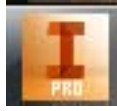# DIY Faraday Challenge Day

## 3D DESIGN & PRINTING

Instruction Booklet

Autodesk Inventor
Quick start guide

As the 3D Design Engineer you are responsible for ensuring that your Beacon is designed to a high standard and is ready to be processed by the print engineering on time.

To help you get started with the designing there is some information below. Just ask the Challenge Leader if you need any help.
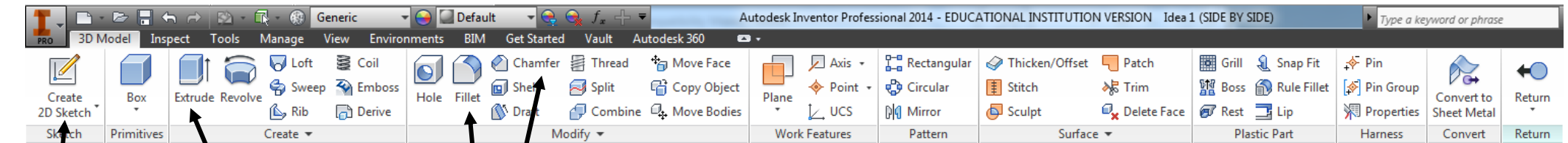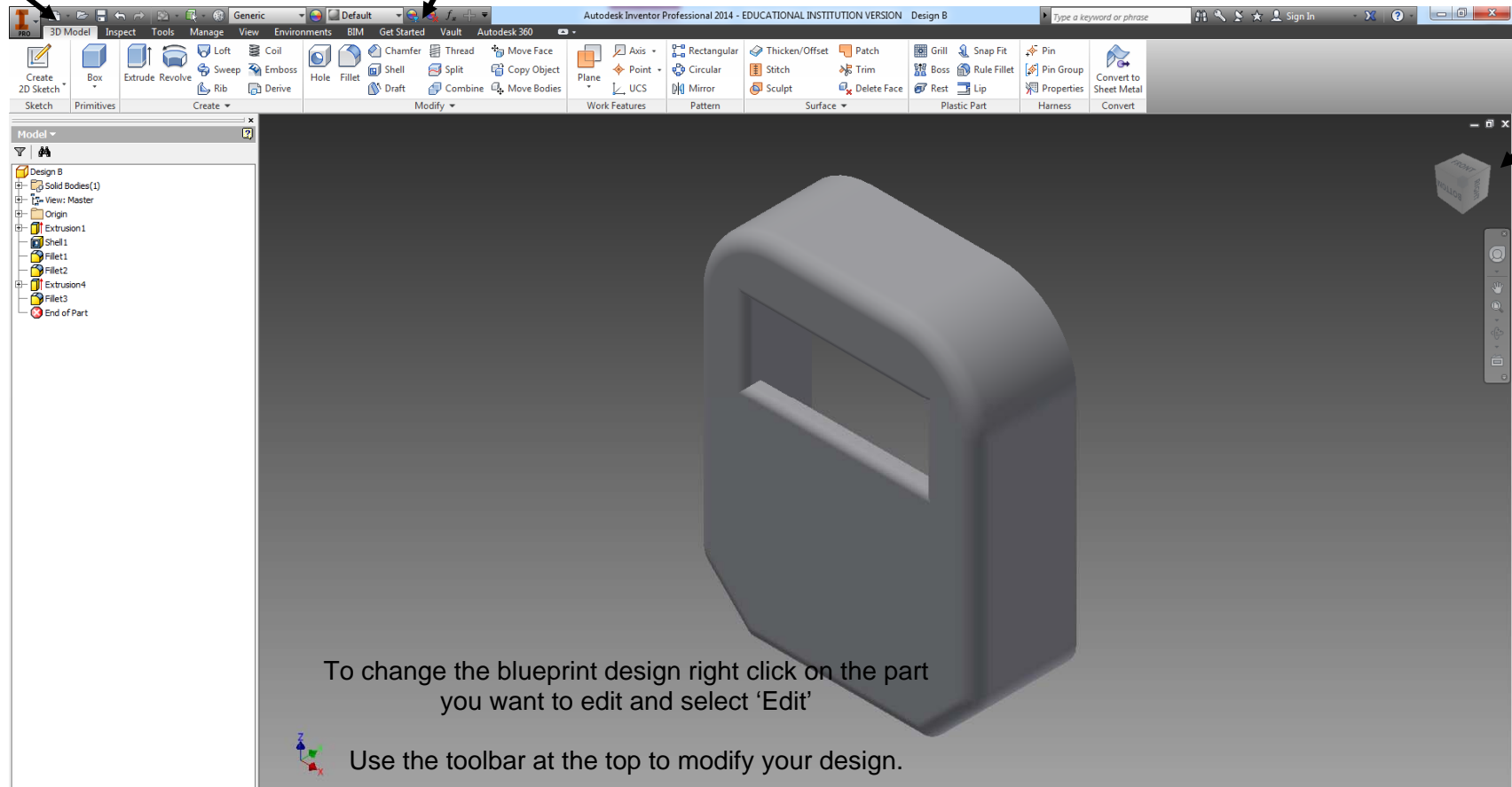
Tutorials

