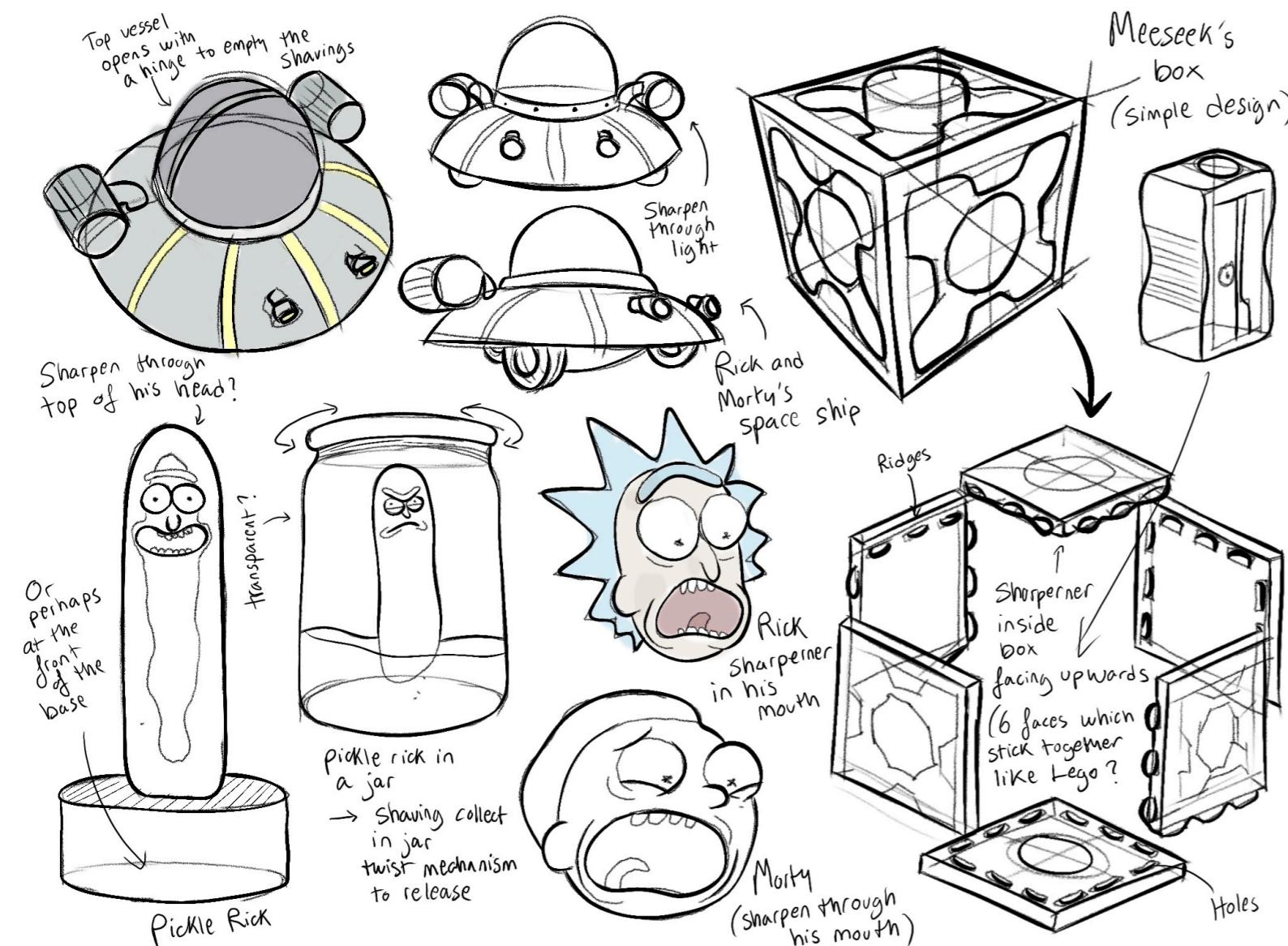
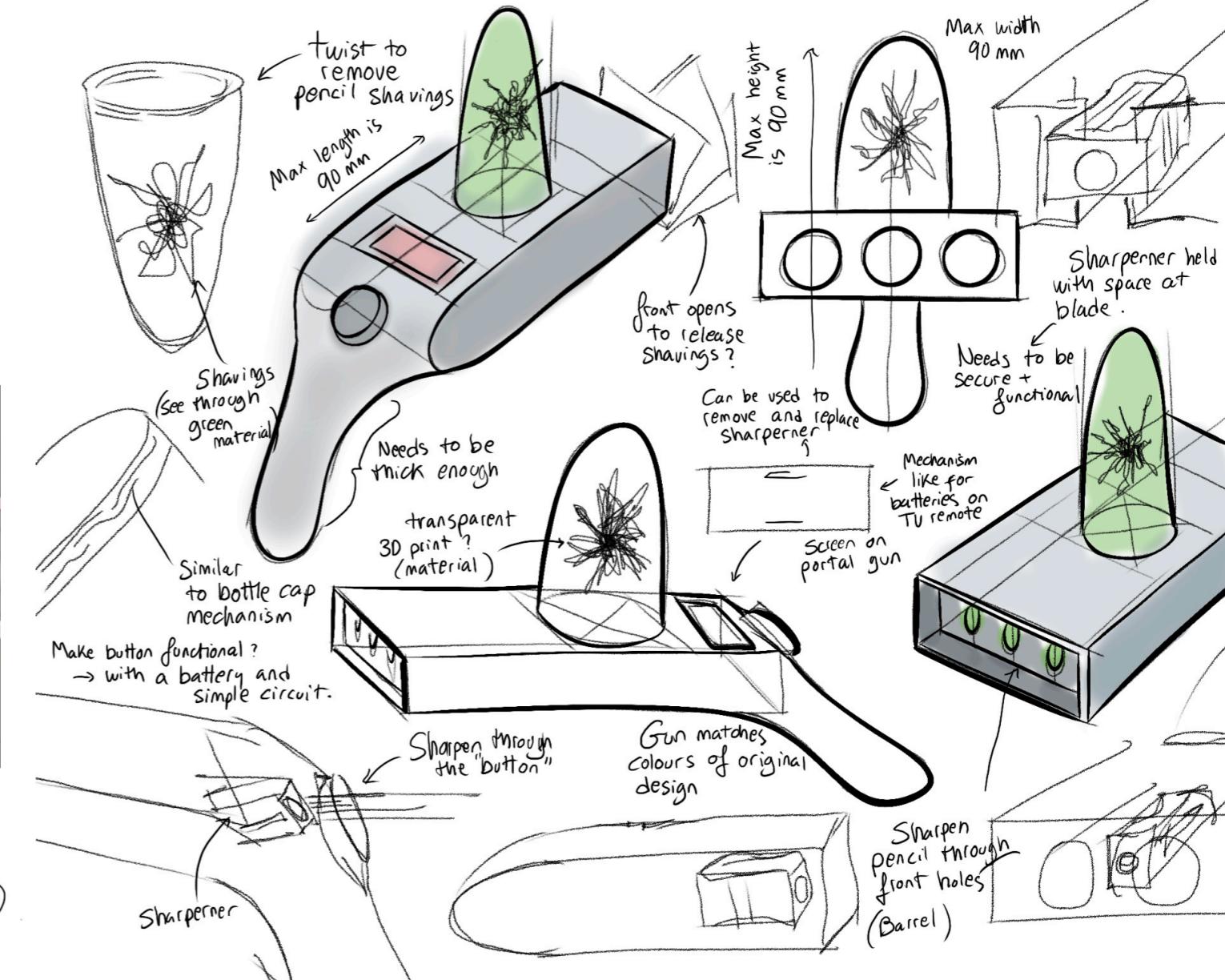
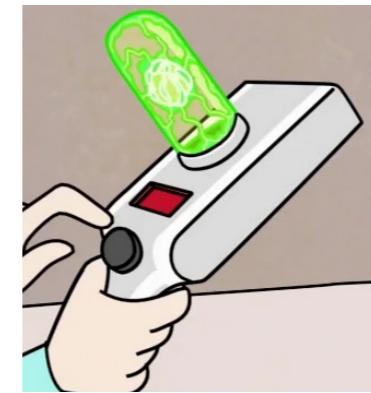


