PROJECT

AIR PURIFIER CONTROL REDESIGN

IXDS1 CONTROL REDESIGN PROCESS BOOK

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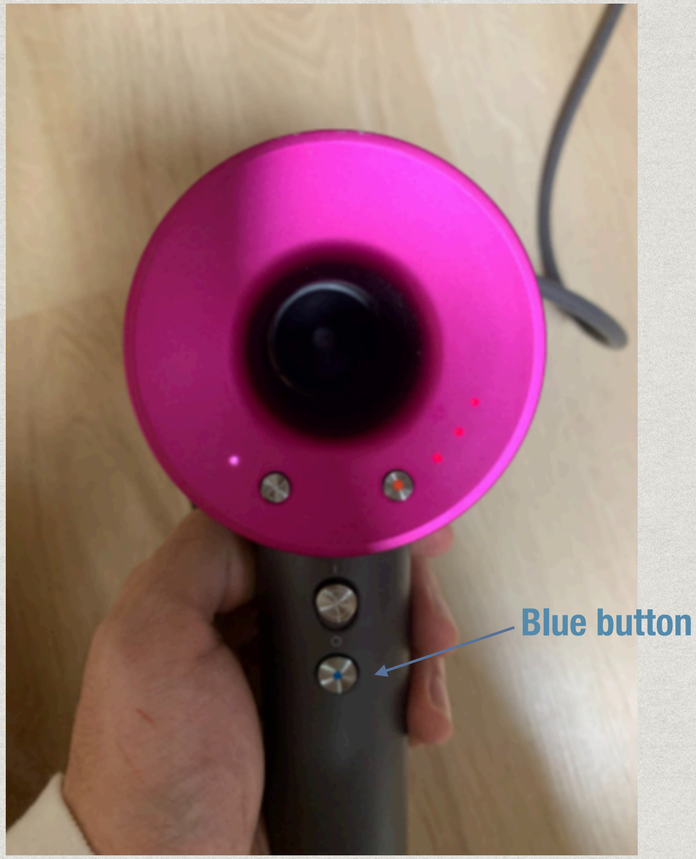
Control Analysis

- Before redesigning the actual control, I analyzed three products in the following categories, which are the building blocks of interaction design - to gain perspective on common pitfalls of control design
  - Perceptual Affordance
  - Feedforward
  - Semantic Carrier of Meaning
  - Direct Carrier of Meaning
  - Feedback
  - Inherent Feedback
  - Coupling
  - Uniformity
  - Expressiveness
  - State

Control Analysis - Hair Dryer



	Pros	Cons
Uniformity	Button design is consistent, giving a consistent look	Blue button looks the same as other buttons, but acts differently (need to hold down)
Semantic Carrier of Meaning	Metaphor for symbol on the control reduces the amount of text to be read to understand the control	This metaphor might not be understood easily for some users since they are too abstract
Perceptual Affordance	Buttons like shape and the little bump from the background tells that the buttons are clickable	However, the perceptual affordance can mislead users to perform same action on a button that is designed to be controlled differently
Feedback	Feedback is clear; the led light lights up to show which state of the control you are in	Feedback is clear but minimal; just led lights are confusing to the users, meaning of led lights are skipped
Feedforward	Enough feedforward on each button since they carry semantic meaning In their symbol	Not enough feedforward on the limits of how far you can go with each button

Excessive uniformity can lead to misunderstandings

Control Analysis - Electric Whisker

	Pros	Cons
Expressiveness	None	Unsure if turbo mode is same for any state of power you are in (redundant with the power control)
Semantic Carrier of Meaning	Number scales are very clear in explaining the state of the power the user is currently in	Scale itself is clear but we see no labeling
Feedback	The click sound and haptic sensation allows users to understand that they have “done” something to the control	User will get direct feedback from the difference in motor sound, but the number scale and the horizontal part of the slider should match horizontally
Feedforward	Number scales are great for feedforward	Number scales are too cluttered; there is no label indicating what state is being changed
Perceptual Affordance	The part that sticks out from the vertical slider tells the users that they need to control the whisker with this part	Why is there a big hole in the vertical slider? What does the.eject do? How do you get it to work?

Semantic Carrier of Meaning is useful for both feedback and feedforward

Control Analysis - Cat Laser Pointer

	Pros	Cons
Perceptual Affordance	Large button draws attention (first step of the control is to turn it on)	None
Direct Carrier of Meaning	You can see the laser pointer move faster immediately; the clicking sound when sliding the slider	None
Coupling	None	Sliders serves two purposes: one is for changing the radius and the other is for changing the speed. Wrong coupling.
Expressiveness	None	Minimal design is served to be inappropriate as users are not used to the features in the cat toy
Feedback	None	Second press on the power button makes the pointer moe fast rather than turn it off

Minimal design is not always great; Do not couple different features

Control Analysis Takeaway

- From each of the control analysis, I was able to find similar patterns:

  1. Uniformity can bring aesthetic value but has downsides in deceiving the users that all controls are supposed to work in the same way

