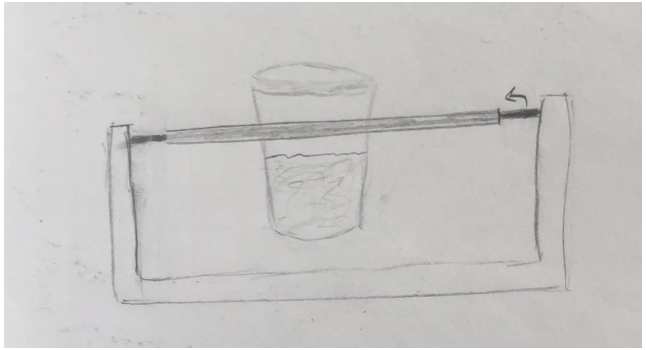
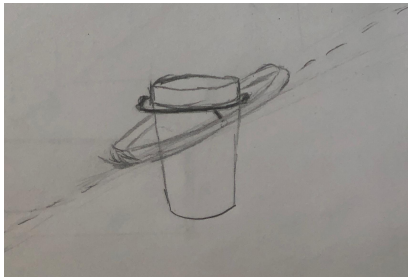
Designing a Device for Everyday Life

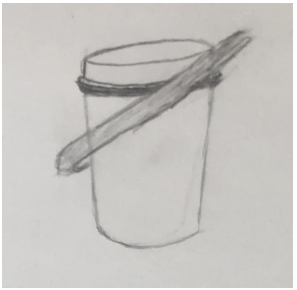
Fernando Rubio, Arya Majjiga, Derek Davis

A Spill-Resistant Cup Holder: Initial Thoughts/Sketches

- A self-leveling cup holder that uses gravity to keep any cup upright at all times.
- Works even when placed on uneven surfaces.
- Uses rings or rectangles to work as a gyroscope.
- Mechanics similar devices used in film to stabilize cameras.

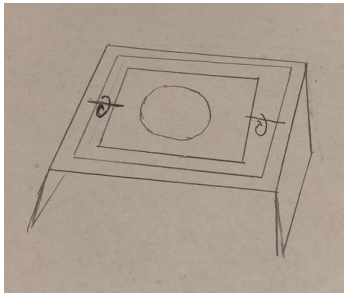


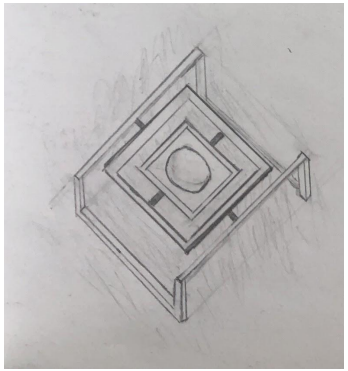




A Spill-Resistant Cup Holder: Initial Thoughts/Sketches

- Able to withstand moderate shaking and prevent spillage.
- Simple design that doesn't involve complex moving parts.
- Would be low cost and affordable if ever mass-produced.
- Takes the environment into consideration: uses sustainable or recyclable materials.





Presentation of Important Factors

Criteria for Design:

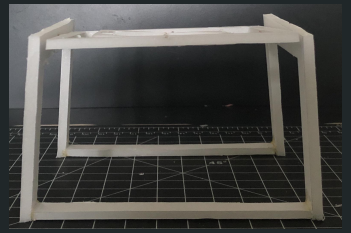
- Able to keep the cup perpendicular to the ground even on tilted surfaces (30 degrees)
- Prevent spilling through bumps
- Works equally well in both dimensions
- Able to stand and remain stable on a surface
- Aesthetically pleasing design
- Ability to be produced sustainably in terms of economic and financial impact (not for prototyping phase, but in the context of mass production)

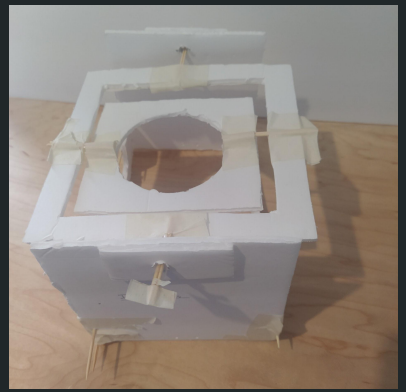
Final Design (Improvements)

- Use a gyroscope to keep the cup perpendicular to the ground at all times
- A gyroscope is a device in which the axis in the center maintains its orientation
- This design will allow the cup holder to be used effectively on tilted surfaces as well as environments with lots of sudden movements, such as cars

Prototypes

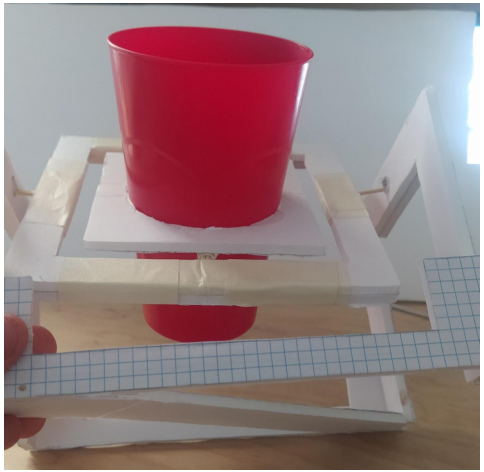
The prototypes determined that the most important factor of the design was the structural integrity. Without strong components and a stable base the gyroscope was subject to fail.

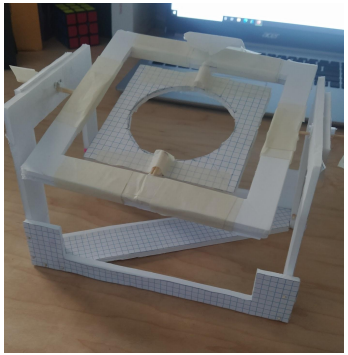


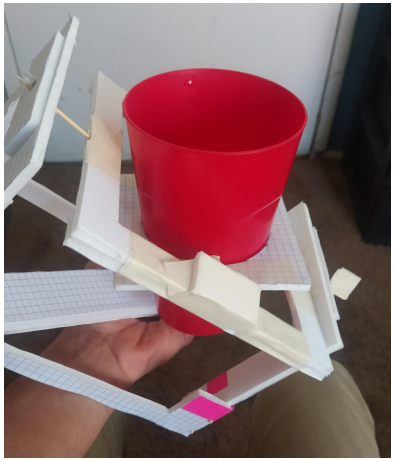


Final Product

- Used a grid (graph paper) to make sure that the measurements were as precise as possible
- Added a bottom crossmember for rigidity







Conclusion and Future Steps

- The gyroscopic design that we came up with proved to be effective, since it was able to keep the cup perpendicular to the ground
- The cup holder worked on tilted surfaces and under significant amounts of movement
- In the future:
  - Thinking about adapting our design so that it can be used in cars and other vehicles.
  - Considering environmental and financial sustainability, especially in a mass-production context.
  - Find ways to make our design more aesthetically pleasing.

Arch24 Assignment 3

Alma Sanchez Garcia, Kaan Taner, Timothy Tucker

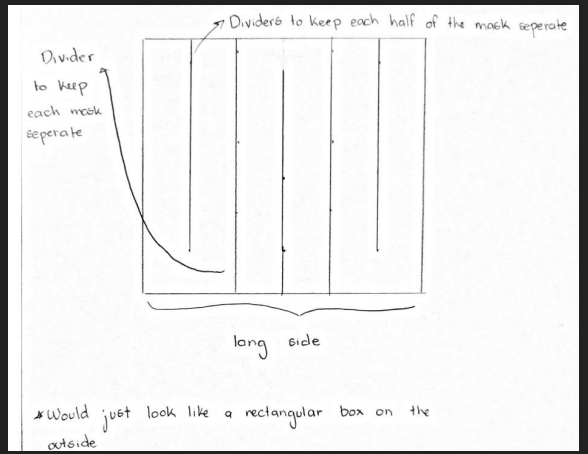
We chose to design a mask-box for the reasons that it would be useful in our current lives. The box should have multiple different sockets or walls dividing each section. The goal is to have multiple different sections of the box to place one mask in each section, hopefully placed in a way that is easy to take out.

List of Performance Requirements

Alma:

The box should:

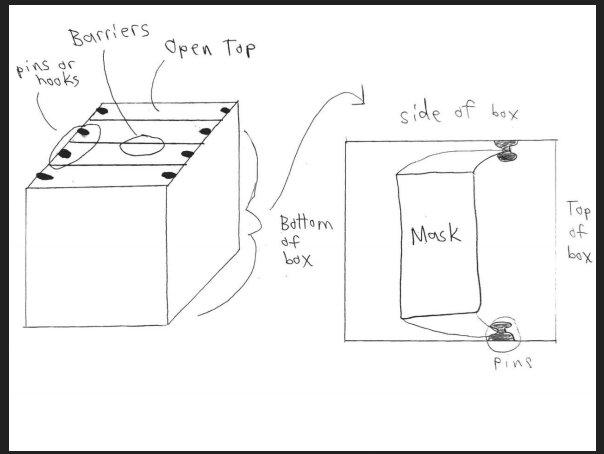
- Have room to fit 3-5 masks (enough for an individual)
- Be set up so that the masks have no contact with each other (avoid cross contamination)
- Have a lid that you can close or put on to avoid unwanted contaminants



Kaan:

The box should:

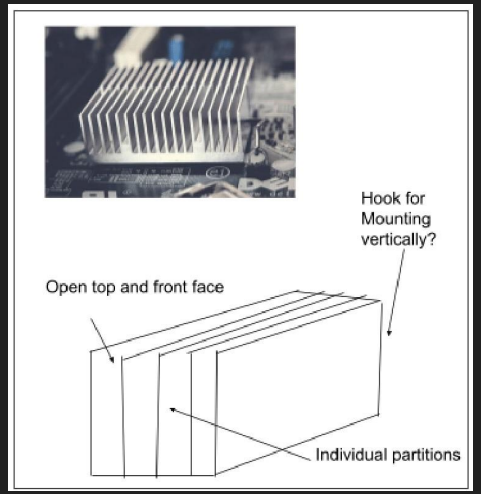
- Hold multiple different masks, and let them dry
- Minimize contact between masks and the walls/floor of the box
- Be easy to take masks out



Timothy:

The box should:

- Clearly separate the stored masks from each other to physically isolate them
- Easily stage masks for on-the-go access



Comments on the what, how, when, where, why of our design.

Alma:

I hope that the design will be useful during the pandemic but also afterwards. By having a clean and safe environment to store the masks in, people will be more inclined to continue using them and help promote a healthier more aware lifestyle. My design aims at keeping contaminants away through the way the dividers are set up as well as by the inclusion of a lid.

Kaan:

This design will be useful during the pandemic. I wanted to make a design where each mask is in the air, so contact with the actual box is minimized. I think using pins to hold up the masks should work.

Timothy:

Our design is representative of an overlooked aspect of daily COVID life. Because of this, it should be easy to use, simple to understand, and not very invasive for the user to implement. The design should be kept simple but still be very effective at isolating masks from one another.

