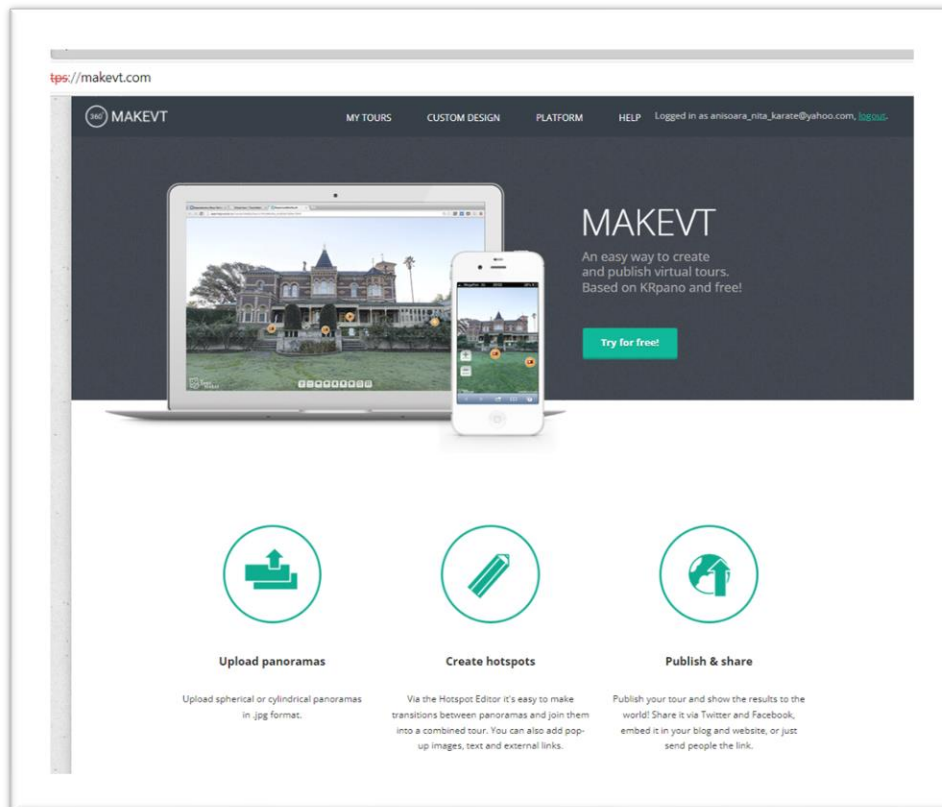
## Tablete Interactive IoT Wi-Fi

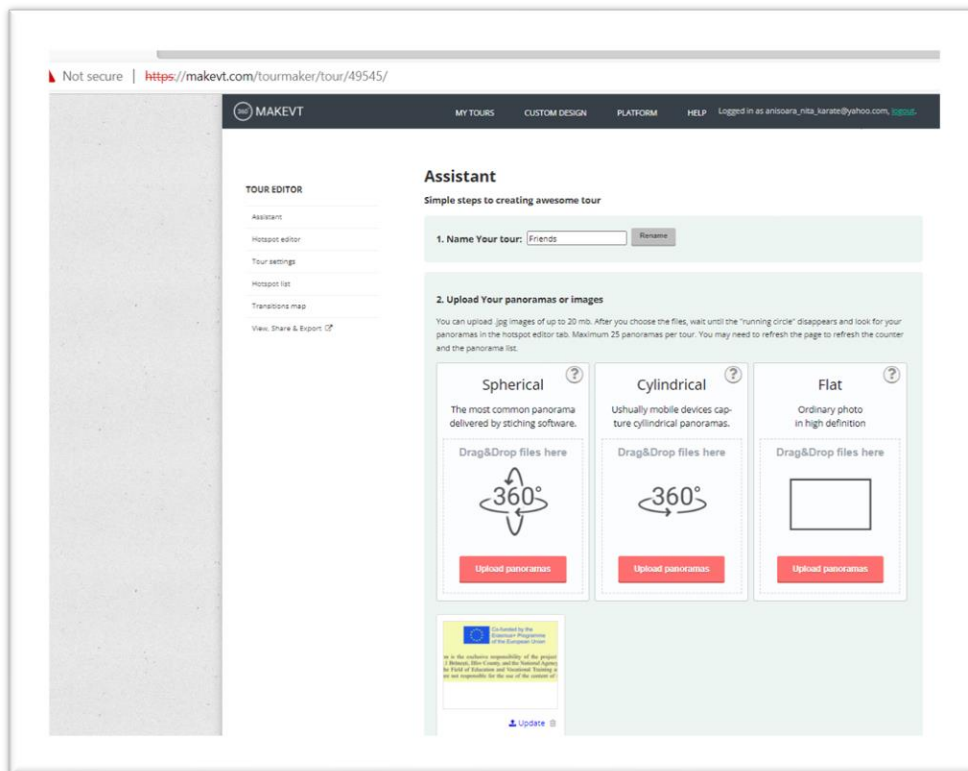
Password: **tabLTCN2021**

### MAKEVT

<http://www.makevt.com/>

An easy way to create and publish virtual tours. Based on KRpano and free.





## STEPS

### A. Recording Your Tour

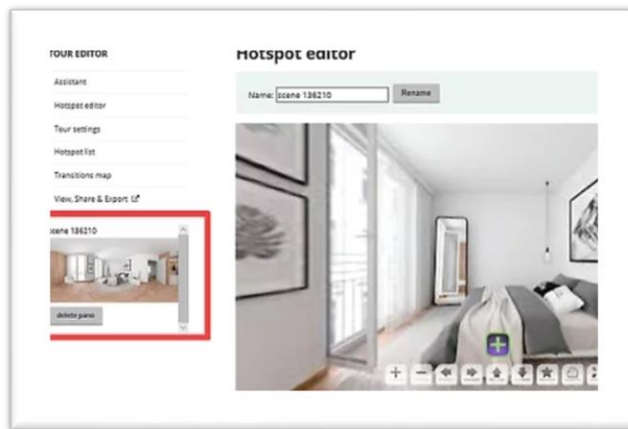
1. You'll need a camera which can shoot 360° panoramic footage, and a tripod for the camera.
2. The camera must be able to work remotely, controlled via a remote or an app on your smartphone so as to avoid capturing you in the shot.
3. Position your camera. Place the camera in the first room that you want to shoot, making sure to position it in the best location to capture the largest part of the room.
4. Make sure your tripod is level.
5. Turn on and connect to the camera. (Bluetooth. Wi-Fi).
6. Take a panoramic shot. Step out of the room in which you're shooting, then use the remote control or the app to record a 360° take of your selected room.
7. Shoot the rest of the scene, a maximum of 25 photos.
8. Move the photos from the camera to your computer.