When you open Autodesk Inventor you will be given the option of viewing skills videos or taking part in interactive tutorials. It is a good idea to look at some of these to help you use the software.
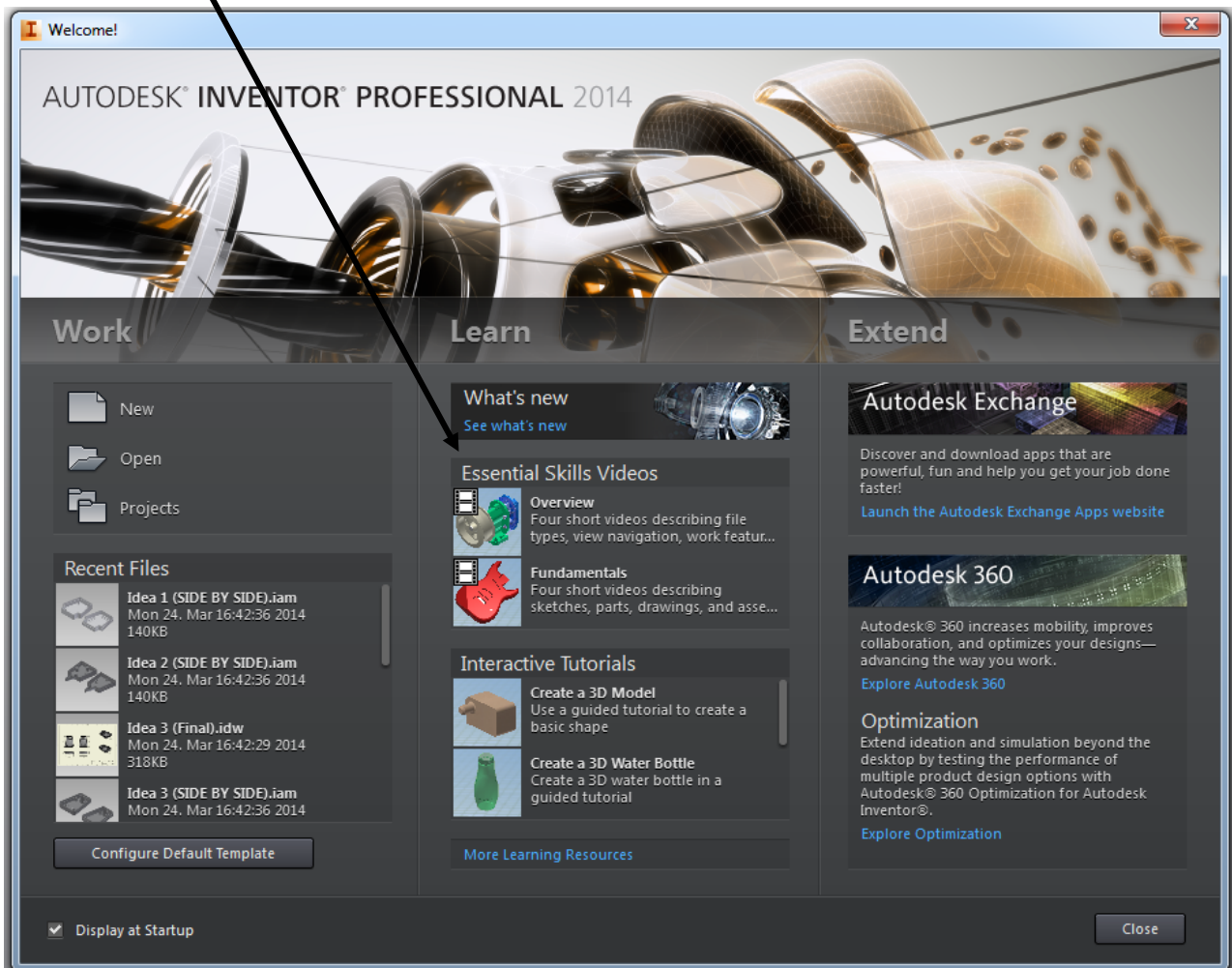
3D Model toolbar allows you to draw and adapt your design.