How it works and Performance Outcomes

Our models will likely be made out of cardboard, using household materials such as tape, glue, string, pins, etc. However, a real version of this design would probably be best made out of wood or plastic, or a mix of both. For size, it would be best for it to be no larger than 1.5 feet wide, 1 foot tall, with space for about 3 to 5 masks. One goal is for the box to be a clean place where masks can be left to dry after being washed. It does not need to be super durable, but a fair amount of durability would be best, coupled with enough weight to stop the box form lifting into the air as someone tries to take out a mask.

Radical ways that specific Performance Outcomes are met.

Alma:

I wished to ensure that no cross-contamination or outside factors would affect the cleanliness of the masks so I added different types of dividers and a lid to my design.

Kaan:

Since I wanted my design to minimize the contact that the masks had with the box, I decided to hang the masks from pins. This way, the masks would also dry while they are being stored. Another goal is to make it easy to retrieve the masks from the box.

Timothy

Because our design is meant to keep the masks decontaminated, we could use a barrier that leverages UV radiation to our advantage by cleaning the masks using the box itself. If we implement technology into the design, the box itself becomes the tool through which the masks are cleaned.

Alma’s Prototype

I made my design for the minimum number of masks we think the final prototype should hold (3). As in my initial sketch I included dividers that would separate each of the masks and smaller ones that would keep the insides of the mask from touching each other.

The design accomplishes some of the desired goals but fails to fully take into account some of the following things:

- Contact between the masks and the barriers may not be the cleanest option
- The lack of air filtration may promote the growth and spread of bacteria and germs or simply worsen mask breath

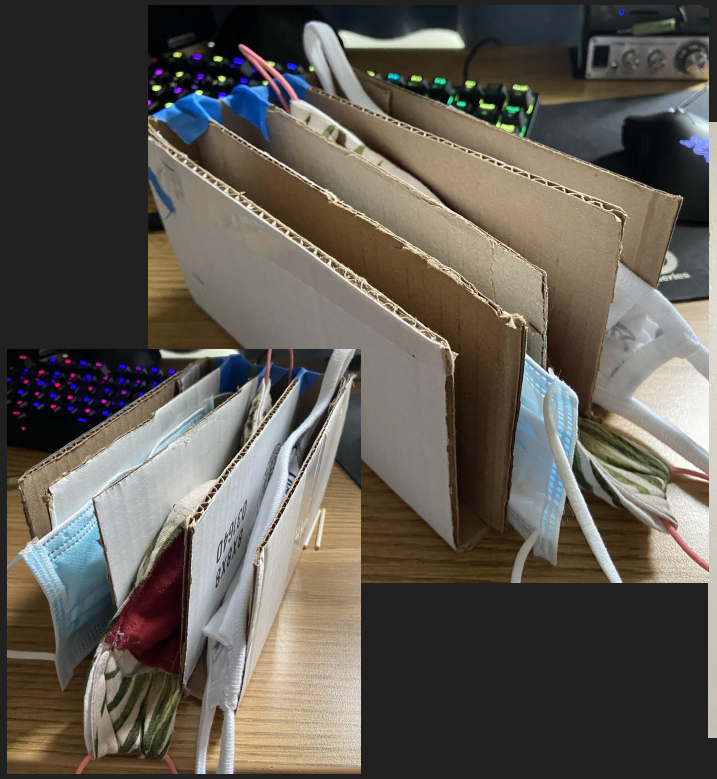
To address these concerns, my design would have to change in order to avoid contact with the dividers and somehow have the masks spread open. I would also have to reconsider the types of materials used to find ways to keep the box from helping germs and bacteria spread. Maybe a superhydrophobic coating or some sort of self cleaning mechanism.

Kaan’s Prototype

This box is split up into multiple different sections, where each section has two pins, one on each side, and this is done so the mask can be hung to dry, without coming into contact with the box.

Improvements: Maybe something like a lid could be useful, to stop dust from falling onto the masks. If I replace the pins with hooks of some kind, it would be easier to take masks out. The hooks can be made out of bent paper clips for my model.

Timothy’s Prototype



This design mimics the heatsink that inspired my line of thought. It has an open face and top for desktop use to separate the masks. Another iteration shows hanging use of the design

Improvements: The structural design makes access to masks difficult, a lid could help isolate masks more, a longer design to fit any size of mask would help

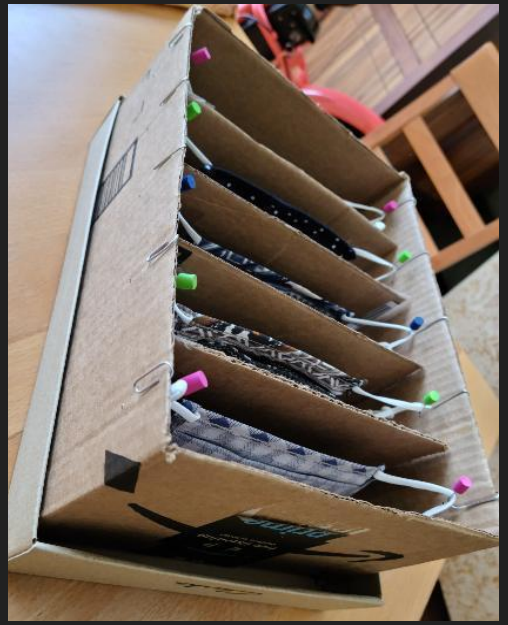
Final Design:

We decided that Kaan's prototype covered most of our performance requirements so we based our final prototype off of his. The main changes it would need are to it's hanging design to make it easier to use and the possibility of adding a lid made from a material that would keep most contaminants away while still allowing air flow. Our final idea for what an actual manufactured prototype would be like is similar to what we initially had in mind but with reconsiderations to the types of materials used. The inside would have to be plastic or a similar material that wouldn't be damaged by water and that could be kept clean easily.

Comments/General Improvements:

The design could be longer or have multiple layers to hold more masks. The lid can be made out of a different material, one that lets the possible smell form the wet masks leave but stops dust from entering. If we wished to further develop our design, we have also considered ways to make the box not only serve as a storage unit but also as a cleaning one through self cleaning mechanisms, or the use of UV lights.

Extra Pictures:



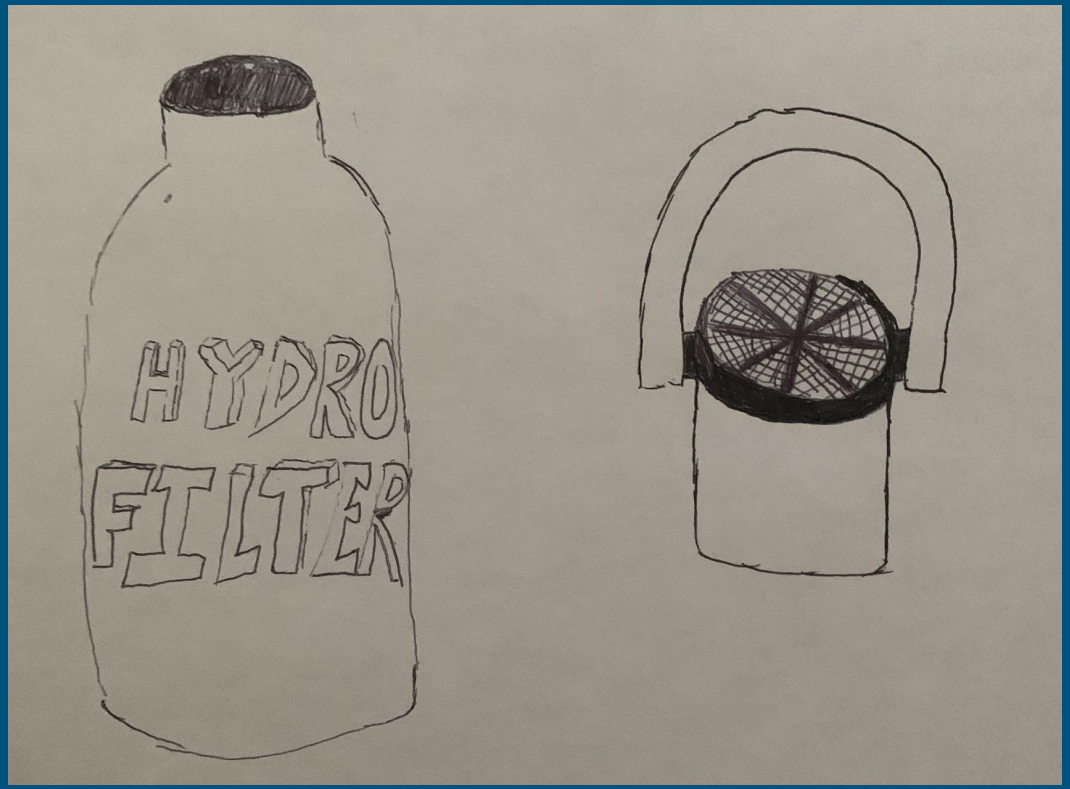
HydroFilter

Clayton Seastrand, Aidan Ramblas,
and Jacob Pashman

Essential Attributes and Characteristics

- Lightweight and easy to transport
- Keep water cold for at least 24 hours
- Take up as little room as possible
- Filter water properly
- Quick and easy to refill
- Under $25

Our First Sketch



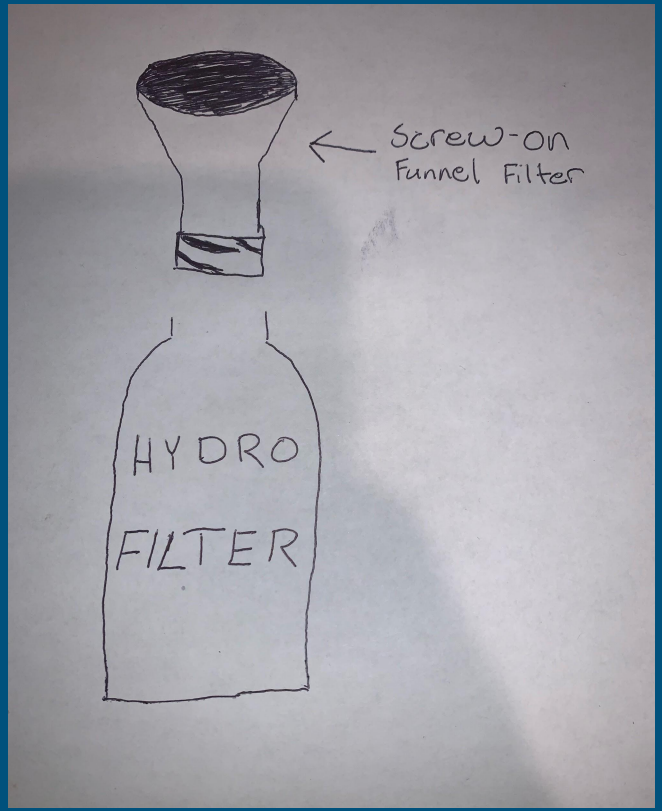
Pros

- Thermal bottle
- Handle on cap makes it easy to carry

Cons

- Filter design is faulty
  - (water would filter to slow and overflow the brim of the filter)
- There is no sealing cap for when its not being used
- No efficient way to clean the filter