### B. Creating Your Tour

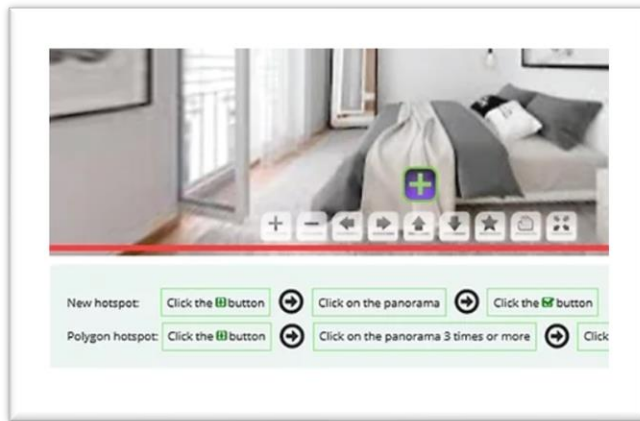




1. Open the MakeVT site. Go to <https://makevt.com/> in your computer's web browser.
2. Click **Try for free!**. This blue button is in the middle of the page.
3. Create an account and sign in.
4. Click **CREATE NEW TOUR**. You'll find this option on the left side of the page.
5. Enter a name for your tour. In the **"Name Your Tour"** text box, type in whatever you want to name your virtual tour, then click **Rename** to the right of the text box.
6. Upload your photos. Do the following:
  - Click Upload panoramas under either the "Spherical" or "Cylindrical" heading.
  - Hold down **Ctrl** (Windows) or **⌘** Command (Mac) while clicking each photo you want to upload.
  - You can upload a maximum of 25 photos at 20 megabytes apiece.
  - Click **Open**.
  - Wait for the photos to finish uploading.
7. Scroll down and click **Go to the Hotspot Editor**. This blue button is near the middle of the page.



8. Select the first scene's panorama. Click the panorama from the first room you shot on the left side of the page. This will open it in the middle of the page.



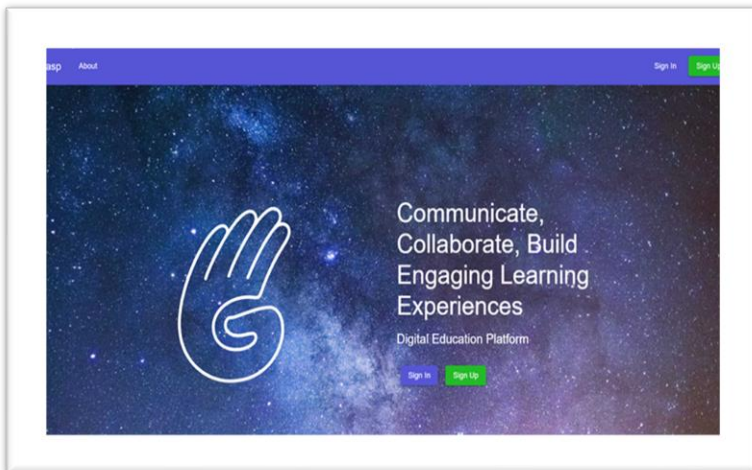
9. Create a link to the next scene. In order to create a link to transition from the first room into the next one, do the following:
  - Click +. Click once the panorama. Click ✓
  - Click an indicator shape (this is what a user will click to move to the next scene).
  - Click the "Select type of hotspot" text box, then click Transition in the drop-down menu.
  - Click the next scene's panorama in the "Select the destination panorama" section.
  - Scroll down and click Save
10. Link the rest of your scenes. You'll do this in the same way in which you built the link from the first room to the second one. Once you've completed this process, you can proceed.

### C. Publishing the Tour

1. Click View, Share, & Export. It's a link on the left side of the page.
2. Click Publish and view the tour. This blue button is in the middle of the page.
3. Open the virtual tour. When it appears, click the click on this link link in the text below the button.
4. Run through your tour.
5. Add the virtual tour's link to other pages.

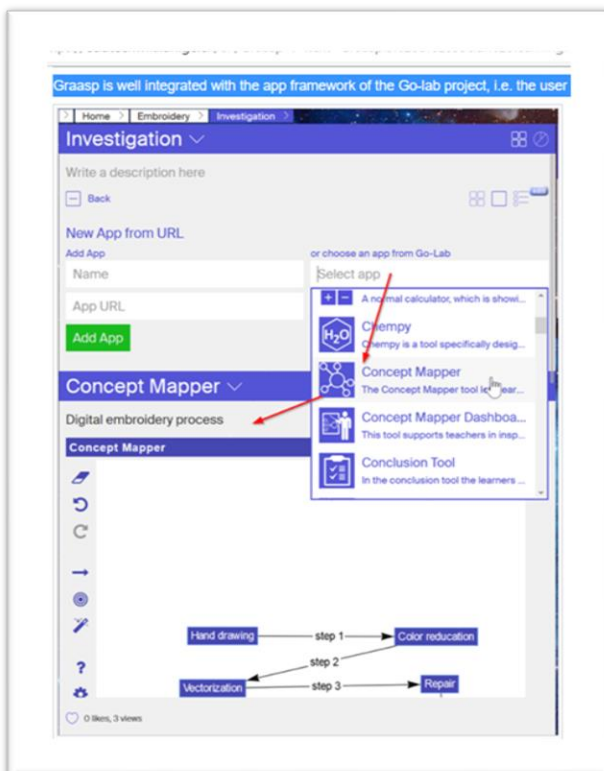
# Communicate, Collaborate, Build Engaging Learning Experiences