Design Research

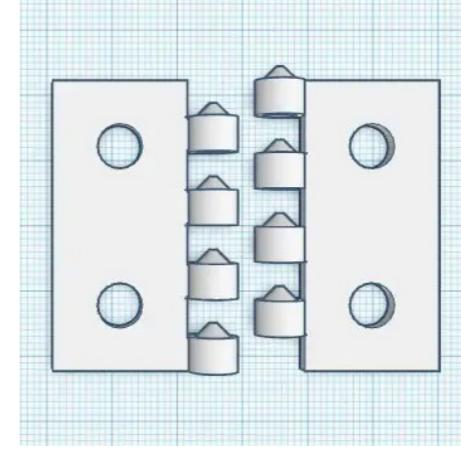
I chose the TV series Rick and Morty for my sharpener design theme. I started looking at different characters and the notable objects they carry. This includes the Spaceship, Rick's portal gun, Mr. Meeseek's box... etc

I quickly realised that I would have to choose simpler objects/characters or reduce the amount of detail in order for the 3D printed designs to be rigid enough. Additionally the maximum build area of 90x90x90 (mm) and maximum volume of 70cm³ made the initial design process quite difficult particularly for the portal gun (due to its actual dimensions in the show)

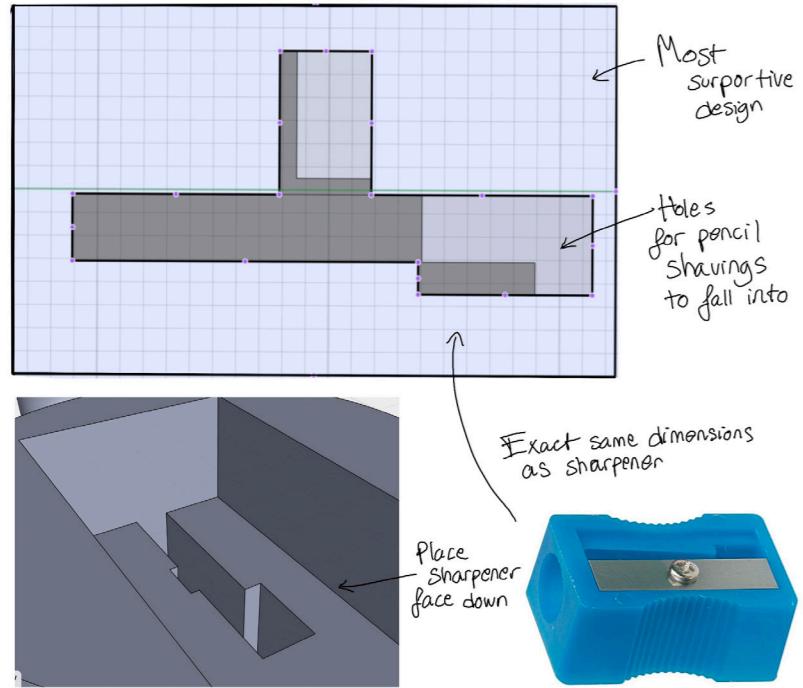


The size constraints of the brief (90x90x90mm and 70cm³ volume) demanded modifications to my initial ideas. The portal gun, for example, was too long. To overcome this, I had to use less material. This led me to simplify the design, slightly distorting the overall shape while trying to retain its appearance. Keeping only the most important features like the front button and the green bulb at the top. Rick's spaceship seemed too intricate for the limited build area. Simplifying it would make it

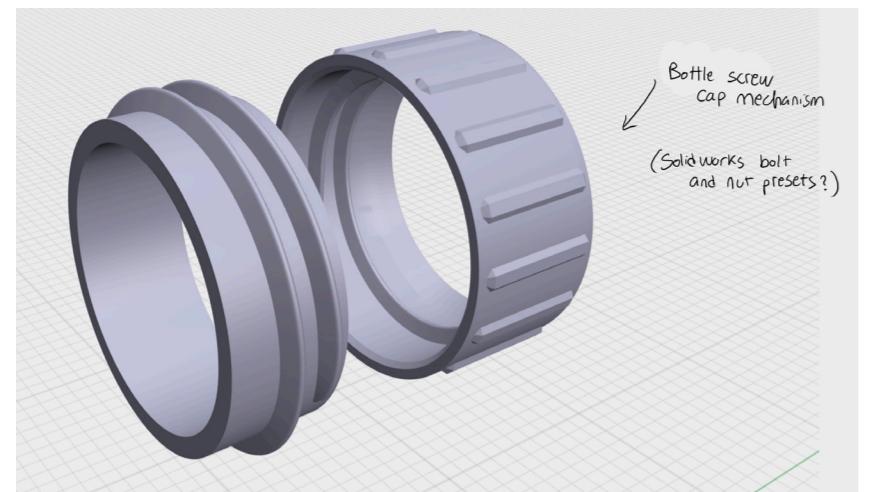
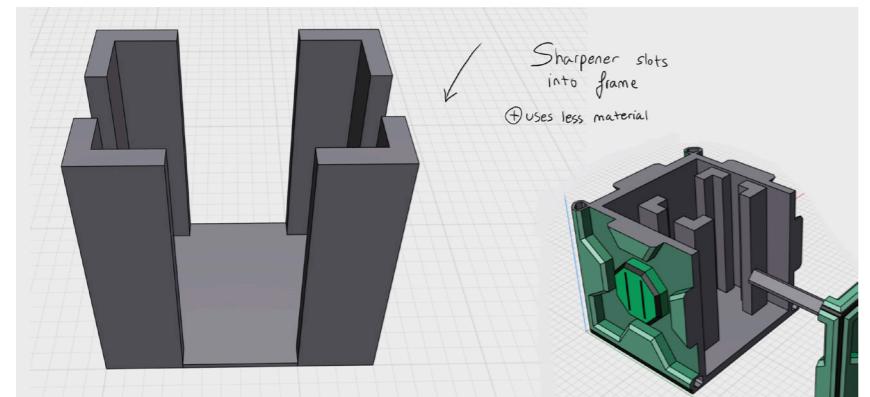
unrecognisable. Therefore, this design needed to be reconsidered. The brief also requires the design be able to replace the sharpener. This made me to explore methods for incorporating openings into the designs, like pin joints, hinges, and screw caps. I came across a modular design for a 3D printed box, where the design is broken down into separate printable sections that snap together (kind of like Lego). This significantly reduced printing limitations. It became clear that some designs, like Pickle Rick, would need to be hollow even if the design was within the maximum build area, because it could still exceed the volume limit. For structural integrity, a minimum wall thickness of 2mm was decided.