Clayton Idea 1



This HydroFilter helps…

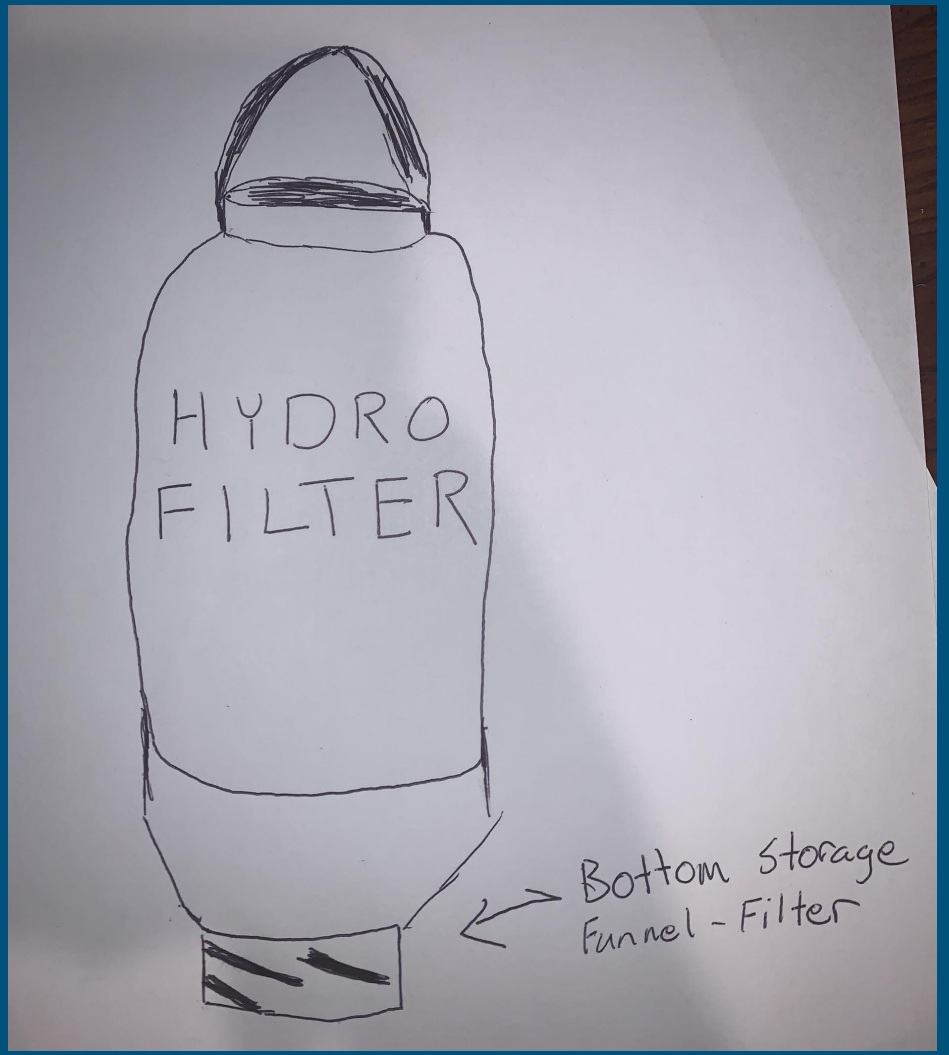
- Prevent spills by having a large funnel
- Provide a pool of water waiting to be filtered

BUT…

- Has no built in storage space
- Is hard to carry

Clayton Idea 2

This design allows for a easier to carry, more space conservative, water bottle filter. However, the design makes it more difficult to stand vertically, especially on uneven surfaces/



Aidan Idea 1

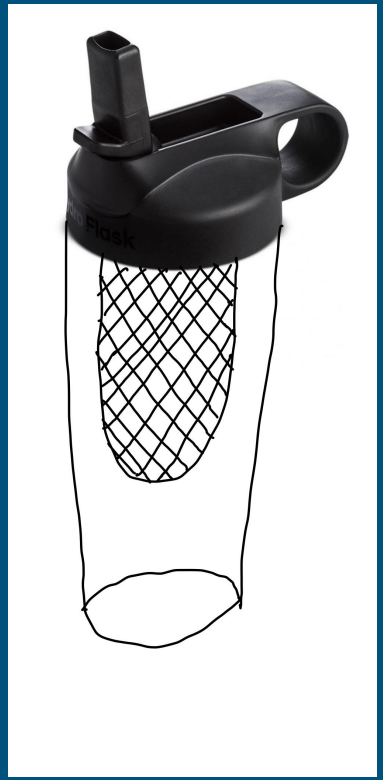
Aidan Idea 2

Aidan’s Idea 3

Jacob Idea 1

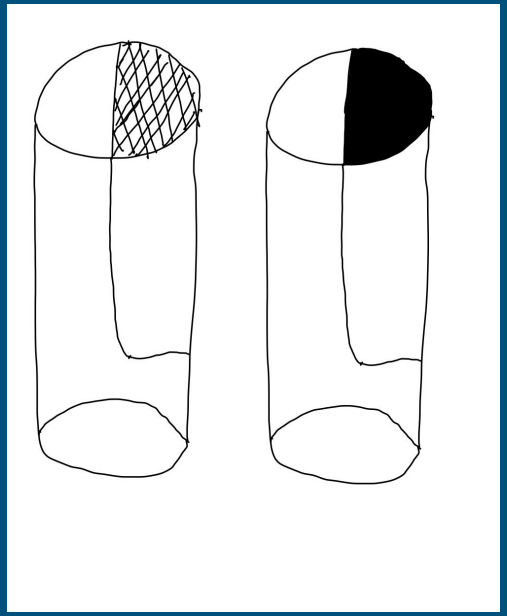
- Large integrated into lid
- Filters water as you drink
- Can use the existing HydroFlask straw cap
- Takes up minimal space and
- Lightweight
- Easy to replace filter
- Water will come out slowly
- Filter effectiveness may not be as high

Jacob Idea 2



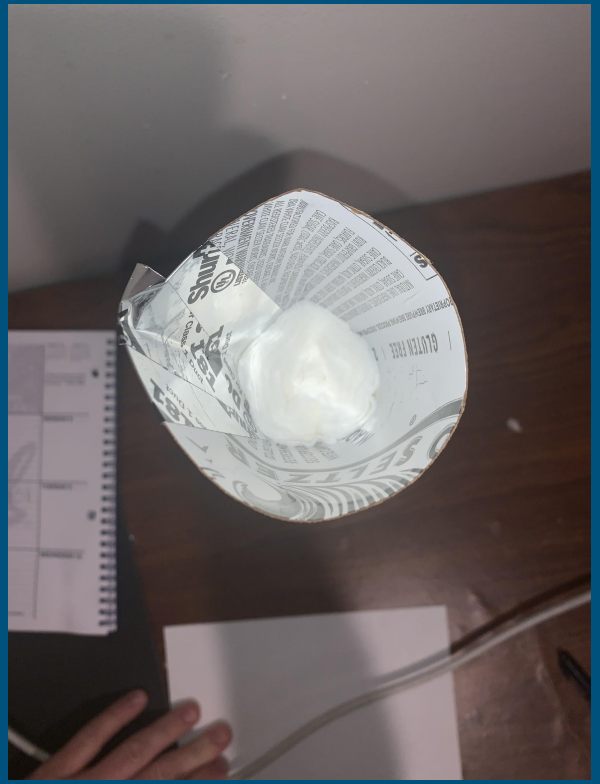
- Large integrated into lid
- Filters water as you drink
- Looks like a normal HydroFlask cap from the outside
- Takes up lots of space in bottle
- Water will come out slowly
- Requires you to tilt the bottle significantly to drink water faster

Jacob Idea 3



- Multi-piece solution that resembles a Brita
- Filters water when you fill it
- Takes up lots of space in bottle
- Water will come out very quickly
- Multiple pieces makes it more complicated
- You could easily lose part of it

Clayton’s Prototype



Aidan’s Prototype

Jacob’s prototype

Final Prototype - Go Bears!

The Quarantine Tray

Alexandra Koullick, Matthew Chun, Ali Fazal

Vision & Attributes

A list of attributes and characteristics that the device must address, its needs and performance requirements

- “wearable cup holder”
- easy to put on/take off
- comes with a removable cup (so you can put your own)
- target audience/buyer
    - multitasking during quarantine
    - somewhere where you need a “third hand” to hold a drink

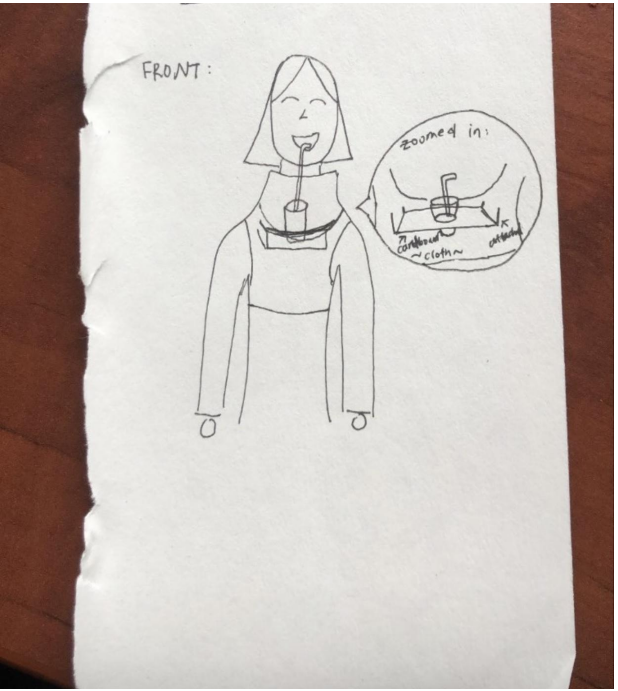
Prototyping Materials needed:

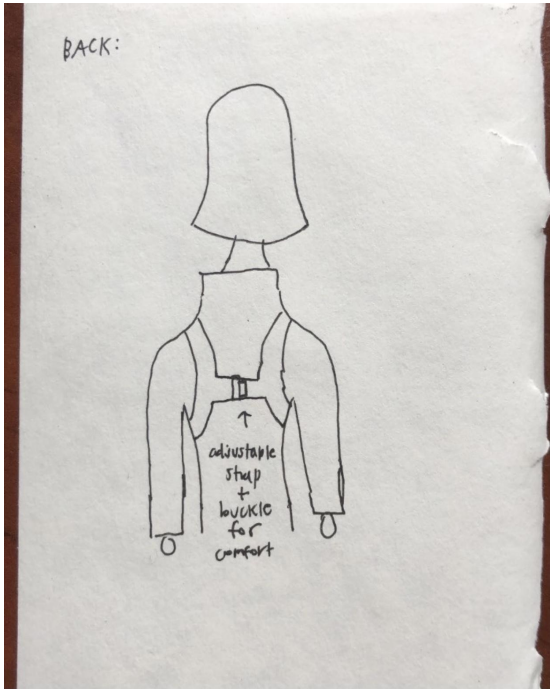
- Fabric
- Twine
- Staples
- Cardboard
- Tape

Performance Outcomes we want:

1. Comfortable
2. Lightweight
3. Stable
4. Easy to put on/take off
5. Adjustable

Prototype 1 - reverse backpack





Interviewing Alexandra - prototype 1

Main goals:

- The design must be lightweight.
- The shoulder straps are comfortable.
- The straps should be padded.