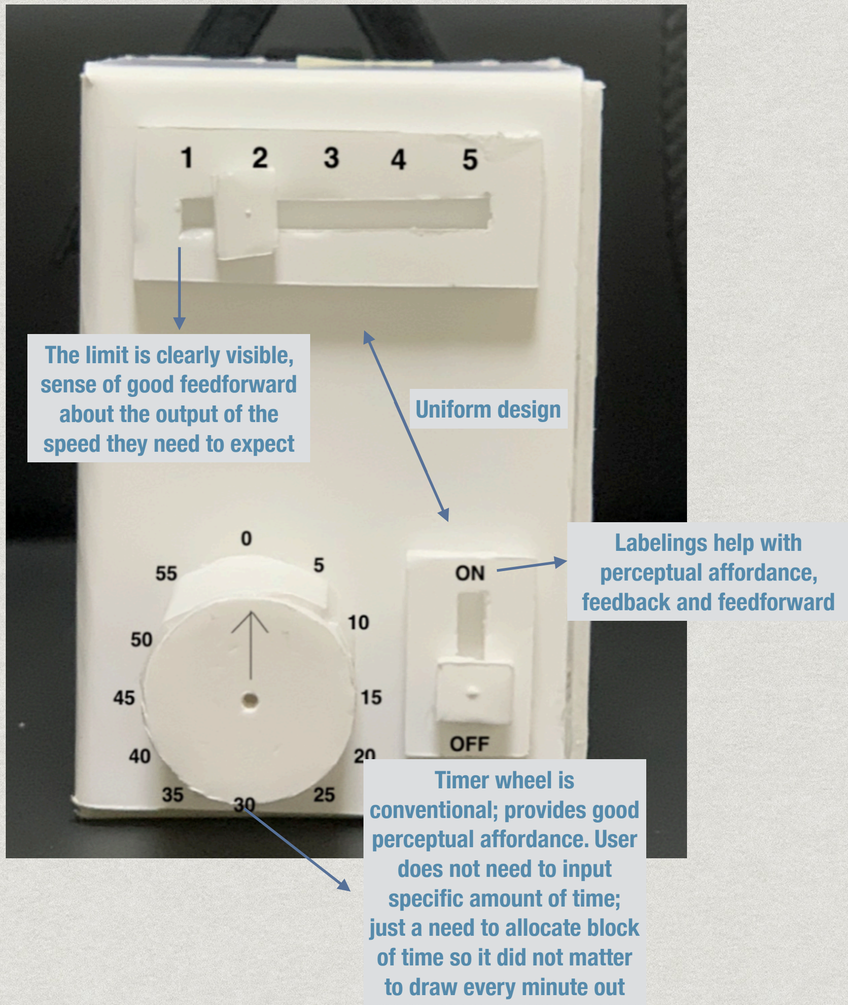
  2. Perceptual affordance and feedback should work together to inform the user that what they think they can do returns an appropriate result (feedback)

  3. Coupling is great for cleaning up features that seem redundant; however it is important not to have one control modifying two states

  4. Minimalistic design should be used appropriately; at least the design should be able to properly carry a semantic meaning

  5. Feedback and feedforward can be well expressed with semantic carrier of meaning

Rapid Sketching - Cat Laser Pointer



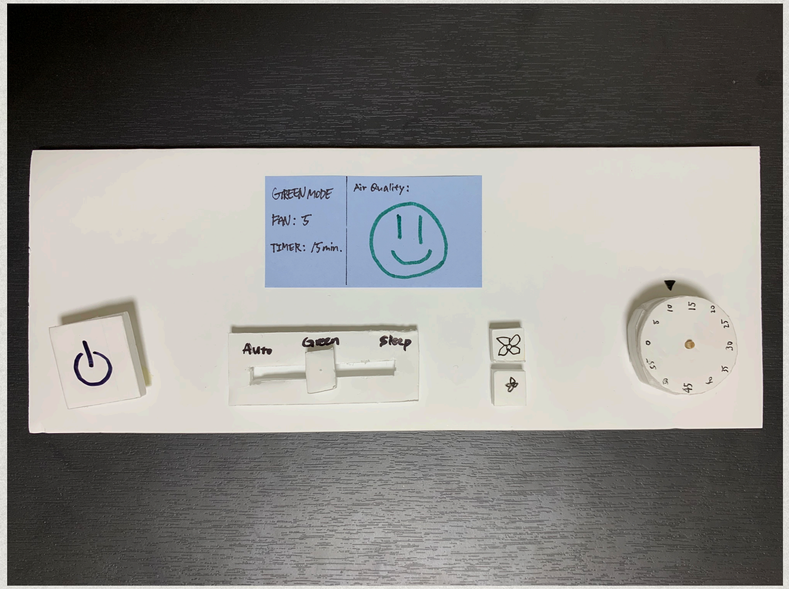
- To improve and explore what kinds of controls are available, conducted a rapid sketching session
- I learned how during the rapid sketching stage, it is not important to make a single control accurate; rather it is more important to explore diverse options and utilize various materials other than foam board that help with “rapid” sketching.
- I haven’t taken into account how the feedback can be displayed in a digital format for this sketch
- Most importantly, what I thought was useful and understandable seemed unnecessary and vague to other users - what is this gap? How do you fill in this gap? This is why I had three iterations of the final control redesign to maximize taking into account the general public’s point of view.
- I realized cat laser pointer was not a great control to redesign; the problem with the existing control was of a design deficiency that lacked the features in the design of the product itself.

