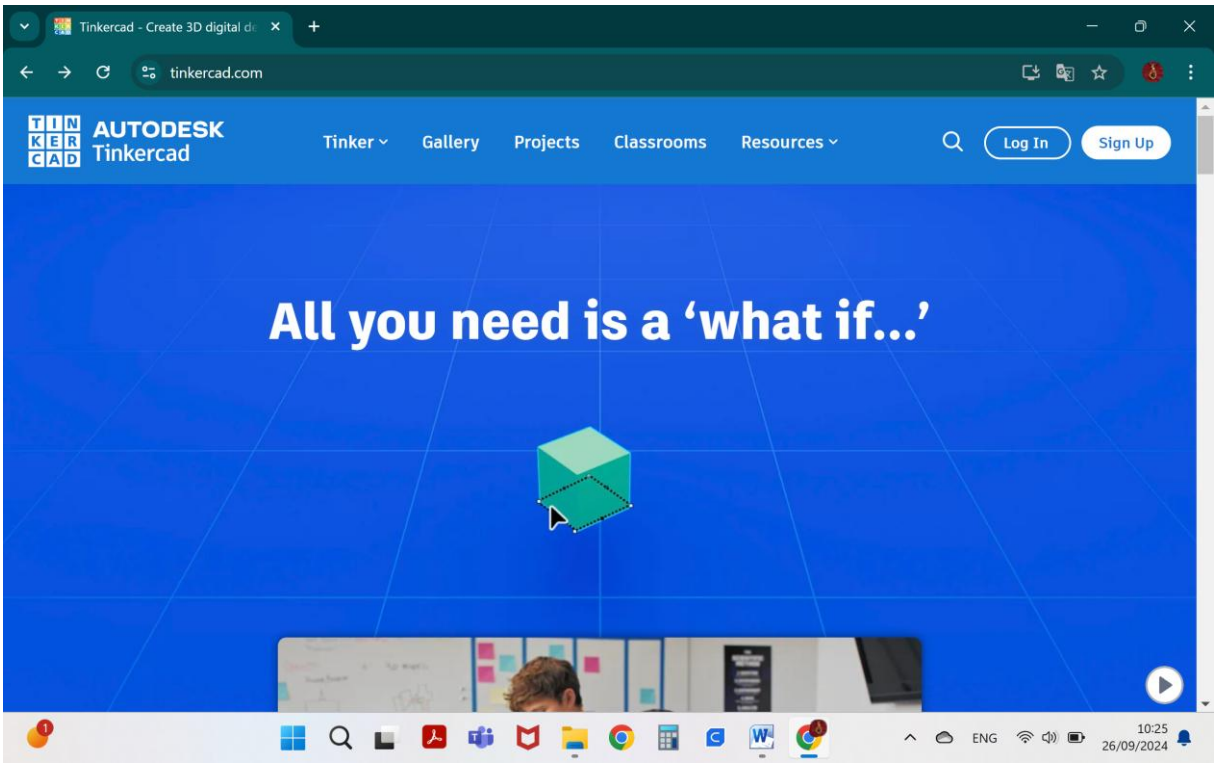
"DIMITRIE BOLINTINEANU" TECHNOLOGICAL HIGH SCHOOL

Prof. Silvia Ioana ENACHE, prof. Mihaela ENACHE

Tinkercad TUTORIAL

Tinkercad is a free web app, developed by AutoDesk, suitable for project based learning (PBL) at STEM subjects.

It can be accessed at https://www.tinkercad.com/



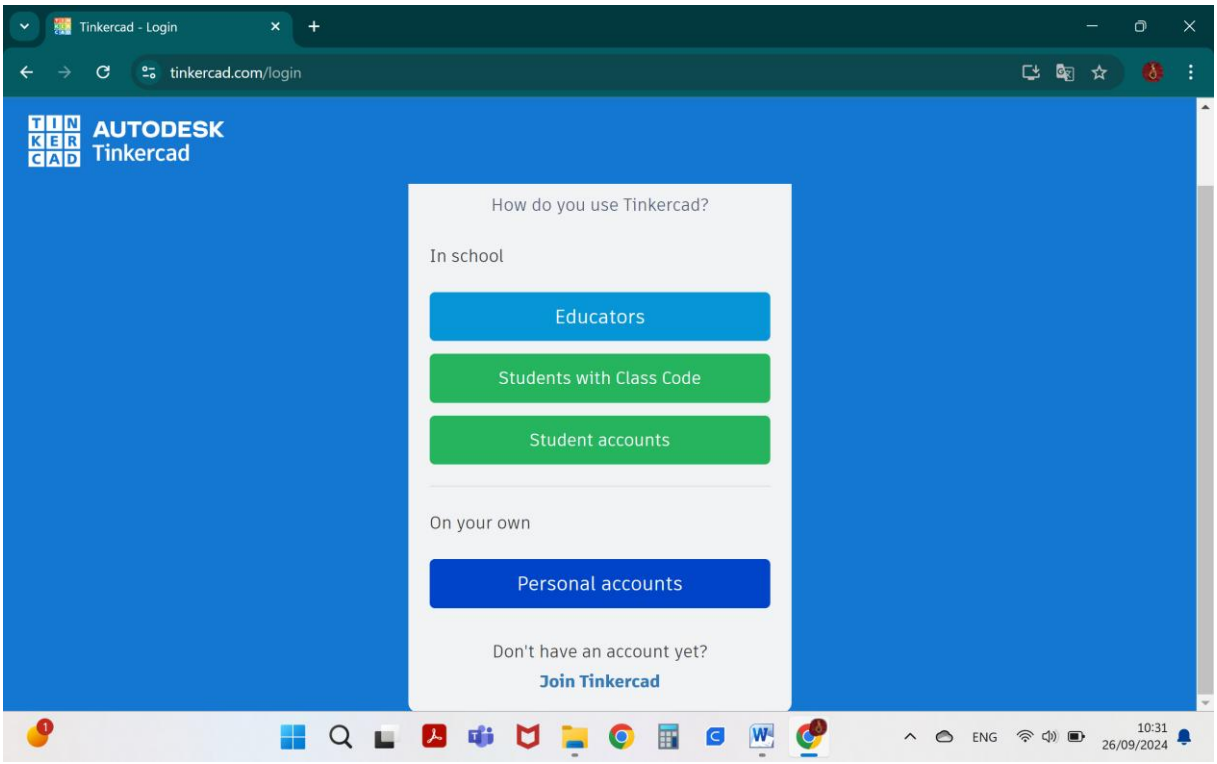
The app can be used by teachers, students, pupils or any independent user who wants to learn 3D modelling, creation and simulation of electrical circuits, use of microcontrollers (micro:bit), simulation of physics phenomena or coding (similar to Scratch or Makecode).

The app has also an extension to another Autodesk app named Fusion – a platform designed for professional 3D modelling and CAD/CAM industrial design and fabrication.

Anyone can access the Tinkercad app from different types of user accounts, as follows:

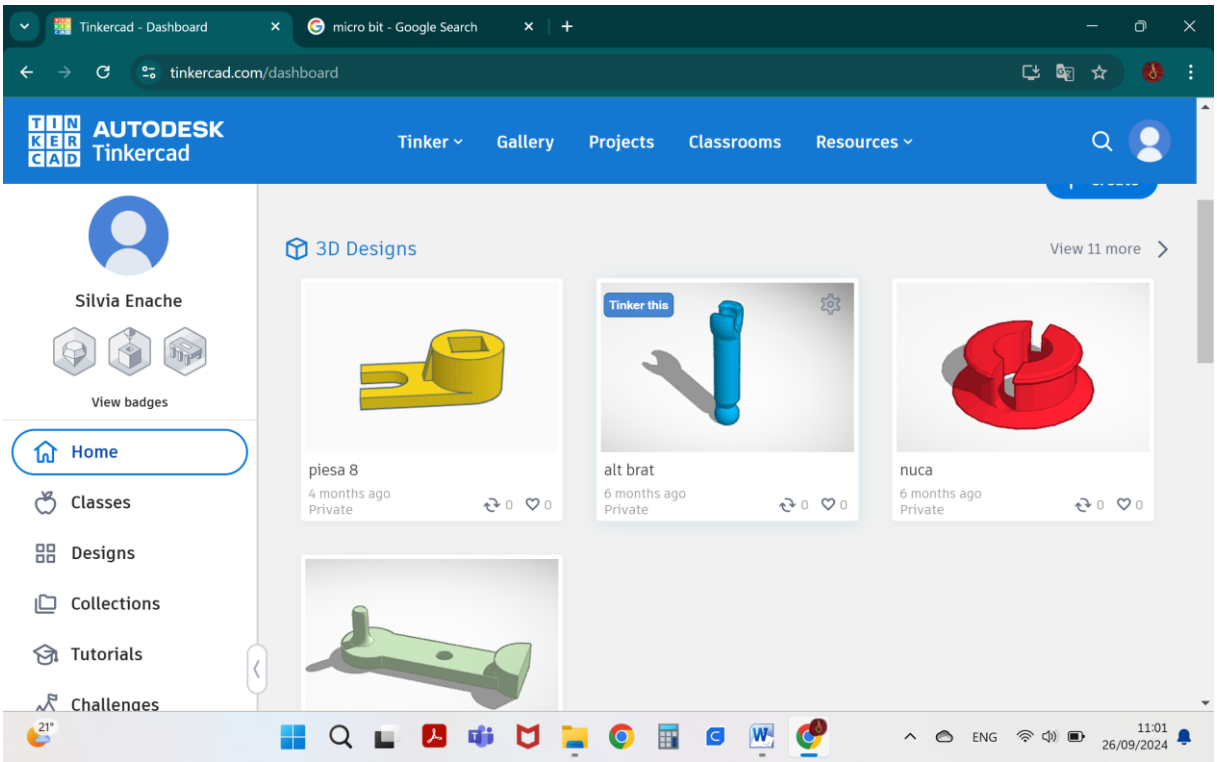
- Teacher account;
- Pupil/student account, independent or enrolled in a classroom;

- Personal account.



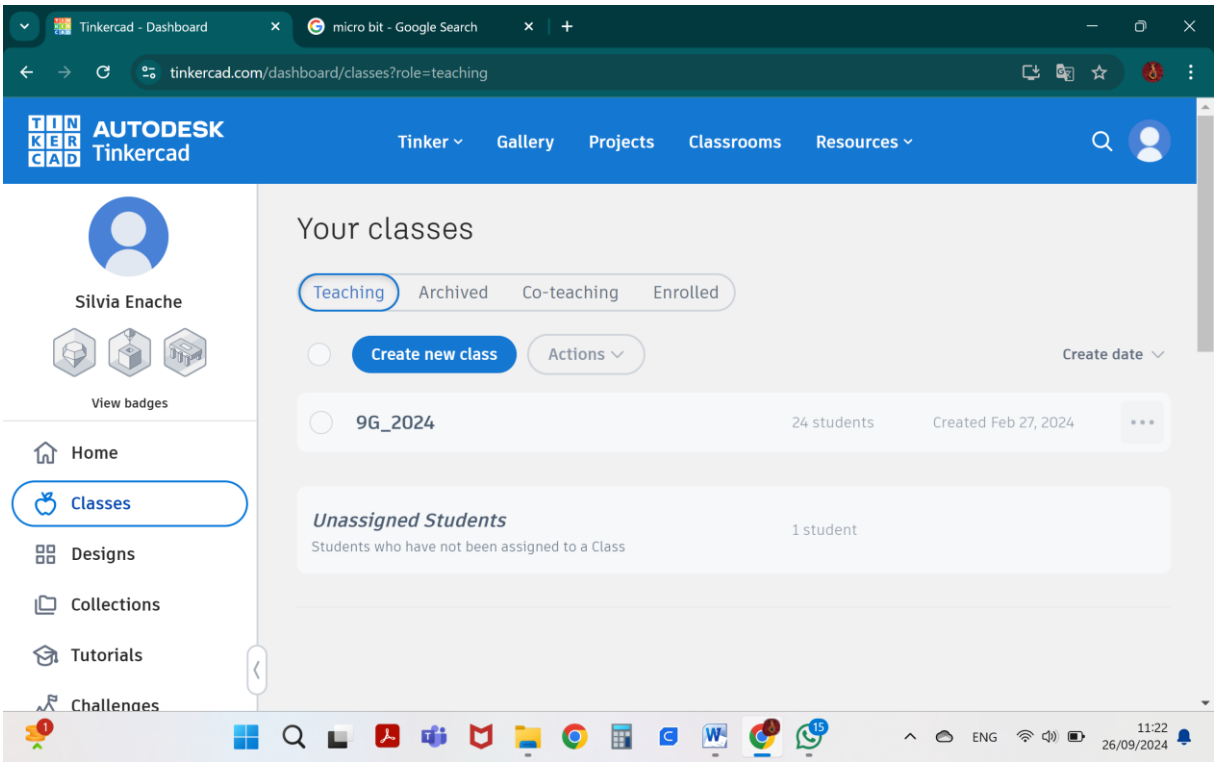
A teacher's account interface displays:

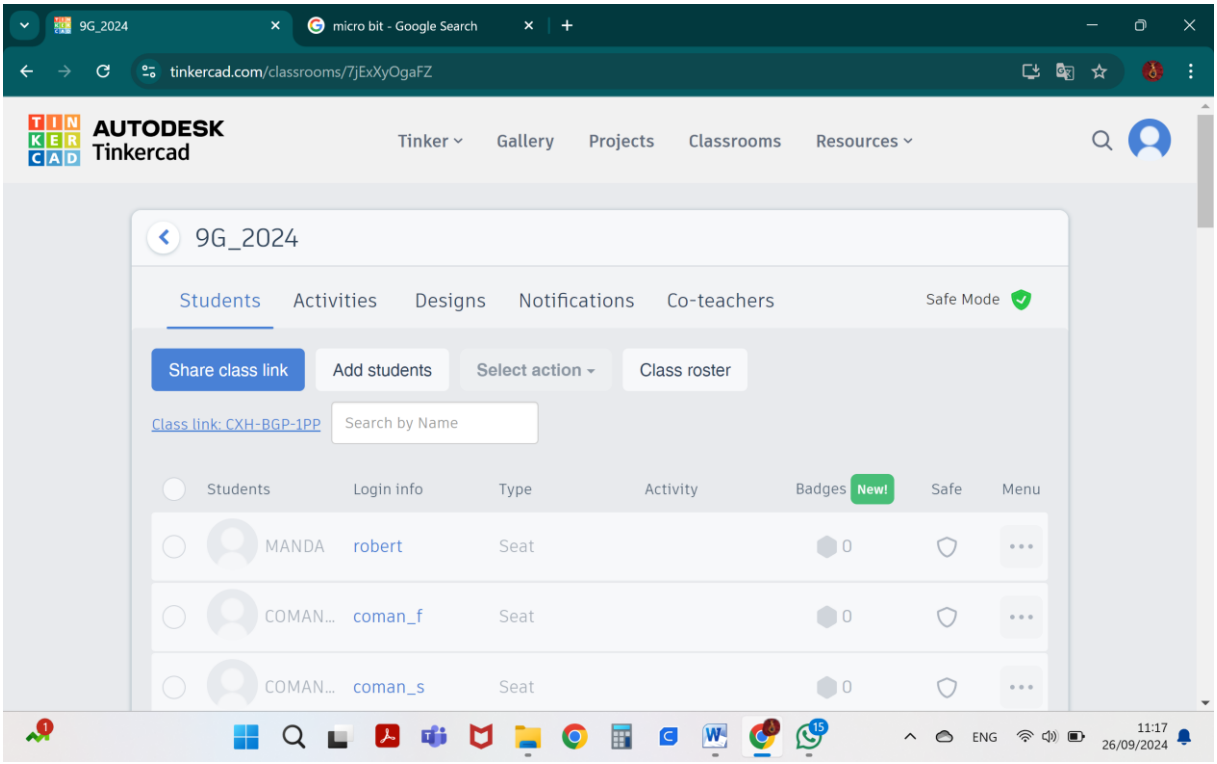
- A main menu (left), where you can see the overall account and its sections;
- a roll-down menu (up), for quick access to the app's main sections;
- a large preview area (center) where you can take a glance at your previous projects.