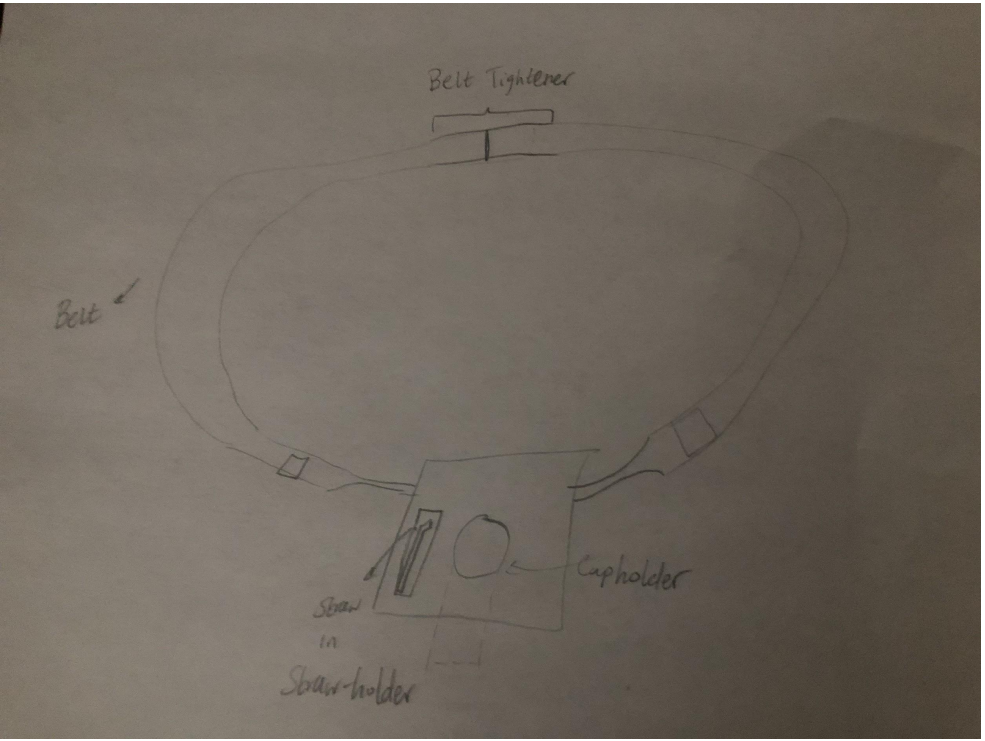
What worked?

- Straps held the tray well
- Tray format was light
- The back strap helped keep it secure
- Tray close to face // easy to drink from cup with a straw

What didn’t?

- The cup wasn’t stable enough - need an additional strap

Prototype 2 - around the waist



Interviewing Ali - prototype 2

Main goals:

-Accessibility

-Relatively heavier since it is on the waist

-Aimed to function as a belt

Advantages:

-Allows wearer to have a larger range of perception (look down more)

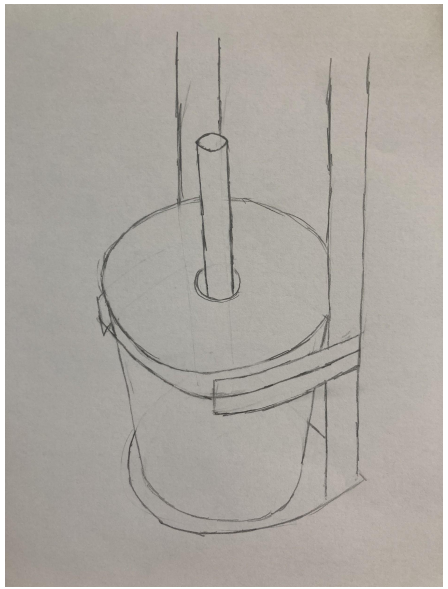
-Shifts some of the tension away from neck

Disadvantages:

- Can be tight around the waist for some people

-Requires user to reach further for cup, which some might not prefer

Prototype 3 - around the neck



Interviewing Matthew - prototype 3

Main Goals:

- Light/Comfortable
- Easy to put on/take off
- Compact/Portable
- Adjustable for different cup sizes

What Worked:

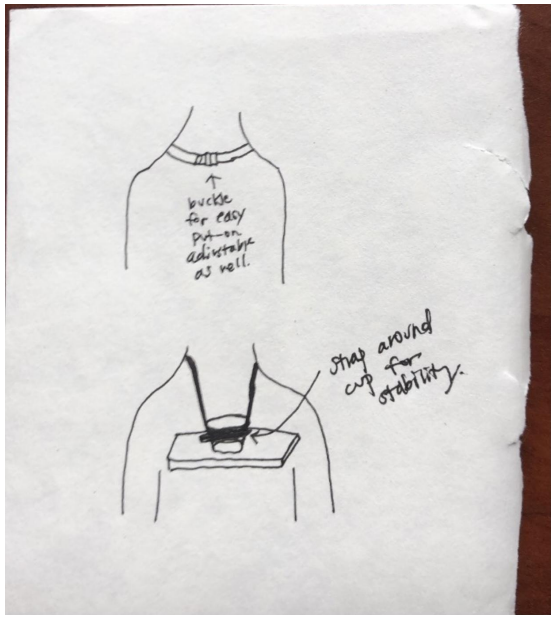
- Neck strap clip
- Adjustable upper ring
- Compact design

What Didn’t Work:

- Uncomfortable for long periods of wearing
- Less stable

3 radical ways performance outcome is met!

- Use recycled plastic as alternative to wood or metal for the tray! - touching upon it being lightweight
- Have another strap dedicated to holding the cup!
    - improves stability
- Have a buckle on the neck strap strap for easy use



Final prototype + adaptations

- Combination of prototypes 1 and 3
- Neck strap allows for stability of the cup (+ attachment of orange strap) & shoulder straps allow for minimizing discomfort and heaviness of the tray
- Clip on the neck strap for convenience
- All straps are adjustable
- Padding

Iphone Case

By: Purbasha, Dhruv, and Michael

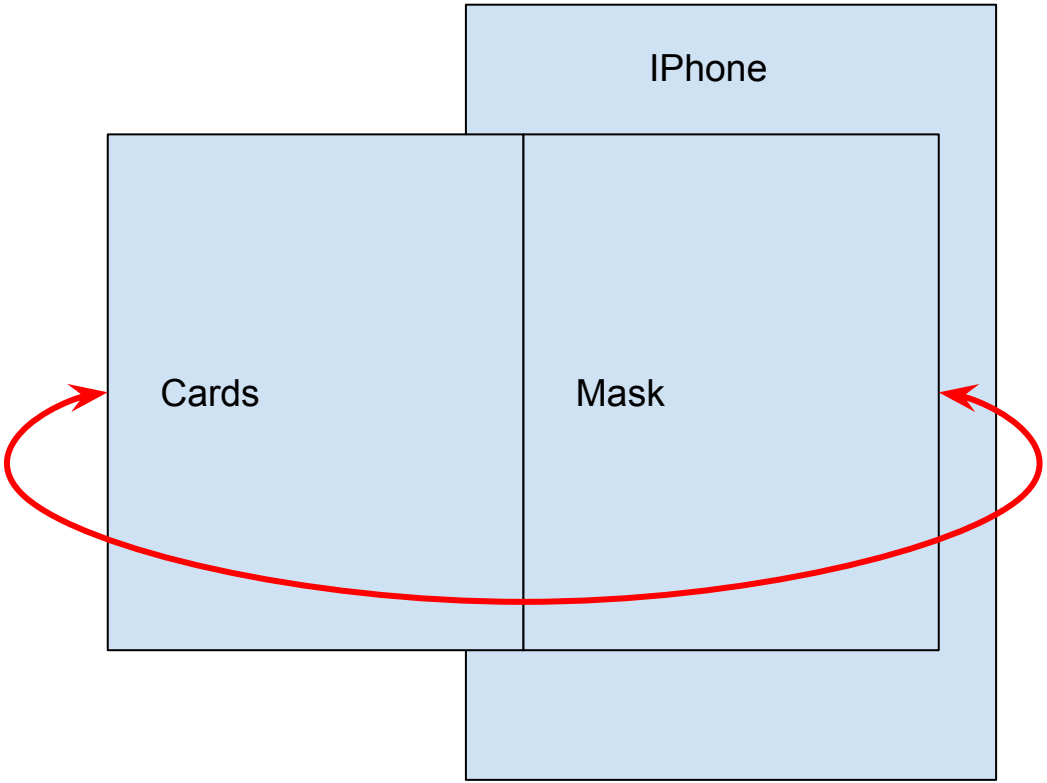
Brainstorming Ideas A list of Problems with phones/cases

- Doesn’t have a place to hold a mask
- Some iphone cases make it hard to attach iphones to the holders in their car
- In most iphone case you have to compromise on features that we all need for example a small wallet on our phone. Those wallets either can only hold i card comfortably or we don’t have one at all

Solutions

- Phone case that can hold masks
- Has a built in wallet which has two layers to it and can fit 2-3 cards to it
- A magnetic backing to allow for the phone to attach to car iphone holders
- Also create some sort of area where a mask can be stored.

