




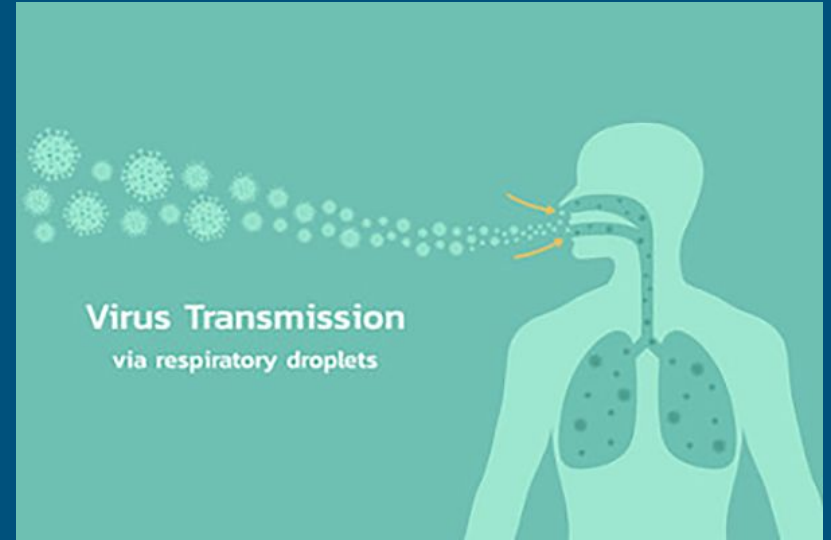
The Re-Imagined Face Mask

Andy Lin, Arianna Nejely, Michael
Seaver, Justin Silvey



The Problem

During the COVID-19 pandemic, it has become evident that a reusable and safe alternative to the common surgical mask is needed to protect individuals from respiratory droplets.



Relevant Details

- People across the globe are trying to find alternatives
- Current alternatives vary in:
 - Size
 - Shape
 - Materials
- Current alternative protective capabilities may not be known
 - May protect the wearer but not those they are around
- Current alternatives cause:
 - Glasses to fog
 - Irritation from material
 - Muffled voices



Some N-95 Masks such as the one above protect the wearer and not those whom they are around.



Some respiratory protection devices, like the device on the right, hug tight to the face and cause the wearers voice to be muffled or unclear