Selecting Control - Air Purifier

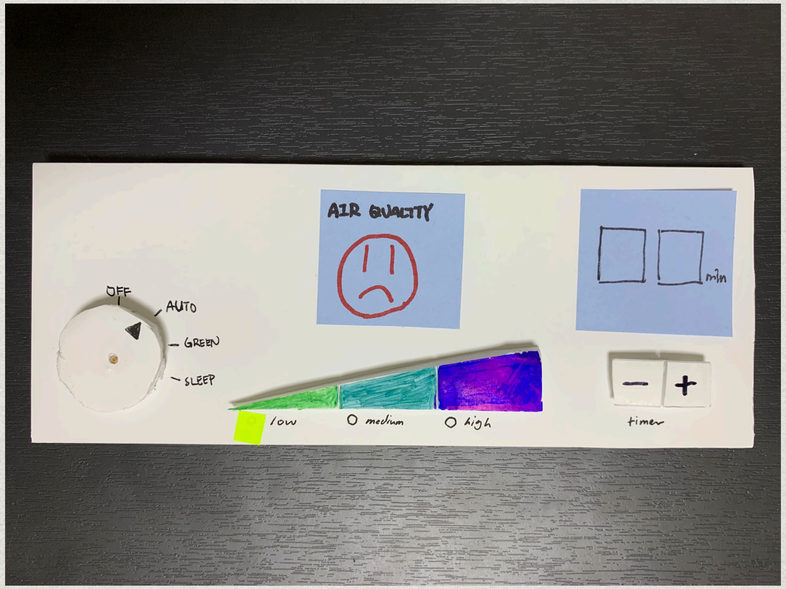
- User controls the air purifier from the top, but the result of controls (feedback) is all at the front.
- Timer feature, speed control feature, power on off and sleep mode are the main controls of usage.
- Air purifier also tells the current air quality through color usage as part of providing information as well as long-term feedback for saying that the air purifier actually works well.
- Circular design may be hard to keep. Therefore, explore different types of controls first and then try to incorporate circular design to keep the original shape on the air purifier so that we can just change the top part.

Three-Dimensional Sketches

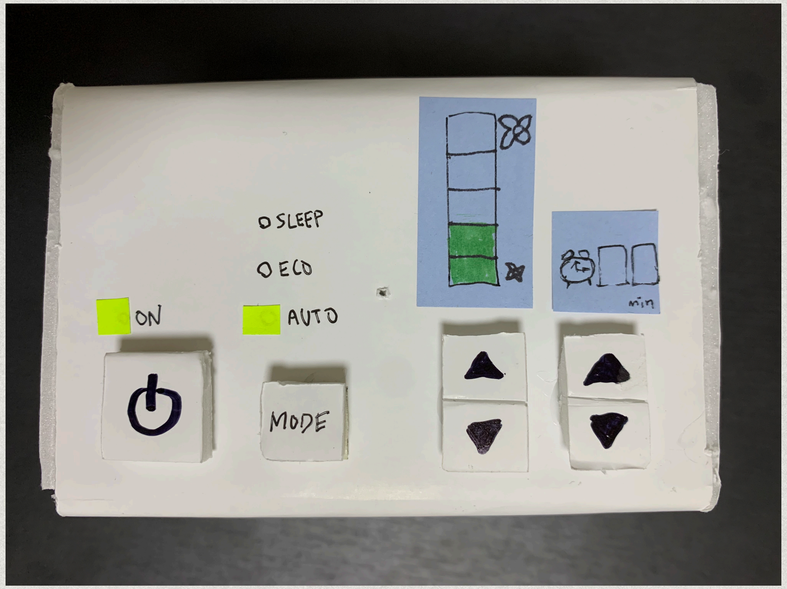
Iteration 1



Iteration 1a)



Iteration 1b)

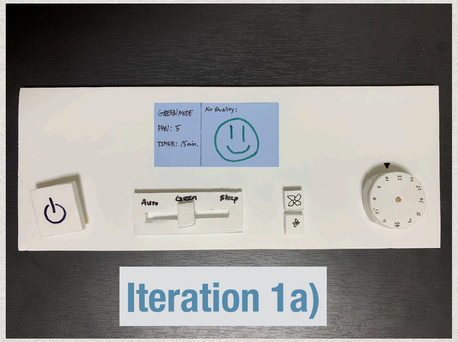


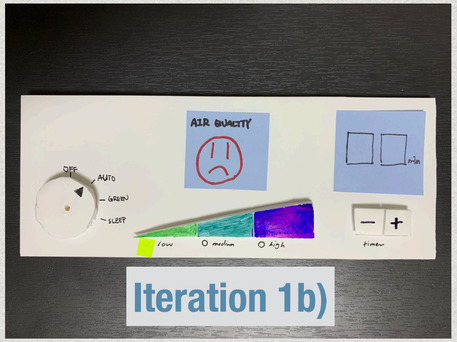
Iteration 1c)