Quick Sketch



More specific

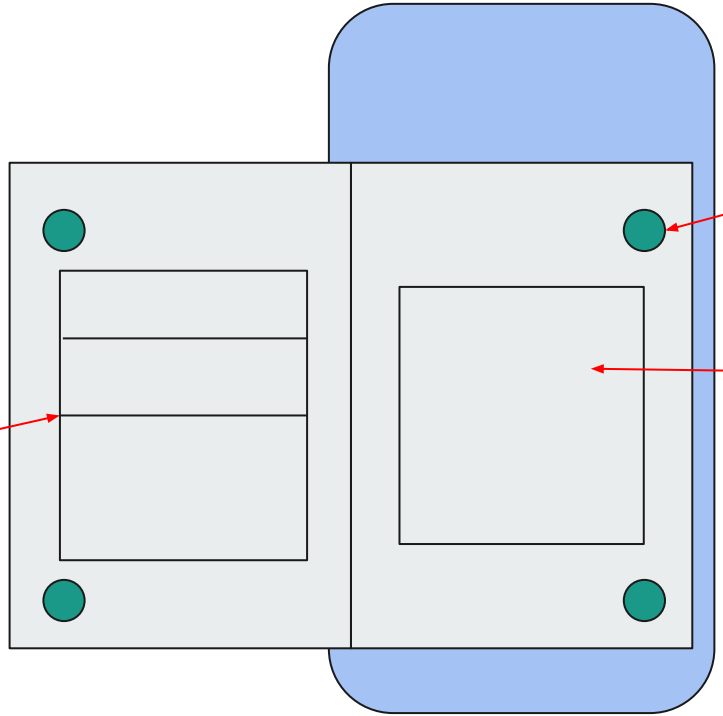
Materials

- Cardboard (lightweight, relatively inexpensive)
- Magnets (small)
- Glue
- Maybe cloth (to make a pocket)

Dimensions – should match dimensions of phone

Example: iPhone 11 is 150.9mm tall, 75.7mm wide, and 8.3mm thick

Dhruv's Idea



Buttons are used to open and close the case at the back of the iphone

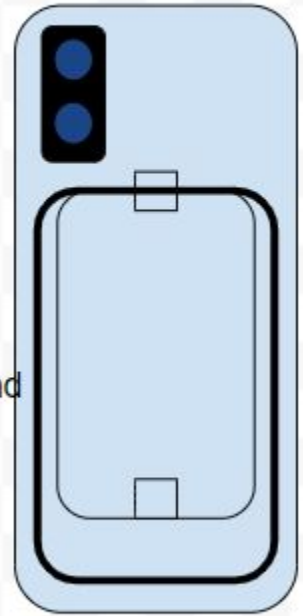
Pocket for masks

Pocket for cards

Purbasha's Idea

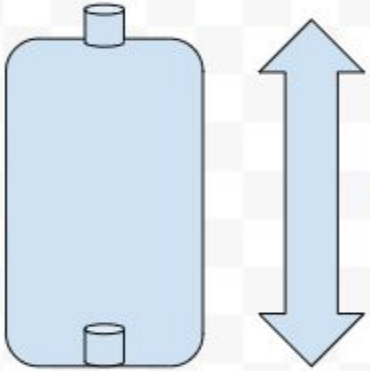
Based on the size of Apple Iphone 12

A phone stand



Wallet/ Place to keep mask

The first layer of the wallet will contain a magnet which will
Allow the phone to be able to attach to car accessories



3 inches high

Can wrap the strad of the straps around the two stubs and then tuck the mask into The pocket of the wallet

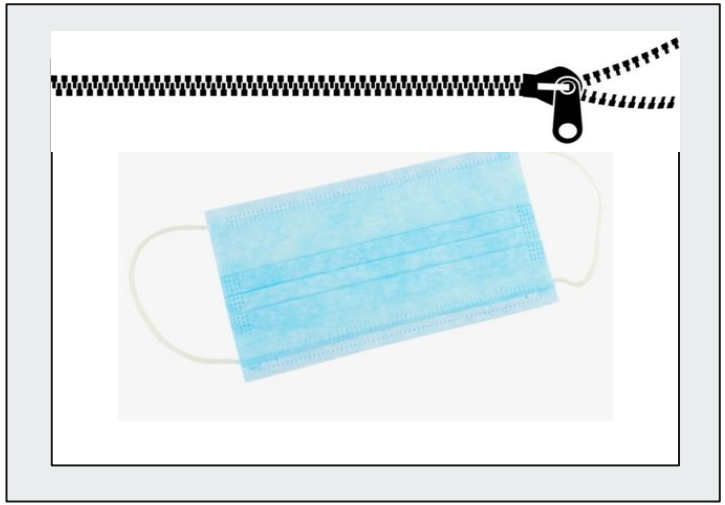
Michael's idea

Cardboard case

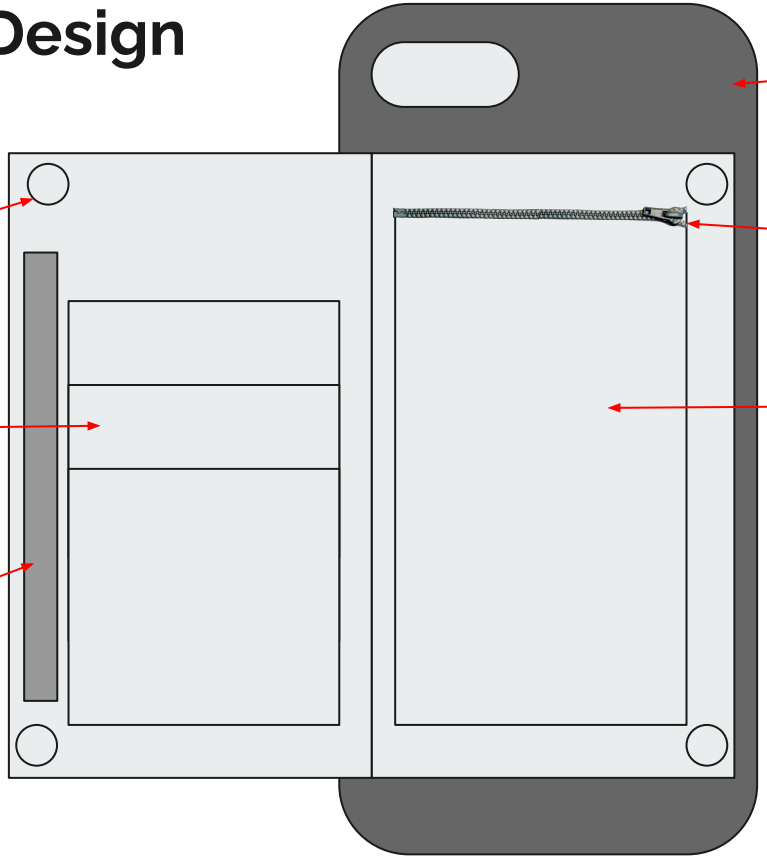
Rectangular pocket made of cloth (for storing masks)

Zipper to open and close pocket

Cloth, zipper, and cardboard all connected together securely via sewing or gluing



Combined Design



Leather-like material

Magnetic buttons to close holder

Zipper

Card holder

Bag to hold masks

Magnetic strip

Apeiron Húdōr

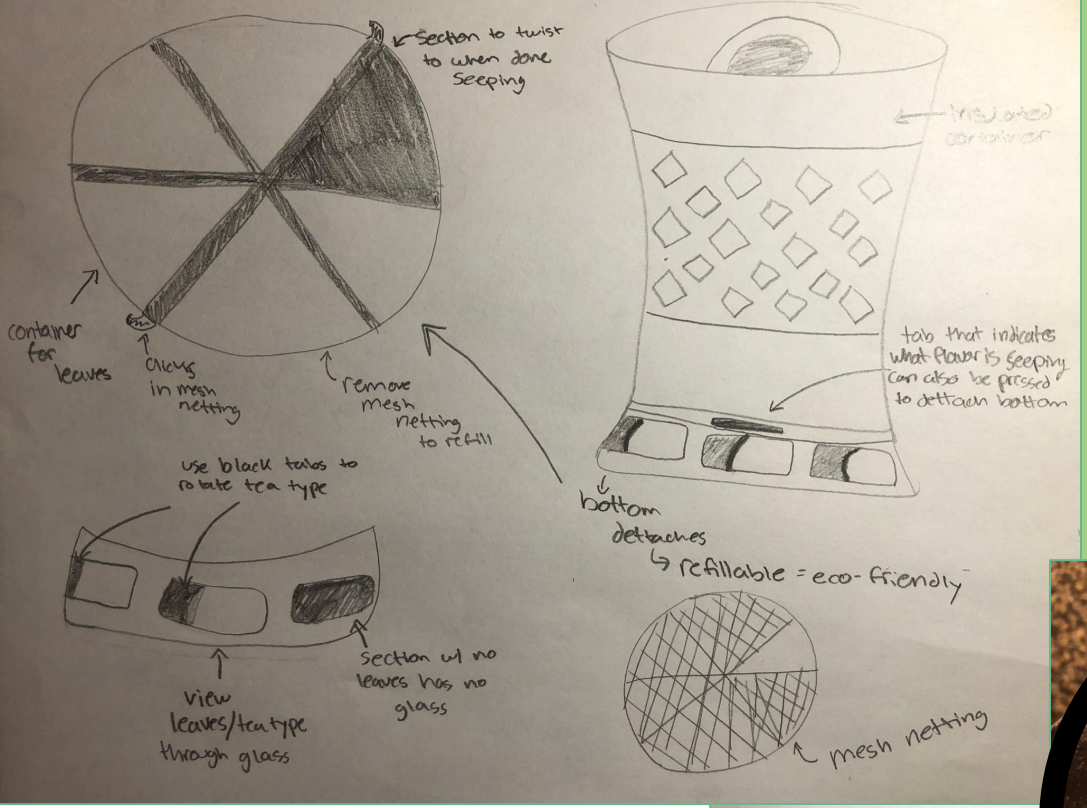
One tumbler. All the tastes.

Ideation

We enjoy drinking tea or coffee, and as there are countless flavors of tea and coffee, we thought that it would be interesting if we could make multiple drinks, possibly at the same time in a container.

Apeiron Húdōr translates to “infinite water” in Ancient Greek. The name emphasizes the infinite possibilities of beverages you can make with just pouring hot water.

Anna's Process

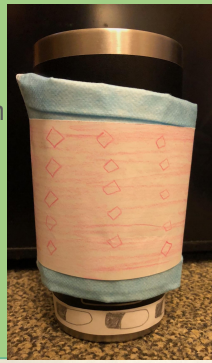


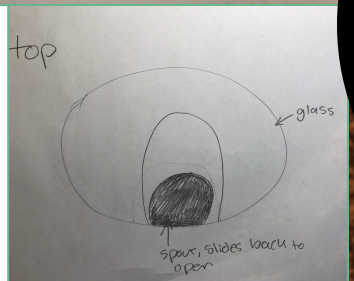
Goals:

- Comfortable to hold when hot
  - Ideally rubber sleeve
- Easy to replace tea leaves in bottom
- Easy to sip when hot
- Stylish design
  - Patterned sleeve
  - Selection of colors to choose from
- Leak proof