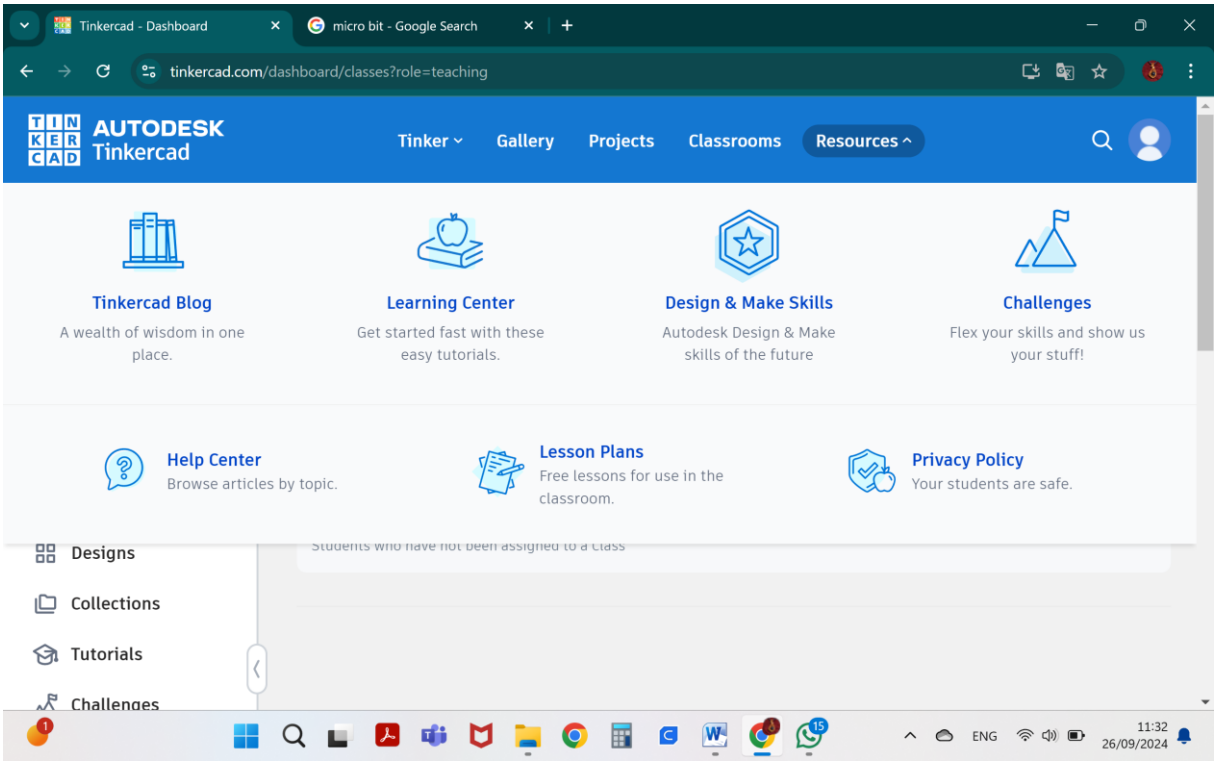
There can be created classes in a teacher account (similar to Google Classroom) and invite students to enroll with their personal accounts, so the teacher can check in real time a student assignment, to see the progress or to offer feed-back.

Also a teacher can invite another teachers in the classroom, in order to assess together the projects (Co-teaching).

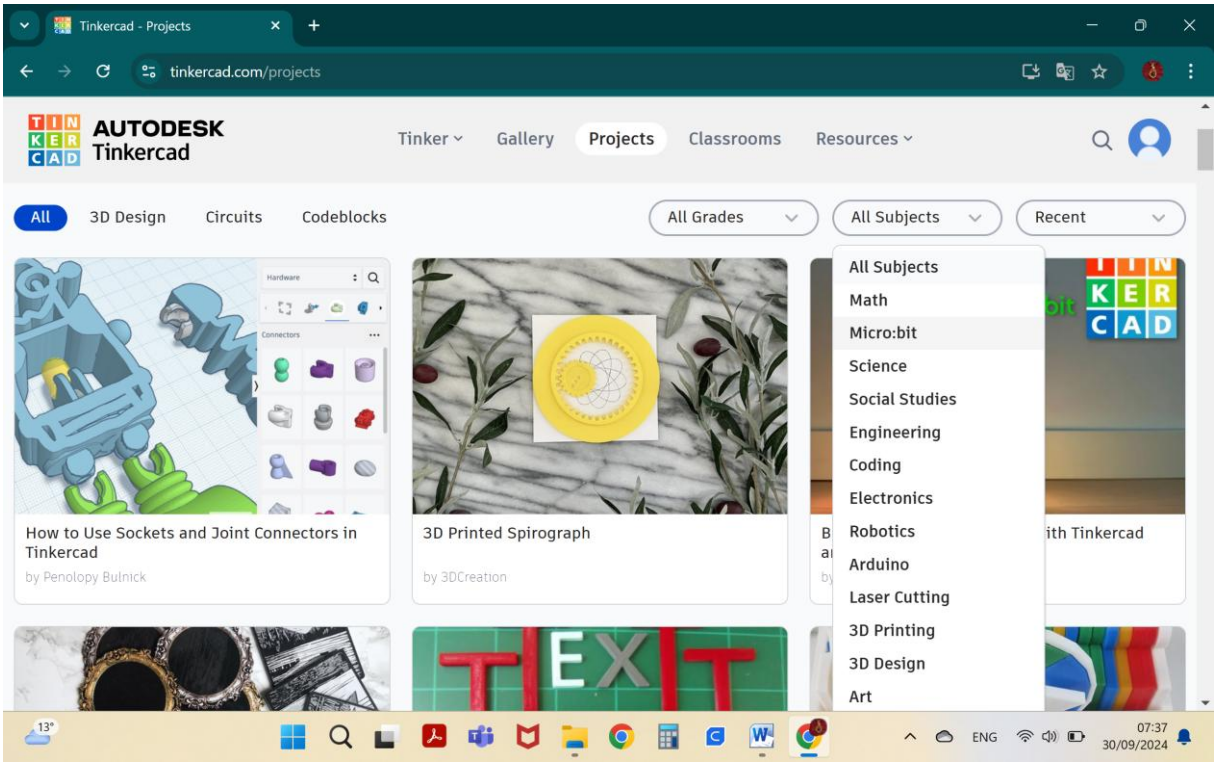




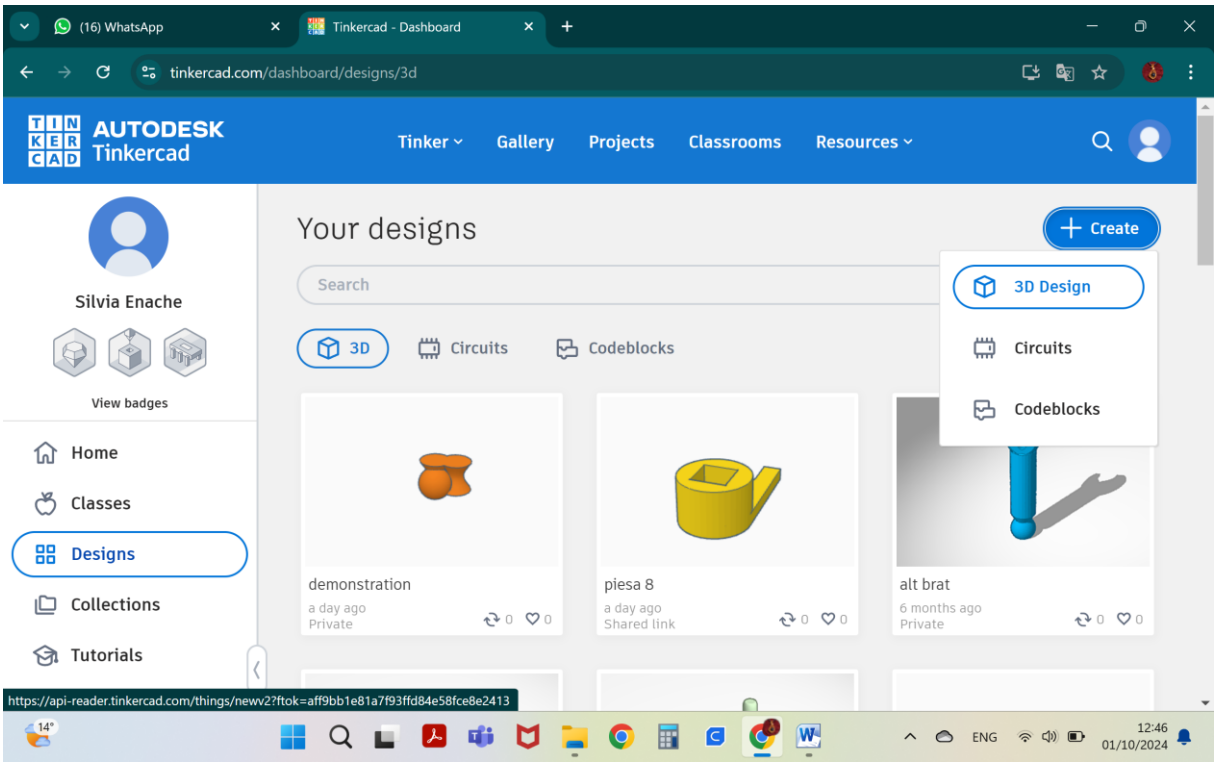
Tinkercad app has many sections where the members of the educational community can share their projects and teaching resources, can ask questions and watch tutorials, can launch challenges etc.



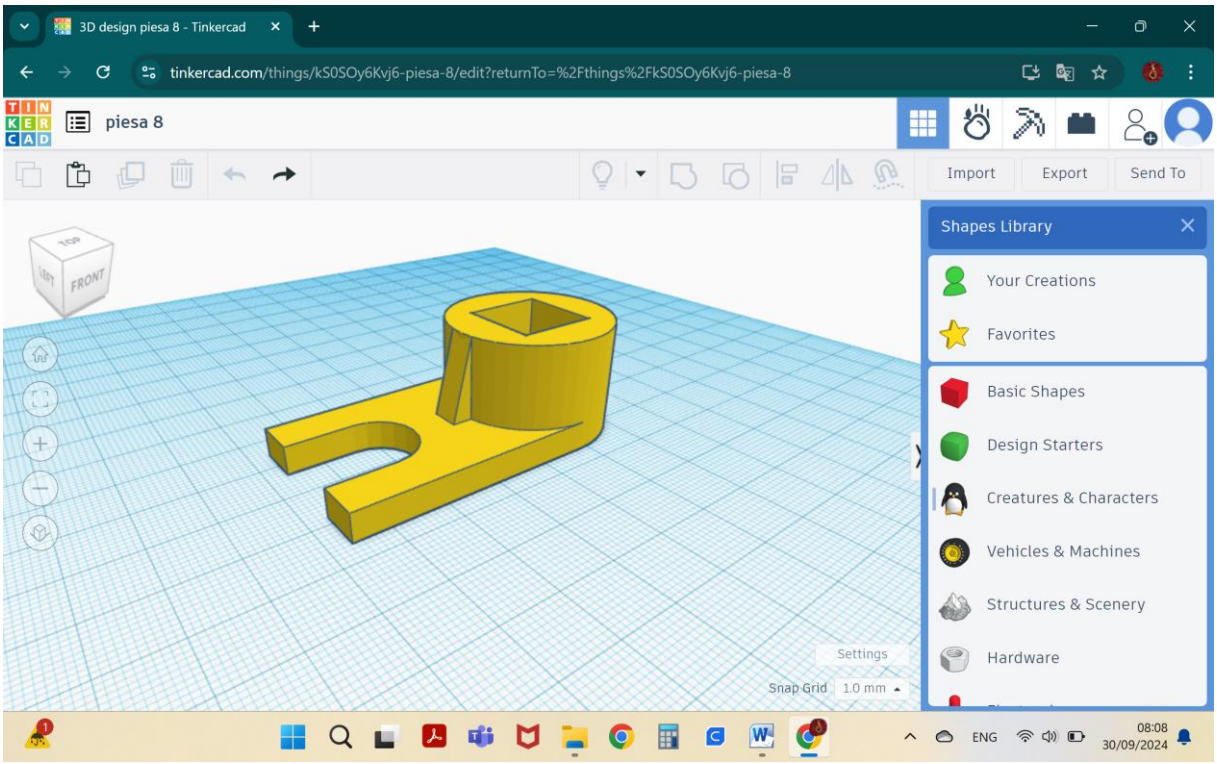
You have quick access to the projects and resources from the menus *Gallery* and *Projects*, where they are organized by type (3D Designs, Circuits, Codeblocks), grade and subject:



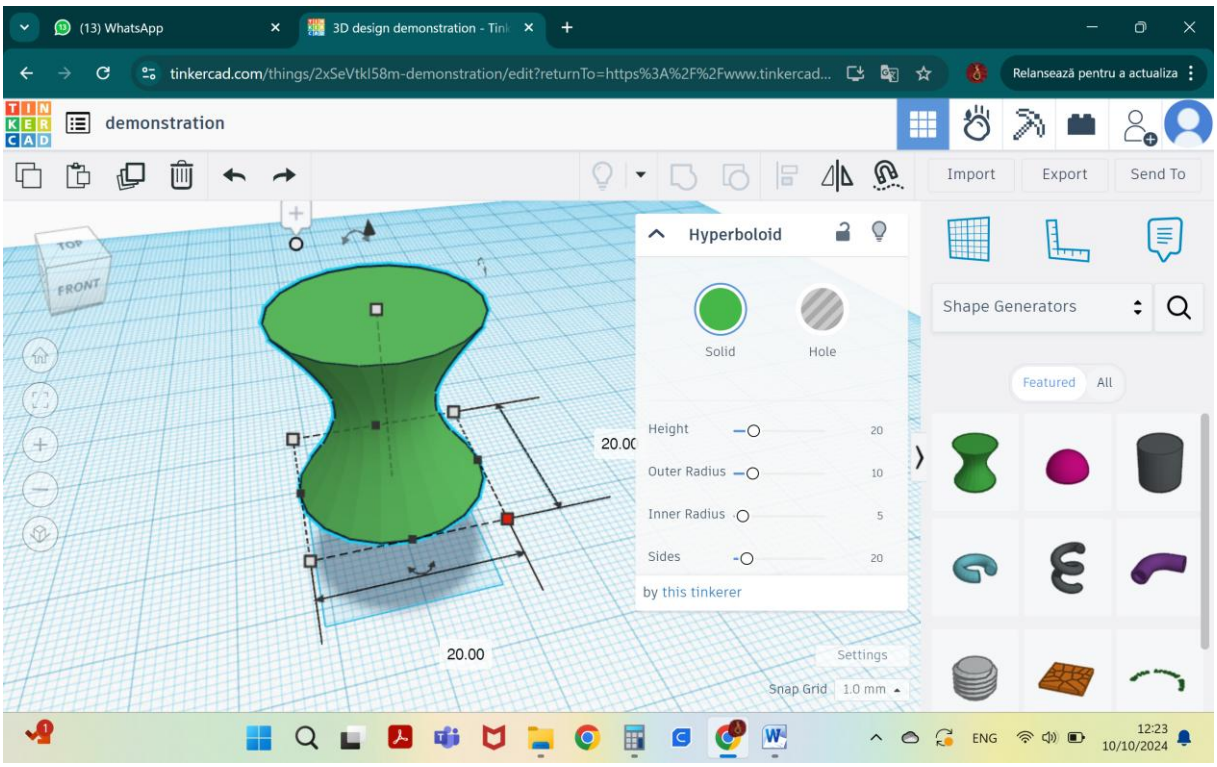
I. 3D Designs:



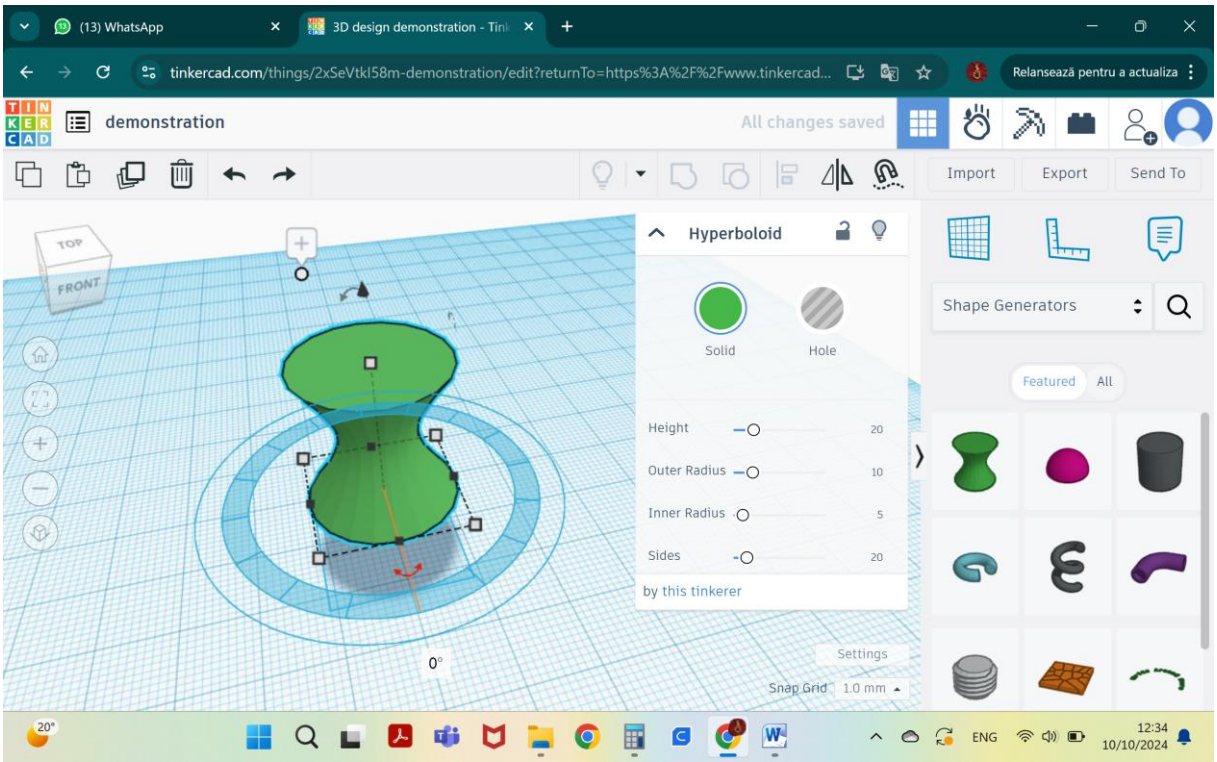
In the *3D modelling* section you can create simple or complex components or parts that can be saved and reuse in another projects. You should use the *Shapes Library*, your previous saved components or instant generated parts based on some parameters:

