O'Cello – printing and assembly instructions. o-cello.com

The O'Cello is a 3D-printable cello developed by Conor O'Kane, which is free to download and print for personal use. This document will show you how to print and assemble your own O'Cello.
For the latest version visit o-cello.com.

Parts & Tools

Parts list – The following parts are needed to build an O'Cello.

- M5x45mm socket head cap screws: 7
- M5x30mm socket head cap screws: 2
- M5 nuts: 9
- M5 washers: 12
- 12mm diameter steel rod, 1m length: 1
- 10mm diameter aluminium tube, 45cm length: 1
- Aluminium L-bar, 20x20x2mm, 30cm length: 1
- Cello strings: 4 – (1 of each C, G, D and A strings)
- Bass guitar tuning keys: 4 – (2 left and 2 right)
- About half of a 1Kg spool of 3D printer filament. The original O'Cello is made with PLA, but ABS should work fine.
- A 3D printer with a minimum of a 20cm build plate.
- 25mm screw plugs (to hold the tuning key screws).

To play the O'Cello:

- A cello bow
- Rosin

Recommended sources for some of these parts can be found at the end of the document.

O'Cello – printing and assembly instructions. o-cello.com

Tools – The following tools are needed for assembly.

- 4mm Hex wrench
- A small cross-head screwdriver
- A hacksaw
- A scalpel
- Hot-glue gun
- Drill with 5mm hardened drill-bit (suitable for drilling aluminium).

Optional extra tools – These will make assembly easier, but are not essential

- Large flat file
- Small round file (<5mm diameter)
- Large round file

Printing
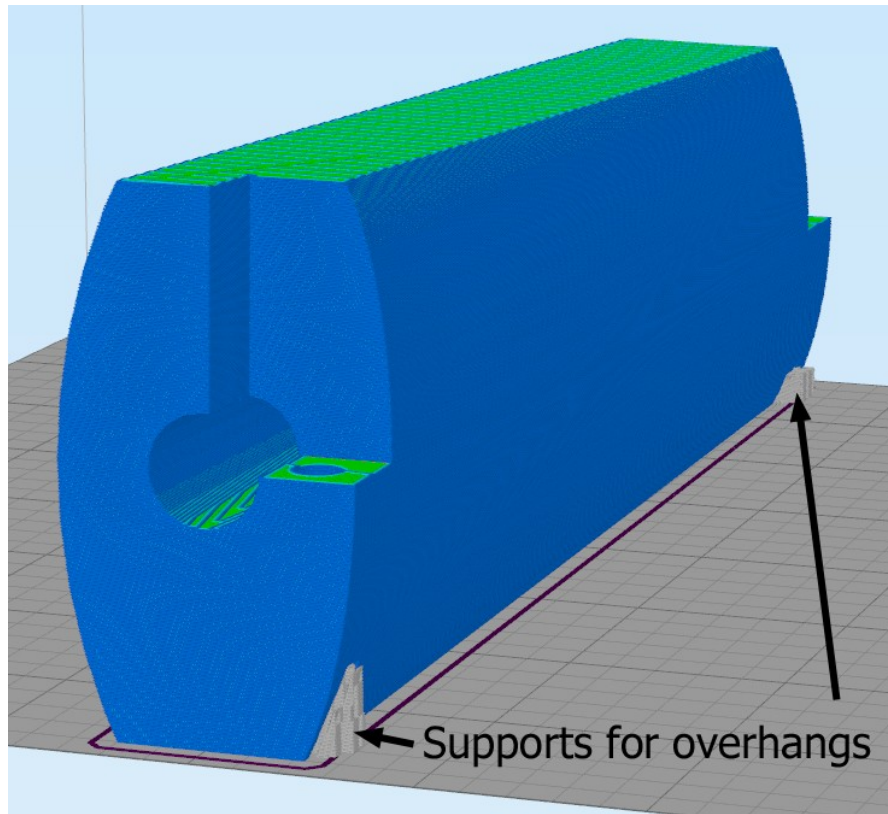
Here are the print settings for each part.