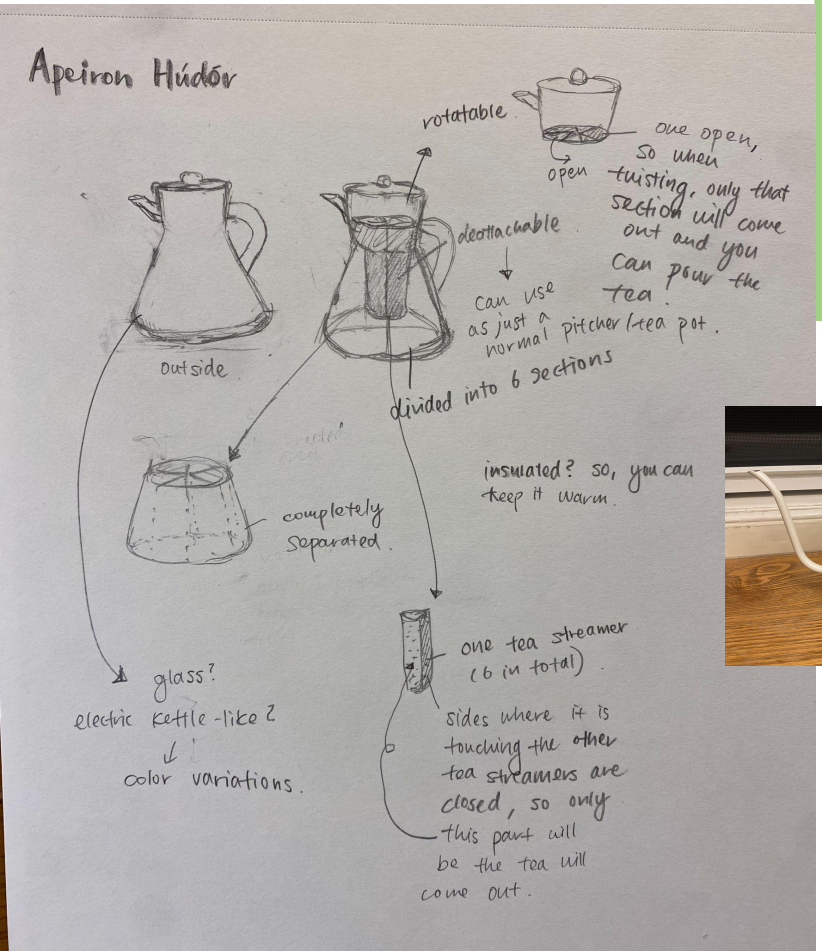
Ideation Methods:

- Quick Prototyping
- Cognitive Task Analysis





Maho's Process

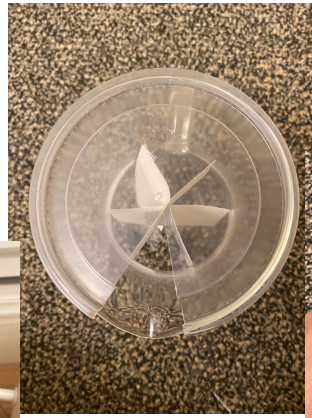


Characteristics/ Performance Requirements:

- Each tea/drink that can be made are in separate containers (does not leak/mix)
- Can be kept hot
- Can make even amount of drink with one pouring of hot water
- Not too heavy
- Size: Fits into hand and can be carried around

Inspirations:

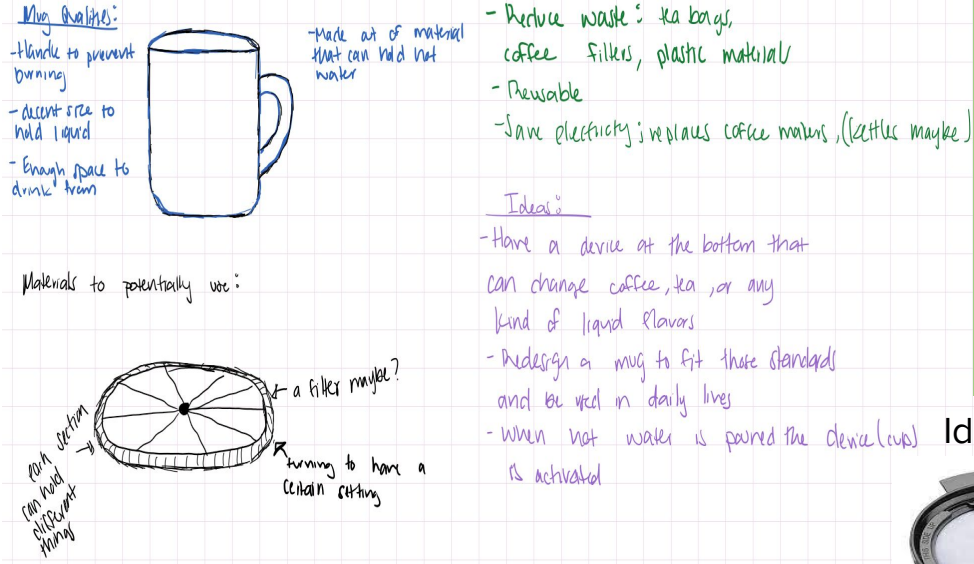
Prototype:



Using plastic lid to see how we can prevent tea from getting all over the place when pouring it into a cup

Marilyn's Process

Brainstorm:

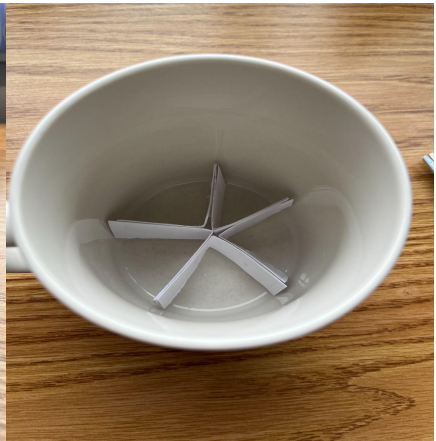


Attributes:

- ➔ Section off different flavors
- ➔ Keep water hot
- ➔ Comfortable to hold
- ➔ Can be washed easily (reusable)
- ➔ Turn to flavors you like
- ➔ Can adjust concentration of tea (push of a button)
- ➔ Mix less=less concentration; Mix more= more concentration
- ➔ Reduces waste from regular tea bags
- ➔ Comfortable to drink from

Ideas:

Prototype:



Final Prototype

Benefits of Anna's design:

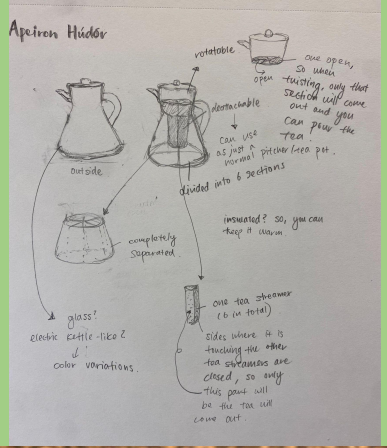
- Good division of tea leaves in bottom of container; comfortable to hold with optional rubber sleeve

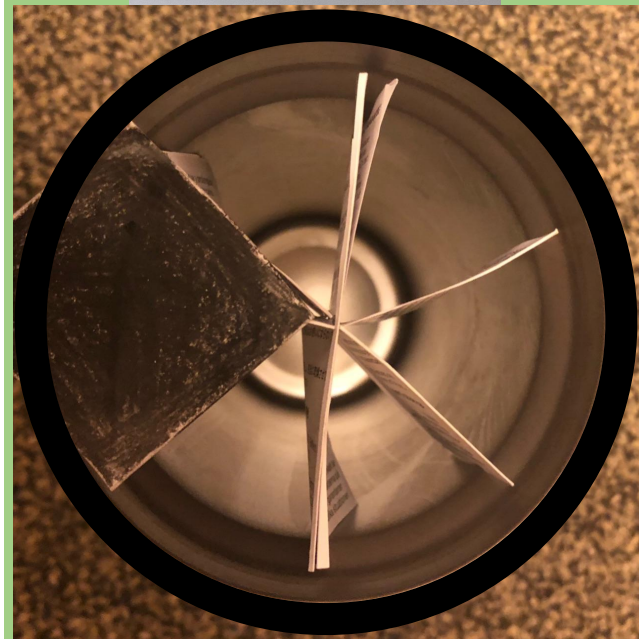
Benefits of Maho's design:

- Detachable tea strainer - can use the container as normal water pitcher/teapot

Benefits of Marilyn's design:

- Can clean easily and adjust concentrations of flavor





DESIGNED BY ANNA, MAHO, MARILYN

APEIRON HÚDŌR

ONE TUMBLER, ALL THE TASTES

WITH JUST ONE POURING OF HOT WATER, YOU CAN MAKE MULTIPLE BEVERAGES AT A TIME! WITHOUT HAVING TO WASH MULTIPLE CUPS AND TEAPOTS, YOU CAN ENJOY ALL THE TASTES

Instructions on how to use

1. Detach bottom from Apeiron Húdōr by pressing black rectangular button. Fill sections with tea leaves of your liking.
2. Reattach bottom. Rotate bottom to tea of your liking. Tea steeping is under black button.
3. Pour in hot water and enjoy! Feel free to mix tea types by rotating bottom!

No more clutter of tea bags!
Less waste!
Less cups used!

Thank You!

By: Skyler Bates, Gabriela Flores, and Alexis Rivera

What is is?

The *Maskase* is a essentially a portable mask caddy. You may have seen some restaurants now start to have this little bag that you can put your mask in when you're not using it, like when you take it off to eat. Well this new invention is going to be not only that but a portable, better, and reusable version, but it also is going to be a one size fits all case that works for any different type of mask. From regular surgical, to basic cloth, to strong KN95 masks, the *Maskase* is your solution for carrying around your mask when you're not wearing it!

Attributes, Characteristics, and Attributes

Skyler's:

- Holds your mask when you're not wearing it
- Protects it from getting dirty in your pocket or hand
- Needs to protect your mask
- Help you keep track of your mask
- Store your mask

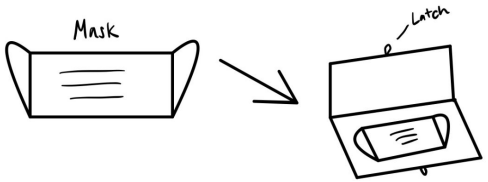
Gabriela's :

- Protects your mask
- Organization "tool"
- Prevents one from losing mask
- Keeps mask sanitized/sterile

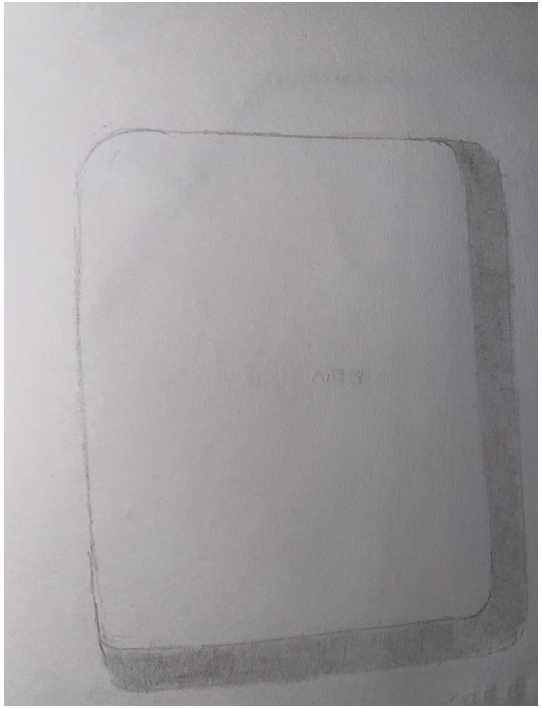
Alexis's:

- To keep your mask clean
- Helps create a designated space for mask instead of always having to search for it in pockets/purse

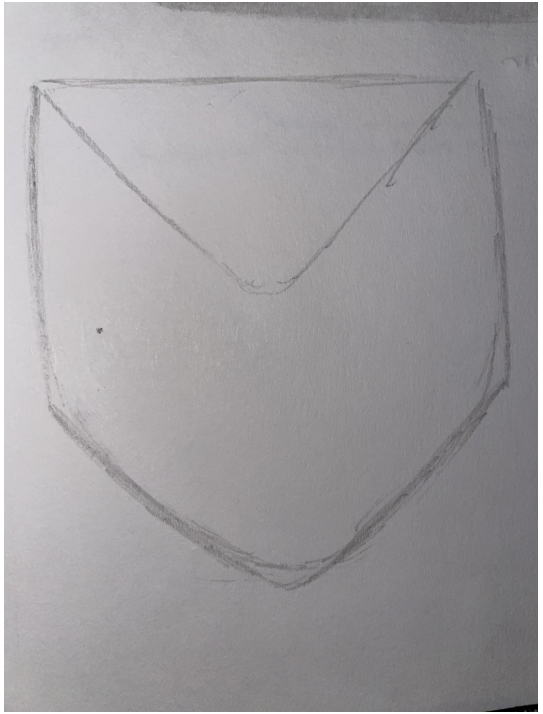
Images (cont'd)



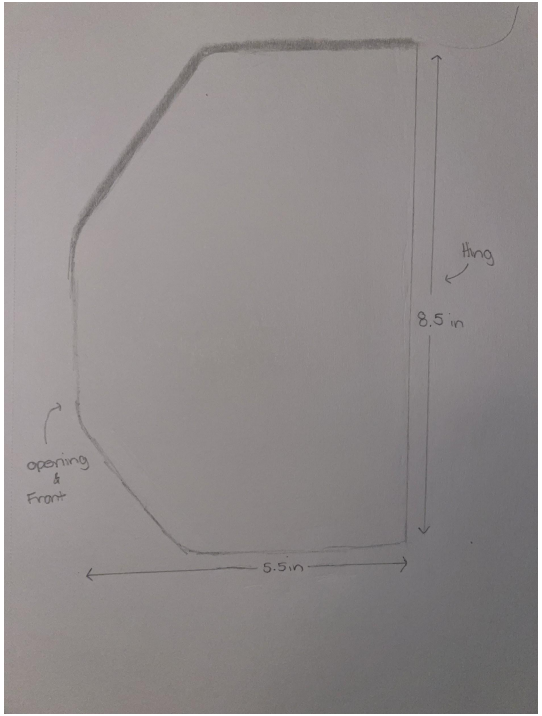
<- Alexis's initial sketch



Skyler's initial sketch



Gabriela's initial sketch



Final design sketch

Outcomes discussion

Name	What	How	When	Where	Why
Skyler	a case for your mask that you can have for any type to make it easier to keep track of your mask (not lose it), keep it from getting dirty or damaged, and to gives you a designated place to put your mask when you're not wearing it	protects your mask with a plastic case	you can use it everyday or whenever you need to where your mask	you can you use it anywhere you need a mask	to have a one-size-fits-all way of protecting/storing your mask
Gabriela	Product is a storage case for face masks of all shapes and sizes for easy and reliable transport and protection between uses	Product is used by placing mask or masks of any kind in case and sealing the case and placing somewhere for easy access	Product can be used in the time user is not required to wear a mask or need to take it off mask	Product will be made to be used anywhere and everywhere users go (tuck into purse/bag/backpack)	To provide universal storage for face masks, and keep masks fresh and sterile between uses
Alexis	A case to keep your mask from getting dirty or lost.	You place the mask inside and close the case to keep the mask safe.	It can be used when you are not using your mask.	Can be used for pockets, purses, wallets.	To create a product that stores masks when they are not in use.

Performance outcomes

Function: To act as a storage case for face masks of all shapes and sizes for easy and reliable transport and protection between uses of the mask

Size: Length: 8½ in by Width: 5½ in

Materials: Biodegradable recycled-plastic

Production: Foxconn (Made in China)

Aesthetics: Any color/design (customizable)

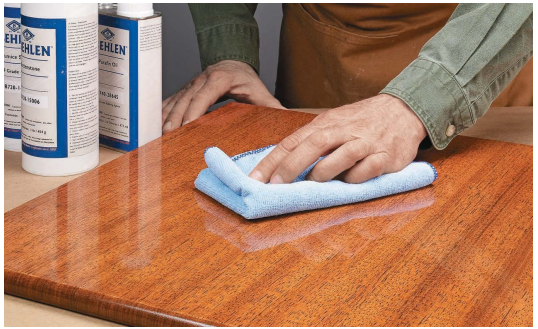
Physical attributes

- Very durable (photograph of heavy duty object colliding/crushing product)
- Environmentally friendly (Diagram of decomposed/ breaking down)
- Waterproof (photograph/sketch of underwater or water exposure)
- Slim
- Smooth (hand rubbing over surface)
- Simple materials (plastic)
- Low cost (rival market price: $8- $15)
- Light weight (able to hold easily in one hand)
- User-friendly
- Compact (Drawing of compressed/ takes up a small amount of space)
- Sturdy

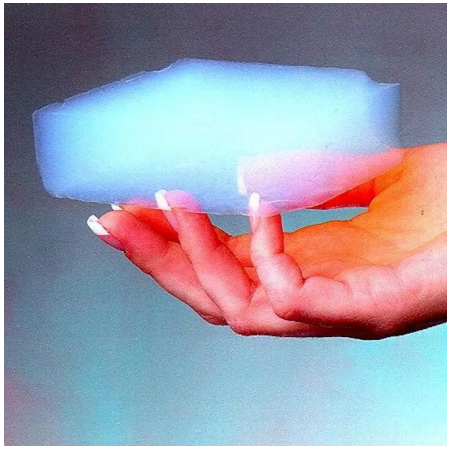
Images

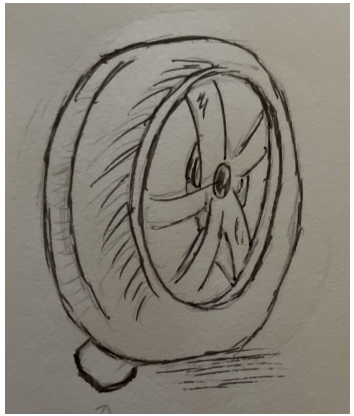
ENVIRONMENTALLY FRIENDLY

SMOOTH

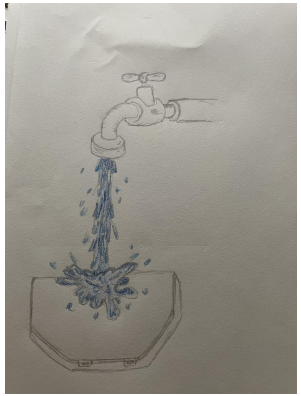


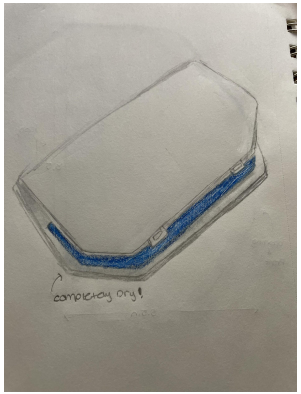
LIGHT WEIGHT





DURABLE



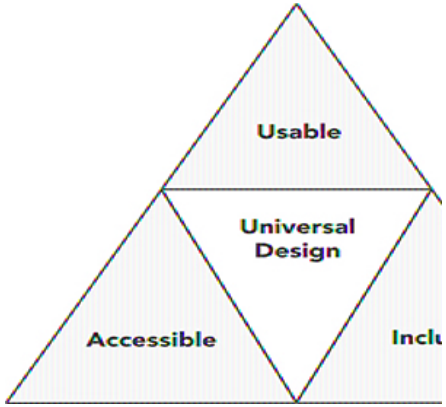


WATERPROOF

COMPACT

Images (cont'd)

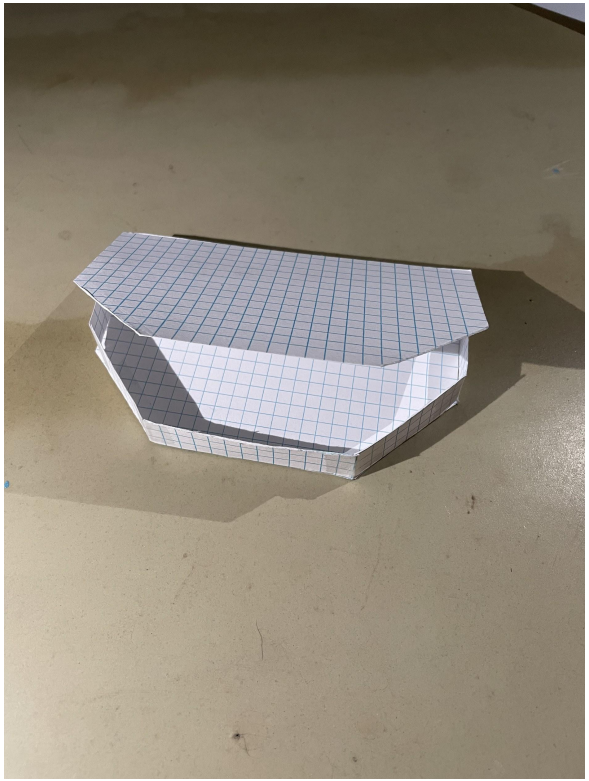
SLIM



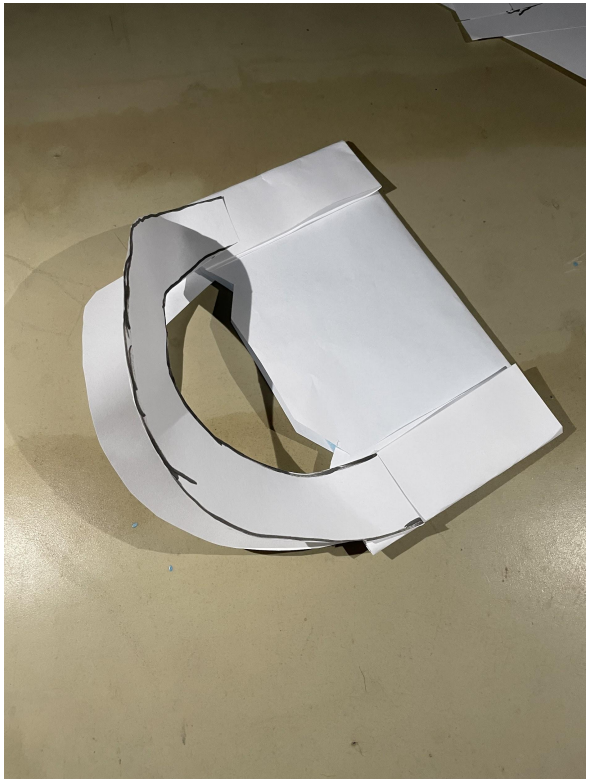
USER-FRIENDLY

LOW COST

Images (cont'd)