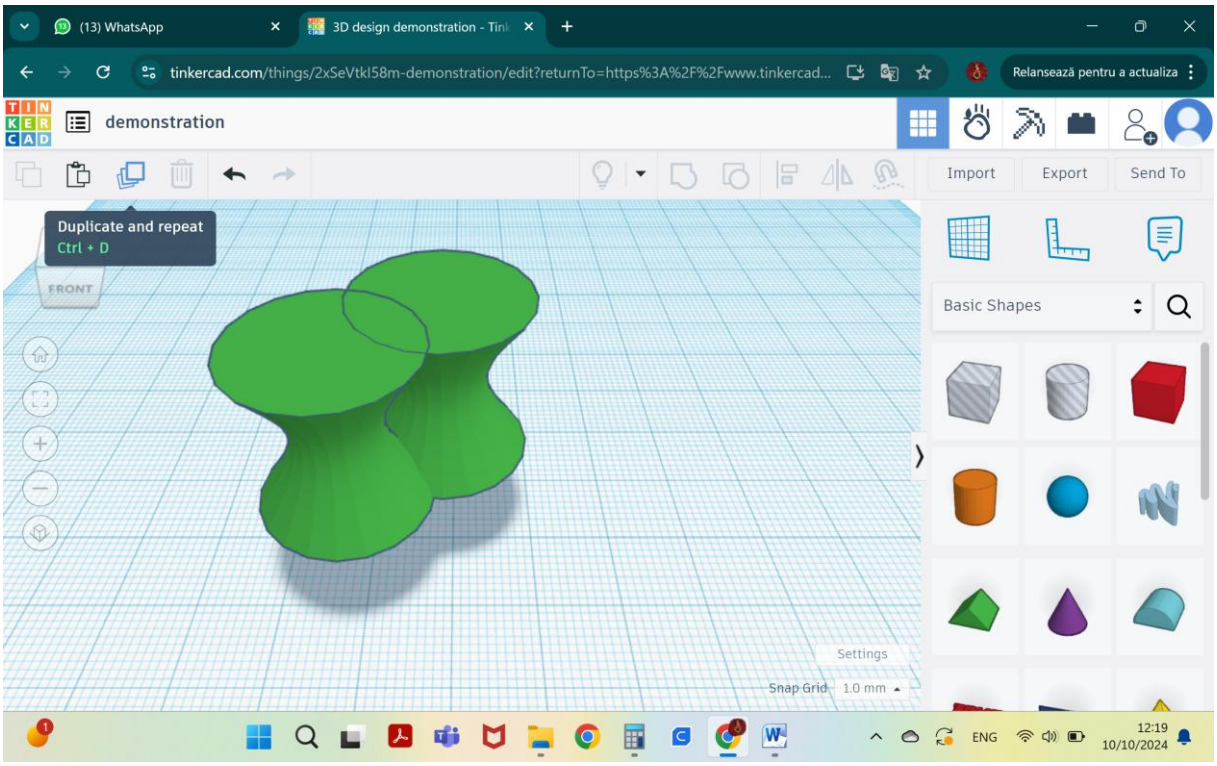


You can modify a shape or a part inserted in a project (colour, dimensions, position, number of sides, solid or hole etc). A shape or a selection of shapes can be also copied, duplicated, deleted, rotated, mirrored, aligned, grouped or ungrouped.

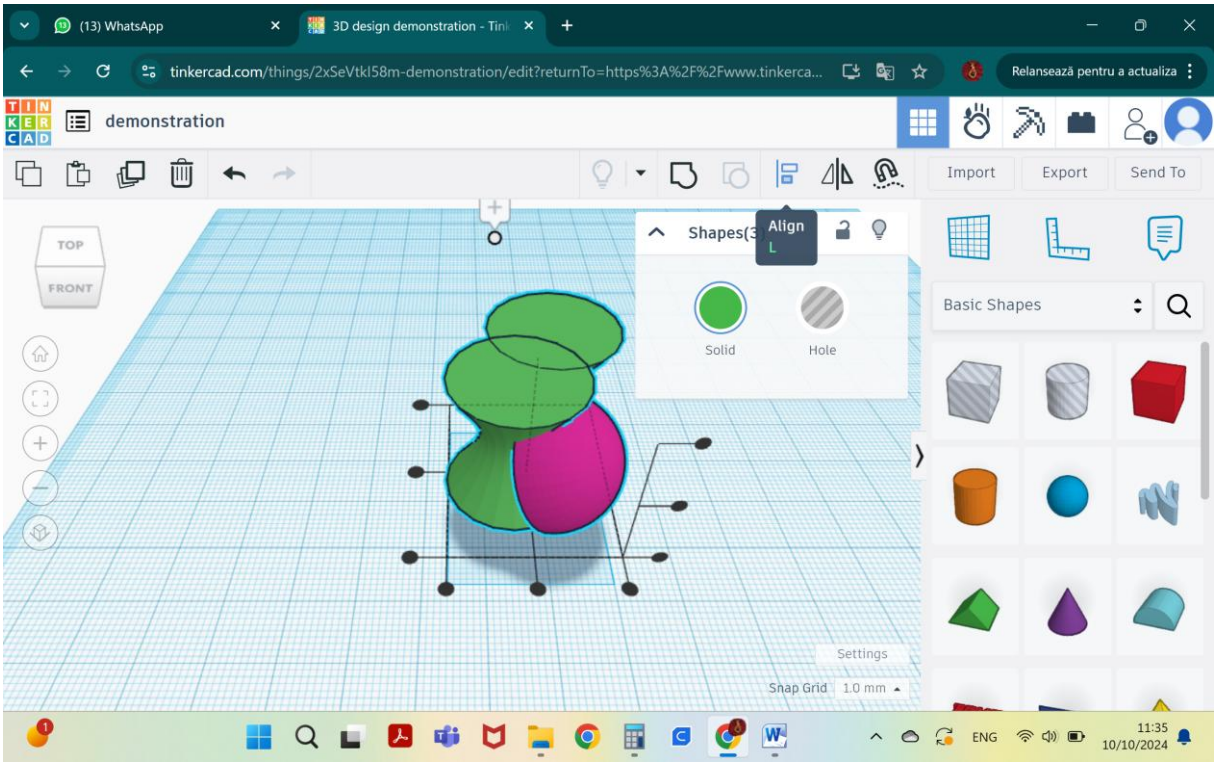


Rotation can be done in relation to any projection plan (horizontal, vertical or lateral).

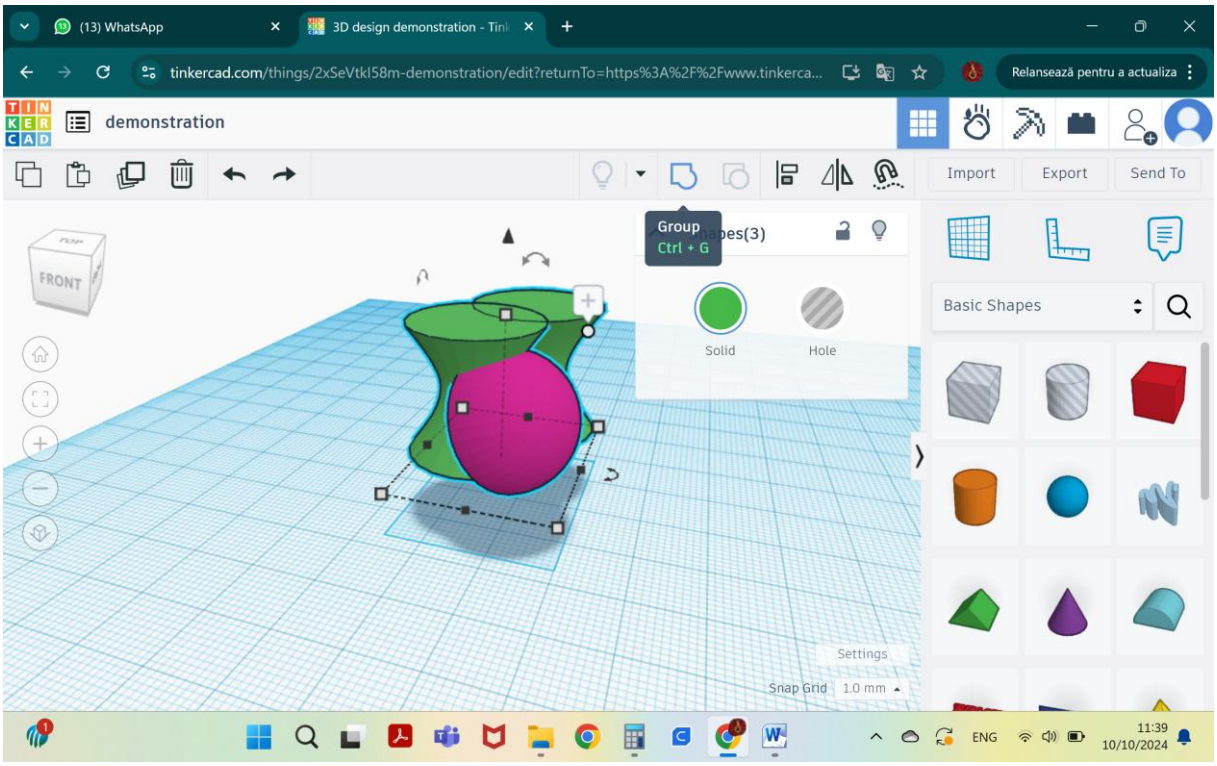


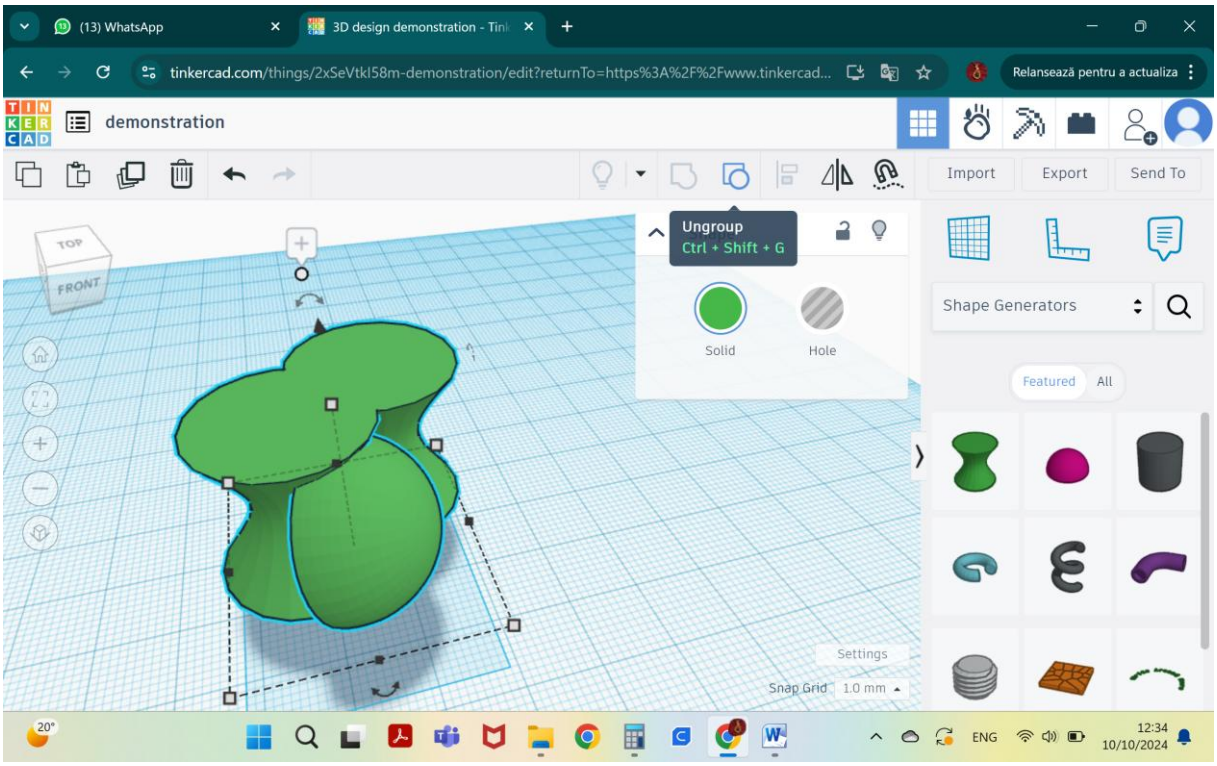


A selection of shapes can be aligned; this means reciprocate positioning in relation to some particular points (centers, endpoints, edges or midpoints etc).

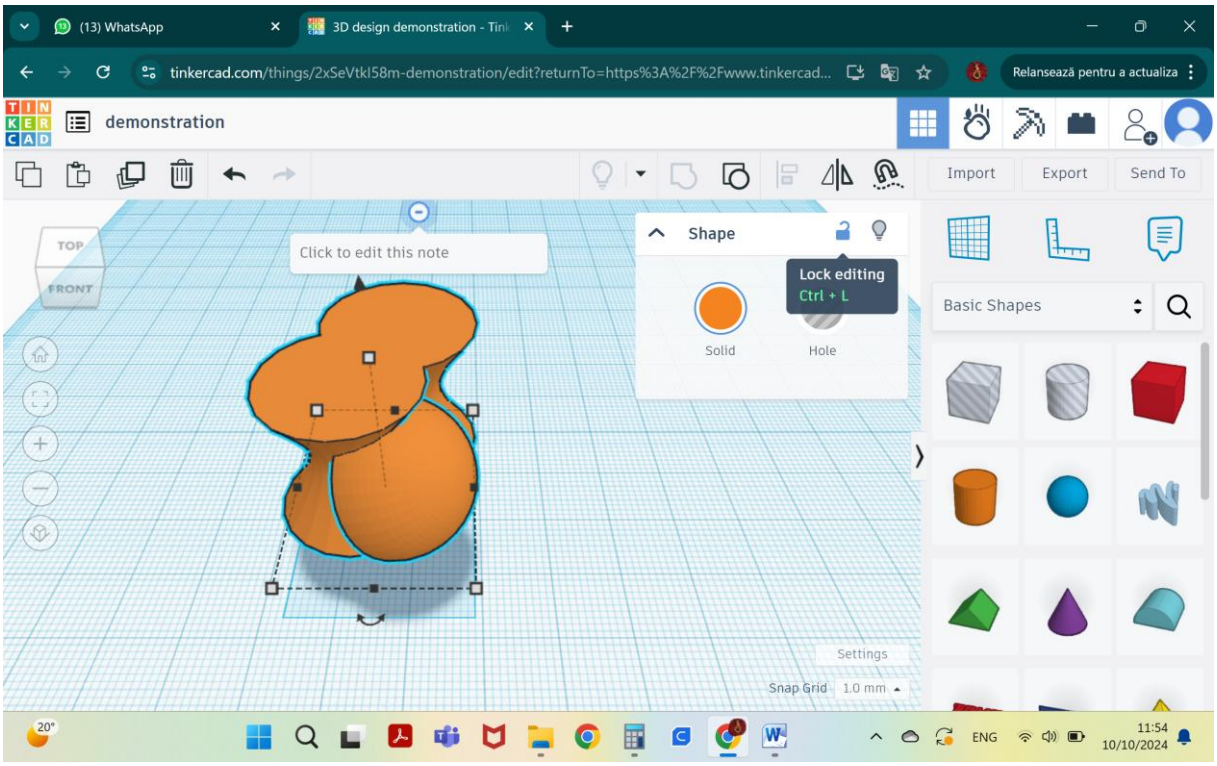


A selection of shapes can be grouped – which means obtaining a complex shape and modify its features “in block”. A group of shapes can be ungrouped if you need to modify a single component.