If you need to learn how to use the software you can return to the Get Started toolbar for tutorials.

Use this tool to view your design from different angles.

To change the blueprint design right click on the part you want to edit and select 'Edit'

Use the toolbar at the top to modify your design.

Draw a new 2D shape.

Turn your 2D shape into a 3D shape.

Change the edges and corners of your design.

3D Print Sheet

As the 3D Print Engineer you are responsible for ensuring that your design is printed on time and to a high standard.

To help you through the print process follow the steps provided below. Just ask the Challenge Leader if you need any help.

## Getting your design ready to print

Once the Design Engineer has completed the 3D drawing of your Beacon you will need to convert it to a printable file .STL file. To do this follow the steps below. <u>You will not be able to edit your design once it is an .STL file</u>.

- Open your 3D design in Autodesk Inventor.

- Click on the Icon in the top left corner of the Inventor.

- Move your mouse over **Save As** and a list will appear. Click **Save Copy As**.
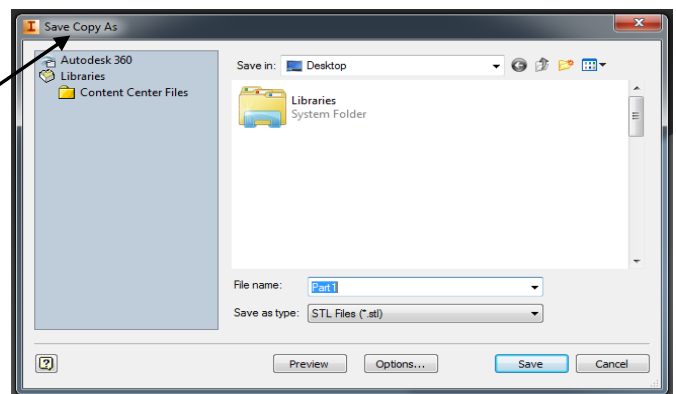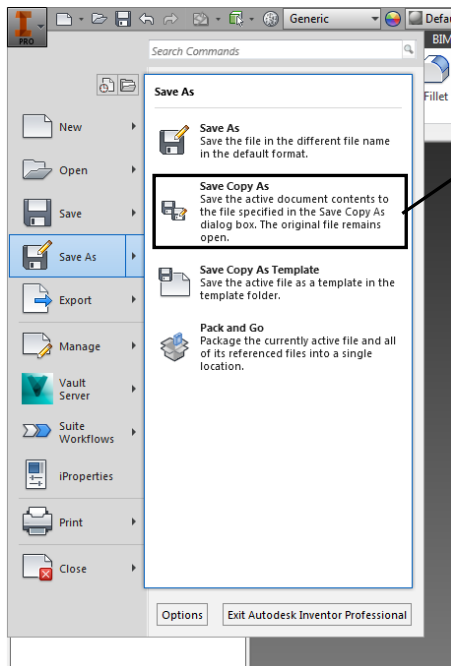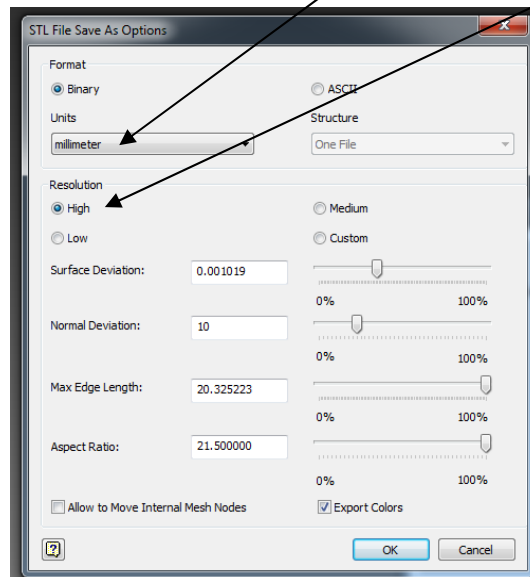
- In the box that appears use the **Save as type** dropdown menu to save your design as a .STL file.
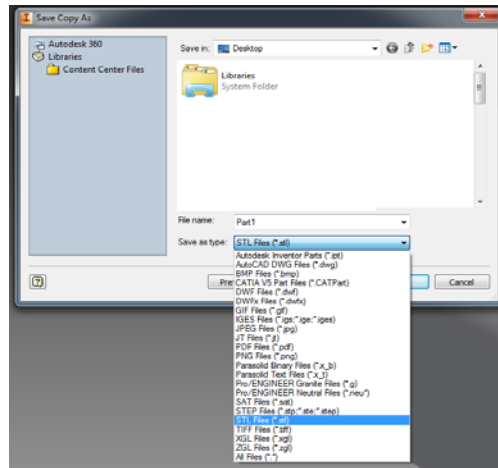
- Click on **Options** and ensure that units are set to <u>millimetres</u> and the resolution is set to <u>high</u>. Leave all other options as they are found.

