Sip: Stay Hydrated

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01 Introduction

Research

Every living organism on earth cannot survive without water. Humans can only survive for about 3 days without water. Therefore, drinking enough water every day is very important. It first prevents dehydration and keeps a normal body temperature. It also helps people “get rid of wastes through urination, perspiration, and bowel movement” (CDC Water and Healthier Drinks). Drinking a lot of water every day is also a smart way to reduce energy intake and lose or maintain weight. People don’t only use water for the drinking purpose but also for agriculture and population growth. For instance, any food or nutritions people consume everyday are also from the water. Without water, nothing can grow or survive.

The statistical data shows that the world from 1990 to 2012 started to drink more water. However, the data doesn’t mean that people started drinking more water nowadays because there are still many people who need to drink more water on a daily basis.

Drinking water coverage in the least developed countries increased from 50% in 1990 to 67% in 2012

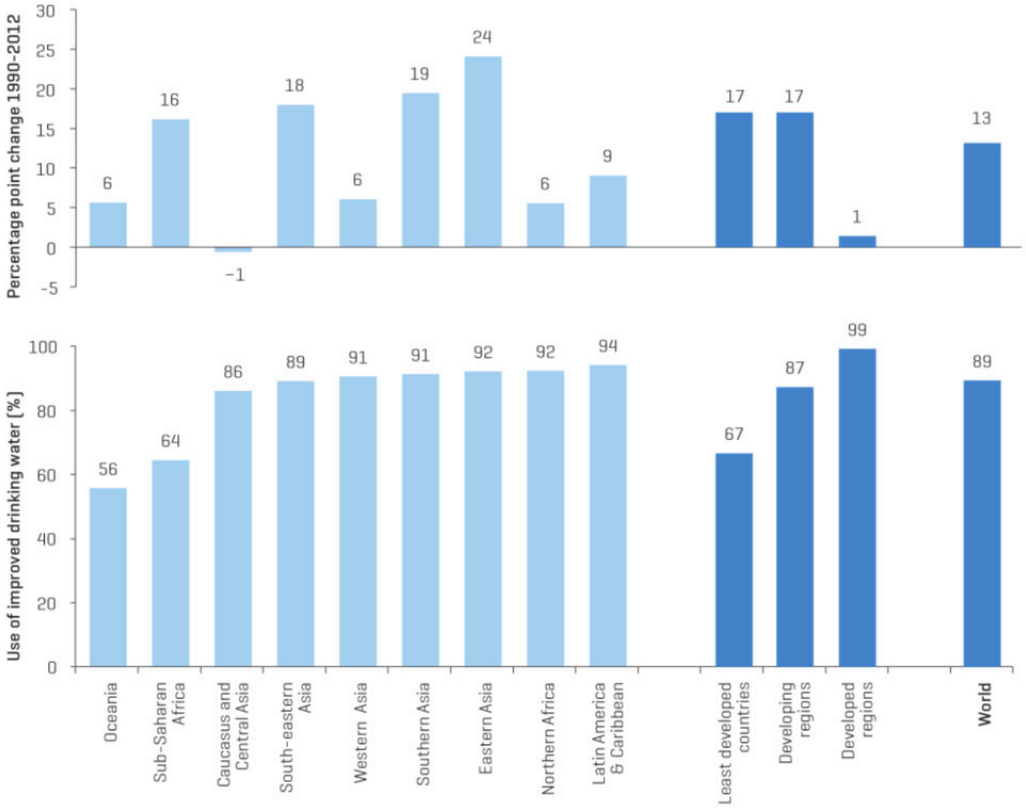
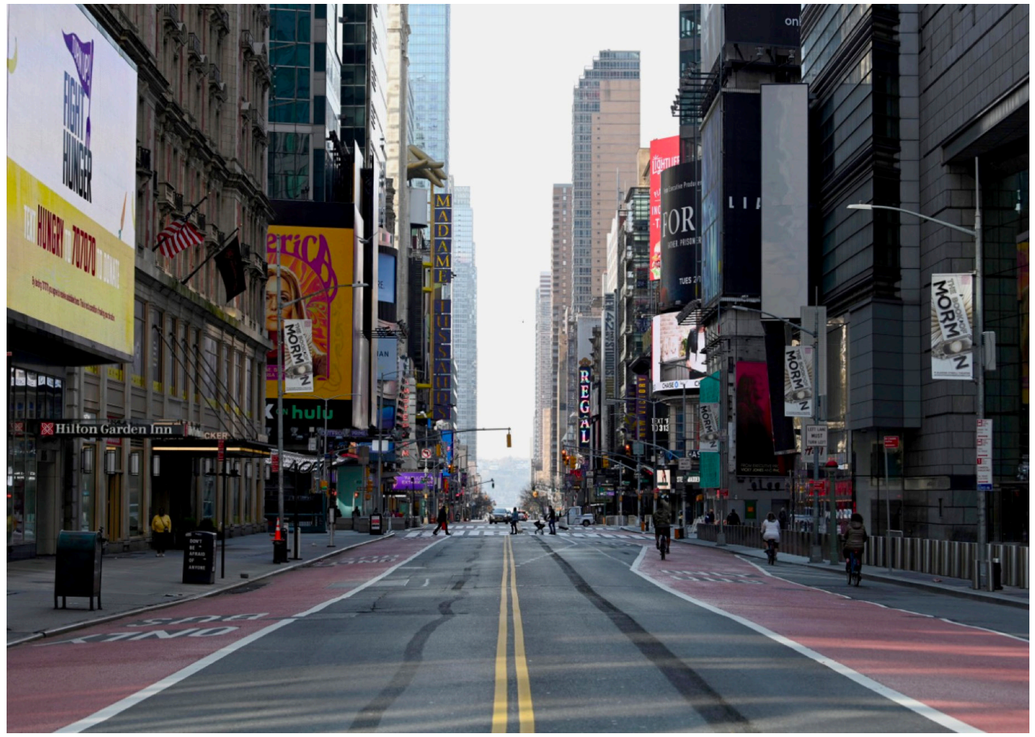