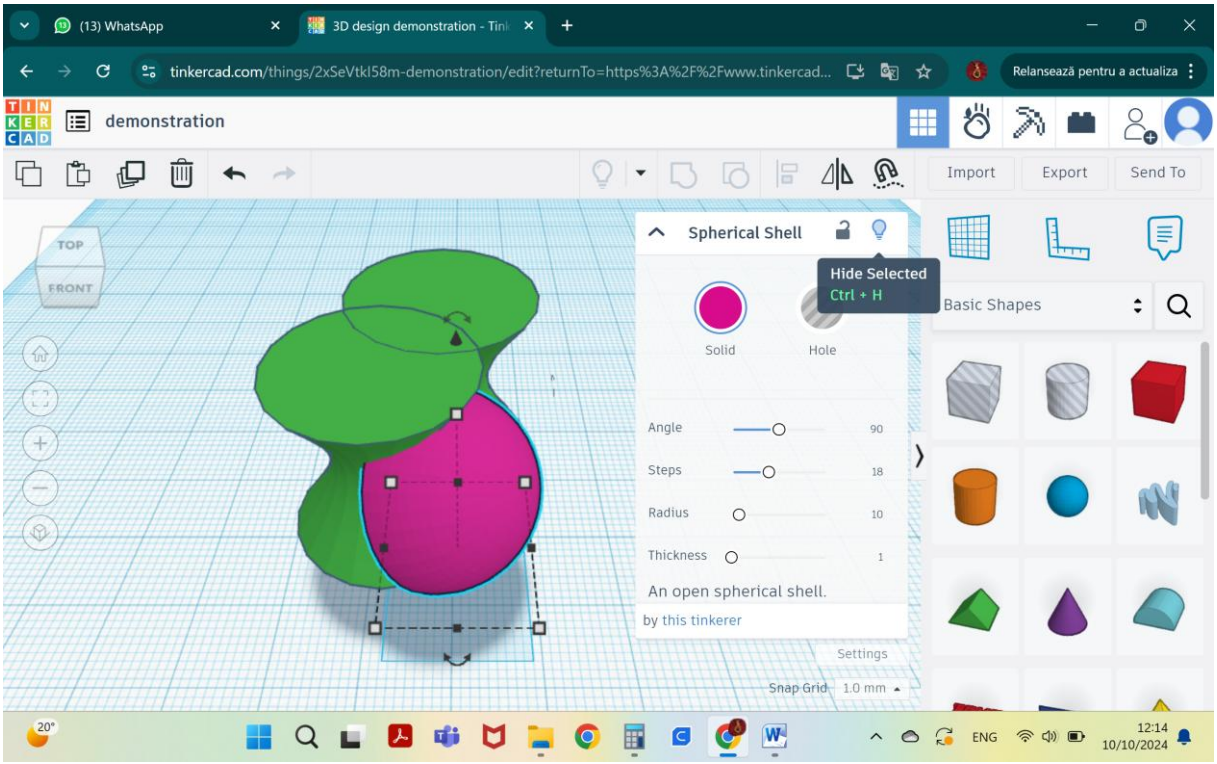


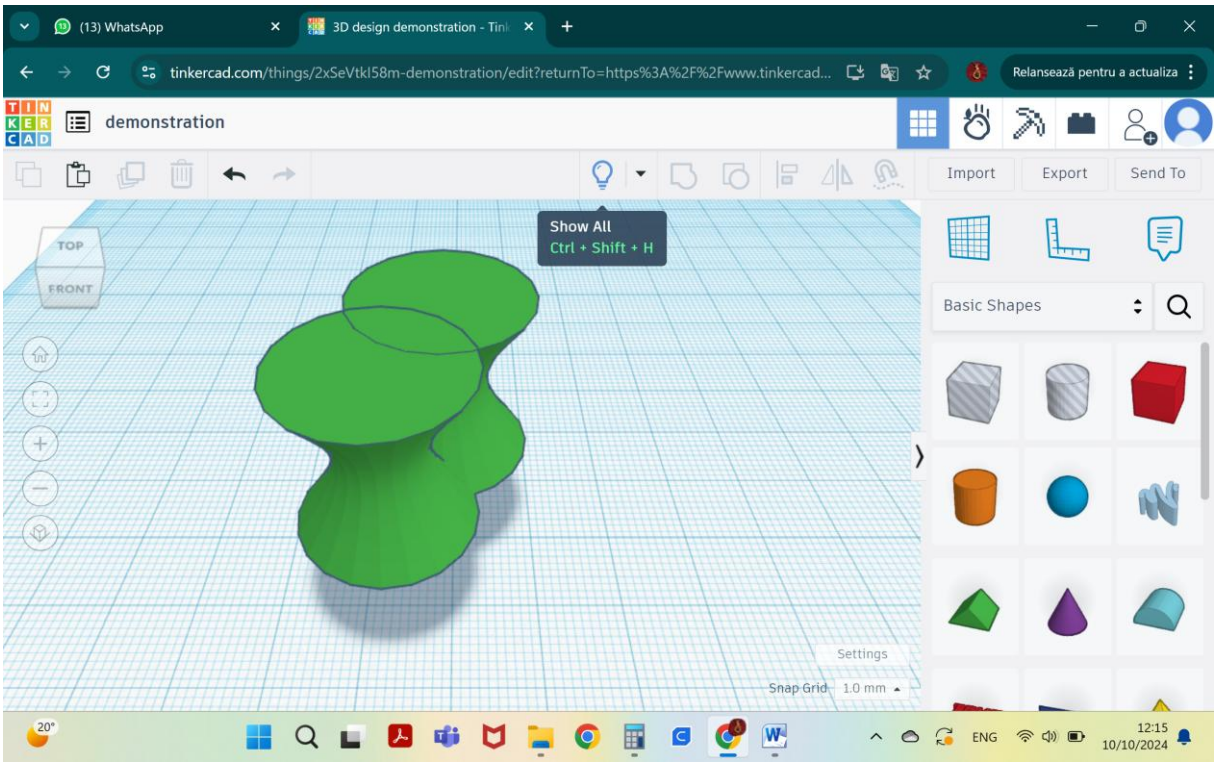


A shape or a group can be locked for editing or temporary hide, for ease of projecting or visualize. After you made the desired changes, you can bring back all the elements on the screen.

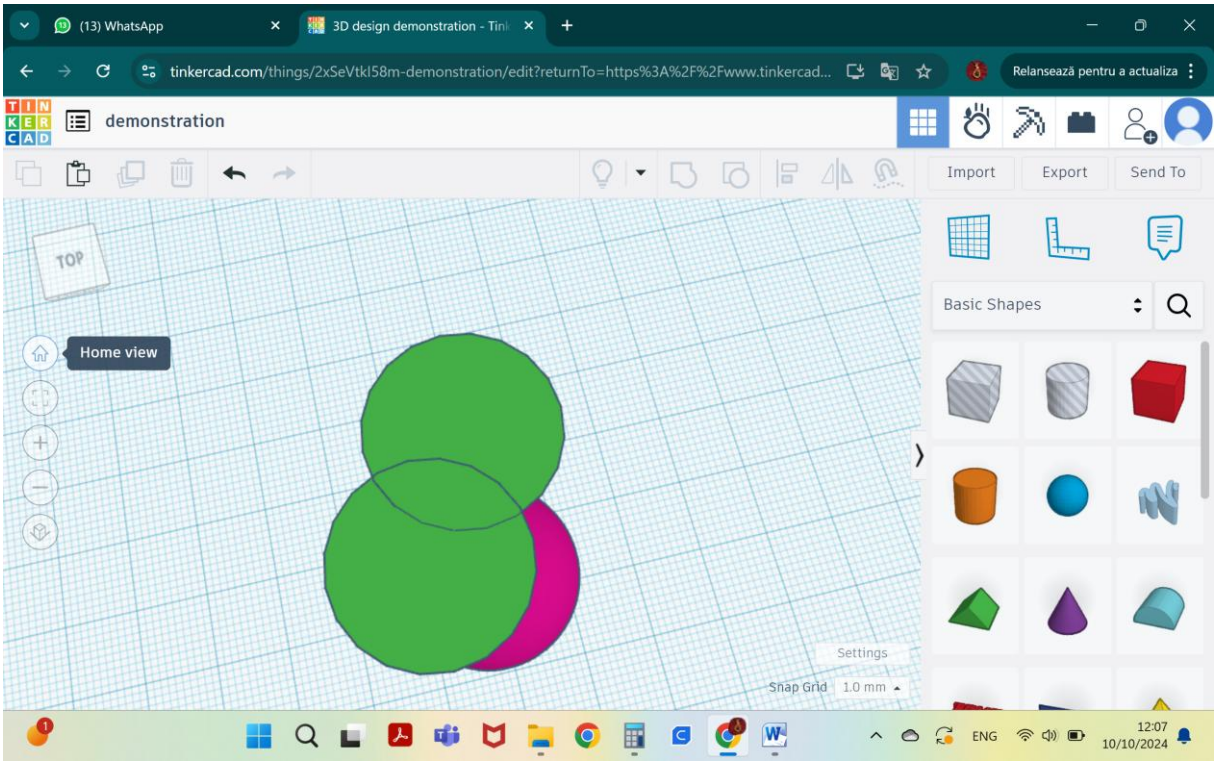


Note: after locking, a shape or a group remains in fixed position until it is unlocked.

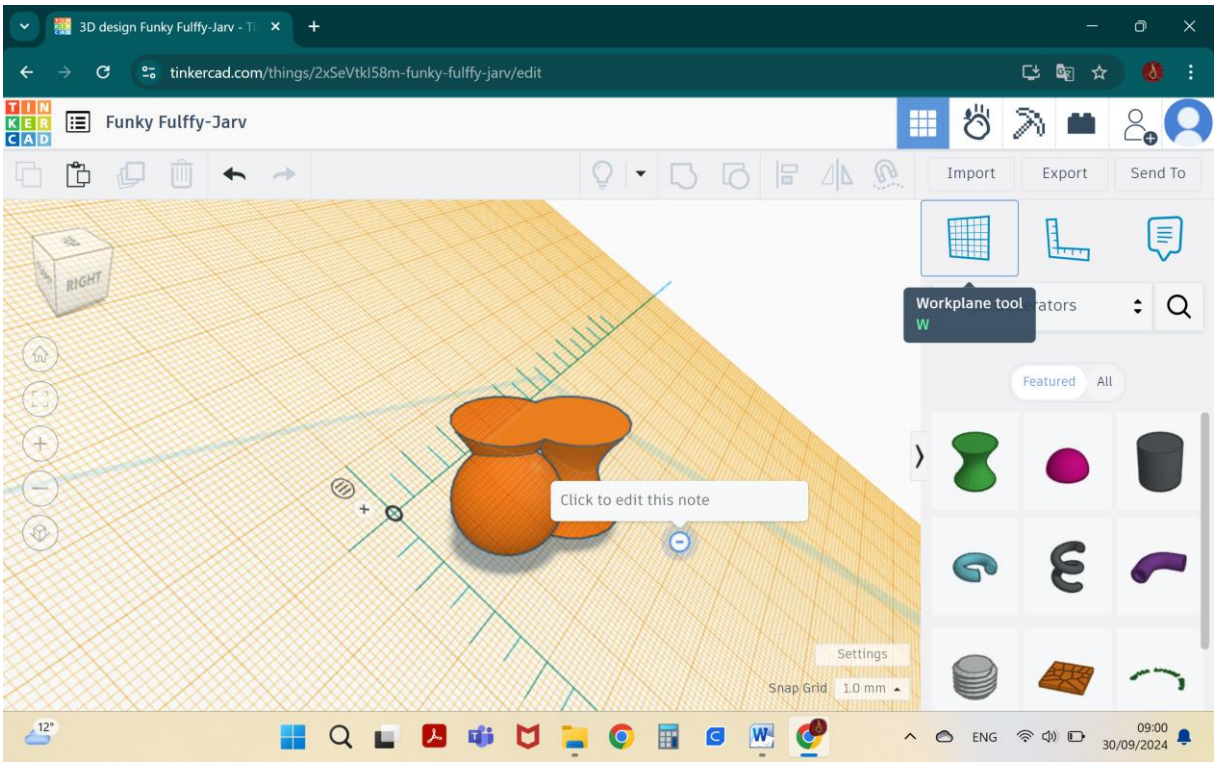




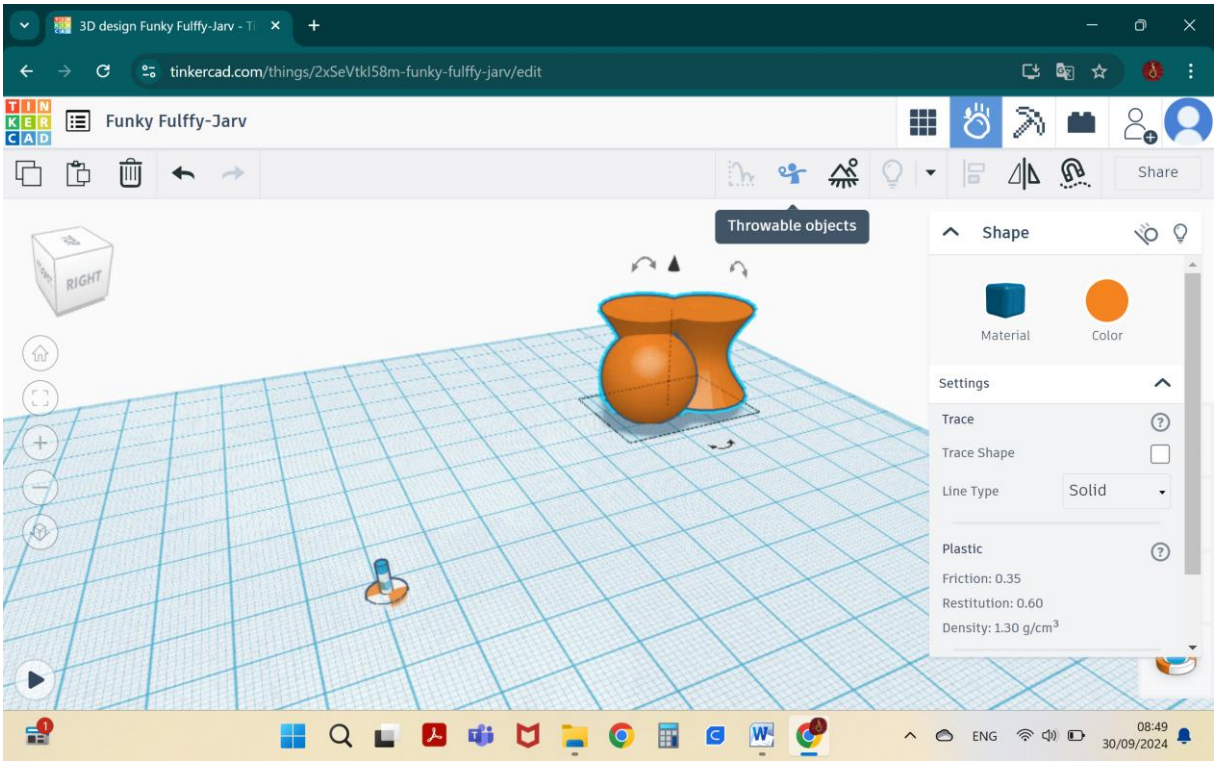
For ease of working, there is a screen menu on the left side where you can change the view:



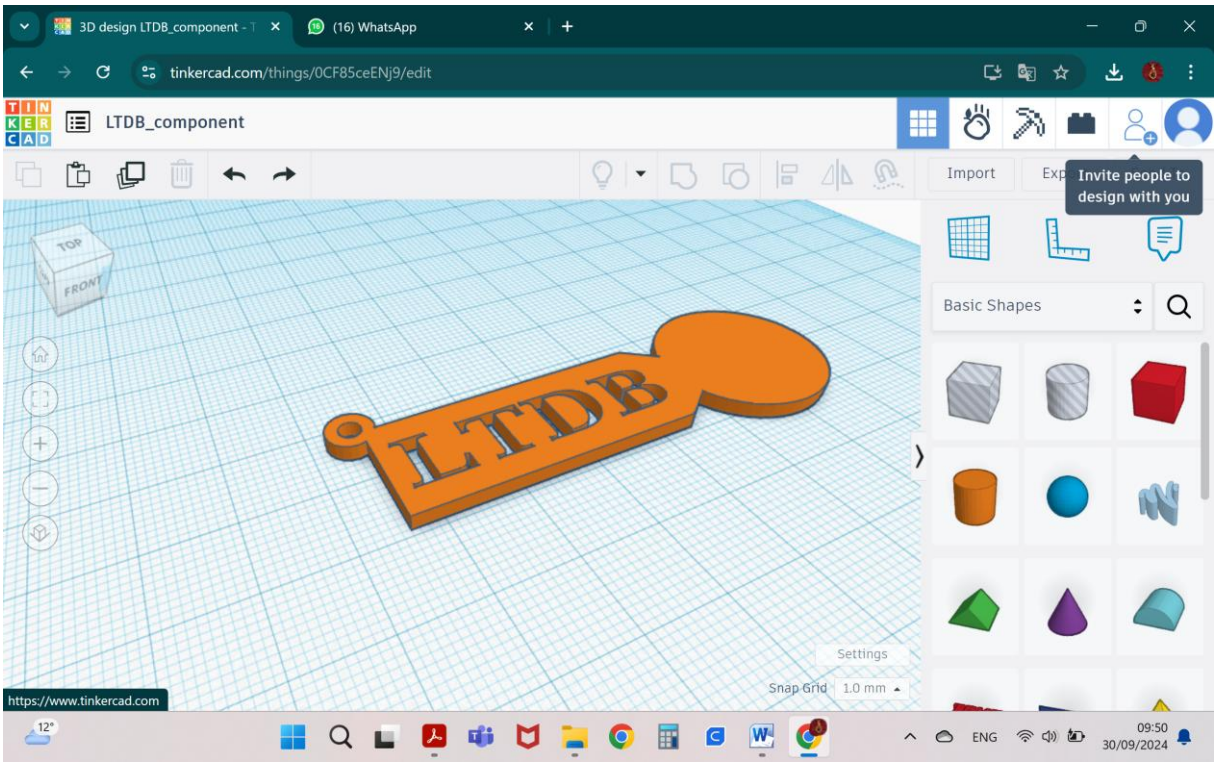
There is also a screen menu on the upper right side where you can modify the working plane, origin of measuring system and you can add notes beside some elements:



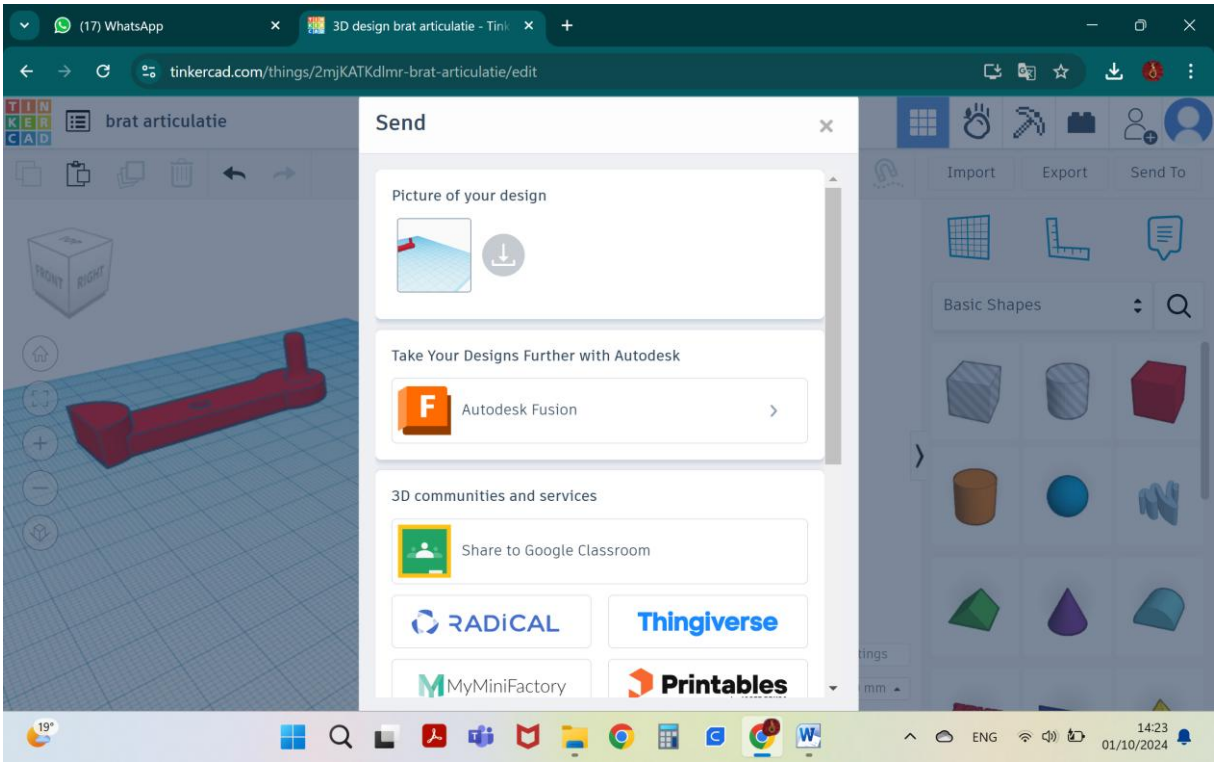
Once you created an object, it can be ported to the *SimLab* section, and assigned with physical characteristics. These are useful for simulating Physics phenomena (fall, bump, flow, move on a trajectory etc).



