

Inventor Challenge: Designing PPE in a Pandemic



The Challenge: Pandemics require many resources, including personal protective equipment (PPE) in order to prevent infection. One type of PPE, face shields, creates a physical barrier between two people to reduce the transfer of a disease through the eyes, nose and mouth. Face shields don't always properly fit people of all shapes, sizes and ages, especially **infants**. That is where you as the inventor will use the invention process to create a face shield for infants.



Background: The response to stop the spread of COVID-19 has prompted a wide range of creative and inventive solutions.

Stanford University bioengineering associate professor Manu Prakash, whose work has long-focused on innovative, low-cost medical devices, started an open source project to modify full-face snorkel masks into reusable PPE for health care workers. To find out more, read "[How Universities are developing COVID-19 Solutions in Real Time](https://www.pbs.org/newshour/science/how-universities-are-developing-covid-19-solutions-in-real-time)" at <https://www.pbs.org/newshour/science/how-universities-are-developing-covid-19-solutions-in-real-time>.

PROCESS

1

Gather materials. You may substitute when necessary or add to the list with items that you have available at home.



A ball that is about the size of an official "Softball" which is 12 inches in circumference. Use this as a model for a keiki sized head for your design.



Cardboard



Clean recycled materials (1 and 2 liter clear plastic bottles recommended)



Paper

Pen and/or pencil



Scissors



Tape

Rubber Bands or Elastic



OPTIONAL Materials:

- Clear plastic sheet, page protector or transparency sheet
- Hot Glue (Use parent supervision and eye protection)
- Foam or cloth padding materials

PROCESS Continued

REMINDER: The prototype is NOT to be tested on a real infant or person.

2

Watch this PBS NewsHour Extra Video: <https://safeYouTube.net/w/TcaL>

Consider the following questions:

1. What are some of the problems that the Shield Team experienced early on?
2. How did they overcome these problems?
3. What features and materials were used in their design and why?
4. How did the Shield Team increase its productivity and deliver thousands of shields?

3



THINK IT. Identify problems associated with a specialized face shield for an infant. Consider:

- When is an infant face shield to be worn?
- How are infants typically positioned?

4



EXPLORE IT. What designs are currently available? What are features that you could improve upon?

Check out these additional resources:

- Read this [1941 US Patent for a plastic face guard for infants](https://patents.google.com/patent/US2276612?q=infant+face+shield):
<https://patents.google.com/patent/US2276612?q=infant+face+shield>
- Read about [safety issues with infant breathing and possible suffocation](https://www.cdc.gov/safecild/pdf/nap_suffocation_injuries-a.pdf):
https://www.cdc.gov/safecild/pdf/nap_suffocation_injuries-a.pdf
- Review [good and bad of face shield designs](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5015006/):
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5015006/>

5



SKETCH IT. Brainstorm and draw several potential solution(s) the problems you previously identified during “Think It.”

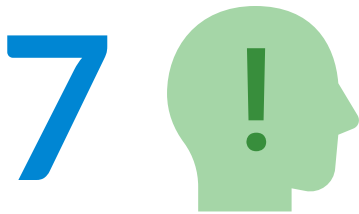
PROCESS Continued

REMINDER: The prototype is NOT to be tested on a real infant or person.



CREATE IT. Evaluate your design and select your best solution(s). Does it meet all of your criteria? Then, create your prototype of your chosen design.

- Use the Softball sized ball you selected as the infant's head.
- Physically construct your infant PPE prototype.
- Take a photo of your prototype.



TRY IT. Test your prototyped PPE on the ball (head) to see how it would function. **REMINDER: The prototype is NOT to be tested on a real infant or person.**

Think back to your criteria and **REFLECT:**

- What about your design works well? **Keep those!**
- What about your design does not work well? **Change it!**

Extension



SELL IT. Create an advertisement for your product. Be sure to showcase what makes your keiki PPE unique.



MODIFY IT. During long shifts medical professionals wear surgical masks with elastics that wrap around their ears and apply constant pressure, resulting in severe skin irritation. Can you invent a device that would relieve the pressure that the elastic of surgical masks puts on ears? Design and build a prototype that allows a person to wear the mask tightly, while taking the pressure off the back of their ears.