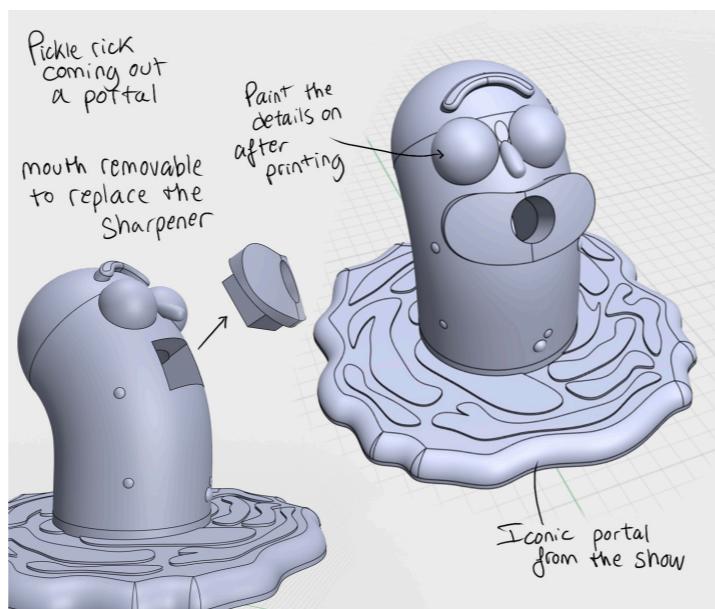
Concept Design



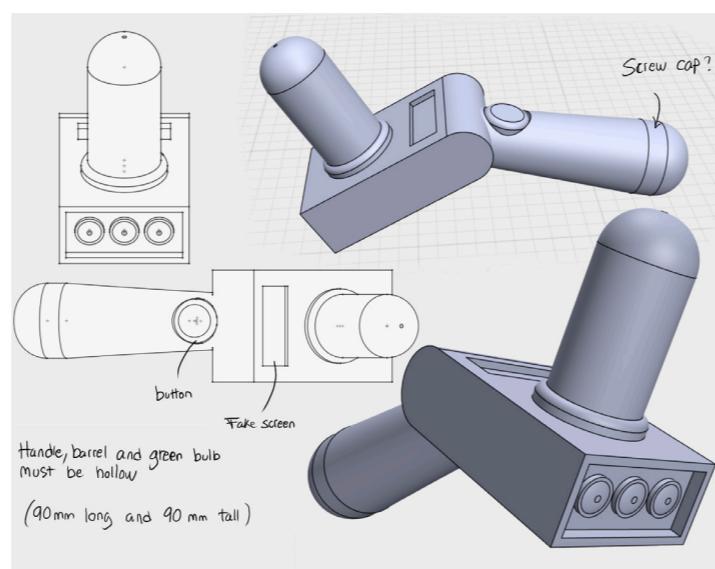
Above is my preferred way of keeping the sharpener in place and below are two additional ways.



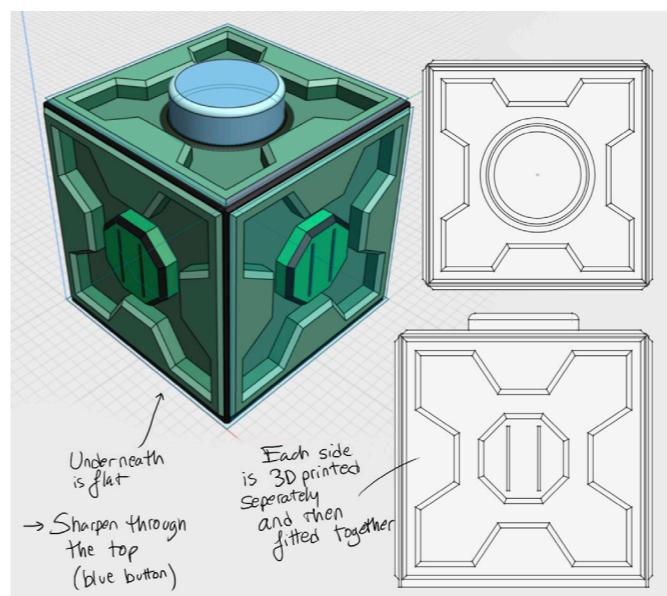
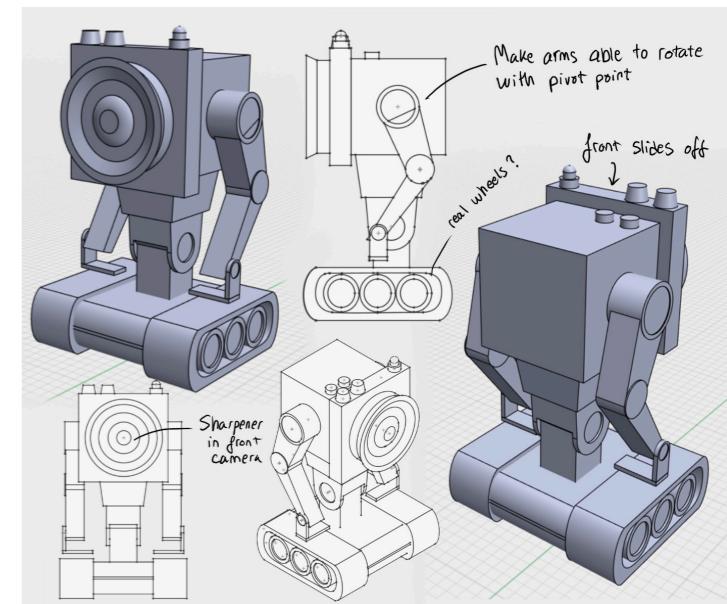
The most important requirements: Fit the brief dimensions, have a shavings storage compartment and the sharpener within must be replaceable.
Medium importance: Be a character or object from the show as true as possible.
Less important: Sits on a table nicely