Fig. 4. Use of improved drinking water sources in 2012, and percentage point change from 1990 to 2012



Due to the pandemic, many countries were forced to lock down and follow strict social distance. The recent survey among the Middle East and North Africa regions shows how eating habits and lifestyles of people were changed before and during the pandemic. The study showed that nearly half of people during the pandemic didn't consume enough fruits and vegetables daily. Furthermore, 74% of people didn't not meet "the recommended water intake by drinking less than 8 cups of water per day" (Cheikh Ismail, L). Low water intake is strongly associated with unhealthy behaviors and performing less physical activities because people are very used to eating, drinking, and moving less nowadays compared to the average amount they should've had or done everyday. Some small physical activities are necessary for people who need to drink more water because it will increase hydration and help them keep up with their healthy behaviors.

	Pre-COVID-19		During COVID-19		
	n	%	*n*	%	*P* (2-sided)
Most consumed meals during the week*					
Home-made	2517	84·7	2886	97·2	<0·001
Frozen ready-to-eat meals	249	8·4	222	7·5	0·094
Fast food	856	28·8	158	5·3	<0·001
Restaurants	686	23·1	123	4·1	<0·001
Healthy restaurants	284	9·6	90	3·0	<0·001
Number of meals per d					
1–2 meals	1355	45·6	1115	37·5	<0·001
3–4 meals	1549	52·2	1670	56·2	<0·001
≥5 meals	66	2·2	185	6·2	<0·001
Eating breakfast on most days					
Yes	1986	66·9	2114	71·2	<0·001
No	984	33·1	856	28·8	
Skipping meals					
Yes	1912	64·4	1340	45·1	<0·001
No	1058	35·6	1630	54·9	
Reasons for skipping meals (if the answer was yes)*					
To reduce food intake	353	18·6	367	27·7	<0·001
Lack of time	1153	60·8	357	27·0	<0·001
To lose weight	382	20·2	315	23·8	0·004
Lack of appetite	586	30·9	502	37·9	0·472
Fasting	189	10·0	349	26·4	<0·001
Amount of water consumed per d					
1–4 cups	1225	41·2	1042	35·1	<0·001
5–7 cups	1069	36·0	1155	38·9	0·002
≥8 cups	676	22·8	773	26·0	<0·001

The chart represents the frequencies and percentage of eating habits before the pandemic and during the pandemic.