- Click **OK** and then click **Save.**

- You can now close Autodesk Inventor.

## <u>Opening your Beacon design read for printing</u>

- Open the UP! Printer software using the shortcut on the Desktop.

- Click on **Open** and locate your design (file_name.STL)**.**

Open your design and take a look at it. Does it look as you expected? You may need to rotate the design, and you will need to make sure that it is in the centre of the base and is at the bottom of the cube, as demonstrated in the picture opposite.
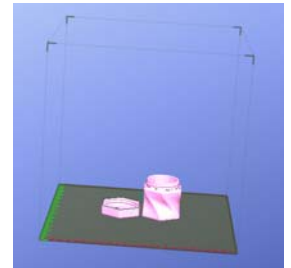
If you need to move your Beacon, click on the **Move** or the **Rotate** icon and then choose the X, Y or Z axis to move your Beacon along.
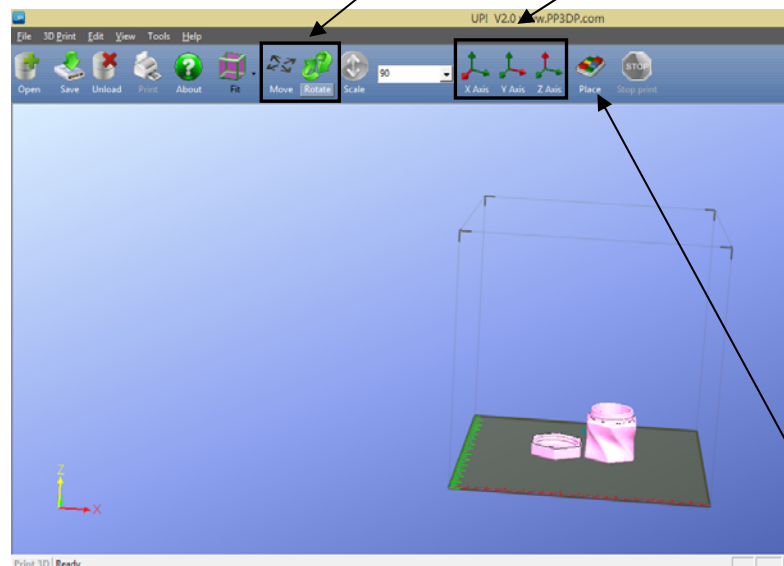
To ensure that your Beacon is in the correct place for printing click on the **Place** icon.