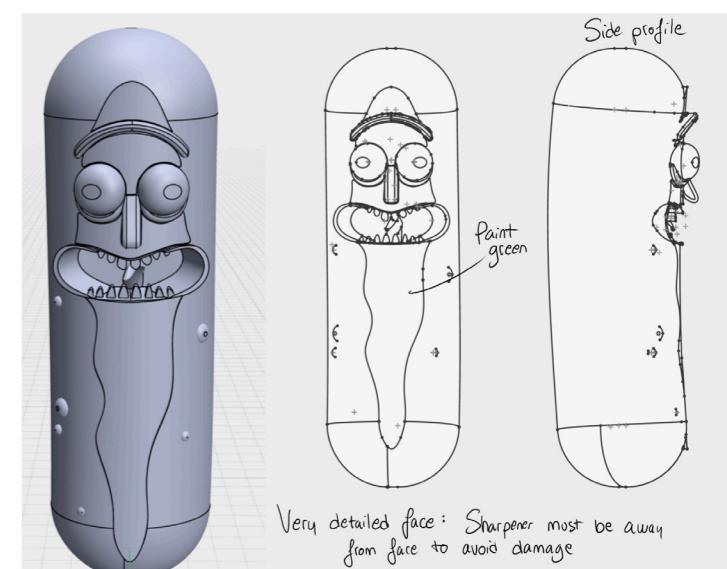
Below is the Portal gun. This was fun to design and took a little trial and error to get the dimensions of the handle and bulb right. The front button is embedded into the handle and my idea now is to make it screw open like a bottle cap, to empty the pencil shavings.



I went straight into designing the sharpeners in solidworks to get some insight into the shapes and extrusions of my initial ideas. I decided it was best to design my initial concepts as true to original as possible and adjust them later to accommodate the replaceable sharpener. On the right is Rick's 'butter robot'. The designing process was fairly straight forward as the robot is composed mainly of simple shapes. I added as much detail as possible and have a few ideas for the positioning of the replaceable sharpener. My main concern is the strength of it's arms.