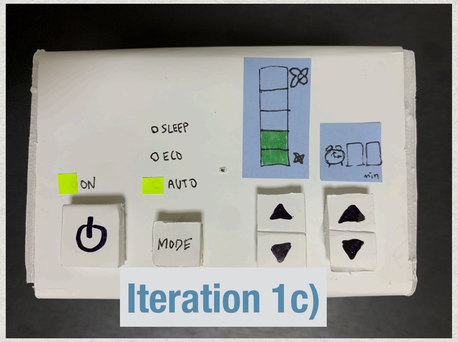
- Tried to explore the various types of controls first before refining
- Digital feedback in a screen format is also included
- All of the iteration sketches account actions to happen in the order from left to right

Three-Dimensional Sketches

Iteration 1







Feedbacks

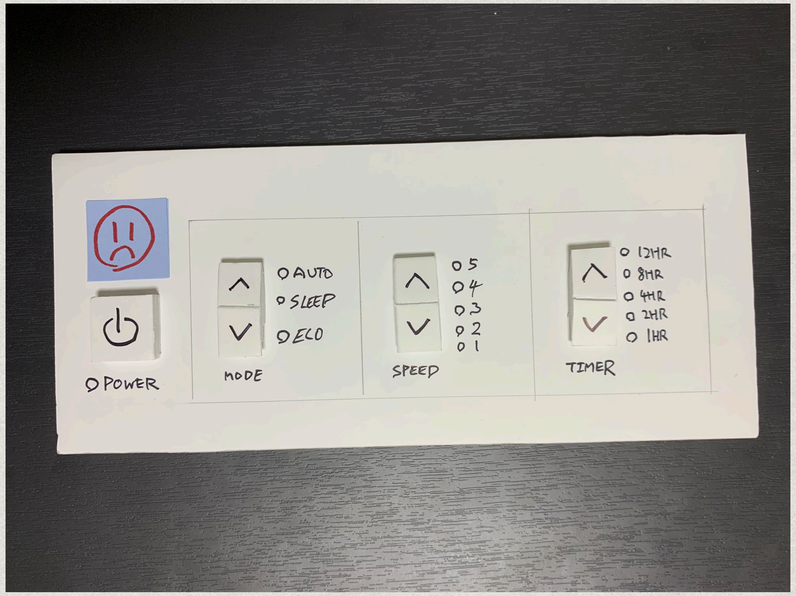
- Smiley face and sad face are understandable for air quality; but would like to see coupling of the colors for clearer feedback
- There are no limits indicated in all of the timers; this confuses the user and there's not much feedforward
- 1c) is clear in structure and people liked 1c) because it was simple and easy to understand
- In 1b), the modes have different colors and does not look like buttons at all to the users
- From 1b) and 1c), users thought led indicators were a good form of control feedback

Three-Dimensional Sketches

Iteration 2

Iteration 2a)

Iteration 2b)

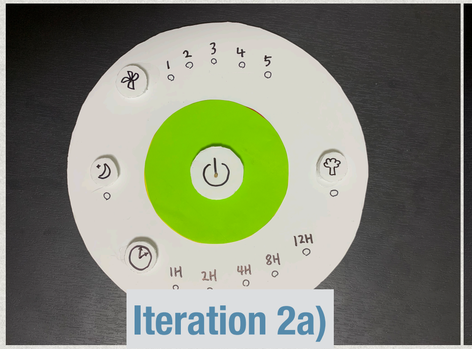


Iteration 2c)

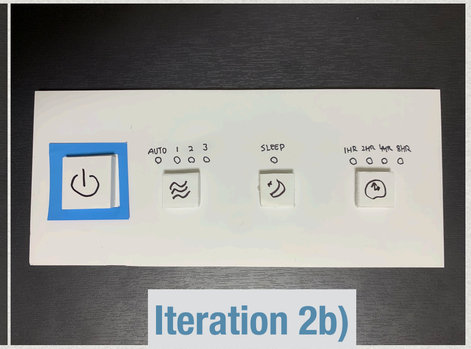
- After researching about the optimal time for the air purifier to be turned on to achieve cleansing effect, I now have a maximum time limit for the timer (between 8~12 hours)
- Instead of words for the buttons, used icons that has semantic carrier of meaning
- This iteration, focused on buttons only one type of button (that is used by pressing)

Three-Dimensional Sketches

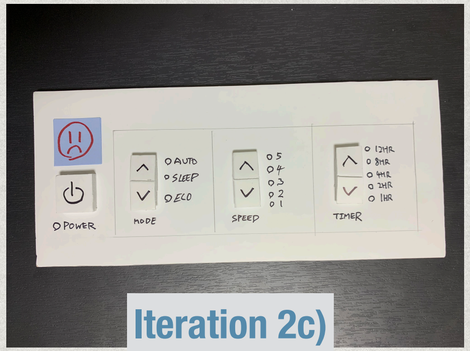
Iteration 2



Iteration 2a)



Iteration 2b)