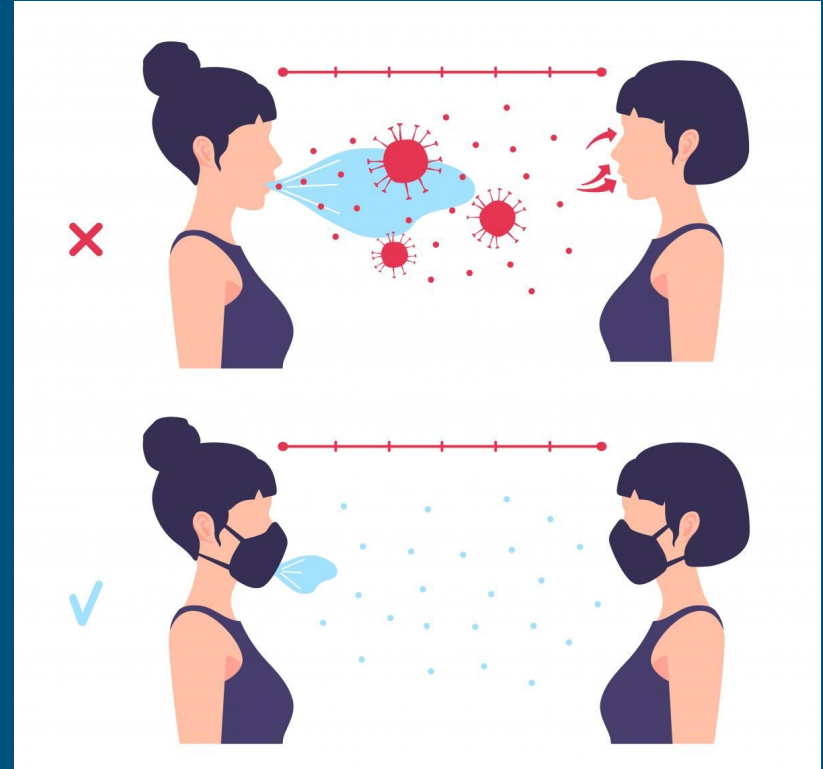
Issues with Current Solutions

- Varying filtration effectiveness, no FDA minimum standard for reusable masks.
- Fogging of glasses
- Material - breathable, durable, comfortable
- Unpleasant Smell
- Single Use or Hand Washable

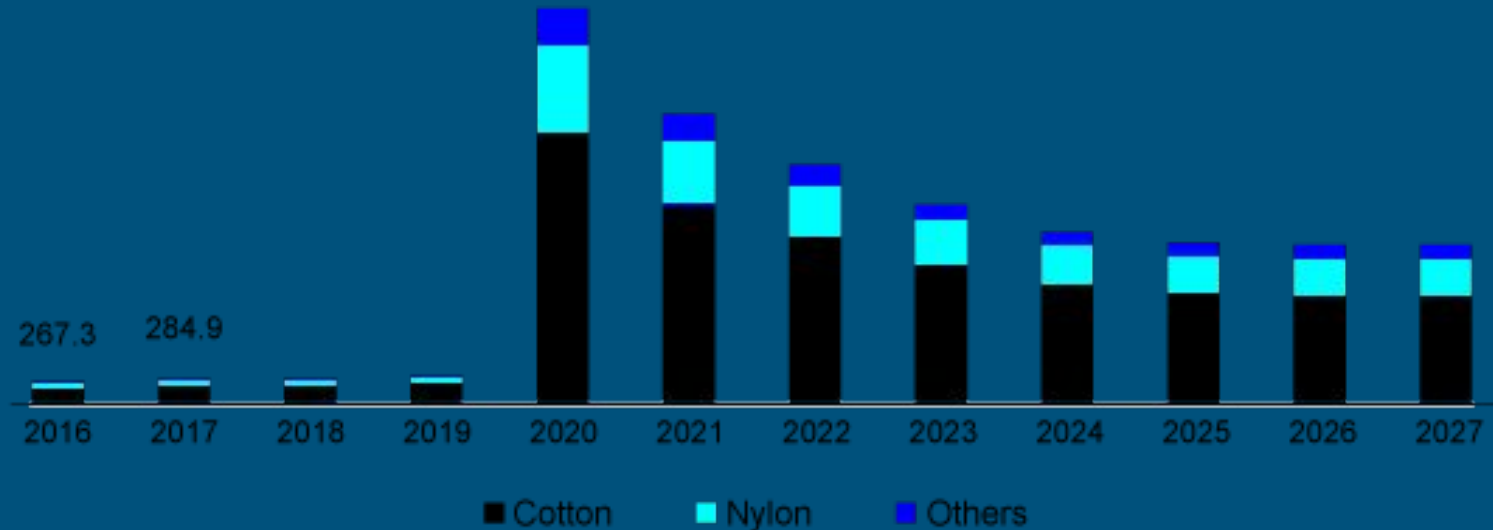


The Opportunity

Develop a device to protect individuals from airborne respiratory droplets



U.S. reusable face mask market size, by material, 2016 - 2027 (USD Million)



Source: www.grandviewresearch.com

- The U.S. Reusable Face Mask Market is expected to have a CAGR of 23.5% from 2020-2027
- Hemp Currently not widely used in the market!