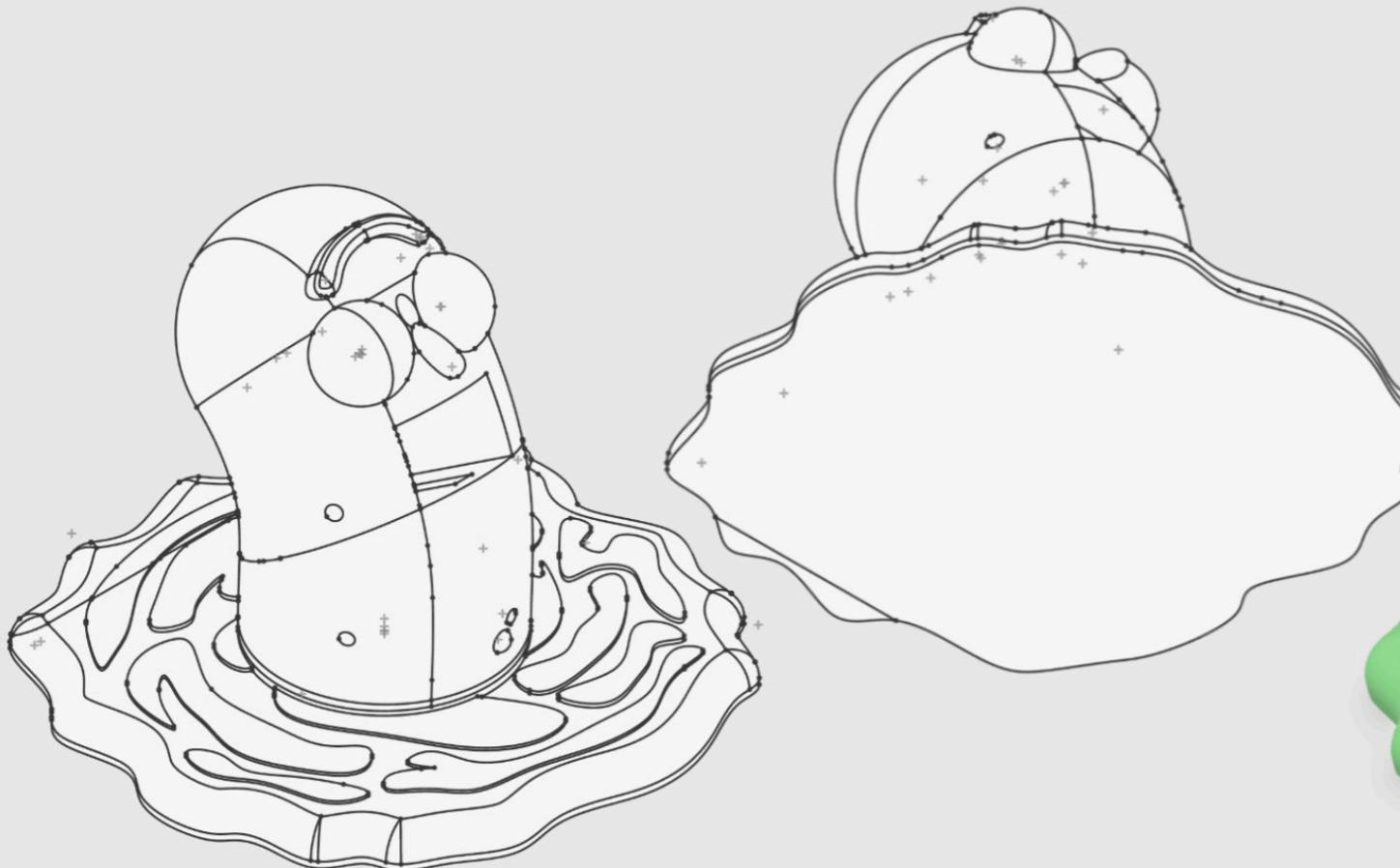
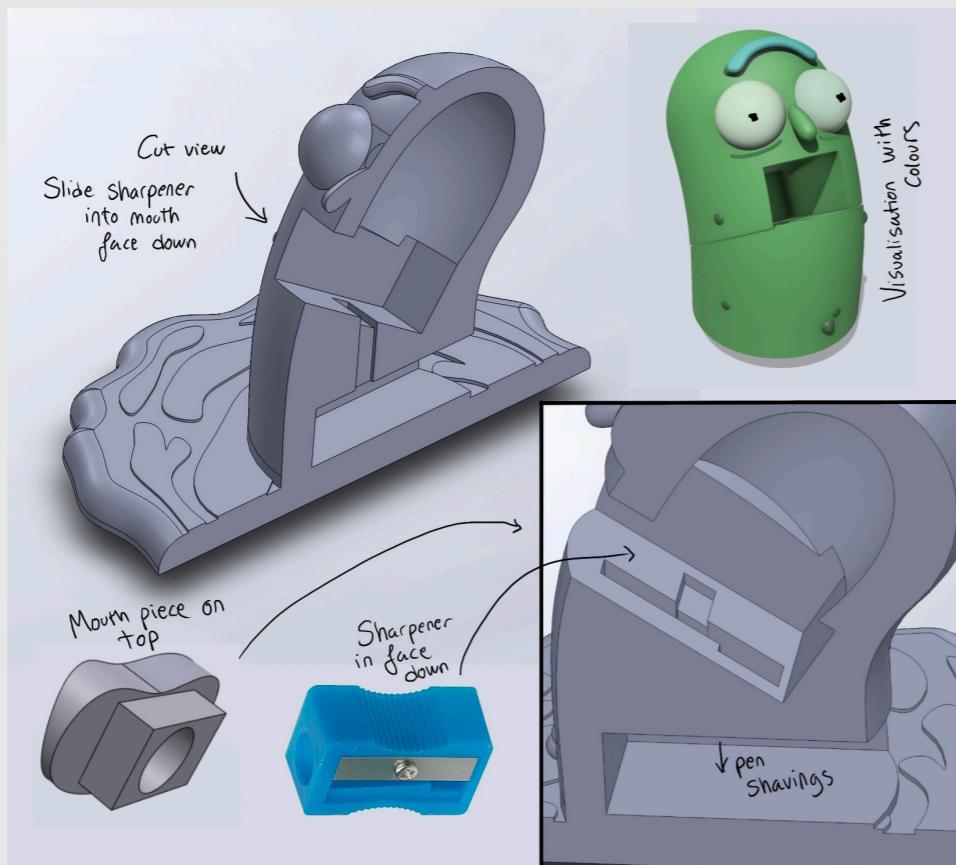


On the left is Mr. Meeseek's box. The design at this point was straight forward with straight edges and easy extrudes. However to achieve the mechanism of locking each face into each other like lego it's going to take a lot of work. The idea is to have ridges and holes on the inside of each face.
This design considers the sharpener to be slotted in vertically so that you sharpen through the blue button on the top.
The shavings also stored in the box, perhaps in a separate compartment?



Detailed design

On the right is a cut view of the final Solidworks design for my sharpener. The replaceable sharpener slides into Pickle Rick's mouth face down. This leads the pen shavings to fall down the perfectly dimensioned holes and into a box space at the bottom. The design allows for it to sit upright on a desk and to sharpen pencils with a single hand. The head is hollow to meet the Max volume requirements. This design is 68.85 cm³.