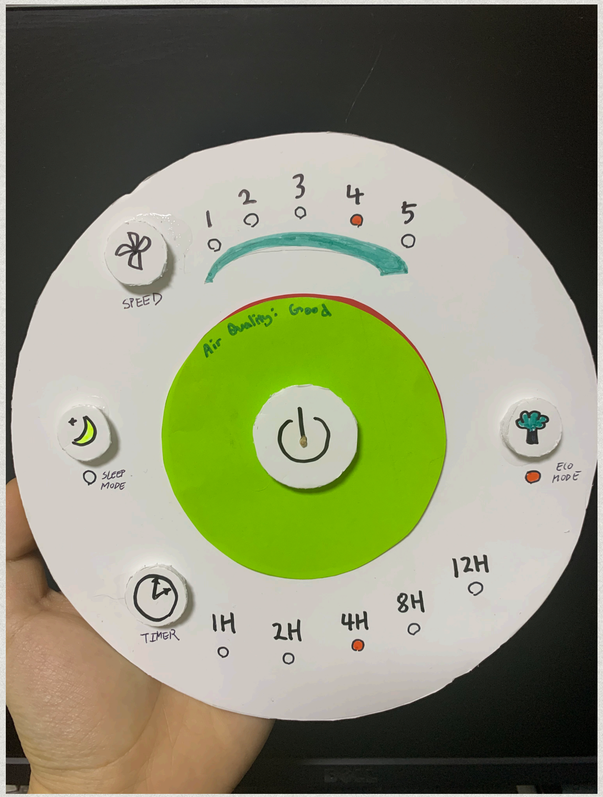
Iteration 2c)

Feedbacks

- The state (expression) is not clear; for example, users feel that sleep mode is confusing. Asked questions whether sleep mode just makes the speed go lower.
- For 2a) and 2b), users asked whether for the timer and speed control, if you press once more at the right-most option, it goes back to the first option or the option to the left. Unclear feedforward.
- 2c) was preferred for control and 2a) was preferred for design aesthetics. 2c) has clear navigation of controls, but is too wordy.
- Possibly, figure out a way to keep the circular design and shape of 2a) but combine the control features of 2c) where there is less word to be shown to the user.

Three-Dimensional Sketches

Iteration 3

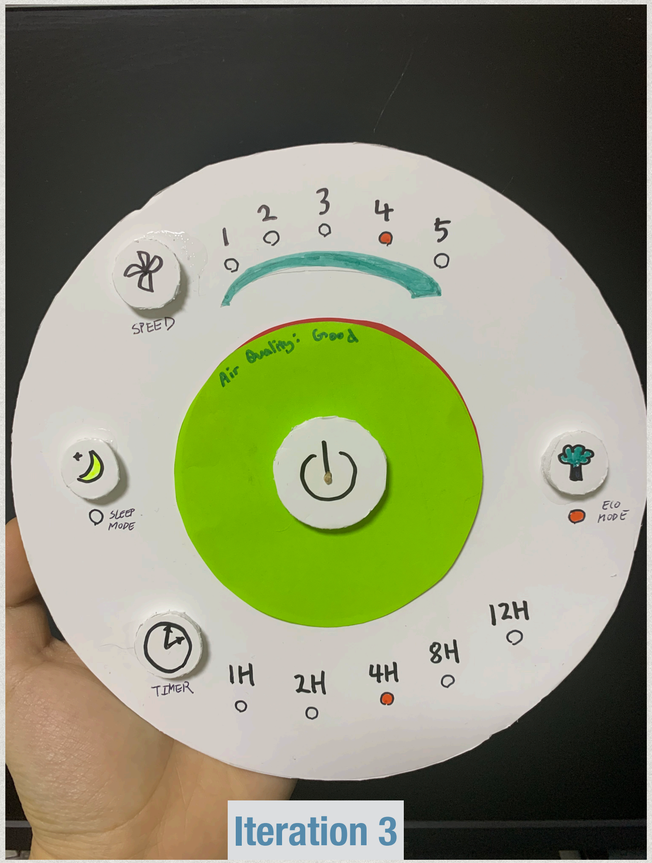


Iteration 3

- **Semantic meaning is added on top of the speed control section (the blue wind shape that increases along the number)**
- **Sleep mode and eco mode now has appropriate icons related to the meaning**
- **Labeling for the color of the air quality for clearer indication of information**