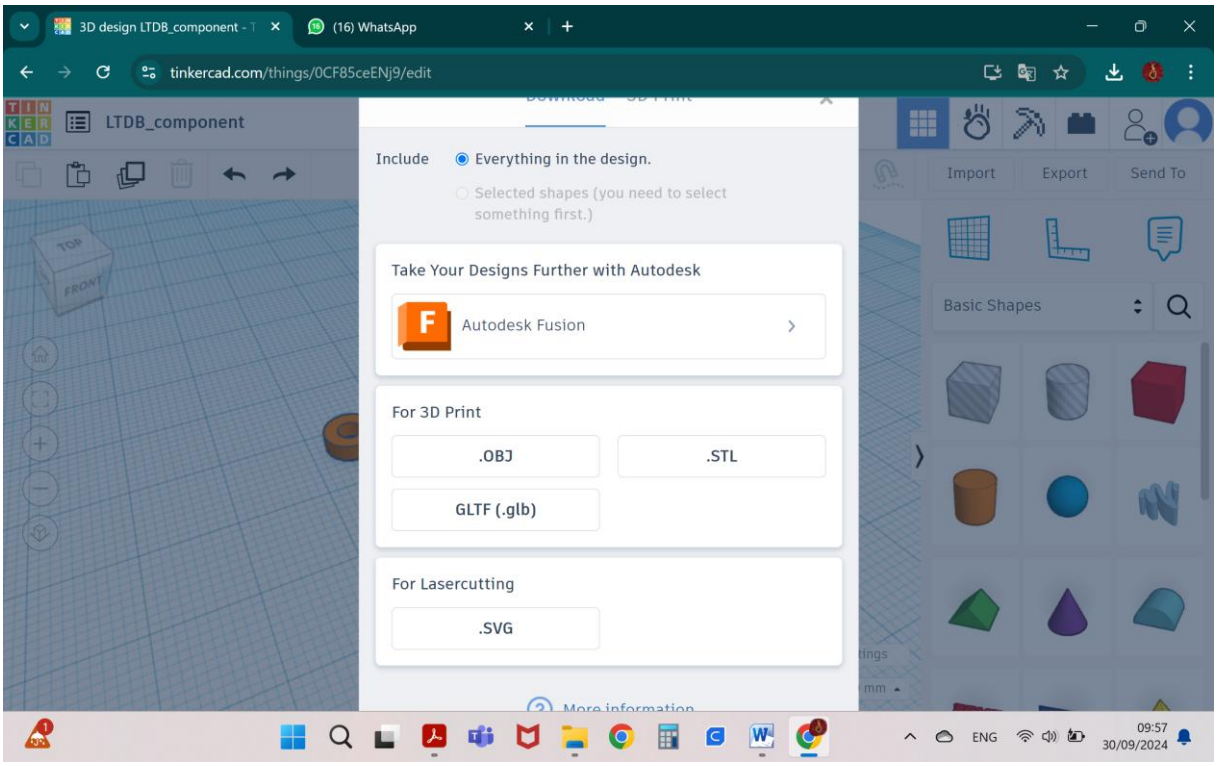
A project can be made by a single person, or in collaboration with others, if they are invited:



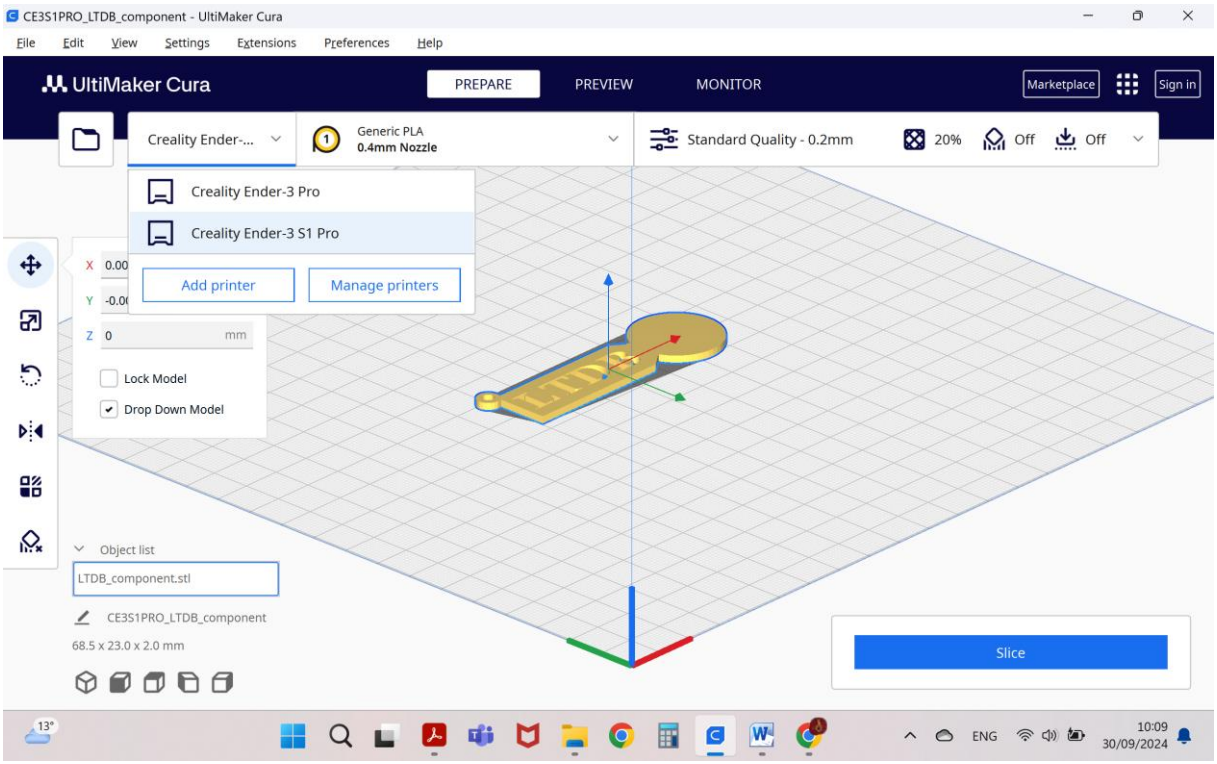
Also a project can be downloaded, shared to Google Classroom (by link), imported from or exported to another apps:



By exporting the file in various formats, it can be transposed in specific apps and prepared for 3D printing, laser cutting etc.



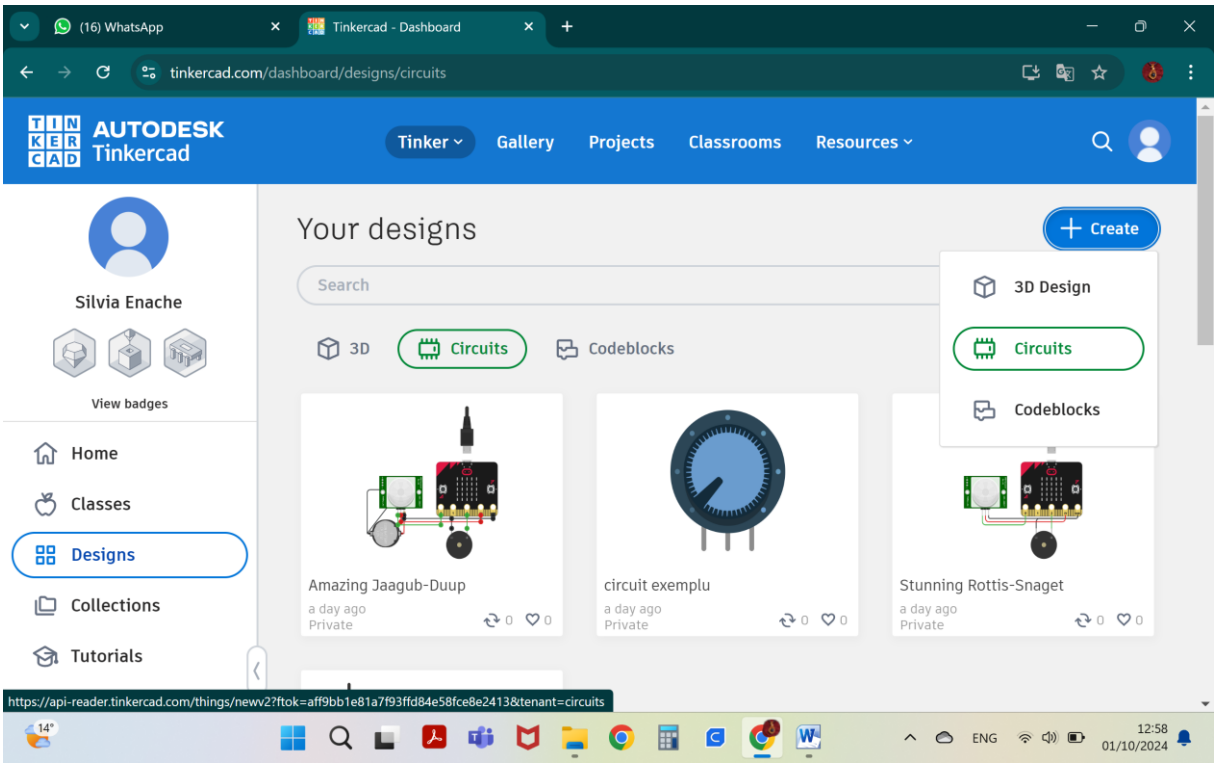
For example the most popular soft for 3D printing is *Cura Ultimaker*, which covers a wide range of 3D printers. The soft is completely free and updated periodically with the newest models from different producers.



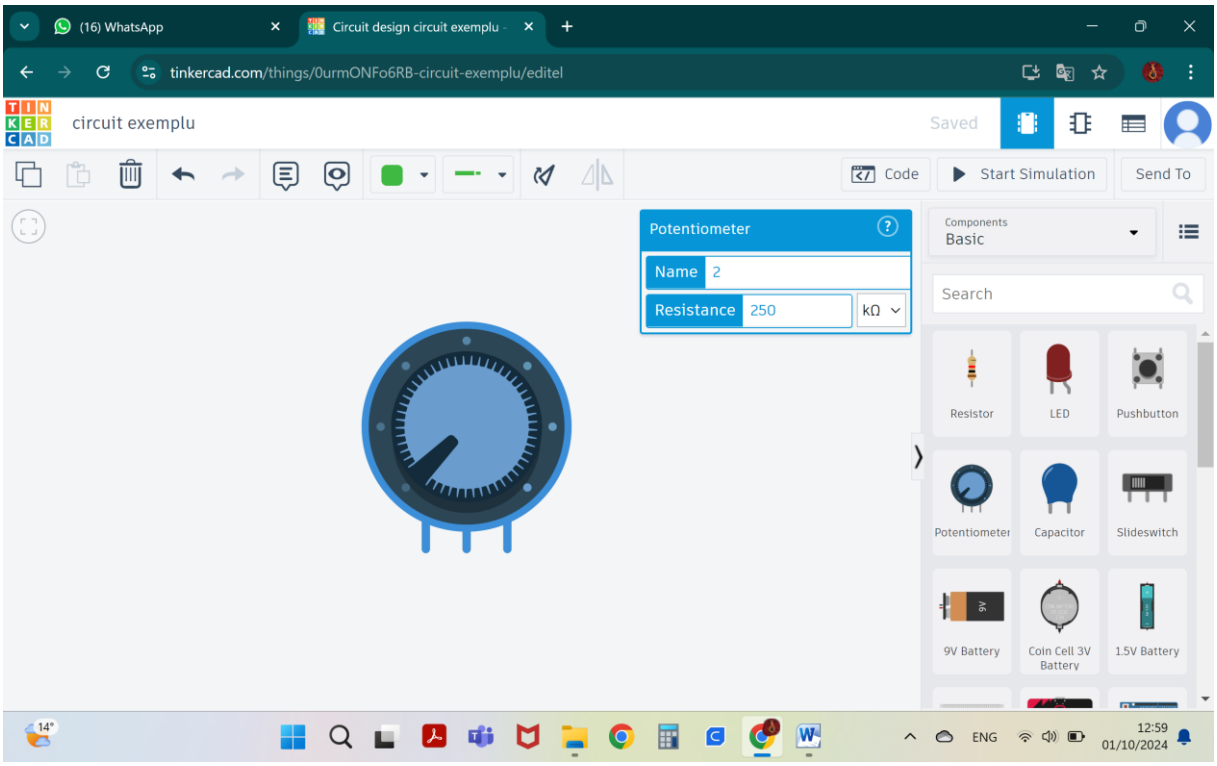
All 3D Design projects can be downloaded from the user account.

II. Circuits:

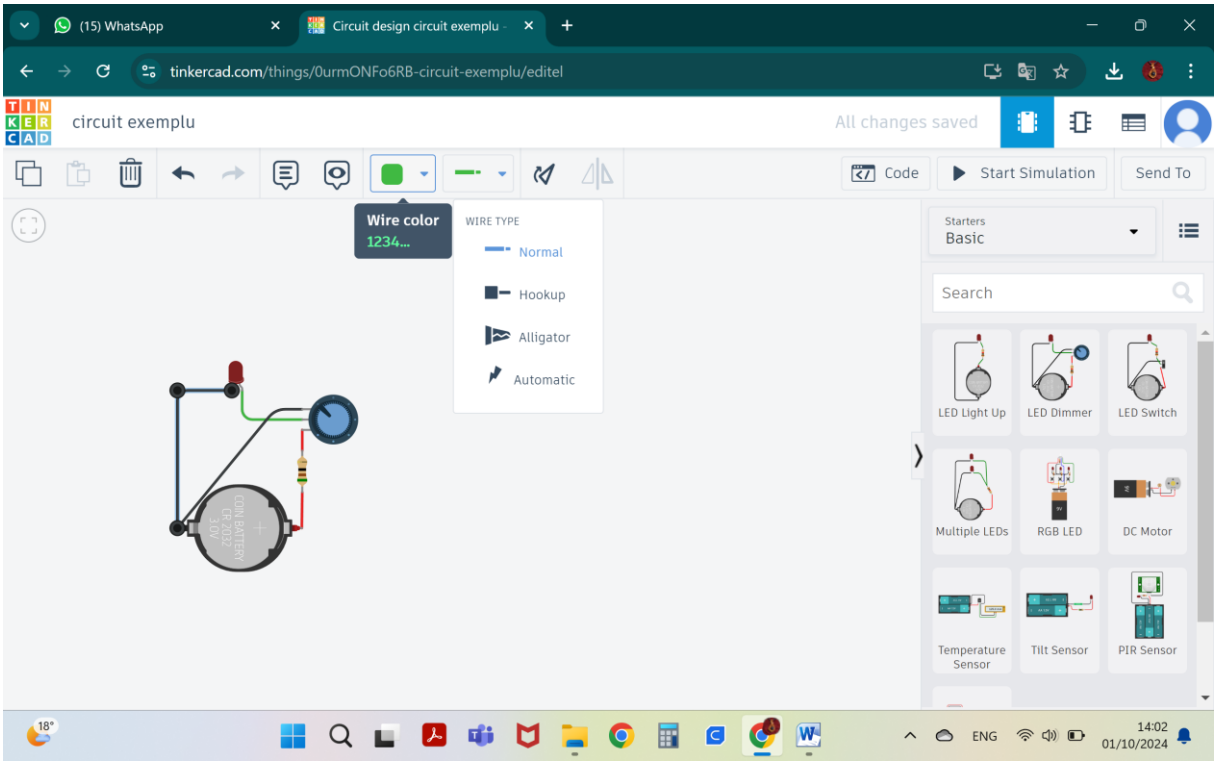
In this section you can create simple or complex circuits, save and reuse them in other projects. You can do the modelling by using circuit components or existing circuits from the section gallery.