<https://graasp.eu/>



Graasp is well integrated with the app framework of the Go-lab project, i.e. the user can directly select an app. However some apps require that teachers do something beforehand.

It is a social learning platform. It supports collaborative learning, inquiry learning, using online labs, knowledge management, creating personalized spaces. Graasp is also part of the go-lab project



Users can create either an empty personal learning environment (PLE) or a structured one enforcing inquiry learning scenarios and referred as an Inquiry Learning Space (ILS). Typically, an ILS is created by a teacher who then can invite students. Graasp has built-in templates to support inquiry learning, e.g. the Pedaste et al. framework, in which inquiry learning is organized in phases: Orientation, Conceptualization, Investigation, Conclusion and Discussion. Each of these items can be filled with sub-items, i.e. "spaces" (aka folders), documents with a page editing tool, attach files, attach links, attach apps, create an ILS, create discussion forum.

Source of image: Graasp - EduTech Wiki (unige.ch)

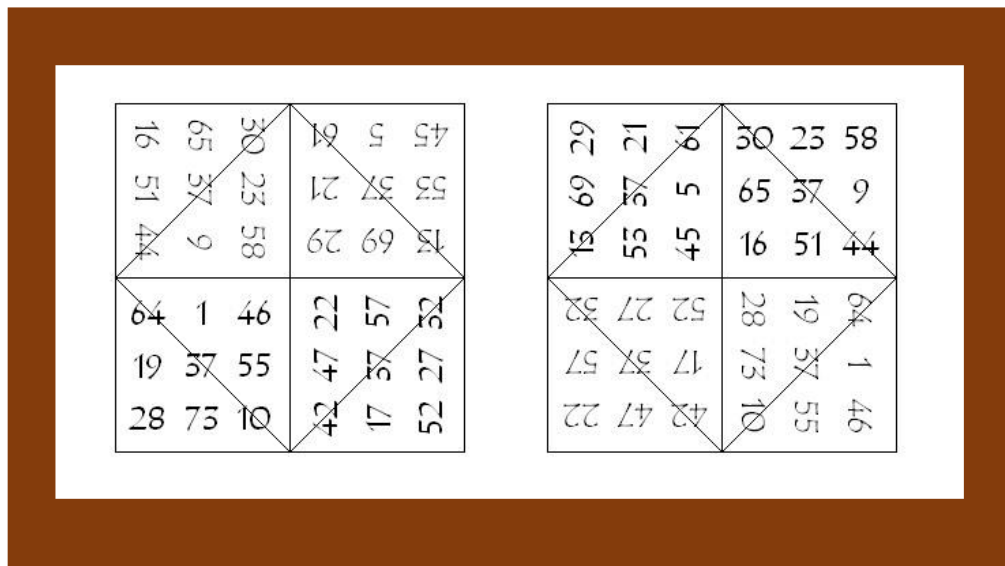
# Geometric Art in nature/ human products



<http://loki3.com/flex/index.html>

Flexagons are fascinating origami-like puzzles. They can be created from a piece of paper by cutting, folding and pasting.

Here is an example: When put on a 3-sided silver octaflexagon, all the rows, columns and major diagonals in the following magic square sum to 222, even after flexing. A flex mirrors each of the four smaller squares along its diagonal and rearranges them, so most magic squares wouldn't survive in this environment.