Parts 1 and 6:

> Layer height 0.2mm
> Infill: 15%
> Top and Bottom layers: 4
> Perimeter shells: 3

All other parts:

> Layer height 0.2mm
> Infill: 15%
> Top and Bottom layers: 4
> Perimeter shells: 2

Cover:

> Layer height 0.2mm
> Infill: 100%
> Top and Bottom layers: 6
> Perimeter shells: 2

Supports for overhangs

None of the parts need a raft to print. They are all designed to have a large flat area in contact with the build plate so that a raft is not needed. Supports are recommended for the overhangs around the bolt holes, as shown in this image.
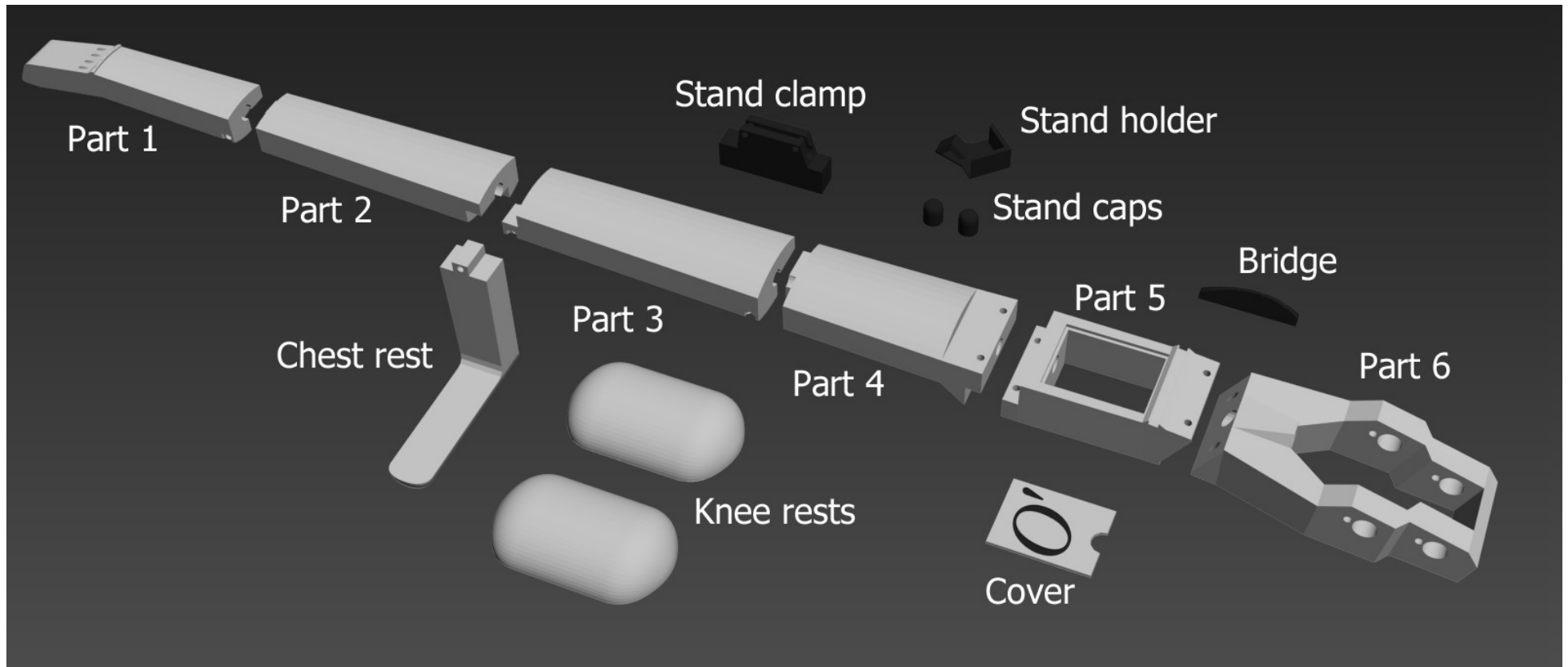
Post-printing cleanup