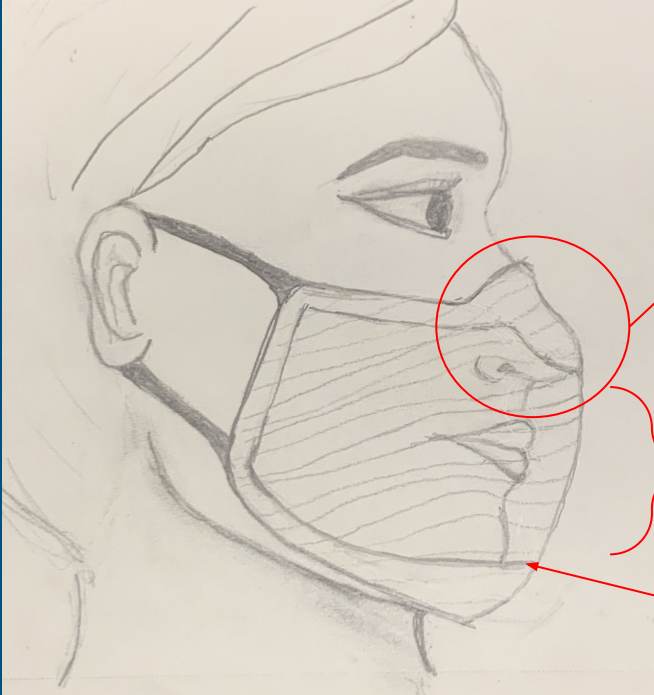
Customer Needs

Opportunity for device which...

- Allows for safe respiration
- Comfortable
- Reusable
- Personalizable
- Inexpensive