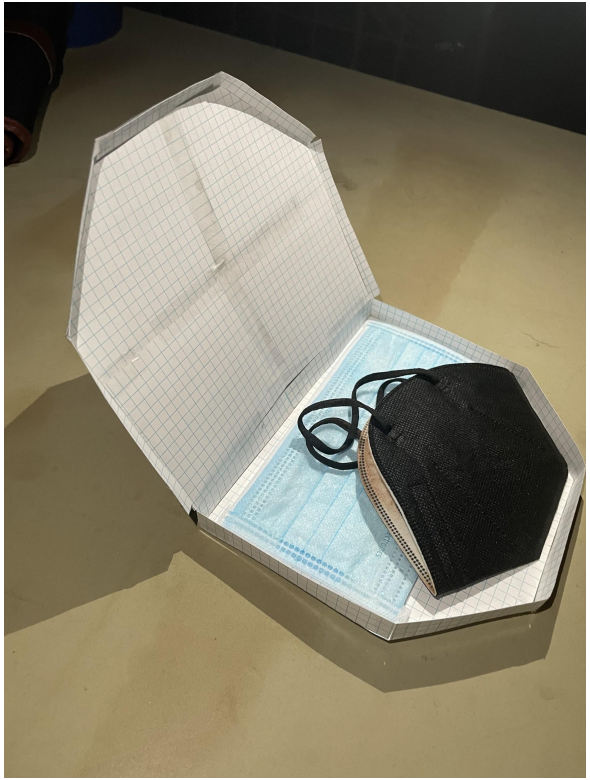
Gabriela's initial prototype



Skyler's initial prototype

Alexis's initial prototype

Images (cont'd)



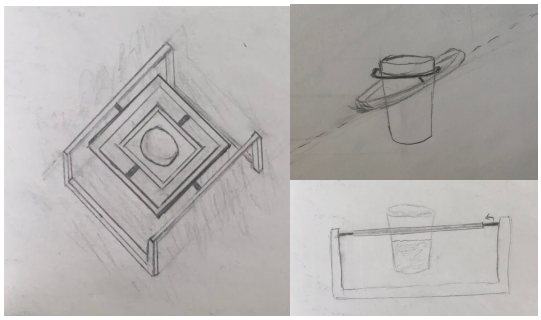
Final Design

The Maskase!

Buy it now!

Derek Davis, Fernando Rubio, and Arya Majjiga
ARCH 24
February 16, 2021

Designing a Device for Everyday Life: Gyroscopic Cup Holder



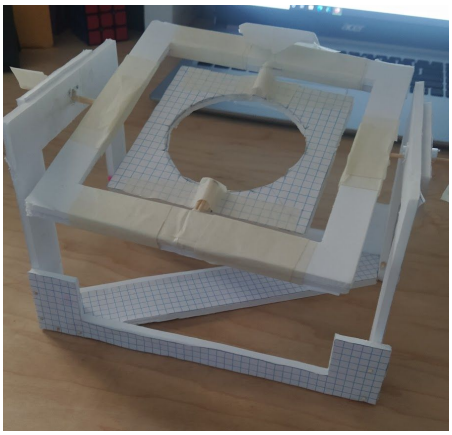
Step 1: List of Characteristics and Sketches

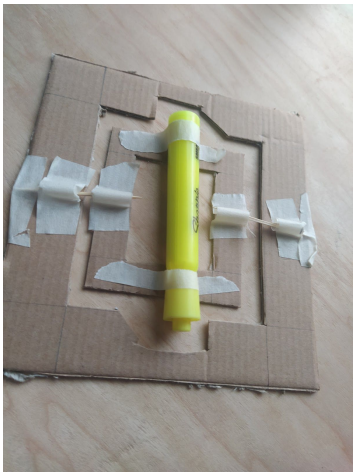
Derek:

- Simple design
- Sustainable/ energy efficient materials used.

Fernando:

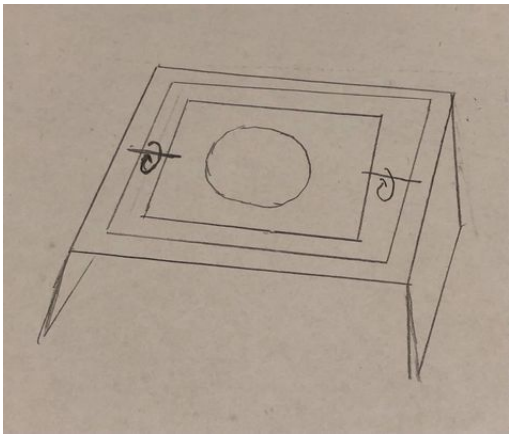
- Gyroscopic leveling feature
- Works on tilted surfaces





Arya:

- Low-cost, especially when considering mass production
- Prevent spills when experiencing motion
    - Ex: Would prevent spills on a bumpy road if the device was integrated into a car.



Step 2: Group's List of Performance Outcomes and Physical Characteristics

Foundational Attributes:

- Increase effectiveness of cupholders
    - Reduce spills
    - Should work on a tilted surface
- Simple design
- Light
- Low-cost
- Aesthetically pleasing design
- Ability to be produced sustainably in terms of economic and financial impact (not for prototyping phase, but in the context of mass production)

Who

Target Audience: This device has a wide target audience. It can appeal to owners of vehicles, since the gyroscopic design of the cupholder can help to prevent spills in a moving car. Additionally, it can appeal to almost anyone who uses a desk or writing surface, since it can be used to keep cups stable on tilted surfaces and prevent cups from spilling due to sudden movements or shifts.

What

Material: The most practical material for the product is plastic. Specifically, Polyolefin would be a good choice. Polyolefin is not very different from many other plastics however it has the potential to be turned into clean fuel at the end of the products life cycle. Source: Purdue University. "Millions of tons of plastic waste could be turned into clean fuels, other products: Chemical conversion process could transform polyolefin waste." ScienceDaily. ScienceDaily, 6 February 2019. <www.sciencedaily.com/releases/2019/02/190206131956.htm>.

Where/When

Applications of design: The most obvious application of our design is in cars and other vehicles. The gyroscopic design prevents spills by keeping the cup upright, so this cup holder would be immune to sudden movements or changes in direction unlike traditional cupholders. As stated earlier, this design can also be used on pretty much any surface to prevent spills.

Why

Purpose of design: To reduce spills and allow cups to be placed on uneven surfaces. The product has great potential to be integrated into several different types of vehicles.

How

How it works: The cup holder uses a gyroscope which uses the weight of the cup to keep it perpendicular to the x and y planes, ensuring that the cup will not spill. The gyroscope consists of several gimbals which allow the product to rotate around a stationary object.

Step 3: Ways in Which Performance Outcomes are Met

Derek:

- A thin and compact design leads to limited material use which also lowers the cost of the product.
- This simple design will also make the deceive more aesthetically pleasing, however it must be done with materials that allow the device to remain sturdy such as hard plastics.
- Use rings instead of rectangles for the gimbals inside the gyroscope. (This was not implemented in the final design). This would be difficult to manufacture but might improve the look of the product.

Fernando:

- The design is sturdy.
- Can maintain the center platform level, at least under force.
- The final product is symmetrical and evenly constructed.

Arya:

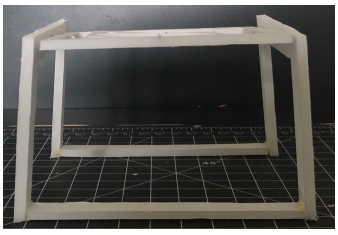
- The gyroscope keeps the cup upright, which allows the cupholder to be used on tilted surfaces.
- My prototype was made with cardboard, which is light and low-cost. Of course, other materials, most likely plastic, would be used if this device was mass-produced.
- The design uses the cup's weight to remain upright at all times, which prevents spills even under significant movement.

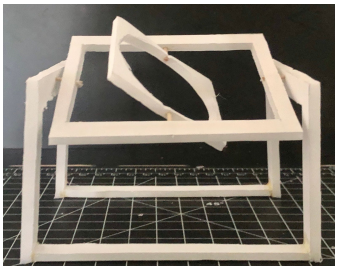
Step 4: Individual Prototypes

What was learned from initial prototypes:

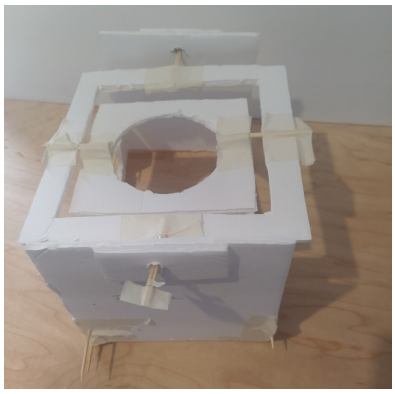
Derek:

- While a thin/minimal design may be appealing for aesthetic purposes and to lower material costs, it will only work if materials are sturdy enough to handle the weight of larger cups.
- It is important for sturdy materials to be used so that the weight of the cup does affect the devices ability to easily turn and self-level
- The cup-holding portion of the device should allow the cup to sink into the holder to prevent a top heavy cup from interfering with the gyroscope.





Fernando:

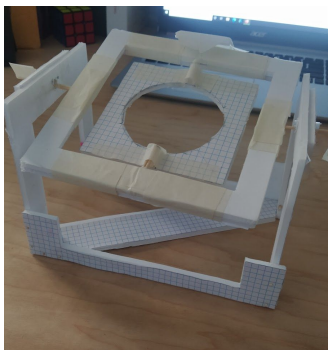


- One of the key details necessary for working well is that the center of gravity is much lower than the axis of rotation, along both dimensions.
- Also, it appears to be good at absorbing impacts, so a possible application is in cars
- One way to go overboard is to use an electronic gimbal, such as the ones used in cameras, to be stable

Arya:

- It is necessary to make careful and precise measurements of the materials before assembling the prototype, because minor errors in dimensions can lead to the prototype not working.
- Cardboard may not be the best material, since it tends to bend if the cup is heavy.
- The stand that holds the gyroscope should be as sturdy as possible, and the device should be able to keep the cup upright regardless of which direction it is moved.

Step 5: Final Prototype



Test Criteria:

- Able to keep the cup perpendicular to the ground even on tilted surfaces (30 degrees)
- Prevent spilling through bumps
- Works equally well in both dimensions
- Able to stand and remain stable on a surface

Outcome:

The final design of the cup holder proved effective. The product is able to hold a cup and rotate well in both dimensions. On slanted surfaces the cup remains upright and perpendicular to the ground. It is also able to react to moderate shaking of the product while keeping liquid inside the cup.

Future Improvements:

- Thinking about adapting our design so that it can be used in cars and other vehicles.
- Considering environmental and financial sustainability, especially in a mass-production context.
- Find ways to make our design more aesthetically pleasing.