



MakeY



Phygital Making

Aim

The word 'phygital' is used to describe the blending of physical and digital domains and elements. The aim of the activity outlined here is for children to create a 3D digital representation of a 3D physical model. This can then be used in a variety of ways, such as 3D printing, importing the design into Virtual Reality (VR), and so on. An app that enables Augmented Reality (AR) can also be used to create an AR version of the child's work, that can be overlaid on the physical version.

Intended Learning Objectives

All children will be able to:

-
- create a 3D physical model;
 - understand that this model can be transformed into a digital form, which can be used in different ways.

Some children will be able to:

- use the Qlone app independently to create a 3D digital model;
- understand the process of 3D printing;
- create a VR world.

Materials

Materials that enable children to create a physical 3D model e.g. clay, paper.
3D printing materials.

Tools

A tablet

Qlone app (see <https://www.qlone.pro>).

Augment platform (see <https://www.augment.com>)

3D printer

HTC Vive and controllers

Laptop

Activity

Scanning to Qlone

1. Children create 3D objects using a variety of media - clay, paper, wood and so on.
2. The children can then use the app Qlone to scan the 3D object and create a digital representation of it. This involves the children holding a tablet whilst the object is turned using a special mat, which can be printed out on paper and glued to card. This mat can then be placed on a 'lazy susan' and turned to enable the app to scan it in. As the children hold the tablet, they should attempt to enclose the object in the cage that appears on the screen. It normally requires several turns of the mat to ensure that the object is fully scanned. Children can work in pairs, with one child operating the app and the second child turning the mat on the lazy susan. Some adult help may be required in this process (see Figure 1).

Figure 1: Child scanning a clay model using Qlone



3. Once the child has scanned the object, save it and export in different formats, including .OBJ, .JPG and .STL.. In the MakeEY project, the models were exported to the 'notes' option and the child's name was entered in order to identify the model at a later stage. The files were then uploaded to iCloud.
4. On a PC/ laptop, the files can then be accessed by logging in to the app. Click on the "Notes" section; click the model to download (there sometimes seems to be a slight pause, but the files do download as a zip, to the Downloads folder).

Qlone to 3D printing

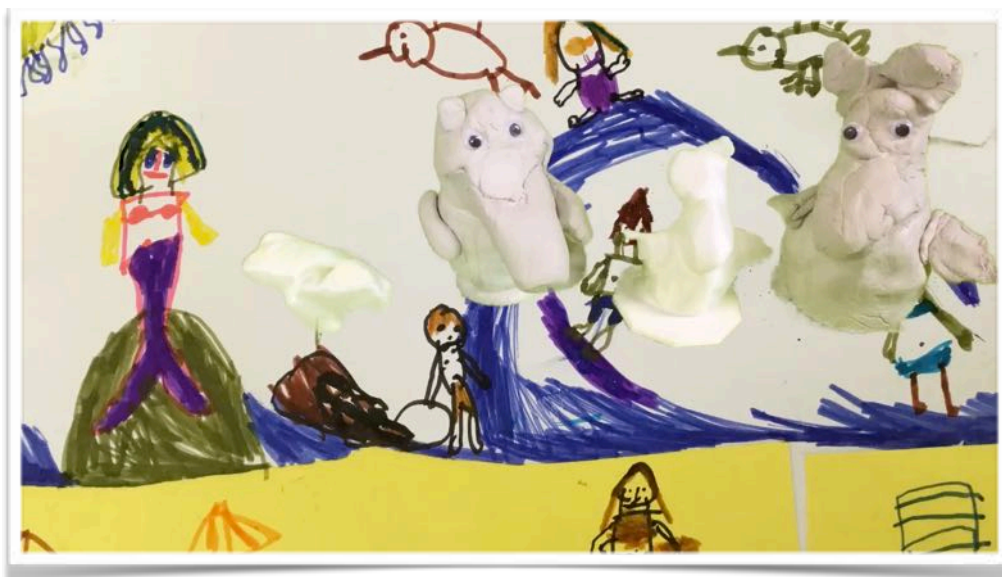
5. Transfer the downloaded .STL files onto a USB drive.
6. Use an appropriate software program to prepare the files for 3D printing. (In MakeEY, an Ultimaker 3 3D printer was used, and the C program enabled files to be prepared and resized.)
7. Save the final versions of the .STL files on the USB drive, and use a 3D printer to print the models. (See Figure 2 for an example.)

Figure 2:A Child's 3D clay model and its 3D printed version



8. The 3D printed versions can be used in different ways. In one of the Sheffield schools, the children made animated films using both their clay and 3D printed models (see Figure 3). This led to rich discussions about the properties of materials, as sometimes the clay models lost elements, whilst the 3D printed models remained intact throughout the filming process.