Edges that were flat against the build-plate may have a small ridge around them where the plastic has splayed out against the build plate surface. Trim this with a scalpel. Pay particular attention to edges that will be in contact with another part, as shown in this image:
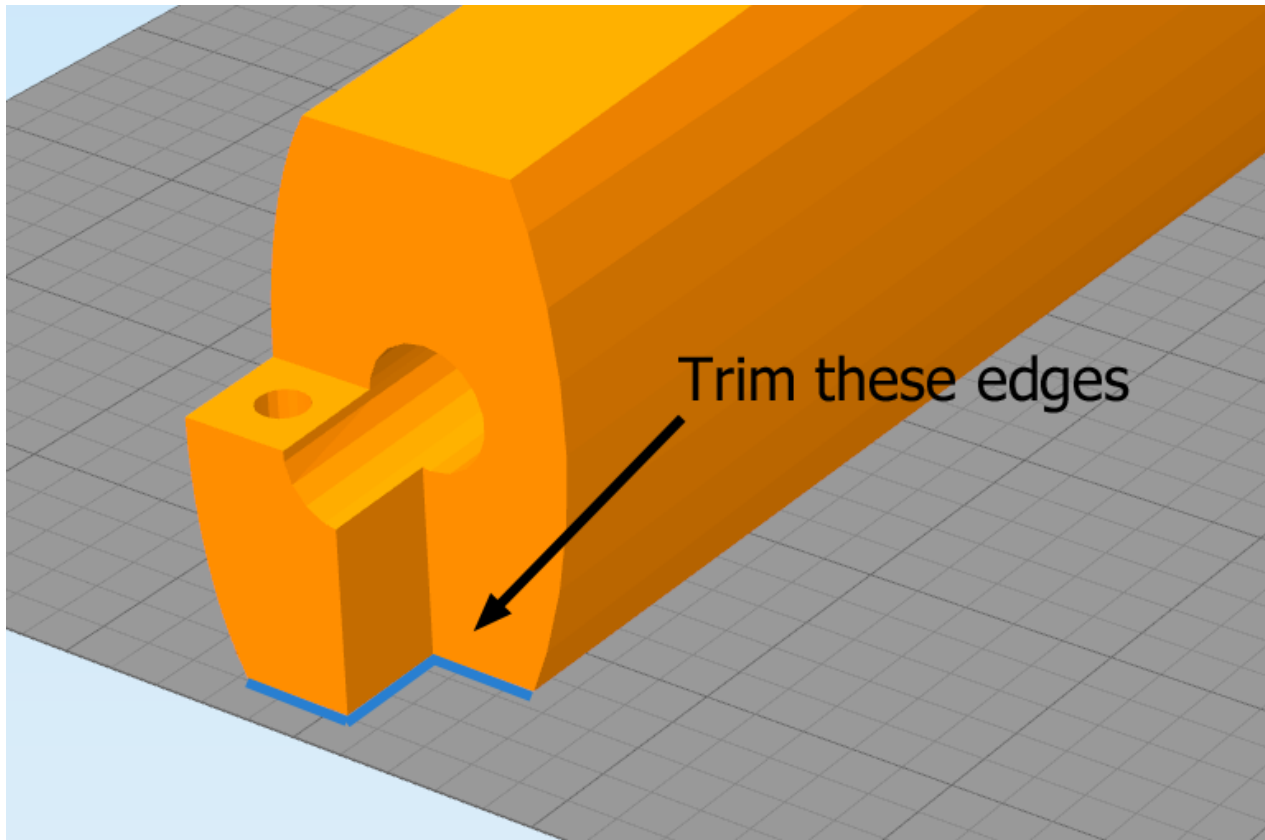
If necessary, use a small round file to clean the inside of the 5mm bolt-holes. Do not file them so much that the bolt slides through easily. They are designed to be just wide enough that the bolt will go through when screwed, but should not slide through freely.

The large central hole for the steel bar should be smooth – if there are any overhangs from the roof of the hole remove them with a large round file. The steel bar should slide through this hole when pushed and twisted, but it should not be so loose that the printed part can slide up and down the bar freely.