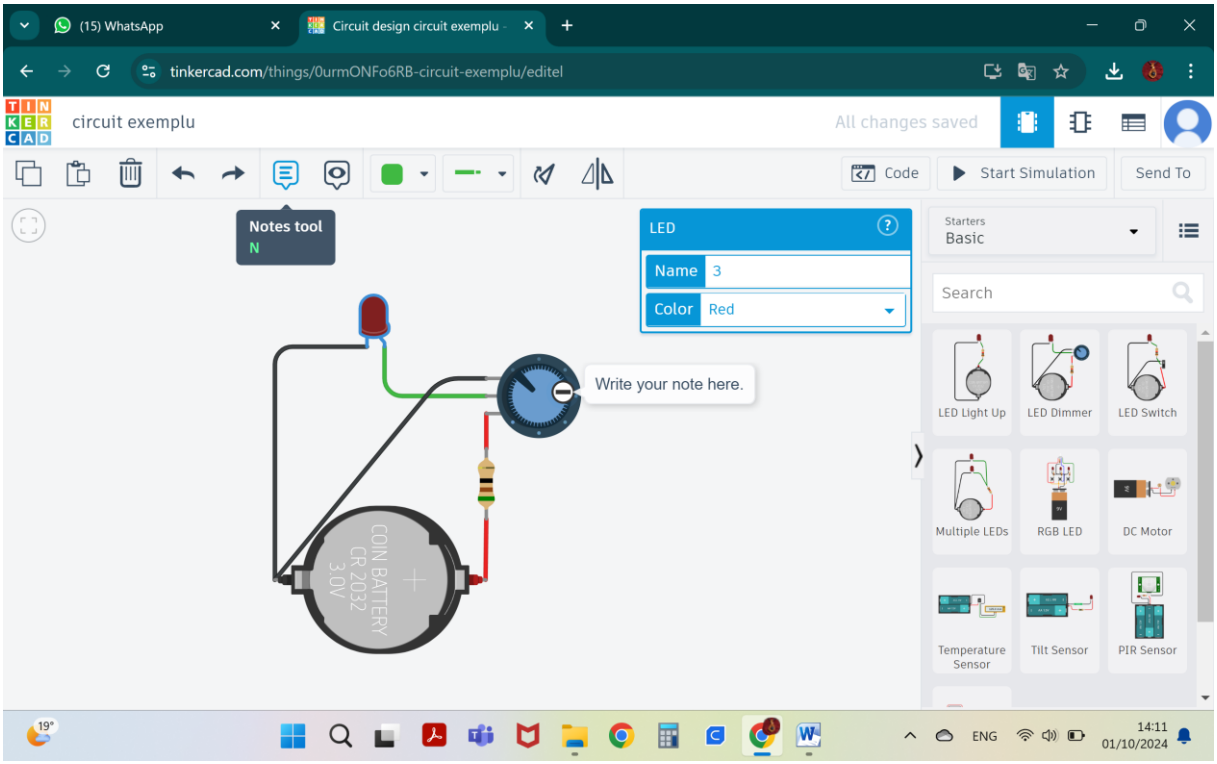


Each circuit can be assigned with values of usage parameters.

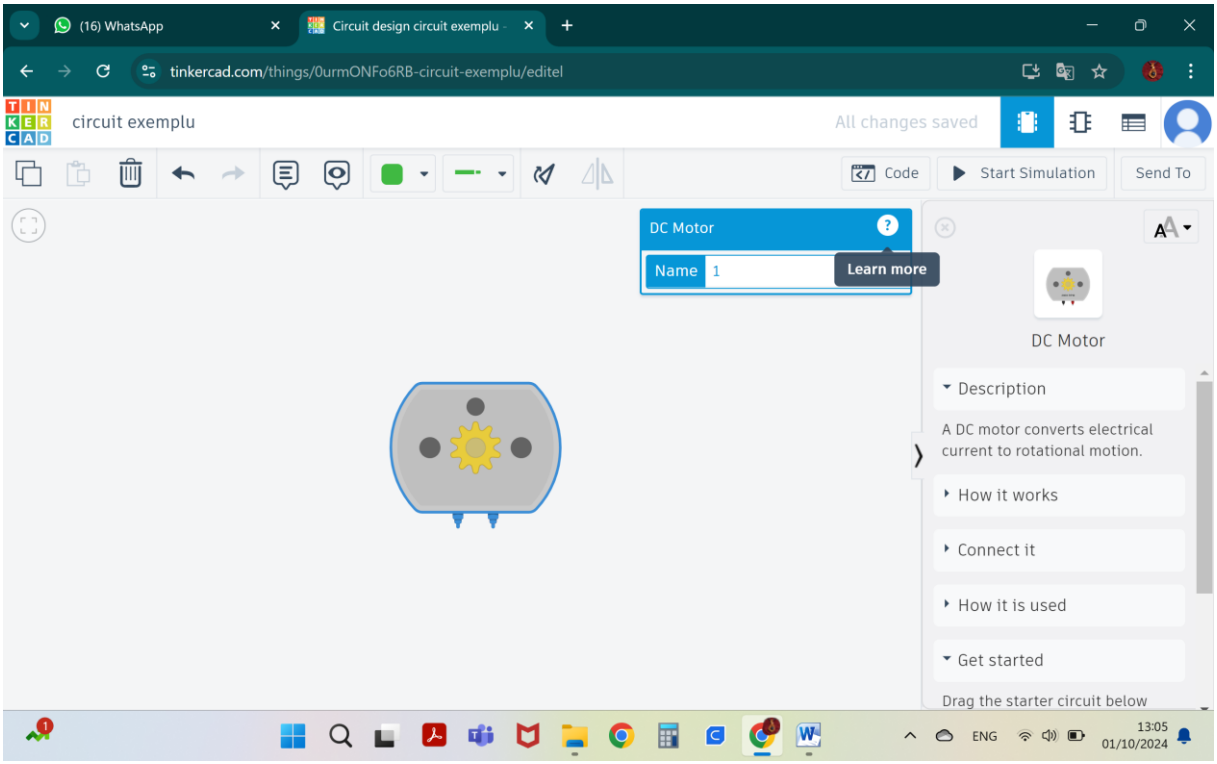


Also, the elements or the circuits can be copied, rotated, mirrored and deleted. You can modify connector types an you can add notes beside components or circuits.

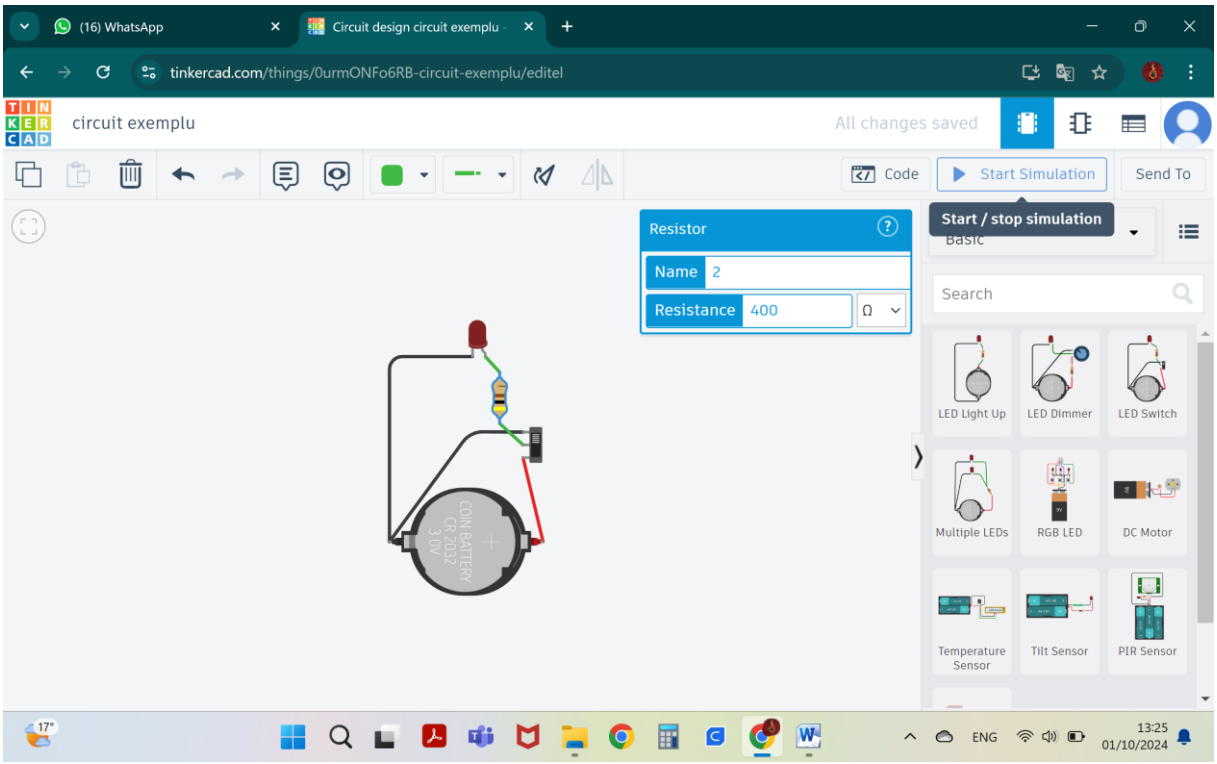




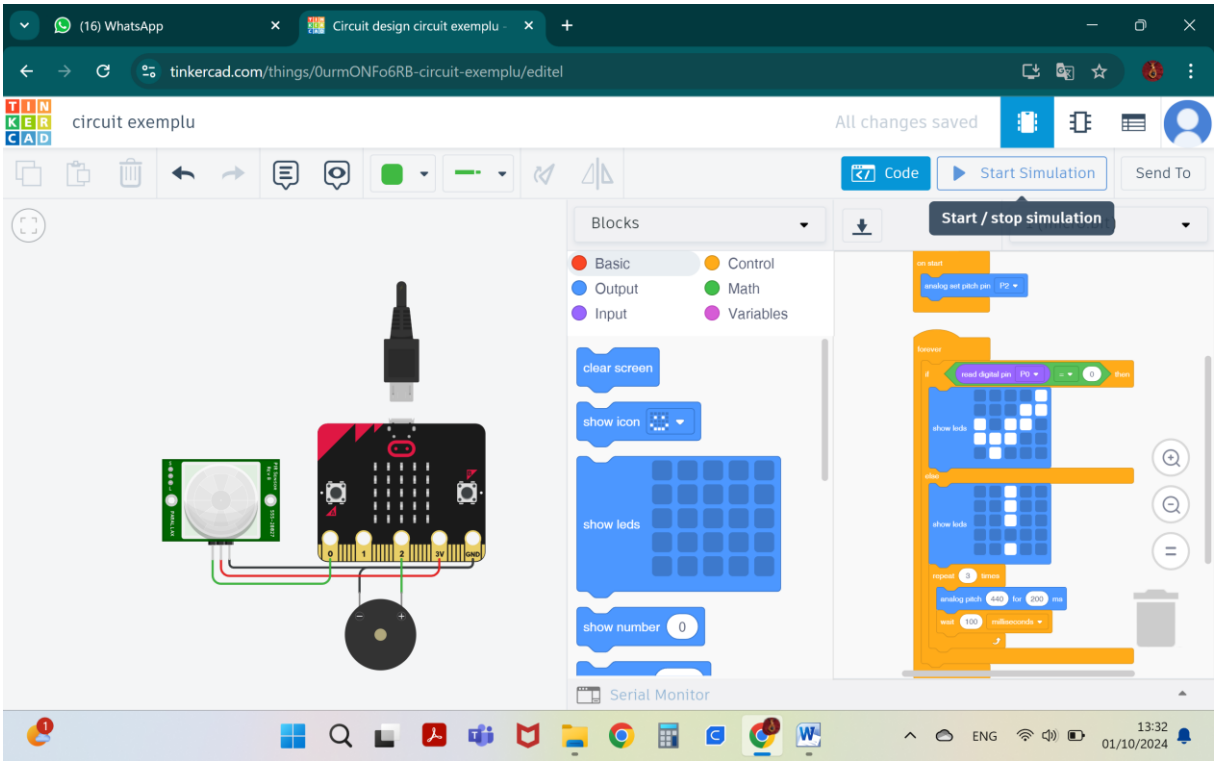
Each component has a section of information attached, which includes the function, connection type, photos etc.

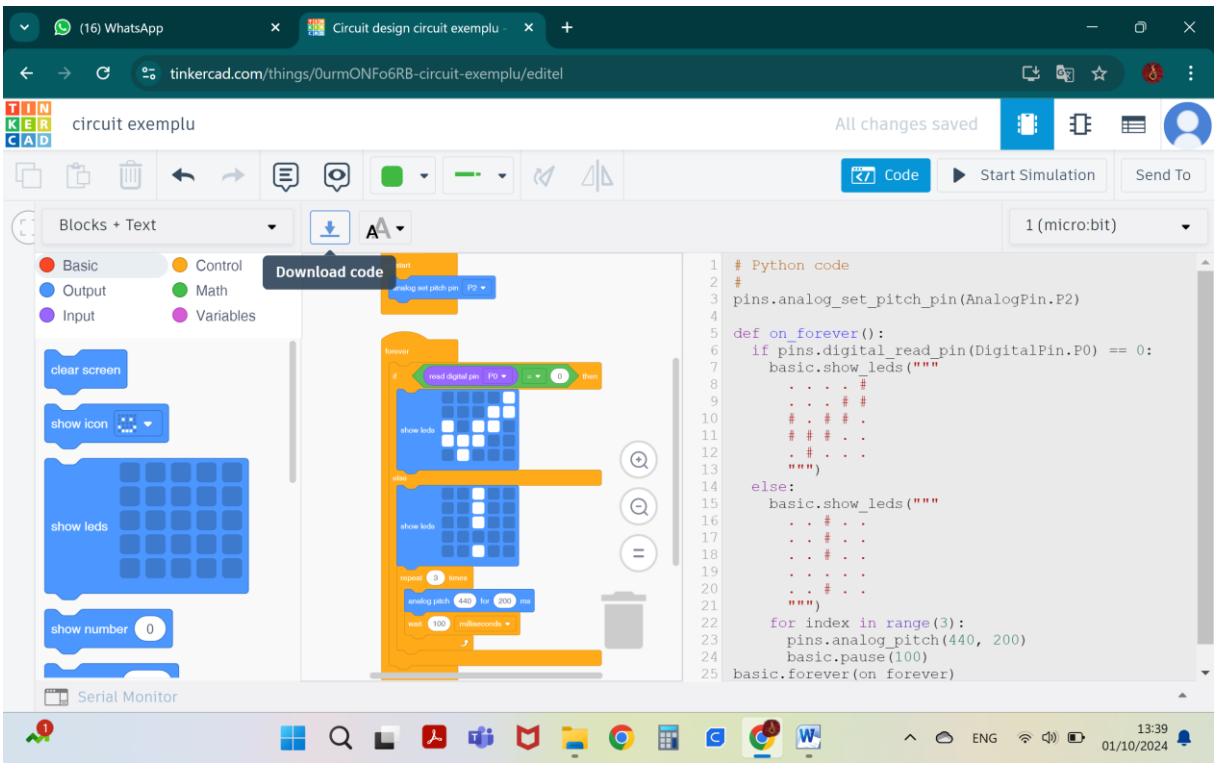


You can simulate working mode for an existing circuit, in order to verify the correct assembling of components or to observe the effect of changing some parameters.



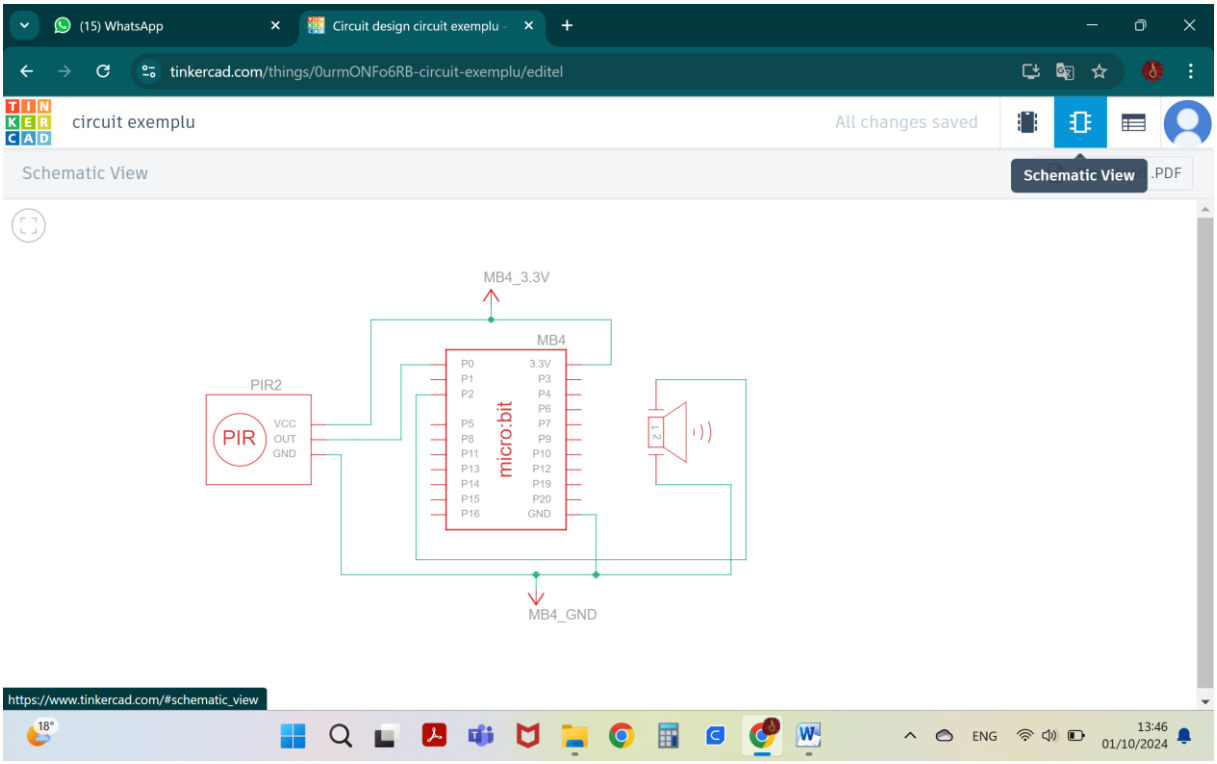
If the circuit includes also microcontrollers (Arduino, micro:bit), these can be programmed using the *Code* extension. Programming can be done either with blocks (similar to Scratch and mBlock), Python code or both. You can simulate the programed mode, just as in analog circuits.