If your 3D Design Engineer needs to make any changes to your design before you print it you will have to open the original design in Autodesk Inventor, make your changes and then export your edited design to a .SLT file and open it in UP!
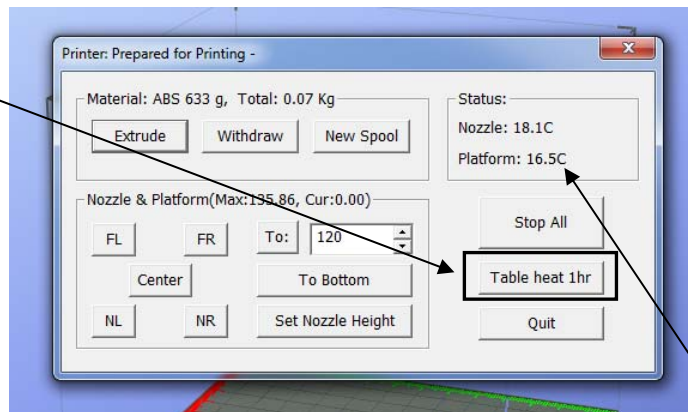
Printing your Beacon

Once your Beacon is ready to print follow the steps to begin the print process.

- Connect your laptop to your printer using the USB cable provided.

- Click on **3D Print** on the task bar.
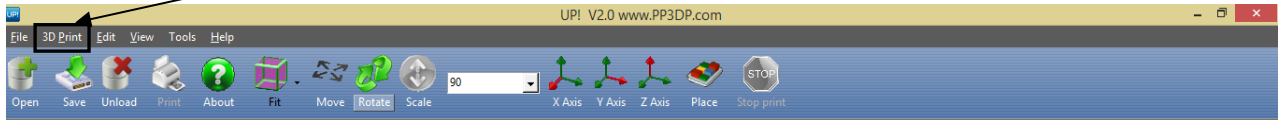
- Click on **Maintenance.**

- The base of the printer will need to be heated before you begin to print so click on **Table Heat 1 hour** and you will see the temperature begin to rise.


Do not begin printing until the platform temperature reaches 80°C.

While waiting for the base to heat up set up your Beacon ready to print:

- Click on **3D Print** on the task bar.

- Click on **Print Preview** and this box will appear. **Do not change the Nozzle Height as this is set by the printer.**

Make sure that the **Quality** is set to Normal if all of your Beacon dimensions are under 100mm, if any are over 100mm set this to Fast.
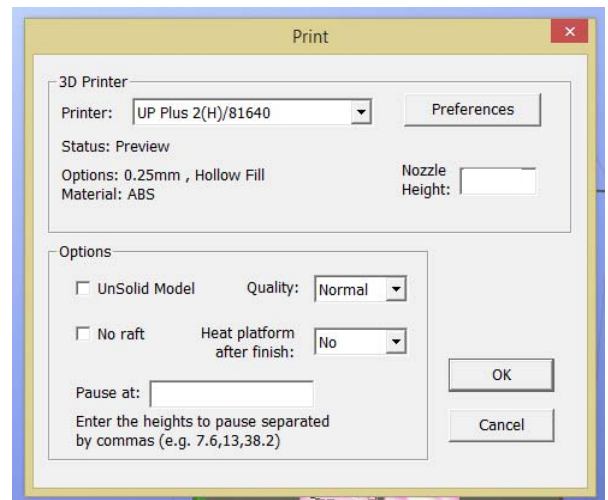
- Click on **Preferences** to display this box.
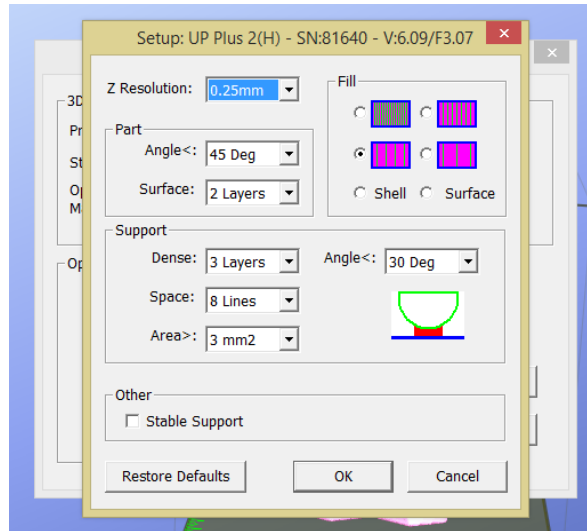
- Make sure that the settings are as in the picture above and click **OK**.