Printed parts list

Part 1

Part 2

Stand clamp

Stand holder

Stand caps

Chest rest

Part 3

Bridge

Part 5

Part 4

Part 6

Knee rests

Cover

Assembly

Thread parts 1 to 5 onto the steel bar. Slide them together and then insert the bolts and tighten. The inside of the bolt-holes are not threaded but they are quite tight so bolts will need to be screwed into the holes. Note which side of the parts take the round bolt-head, and which sides take the hex nut. Push the hex nut all the way into its slot before screwing in the bolt.
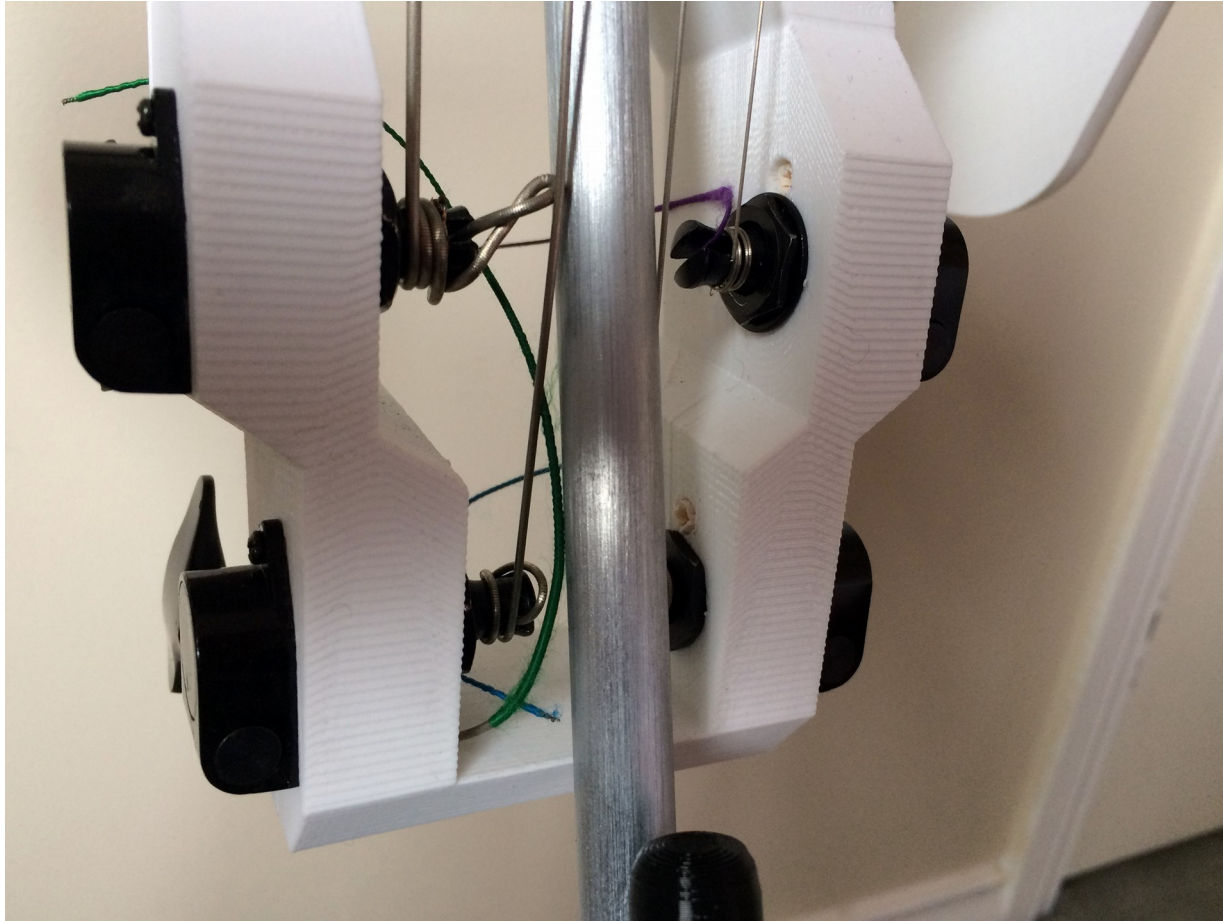