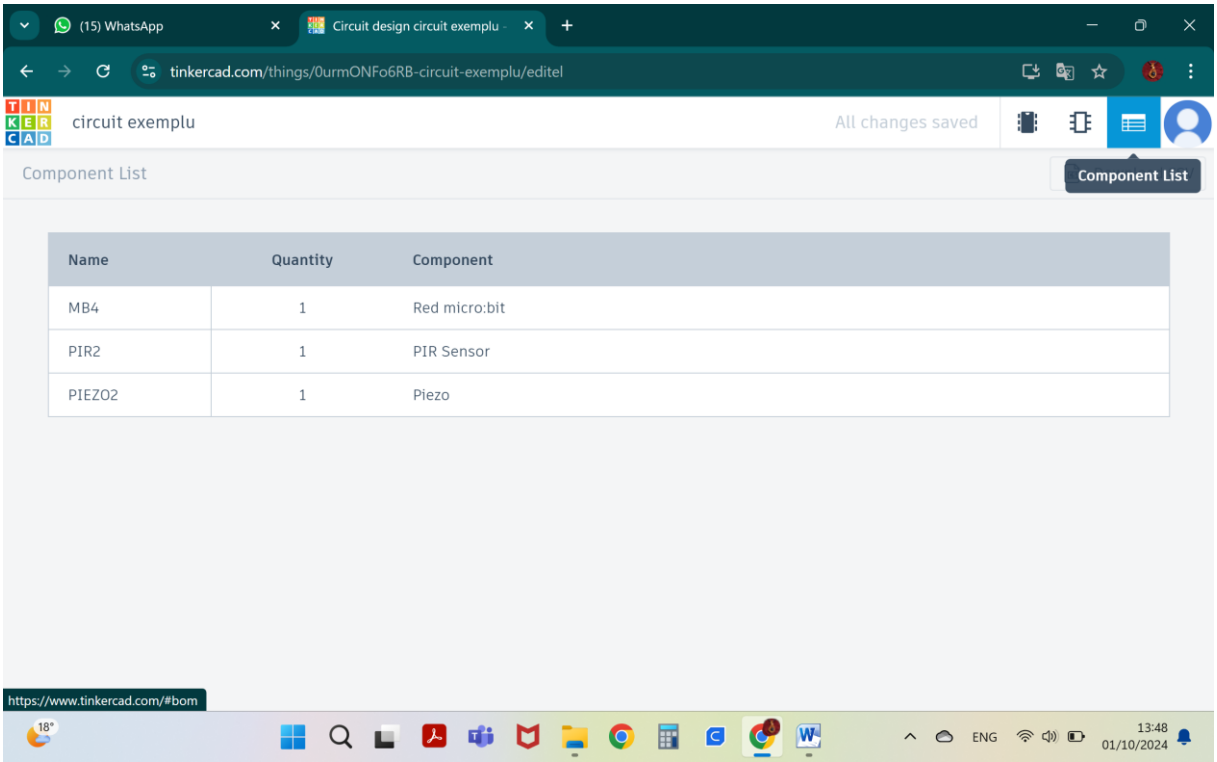




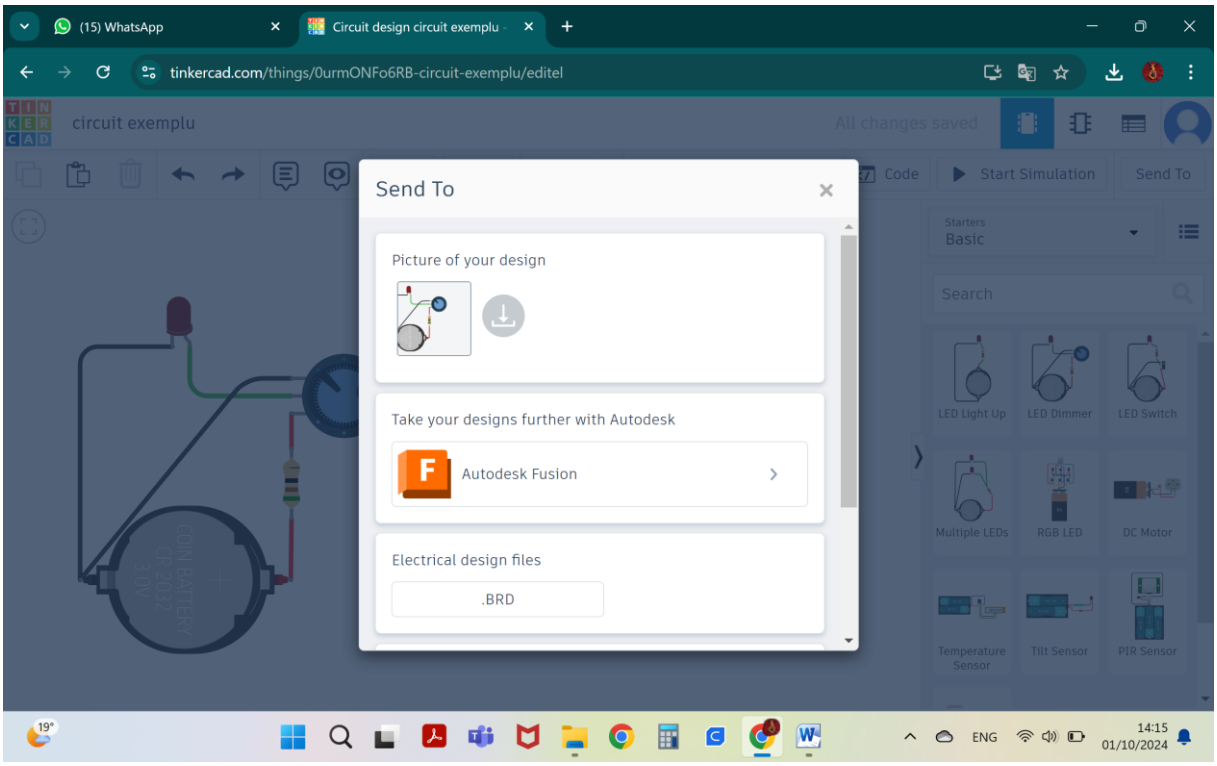
Once verified, the code you create can be downloaded.

For a given or projected circuit, the app can display the electrical scheme and a list of components and materials.



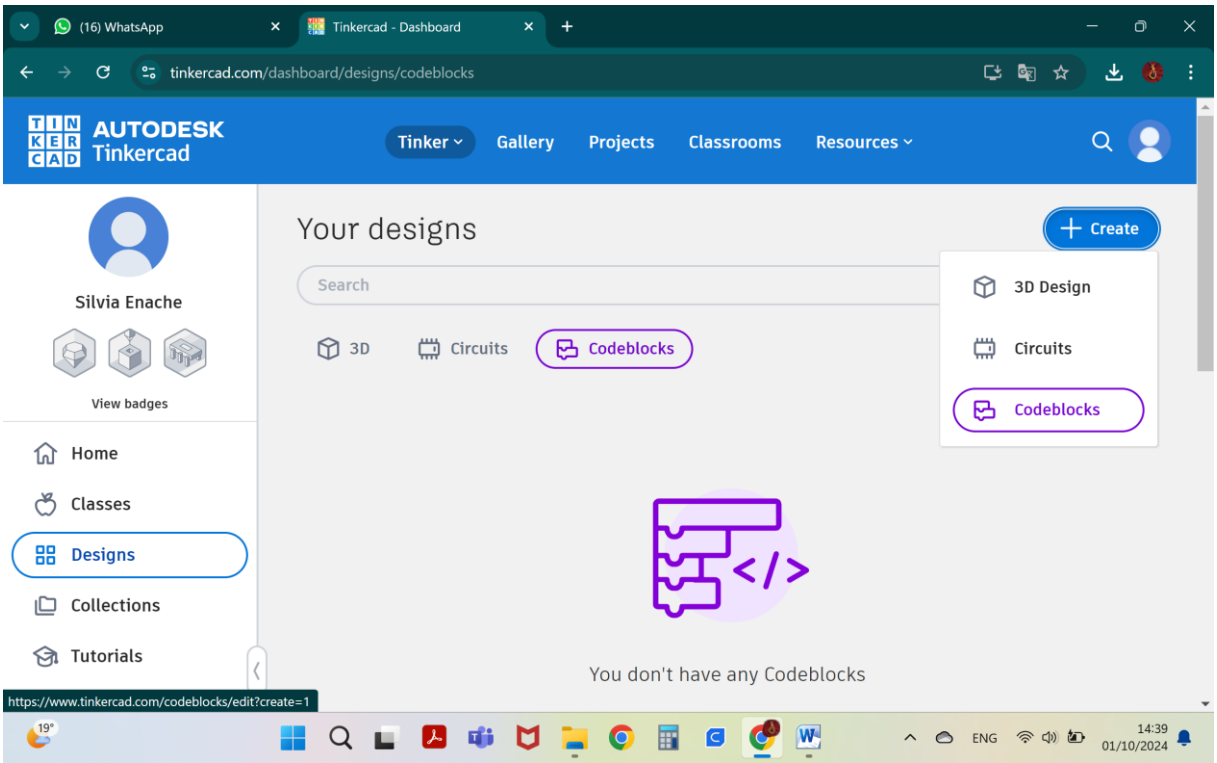


The circuit project can be downloaded, shared or exported to other apps.

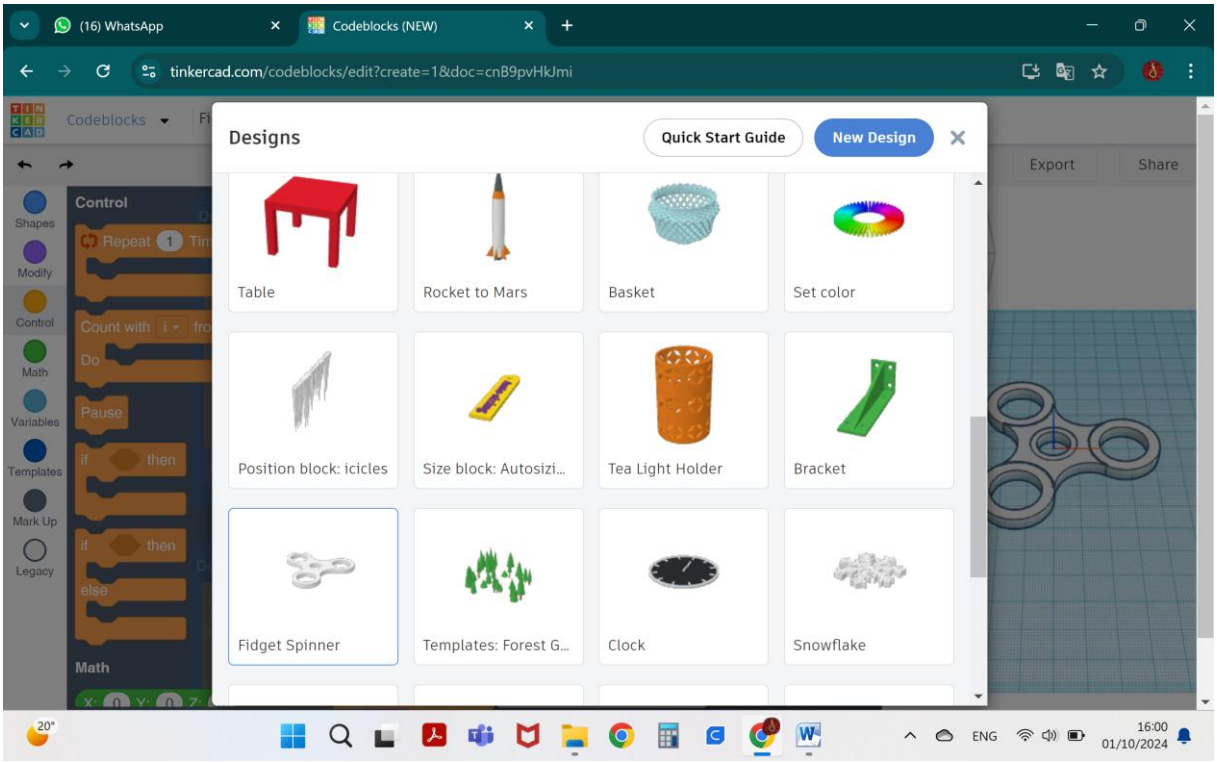


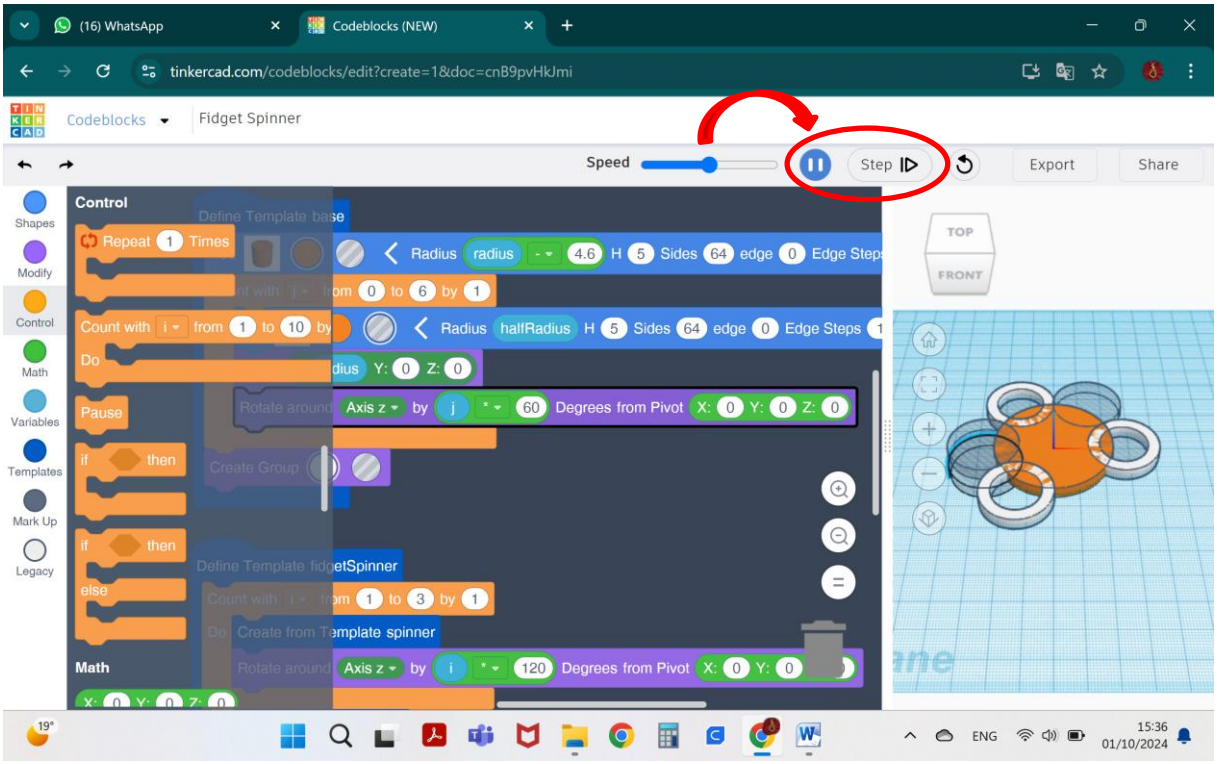
III. Codeblocks (code writing):

In this section you can create animations of any objects or groups of objects, which can be selected from the app library or created in the 3D modelling section.



For example, you can select an object from the gallery and modify it's shape and movement variables, and you can preview the animation (step by step or continuous, with a preset speed).