Three-Dimensional Sketches

Iteration 3

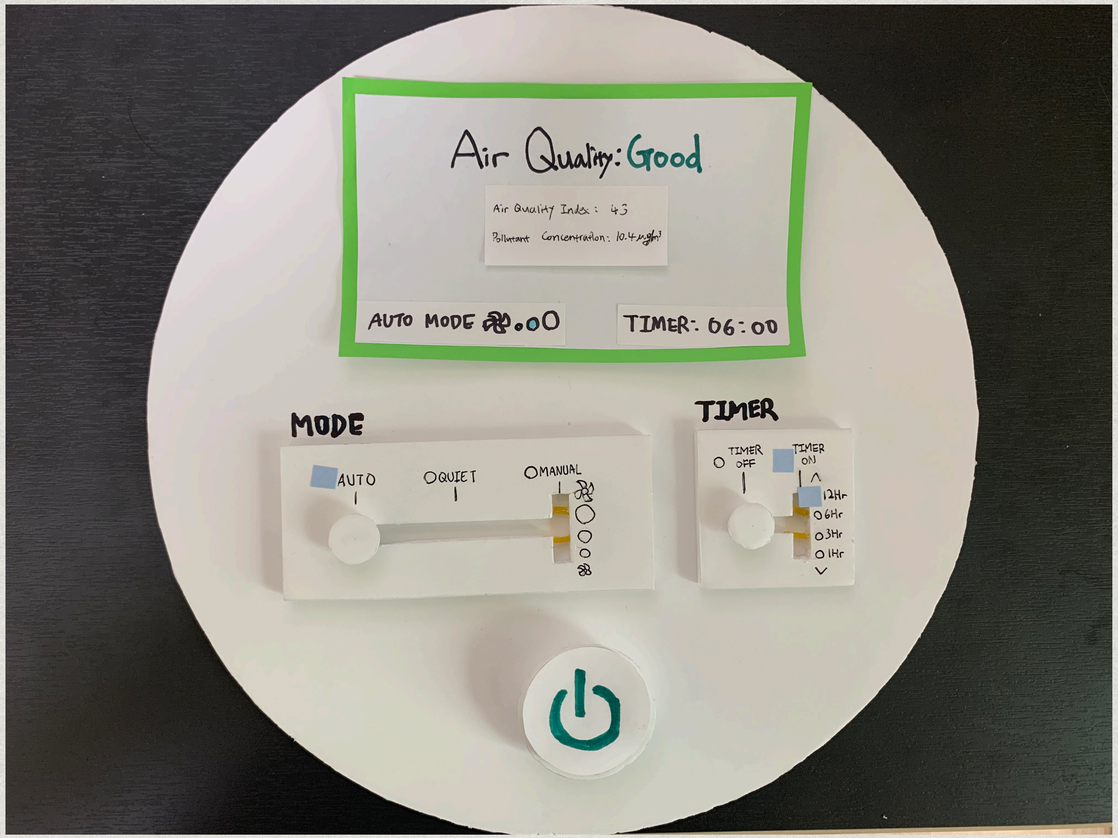


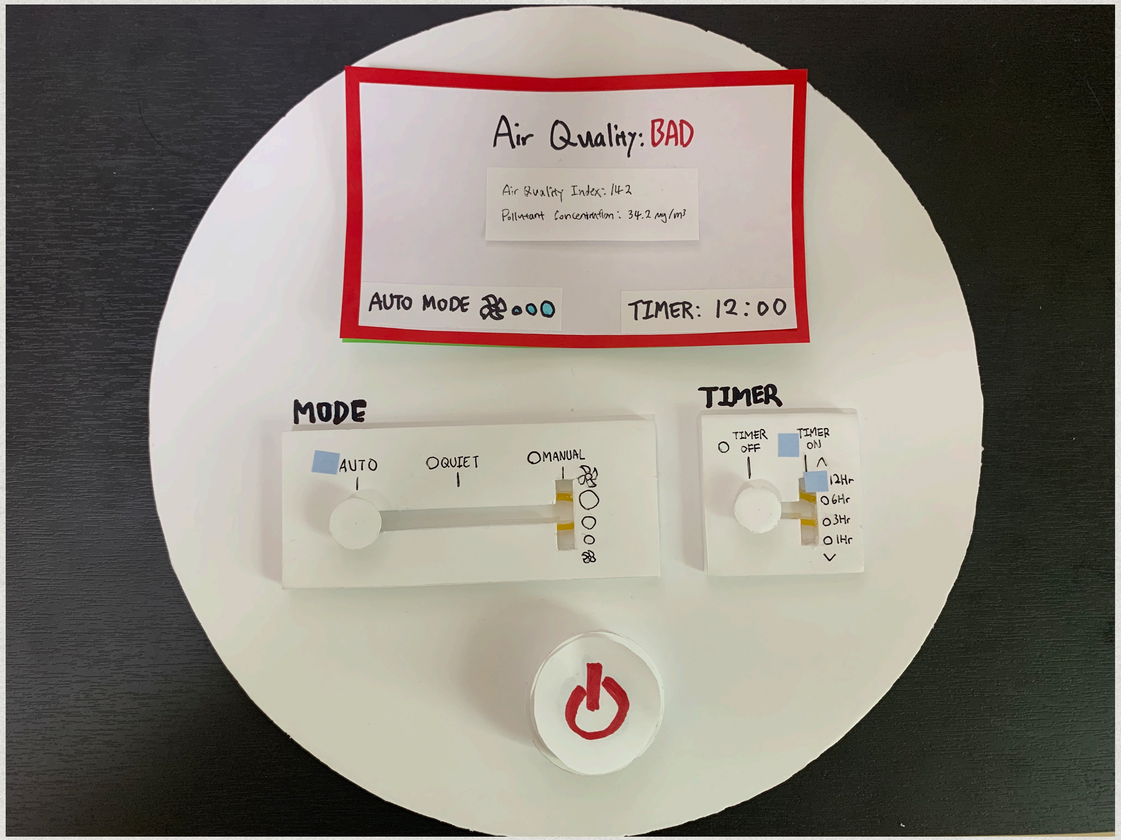
Iteration 3

Feedbacks

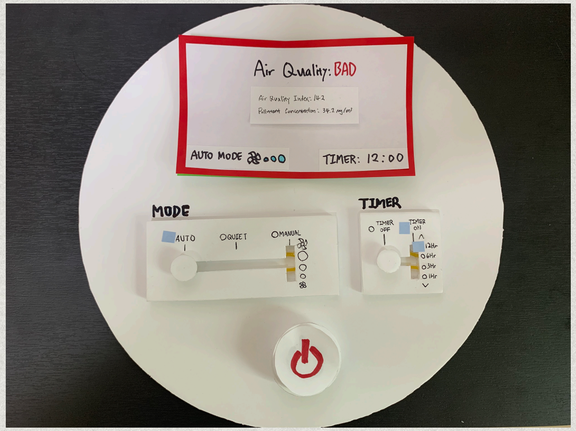
- This was where I got stuck; I kept my original design of pressing button format because I thought it was the most natural for people to control while standing up.
- However, the simple buttons were not complex enough; other types of buttons such as sliders will allow me to leave some part of the detail out
- I figured out sliders have advantage over a simple button in this case, because it naturally has upper and lower bounds that does not need to be specified
- Sliders also are better when a single control has to go through multiple different states within a feature.
- After research, I found out that sleep mode is just the device's inherent technology to make the motor quiet, not the speed to go at a lower speed.
- Eco mode was unnecessary feature, according to many users; auto mode suffices
- It was also unclear how to turn off the timer once the user accidentally clicks on the timer button

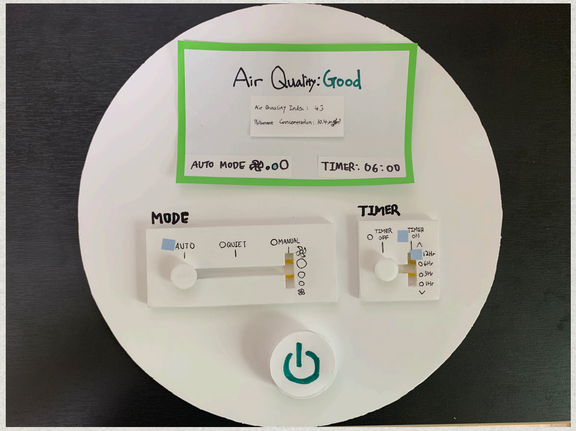
Final Sketch





Final Sketch





Final Sketch Improvements