Preliminary Product Concept



3D Printed Nose-Piece: PLA or ABS

- Prevent Fogging
- Adequate Seal at Bridge of Nose

Mask Shape - Keeps mask away from mouth

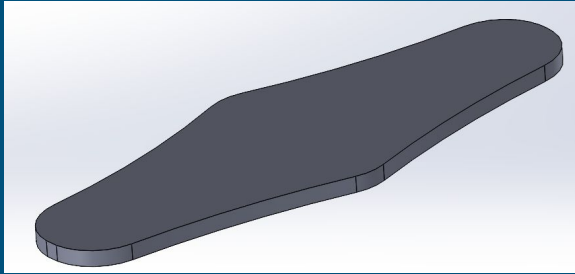
- Clear Voice with Adequate Seal

Anti-Microbial Hemp Fabric

- Prevent Fouling
- Adequately Protect User

Product Concepts: Nose-Piece

Flat

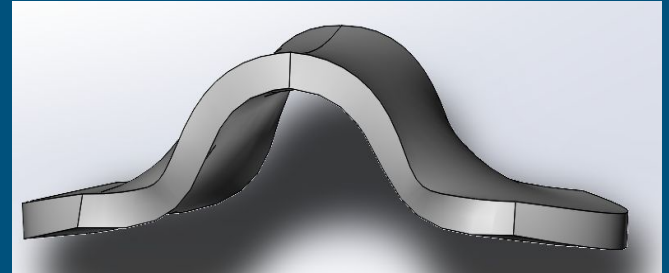


PLA



ABS

Curved

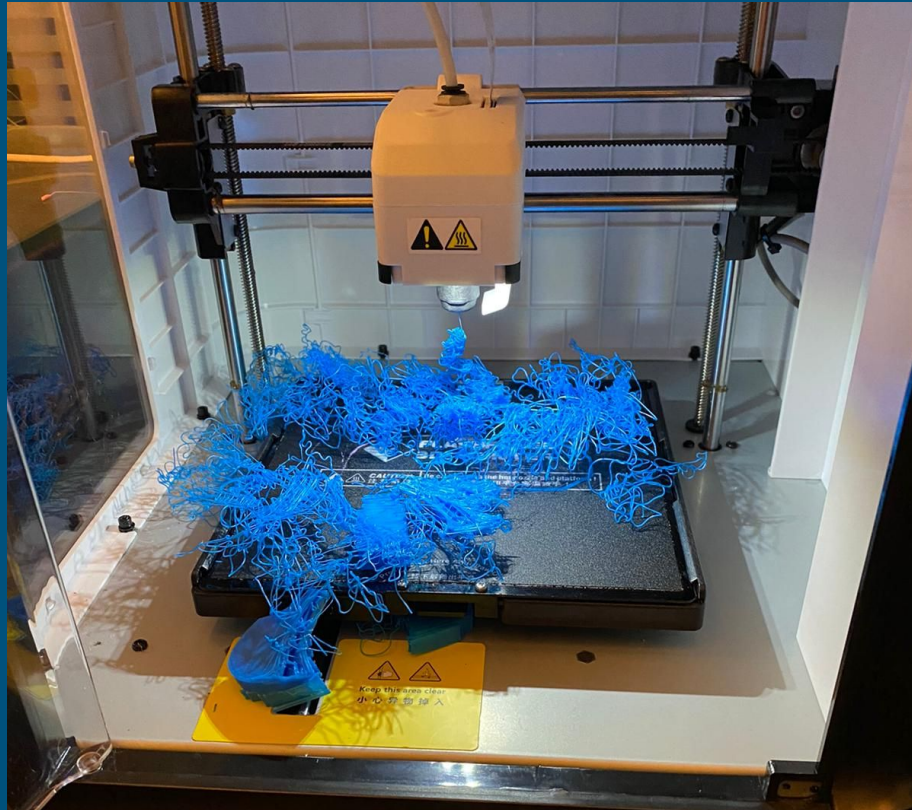


PLA



ABS





Initial Material Consideration: PLA preferred over ABS

Product Concepts: Nose-Piece Molding Process

Molding with Hot Water

1



2



3

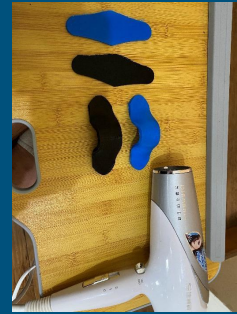


4



Heat and cooling with Blowdryer

1



2



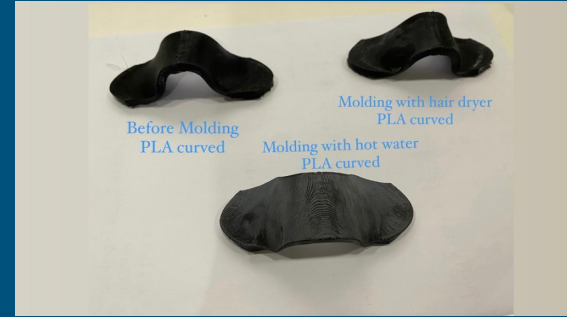
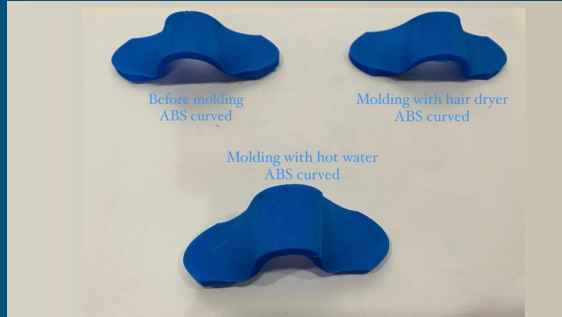
Product Concepts: Nose-Piece Molding Result

	PLA Flat-with Hot Water	PLA Curved-with Hot Water	ABS Flat-with Hot Water	ABS Curved-with Hot Water	PLA Flat-with Blowdryer	PLA Curved-with Blowdryer	ABS Flat-with Blowdryer	ABS Curved-with Blowdryer
Required Molding time	10s	7s	44s	56s	20s	22s	2min 33s	3min 21s
After molding								