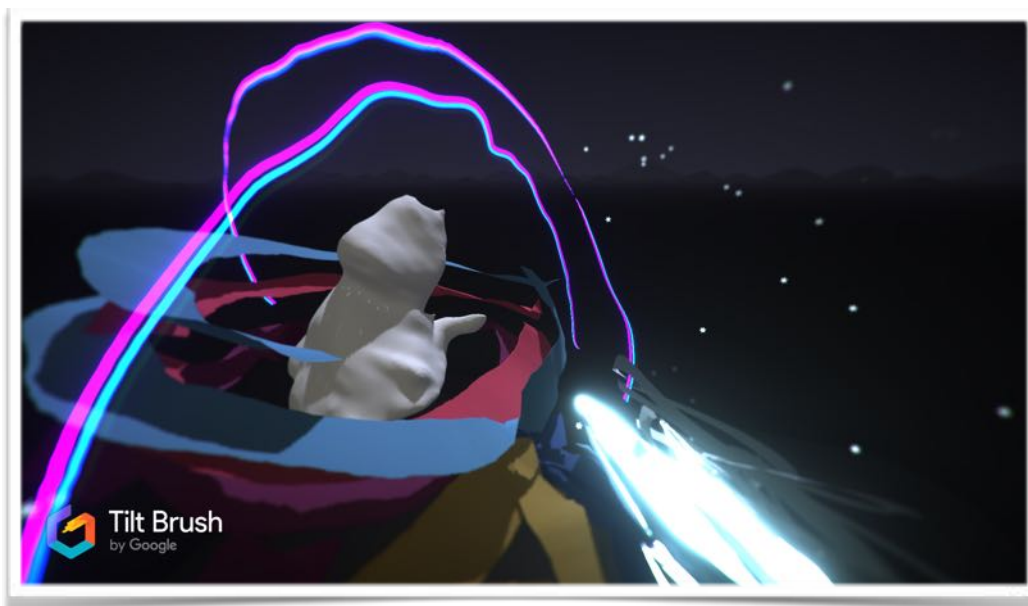
Figure 3: Still of animated film using clay and 2D models



Qlone to Tilt Brush

9. Using the “Extract All” option (when you select the zipped folder in Downloads, see instruction 4 above) extract the folder contents to:
Documents>TiltBrush>Media Library>Models and ensure you change the name of the .obj file to the child’s name
(the .mtl and .jpg will also need changing to match).
10. Using the laptop linked to the HTC Vive and handsets, Open Tilt Brush in VR.
11. Navigate to the “Labs” section - on your paint palette, swipe to the Tools panel and select More(...)
12. Choose the model (click once to select, and again to import it into Tilt Brush VR)
13. To move the model, highlight the model with the right hand control and click the inside gripper. Hold and move.
14. To resize the model hold down the inside gripper of both hand controls and move them apart until the model is the desired size.
15. To discard a model, highlight the model with the right hand control and click the inside gripper and then “toss away” and it should disappear.
16. Once the model is imported into Tilt Brush, a VR world can be painted around it (see Figure 4).

Figure 4: A digitised version of a 3D printed model imported into Tilt Brush



Using a Tracker (an image that triggers a particular model) and a 3D model with Augment

16. Log into Augment using a PC or laptop. Click on “Add Model” and navigate to the Downloads folder and select the zip from the Qlone export (if this seems to take a long time to load , you can also drag and drop the zip onto the “Add Model”).
17. Click Save/OK on the dimension and publish model.
18. Swap to the iPad Augment app now and login.
19. Click on Your Models and find the latest model (it will be at the bottom).
The model should appear in front of you and can be resized/reorientated using the finger controls on screen. Use the camera function to take a picture of the model in situ. Photo will be saved in the gallery and can be uploaded to Notes on icloud in the same way as in step 4 above.
20. Follow the instructions above “Qlone to Augment” to load the model into Augment
21. Click on “My Trackers” in Augment (desktop), and then “All Trackers”. Click on “Add Tracker”.
21. Select the image you wish to use for the tracker - ideally this should be a piece of children’s work that you have taken a photo of (e.g. their 3D clay model).
You can also select the image and “drag and drop” it onto the “Add Tracker” icon.
22. On the next screen, check the dimensions of the tracker and under “Link to:” option, select “3D Model” and choose the correct model from the drop down list (the model must be loaded first).
23. Click “Save and Publish” in the top right.
24. Swap to the iPad Augment app now and login - must be the same account as the model has been uploaded to.
25. Click the “Scan” icon (bottom, middle icon) with Augment app open, and hover over a printed image of the child’s picture. A barcode laser will appear and will pause once it has identified the image.
26. After a few seconds, the child’s model should appear on top of the printed picture as an augmented reality model.
27. The model can be resized/reorientated using the finger controls on screen.
Once the model is orientated as required, click on the “Settings” option in the app and turn on “Freeze orientation” and “Freeze Scaling” and save. This will mean that the tracker, when scanned in future by other people, will call the model up in the same orientation and size as it has been set.

28. Use the camera function to take a picture of the model on the tracker. Photos will be saved in the gallery and can be uploaded to Notes on icloud in the same way as in step 4.

Notes prepared by Bryony Olney and Jackie Marsh

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