- I decided that sliders with a special tweak would do the trick of saving up space. However, since this tweak is novel idea to the users, I thought bringing uniformity to the control by using the same type of control would bring a faster learning curve to the users.
- The sliders behave in a normal way (slides and locks when it reaches a new state) until it reaches the rightmost corner. The vertical holes tell the users that the slider button can be shifted up or down. These buttons come back to its neutral state so the users do not need to go through tedious steps of shifting once more to go back to auto mode.
- Color scheme for air quality is well defined, along with appropriate information display (from research, those metrics were standard usages in air purifiers)
- Information display panel confirms feedback for the users once more, along with the usage of led indicators for each state
- Timer can now be manually turned off even if it did not reach 0:00 remaining time. It automatically switches to off state when it runs out of time and information display panel shows the remaining time as well.

Pitching

- The following four slides are my pitch slides

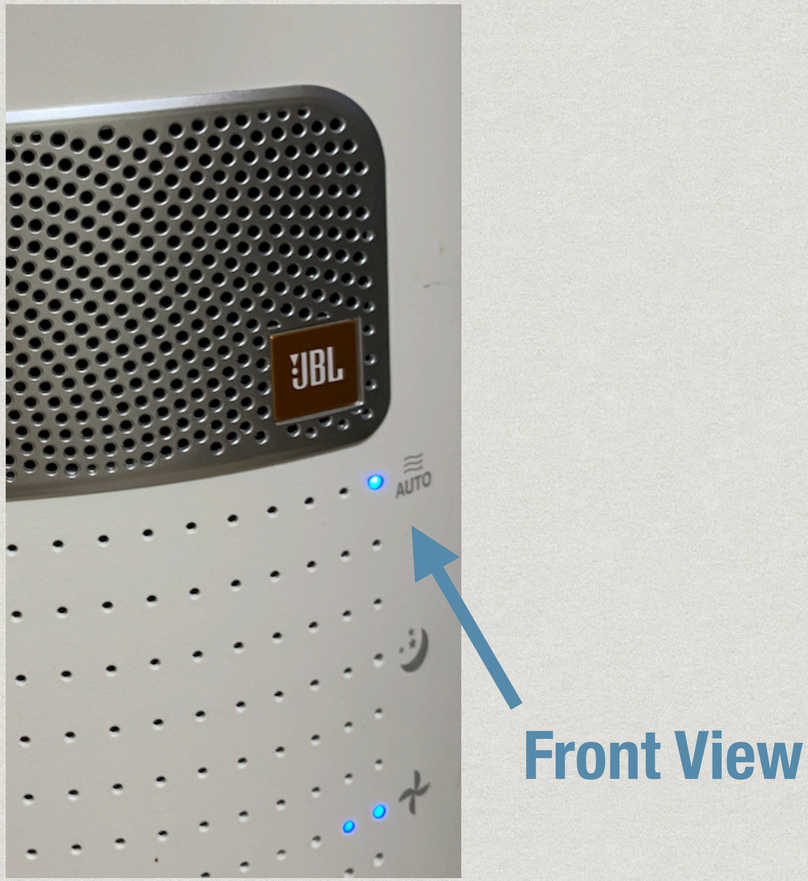
Air Purifier

Aesthetic-wise, very pleasing

What could be wrong?