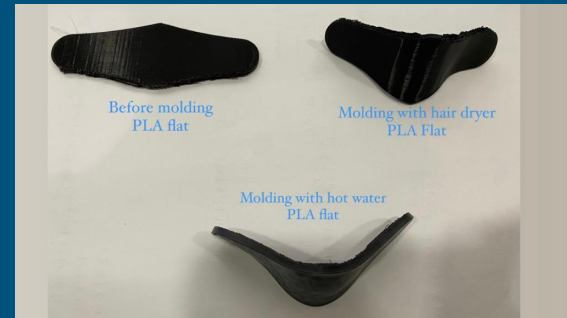
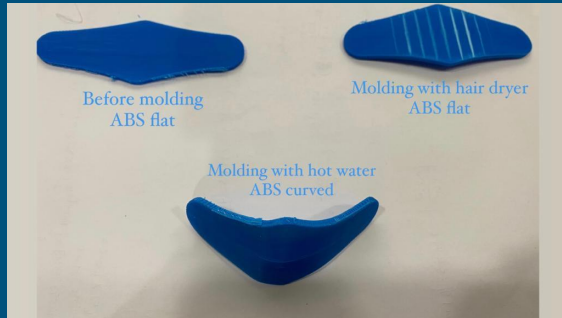
ABS

PLA

Curved



Flat



Initial Molding Consideration: Hot Water w/ PLA Preferred

Product Concepts: Face Mask Shaping and Sizing



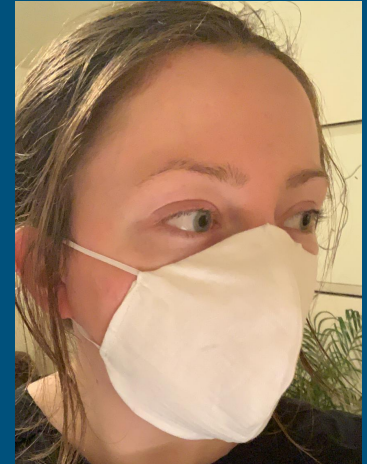
Mask #1

- Too tight to face
- Muffled voice
- Little room for nose-piece integration



Mask #2

- Blocked Vision - when moving head
- Imperfect Seal on sides
- Easier nose-piece integration



Mask #3

- Sits away from mouth
- Easy Integration of Nose-Piece
- Minimal voice muffling
- Uniform Seal

Final Mask Design Considerations

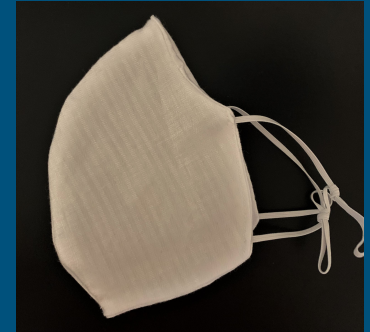
Nose-Piece



Molding



Face Mask



PLA

- Quick printing time
- Material comfort
- Curved: moldability

Hot Water or Blow Dryer

- 7 Seconds (Water)
- 22 Seconds (Blow Dryer)
- Ideal mold to bridge of nose

Mask #3

- Sits away from mouth
- Easy Integration of Nose-Piece
- Minimal voice muffling
- Uniform seal around mouth and nose

Future Considerations: Nose-Piece Integration



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References:

Slide 2:

Transmission: <https://hscweb3.hsc.usf.edu/blog/2020/03/18/curbing-contagion-new-findings-on-coronavirus/covid-19-respiratory-droplets-600x400>

Slide 3

N95: <https://www.healthline.com/health-news/certain-type-n95-mask-harm-covid19-spread>

Gator: <https://www.walmart.com/ip/Aqua-Design-Men-Washable-Reusable-Water-Camo-UPF-50-Sun-Guard-Protection-Mask-Face-Tube-Multipurpose-Wind-Head-Neck-Sizes-Youth-Adult-XL-Sports-Fishi/133495664>

Slide 4:

Fogged mask: <https://www.eatthis.com/face-masks-side-effects/>

Uncomfortable mask:

<https://creakyjoints.org/living-with-arthritis/coronavirus/managing-symptoms/difficulty-breathing-face-mask-asthma-lung-disease/>

Slide 6:

Market Analysis: <https://www.grandviewresearch.com/industry-analysis/reusable-face-mask-market>