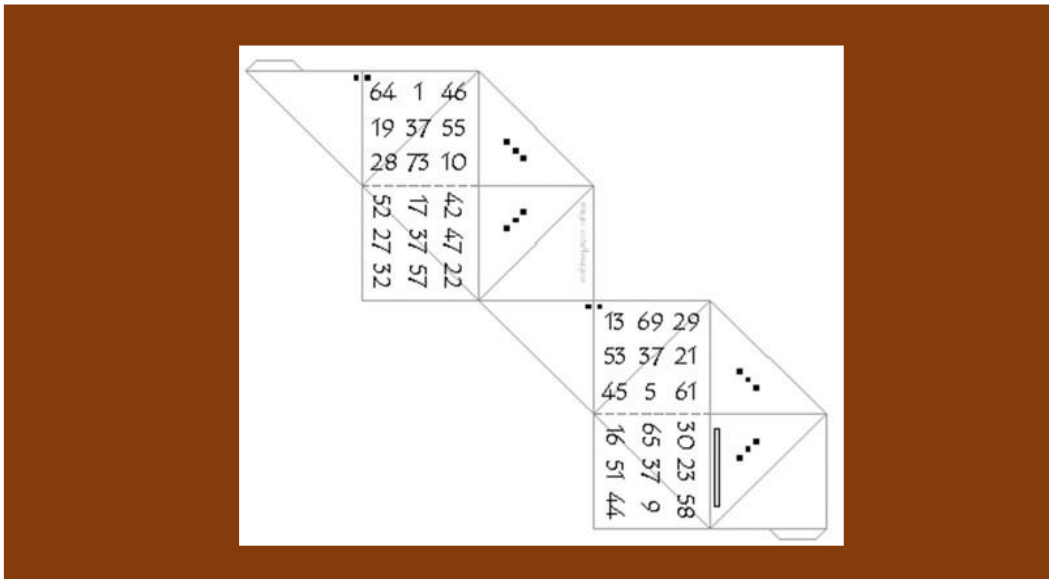


To make a magic octaflexagon, click on the following image to get the full sized version. Print and cut out.

After cutting it out, also cut along the two dashed lines. Pre-crease along all the gray lines. Find the two numbered squares connected by only a single edge and fold them backwards and paste in place. You should see two pairs of adjacent triangles with three squares on them. Fold these adjacent triangles face to face. Fold the two pairs of

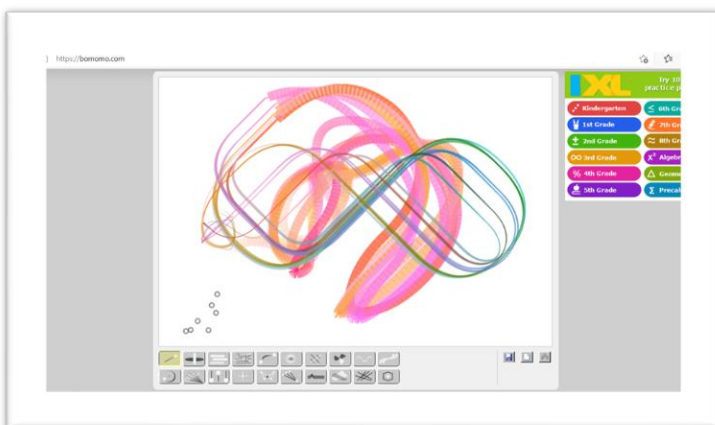
adjacent triangles with a single square in the corner back to back. You should now have a large square, with all the numbers on one side. Tape the extra flaps down to finish the flexagon.

To flex the flexagon and rearrange the numbers, start from the numbered side and perform a pinch flex, similar to what you can do on a hexaflexagon. Fold the four diagonals into valley folds and the four lines between the squares into mountain folds. Bring the four corners together in the back and open up the center. This rearranges the numbers, but all rows, columns and major diagonals still sum to 222.