Inherent Design Mistake

Control Center

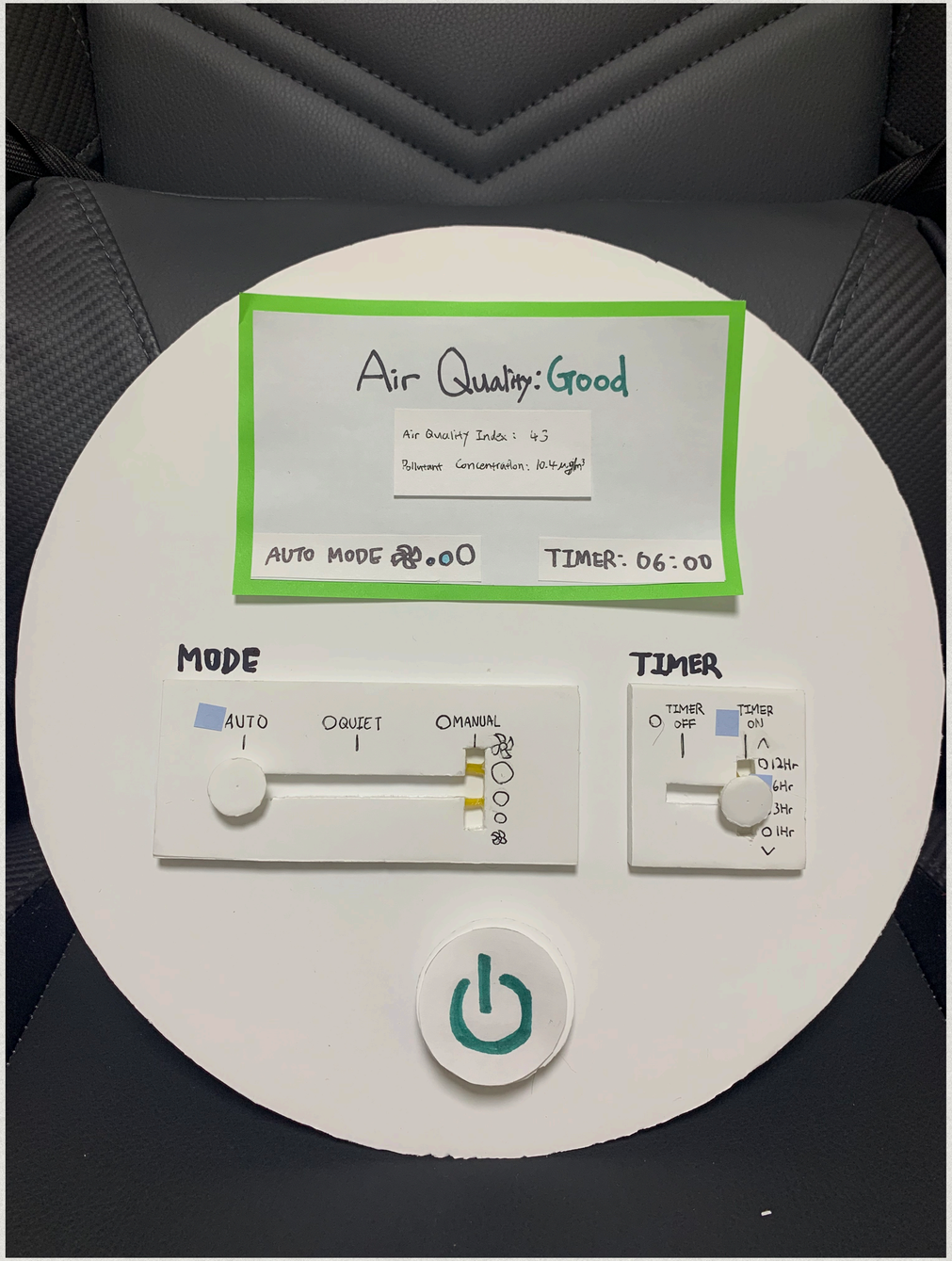


Result of Control

Consumer Need

- Features that users want most
- Information that users want
- Easy to use
- Easy to understand

Redesign


Air Quality: Good
Air Quality Index: 43
Pollutant Concentration: 10.4 µg/m³
AUTO MODE
TIMER: 06:00
MODE
AUTO
QUIET
MANUAL
TIMER
TIMER OFF
TIMER ON
12Hr
6Hr
3Hr
1Hr

Pitching also takes form of designing

- Never have I spent more time on a pitch. I realized that only through iteration that pitch becomes perfect. Especially because it was recorded, we had infinite amount of trials before we have time to present it to the class
- 2 minutes is short. You need to focus on developing drama and how you come to resolve it. In my case, I started off with an inherent design mistake of an existing control, what could be done to improve the control and how my final redesign is better
- I thought it was important to show my controls actually work in the pitch because having a slider that goes both horizontally and vertically is not something you see everyday and allowing the audience to see how it works before they interact with the actual product, they will feel more keen to the product when they actually use it

Takeaway

- Foam boards are really hard to design accurately
- Iterations are way to go but I found that waterfall approach can also work; I had completely forgot about market research and user research for my first iteration but after taking into consideration, I was able to clarify a lot of the vague design choices I've made and advocate for my design choices
- Exploring diverse set of options first is always desirable since you may want to go back to that design at any stage in design (how I switched from normal buttons back to sliders)
- My opinions are always biased; critiques are never enough