Round side for the bolt

Hexagonal side for the nut

Push the nut in as far as it will go
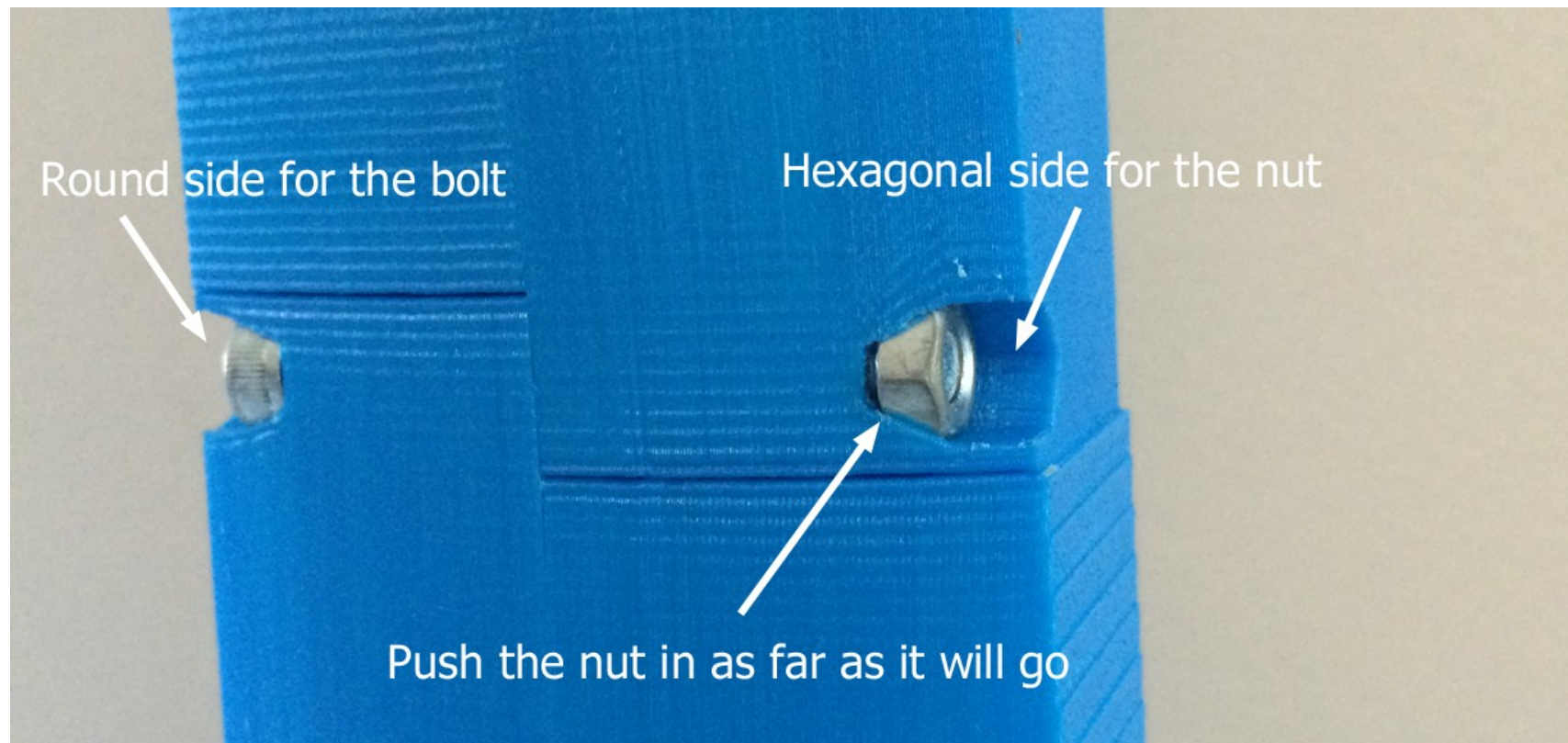
Chest Rest

The chest rest fits between parts 2 and 3. Only print one chest rest. For right-handed playing use Chest_rest_right.stl and for left-handed playing use Chest_rest_left.stl. Pass the bolt through all 3 parts to hold the chest rest in place.

Tuning Keys

When attaching part 5 to parts 4 and 6, ensure the bolts go in from the front of the cello so that they extend out the back.

It is easier to attach the tuning keys to part 6 before joining it to the rest of the cello, so attach the keys now. Slot them through their holes and tighten the nuts. Ensure they are pointing towards the back of the cello. Screw them in place with the included scews. The screw-holes will need plugs to hold the screws in place. Cut some 25mm plugs to a suitable length and insert them into the screw-holes as shown in this image.

Knee Rests

Once the tuning keys are attached, slide part 6 onto the bar, then insert and tighten the bolts to attach part 5 to part 6, again ensuring they go in from the front and extend to the back of the cello. You can use washers on these bolts going through part 5 to prevent the printed parts from cracking.