## Making geometric line art – simple drawing using pencil and colour expression and tools

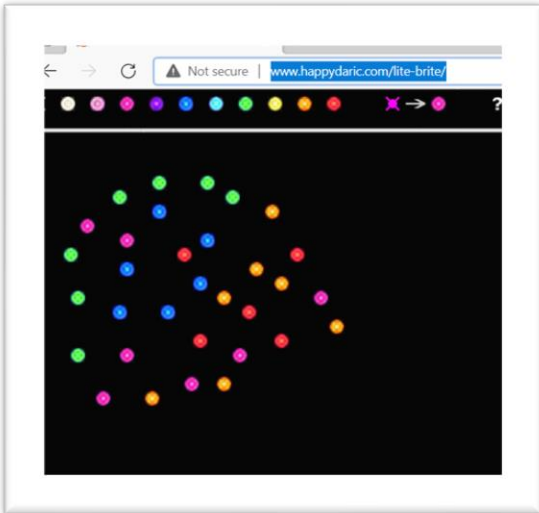
[bomomo.com](http://bomomo.com)



It is an online tool in which users can use their imagination and create pieces of abstract art while moving the mouse around as they please. This is not an art program that you use when you already have an image in mind, everything happens in the present moment and this is what makes it unique and very fun.

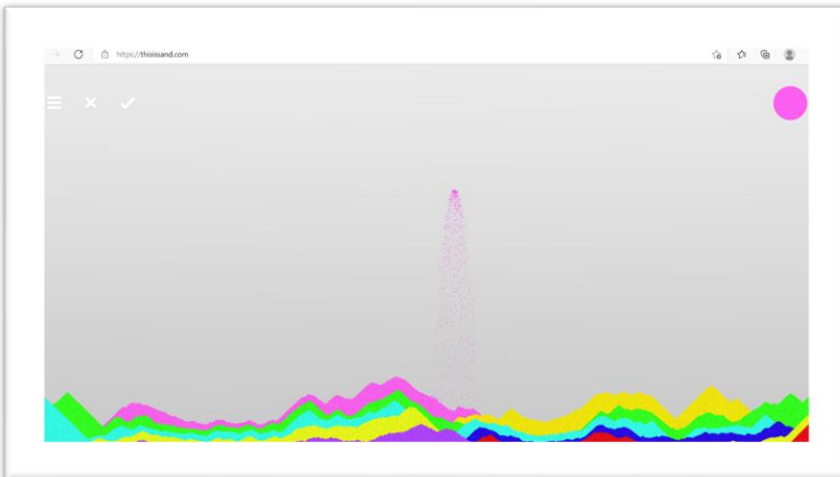
This art program does not have an erase option, just a clear. Although correcting mistakes is possible, as there is a permanently white brush. The user does not choose the colours. They are randomly selected, and usually change. Drawings can be saved in jpg format.

<http://www.happydaric.com/lite-brite/>



**Lite-Brite** is a toy that was originally marketed in 1967. It consists of a light box with small colored plastic pegs that fit into a panel and illuminate to create a lit picture, by either using one of the included templates or creating a "freeform" image on a blank sheet of black paper. There are eight peg colors: red, blue, orange, white (clear/colorless), green, yellow, pink, and violet (purple). In the event that pegs were lost or damaged, Hasbro provided refills and/or new colors. Color-by-letter templates were sold with the set so that children could create characters including Mickey Mouse, *Scooby-Doo*, *My Little Pony*, and *Transformers* among others

<https://thisissand.com/>



Thisissand was created in 2008 as a website. It was a school project of a few art students from Finland, and to a surprise for the creators it attracted lots of visitors for years to come.

In 2012 Thisissand was developed into an app and is still run by one of the original creators. It offers different kinds of tools for choosing the sand color.

<http://weavesilk.com/>



Weavesilk--Generative Art, also known as Silk, is an Amazing free online art tool that allows you to create colorful digital drawings. Silk was made by Yuri Vishnevsky, with music and sound crafted by Mat Jarvis.





# Erasmus+



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Co-funded by the  
Erasmus+ Programme  
of the European Union