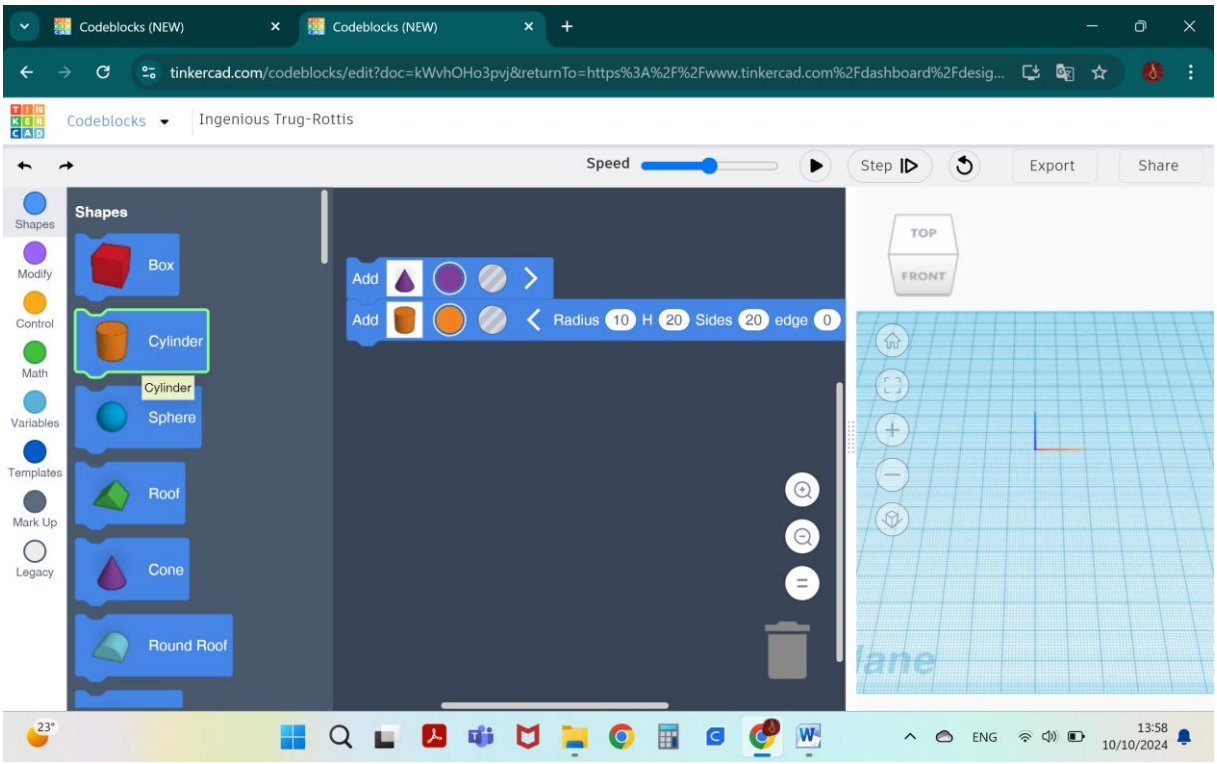


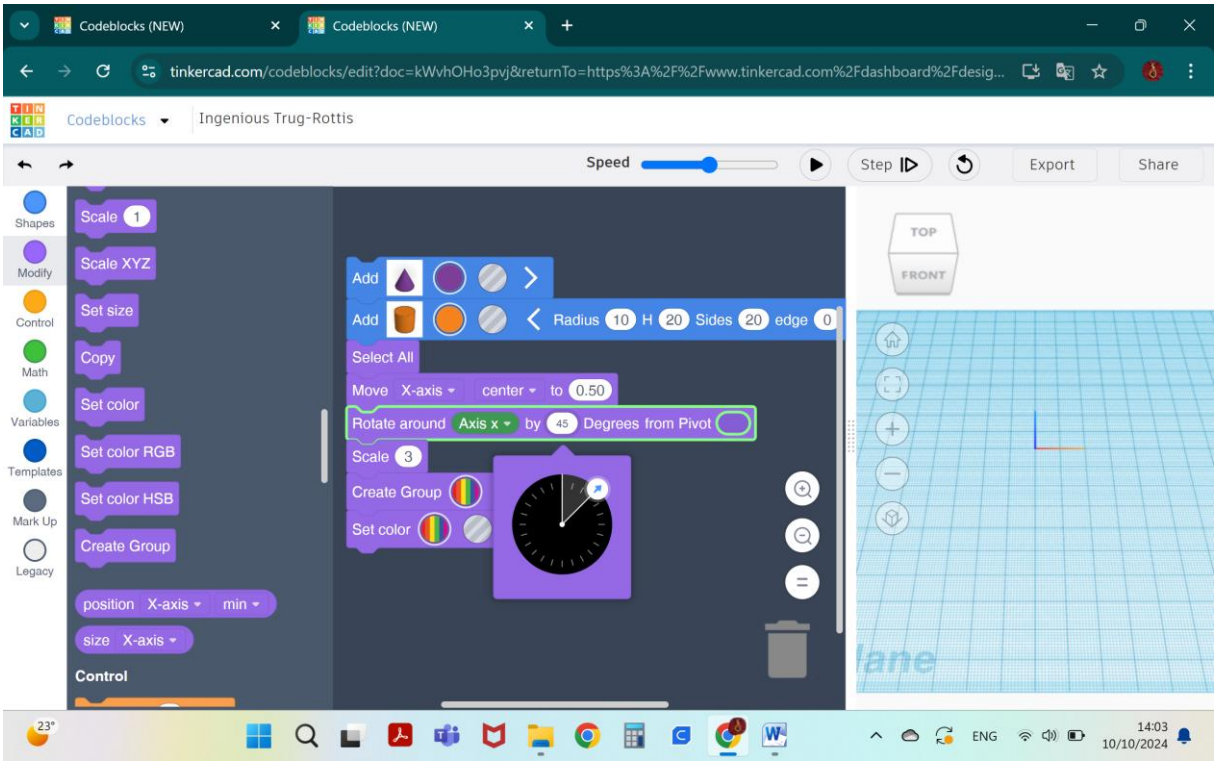


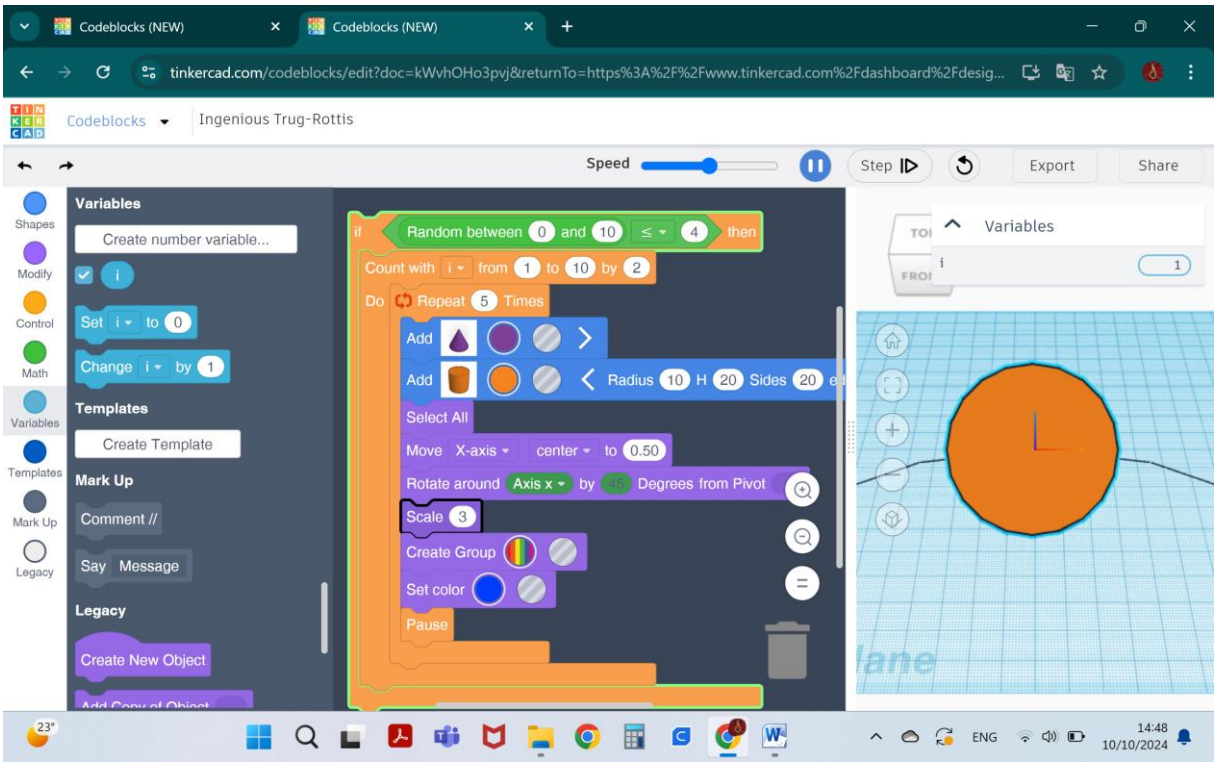
Or you can create a shape/a group of shapes by adding from the *Shapes* menu, to which you can assign specific properties or position variables from the

Modify menu (as well as in the 3D modelling section) and movement conditions/controls (from the *Controls* menu), in order to create an animation.

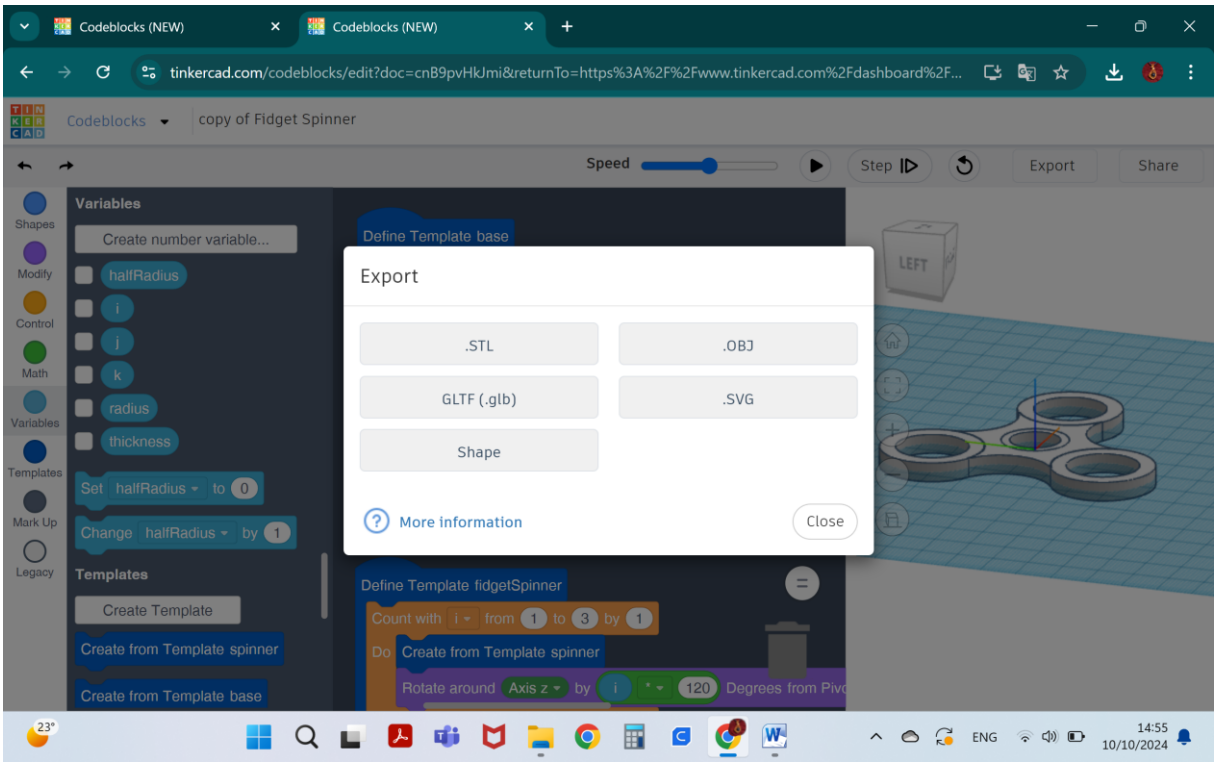
Observation: In the *Variables* menu you can define your own variables, and in the *Math* menu you can do operations with variables.

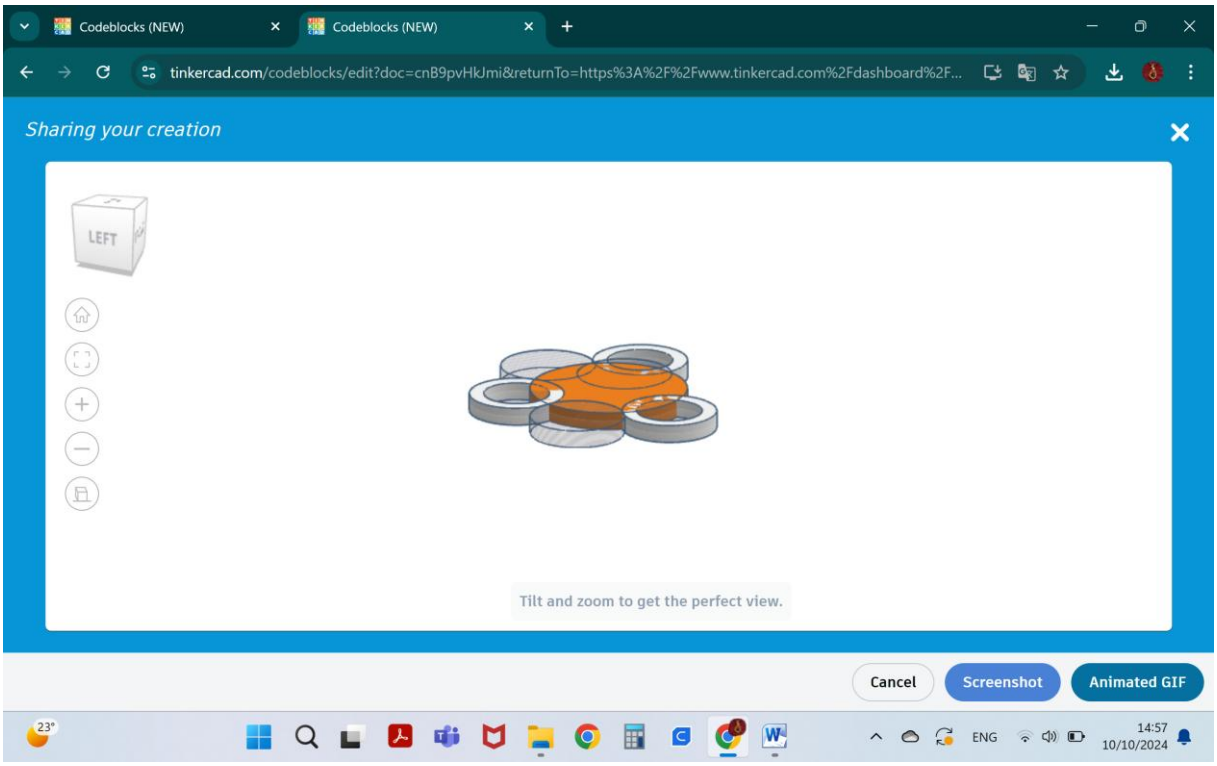


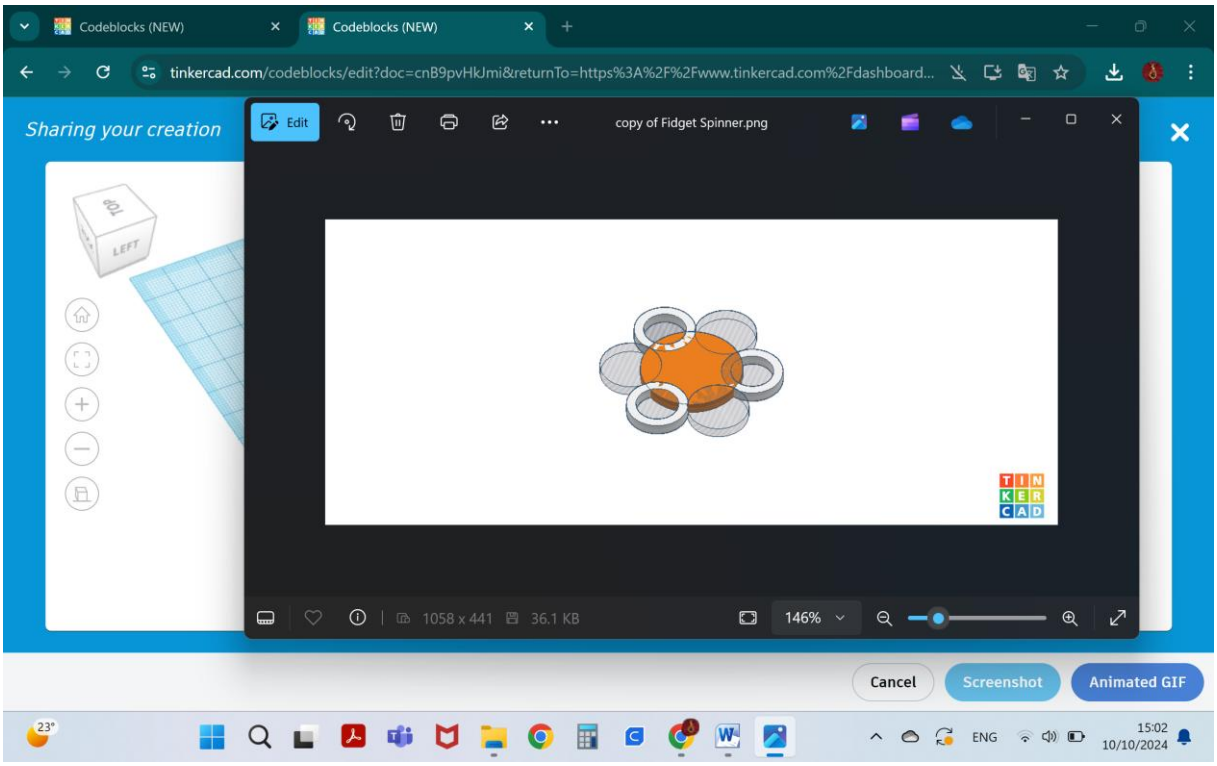




Once done, a project can be exported to other apps or shared in different forms:







Remember:

You can find additional explanations and step-by-step tutorials for each command of this app, in the *Resources* menu, in the section *Learning Center.*