The knee rests fit on the ends of an aluminium L-bar which is attached to the lower bolts protruding out the back of part 5. You will need to drill 5mm holes in the L-bar and cut it to a suitable length. 30 to 35 cm should be appropriate; find a length that is comfortable for you when seated.

Apply some glue with a hot-glue gun to the ends of the bar and then push the printed knee-rests firmly onto the bar.

Bridge

Slide the bridge in from the side. You may need to trim the base of the bridge with a scalpel for it to slide easily into its slot. Note that the bridge is not symmetrical, it should be raised on the side for the C and G strings (on the player's right, when seated behind the cello, for right-handed players). The bridge is printed separately so that it can be easily customized to suit the player's preference. Changing the shape, infill-percentage and height of the bridge can modify your O'Cello's sound and feel.

The cover snaps over the hole on the front of part 5 (again it may need trimming with a scalpel to get a good fit), and your O'Cello is now assembled.
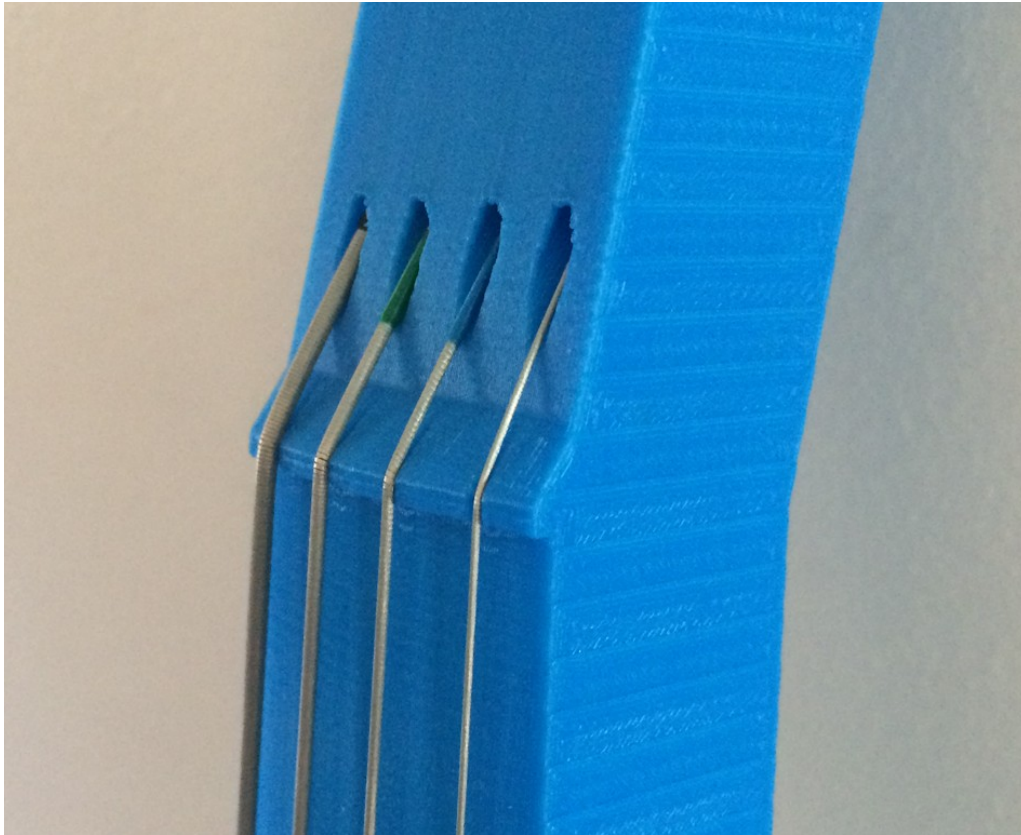
The O'Cello is designed to be playable without needing any sanding or painting. You can string it now and play right away. Once the bar is inserted the fingerboard parts should fit snugly together so that there is only a small gap between the parts. Stringing the cello will apply a compression force on the front of the fingerboard, further reducing any gaps.