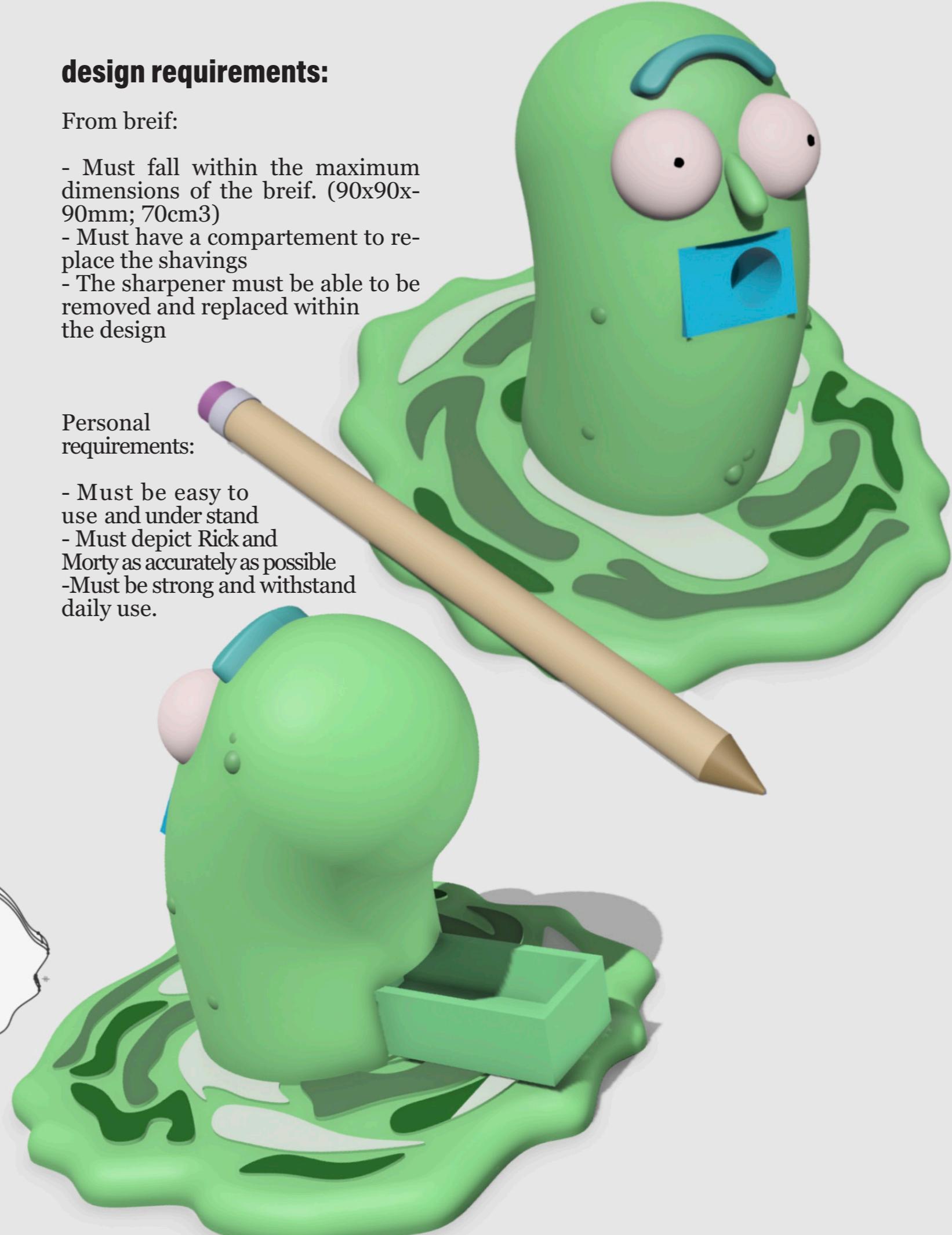
design requirements:

From breif:

- Must fall within the maximum dimensions of the breif. (90x90x-90mm; 70cm³)
- Must have a compartment to replace the shavings
- The sharpener must be able to be removed and replaced within the design

Personal requirements:

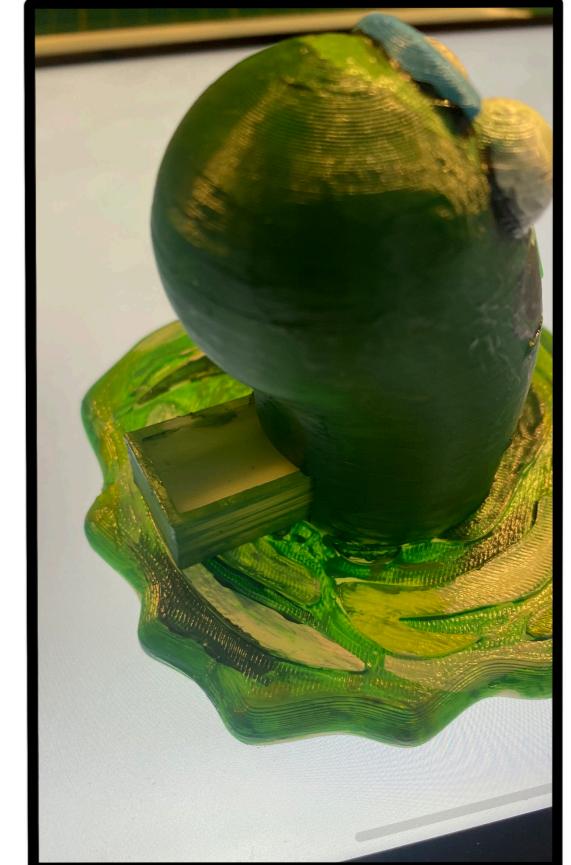
- Must be easy to use and understand
- Must depict Rick and Morty as accurately as possible
- Must be strong and withstand daily use.