- Click **OK** and the software will calculate the time that the print will take and the amount of material that will be used in grams.

Check:

Is the weight within the weight limit? If not how much will the penalty cost your team?

Will the Beacon print within the time allowed?
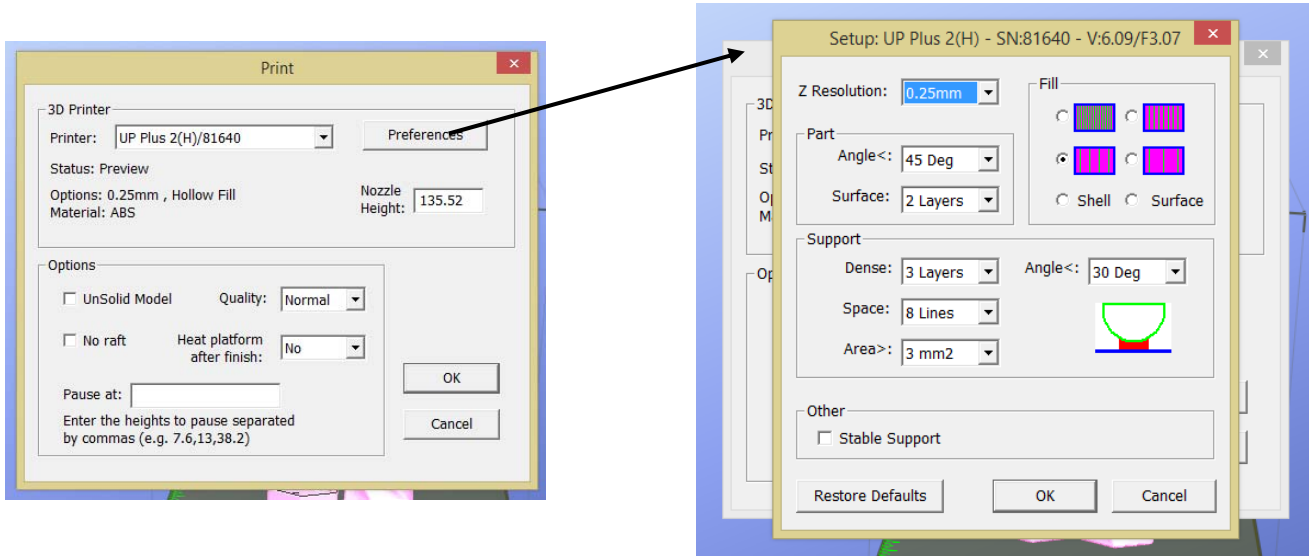
How much will the printing time cost you?
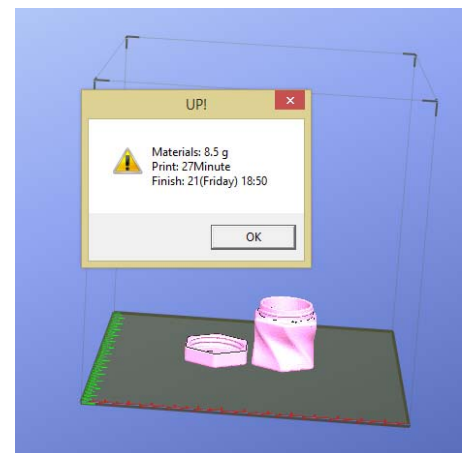
If you and your team are happy with this then make a note of the weight and time and then get your Challenge Leader to check your settings.

- Check that your print base has reached 80°C by clicking on **3D Print** and then **Maintenance**.

- Click **OK** to print your design. The light on the front of your printer will flash and the printer will start the print.

Print Preferences

Z Resolution	Thickness of each print slice. Thinner = better quality. Thicker = shorter print time.
Film	Solid = strong but slow. Loose fill (honeycomb pattern inside) = weaker but quicker.
Shell	Prints a hollow part. If you are printing a hollow structure then you cannot print flat surfaces at the top of the structure as these will collapse when printed.
Surface	Prints the outline of the part, no top or bottom.
Quality	**Normal**, **Fast**, **Fine**. Normal is used for most prints however if the part is very large Fast will decrease the print time. If the part has dimensions over 100mm then use Fast to print it to ensure a good cohesion between the different print layers.