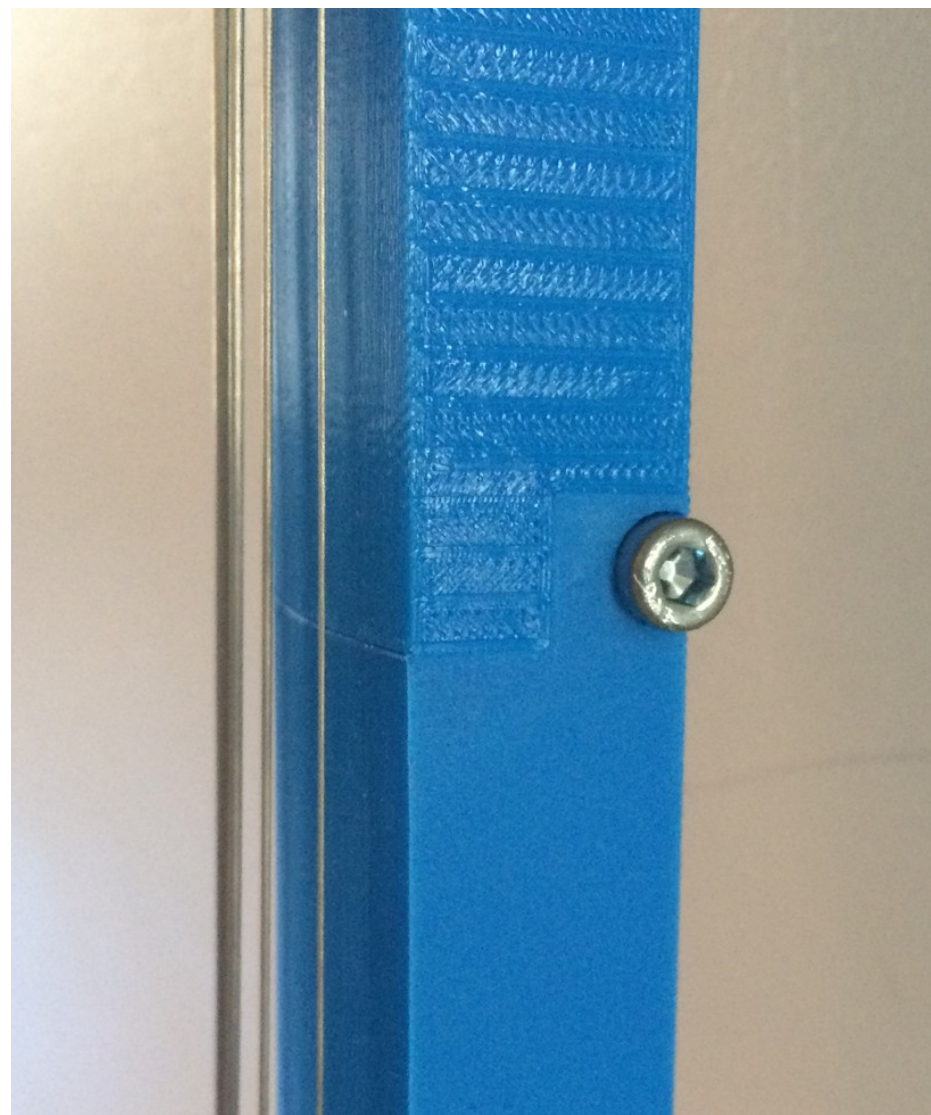
Insert the strings into the back of part 1, over the bridge and then wrap them around their key, feeding part of the string through the center of the key so that it grips tightly. Hold the wound string in place with one hand while tightening the tuner with the other until the key grips the string firmly, then continue to tighten. Once all 4 strings are attached, ensure they are seated in their slots in the bridge and the nut (the raised part at the top of the fingerboard), then tighten further until they are all in tune.

The Stand (End pin)

Assemble the stand by inserting the protruding part of the steel bar into the stand clamp then feed the aluminium tube through the slot on the front. Use 30mm bolts with washers to tighten the stand clamp to hold the O'Cello at a comfortable playing height. Glue the two stand caps on the top and bottom of the aluminium tube to cover the sharp edges.

When playing on a smooth floor, use the stand holder to prevent the stand from slipping. Tie a shoolace to the stand holder and then loop it under the leg of your chair.

Recommended parts sources

eBay store i-fox sells cheap cello bows.

eBay store skull_music sells cheap cello strings.

eBay store ninehouseshop2014 sells the bass guitar tuning keys used in the O'Cello prototype.

The bolts used in the O'Cello are Romak socket head Cap Screws, M5x45mm and M5x30mm.