Prototyping

The 3D printing prototype of my sharpener turned out exactly as expected. All the small grooves and detailed appeared as they did on Solidworks. The compartment for the sharpener was perfect and it was clear that the design can withstand the resonable force.

However when trying to fit the replaceable sharpener in it's compartment, i realised that I had not allowed enough tolerance for the sharpener's screw that extends its width. It was easy to fix though, with some quick sanding work.



Painting the prototype brought the piece to life. With the iconic green colours it clearly looks like pickle rick and the portal from the show. Acrylic paint was easy to use and stuck to the material well.

However the paint on the shavings storing box chips away after slotting it in and out of its compartment a few times. It seems using a green material during 3D printing would solve this.



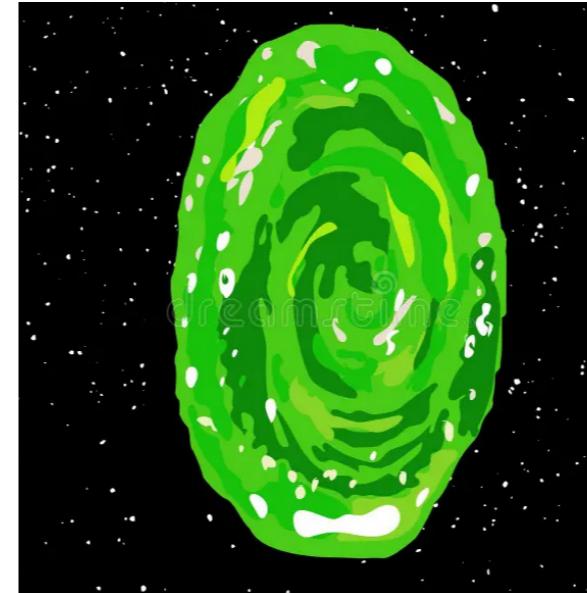
I made a mistake in my calculations and realised that the mouth piece does not fit on top of the sharpener. This mistake made me learn to double check the final CAD model before submitting it for 3D printing.

Design Reflection



The whole process included:

Getting inspiration from the internet, the drawing my initial ideas, then making in Solidworks and keep modifying it and making the sharpener compartment. Then Visualising it, then 3d printing it then painting it.



Overall, this design is successful; It functions and it looks like pickle rick. The good :

The sharpener is easy to use as it sits upright on a desk. The visualisation using paint works well. Pickle rick is accurately depicted, aswell as the portal design. Additionally, the walls of the prototype are strong and seem be able to withstand daily use.

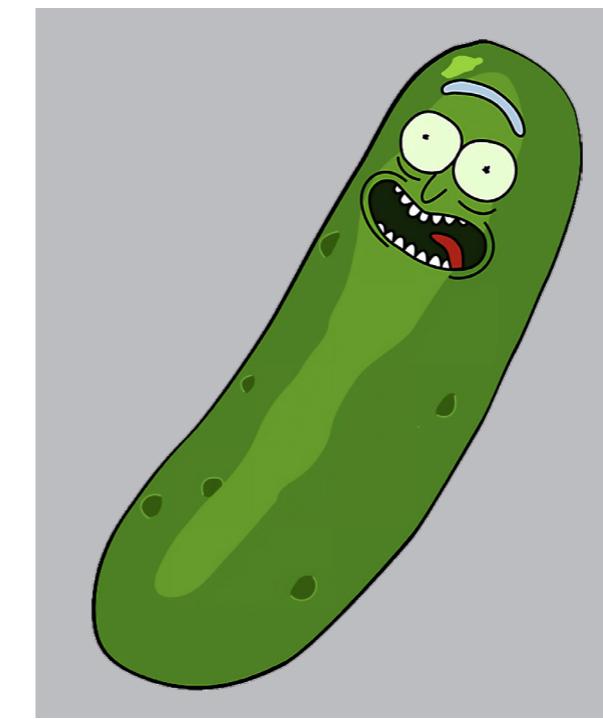
The bad:

The shavings storage box is a little small, The painting is not super precise and might fade away after daily use.

Improvements:

In retrospect, more detail could have been added to the design. Before the 3D printing iI thought that the small details would be too fragile and break off when the sharpener is used.

With the design in hand now it seems to be much strong than I originally thought. Additionally a larger compartment for storing the shavings should've been considered, as the current one is too small and needs to be emptied after every use. In practice, I should've left a bigger tolerance for the screw on the replaceable sharpeners to fit. I had to sand a bit more space for it to fit.



Reflection of the requirements:

- Must fall within the maximum dimensions of the breif. (90x90x90mm; 70cm3): **Successful**
- Must have a compartment to replace the shavings: **Successful**
- The sharpener must be able to be removed and replaced within the design: **Successful**
- Must be easy to use/ understand: **Successful**
- Must depict Rick and Morty as accurately as possible: **Successful**
- Must be strong and withstand daily use: **Successful** (for now)