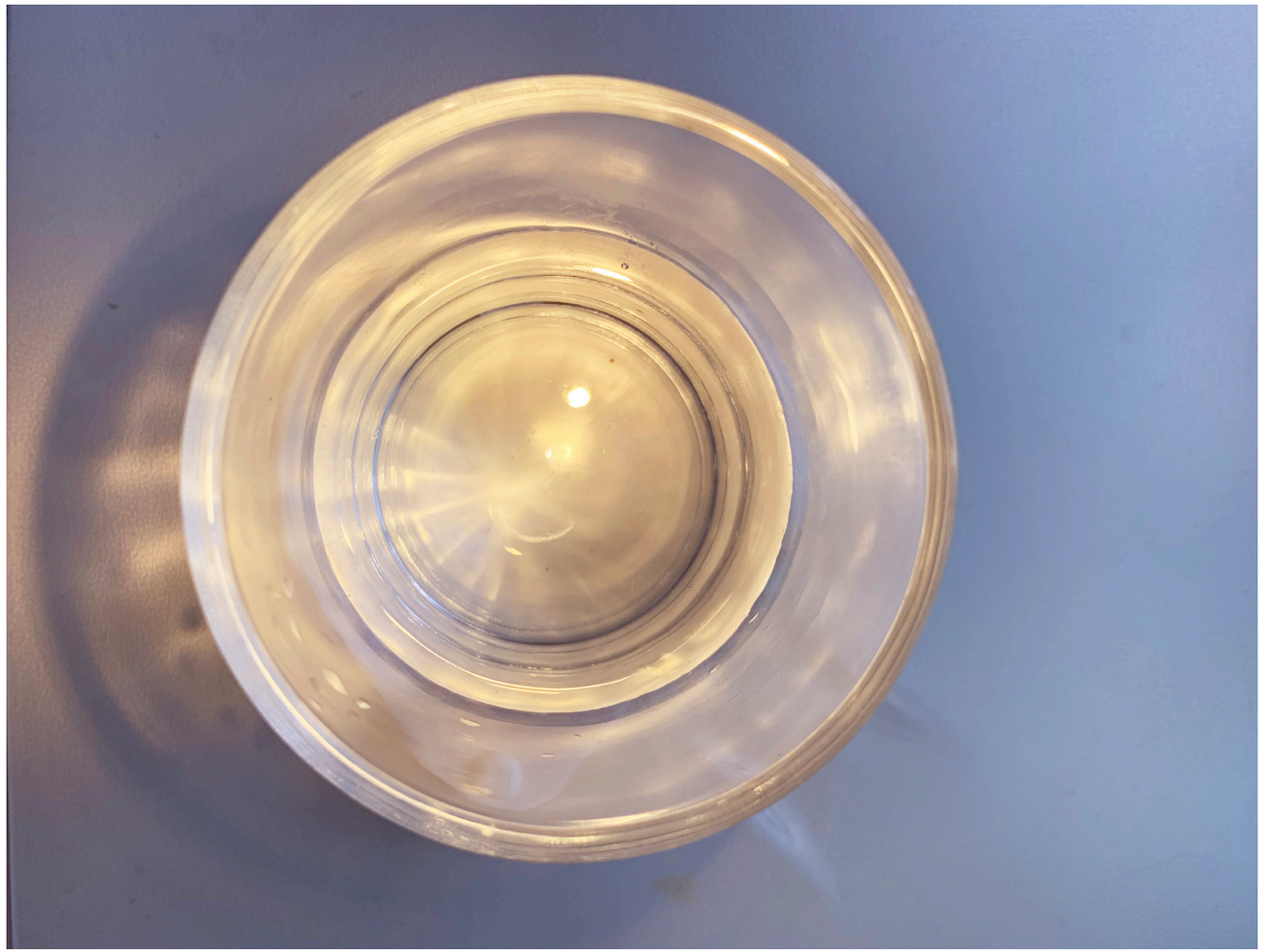
Users

Young people and elders especially who live alone don’t drink enough water at home during the pandemic. Moreover, “older adults have lower fluid consumption” compared to the young people “due to a decrease in thirst” (Barry M Popkin). The research study about the water intake among the older adults explained that the water consumption decreases as people age and also may not recognize that they are thirsty. Because their sensory receptors receive the sensation of thirst very slowly. This is why elderly people forget to drink water at home when they are alone.

Mild and moderate dehydration can influence cognitive functions “such as short-term memory, perceptual discrimination, arithmetic ability, visuomotor tracking, and psychomotor skills” (Barry M Popkin). Based on the research studies, people’s cognitive performances were divergent under the different dehydration conditions. Young adults under the mild dehydration experienced some decrease in their cognitive tasks. Furthermore, the only consistent effect of those experiments was significant changes in their mood that caused the heat stress. Apparently, there’s a possibility that heat stress might have enhanced dehydration.

The skin “contains 30% of water” and is “important for maintaining body water levels and preventing water loss into the environment”(Barry M Popkin). Water intake is also important for improving skin condition. Any young adults who suffer from acne, skin dryness, or other skin conditions will benefit the most from drinking water everyday. Because water can improve “skin thickness and density”(Barry M Popkin). Water can strengthen the skin barrier so it can provide a moisturized look or feeling of the face.

Project Statement



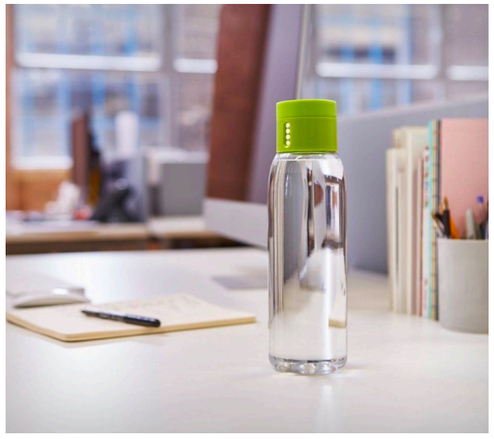
In order to remind people to drink more water everyday, this pod device will light up the cup and play a soft and gentle sound every hour to let people know when they should drink water and how much water they should drink. The reminder device is designed for anyone who lives alone such as elders or college students. Since the base of the device is large enough for any size of cups to fit, users can use any favorite kinds of glass cups.

Existing Precedents

Before the ideation, looking at what people already designed would be important because it would help the designer figure out how he or she would design a device more unique and different from what already existed.

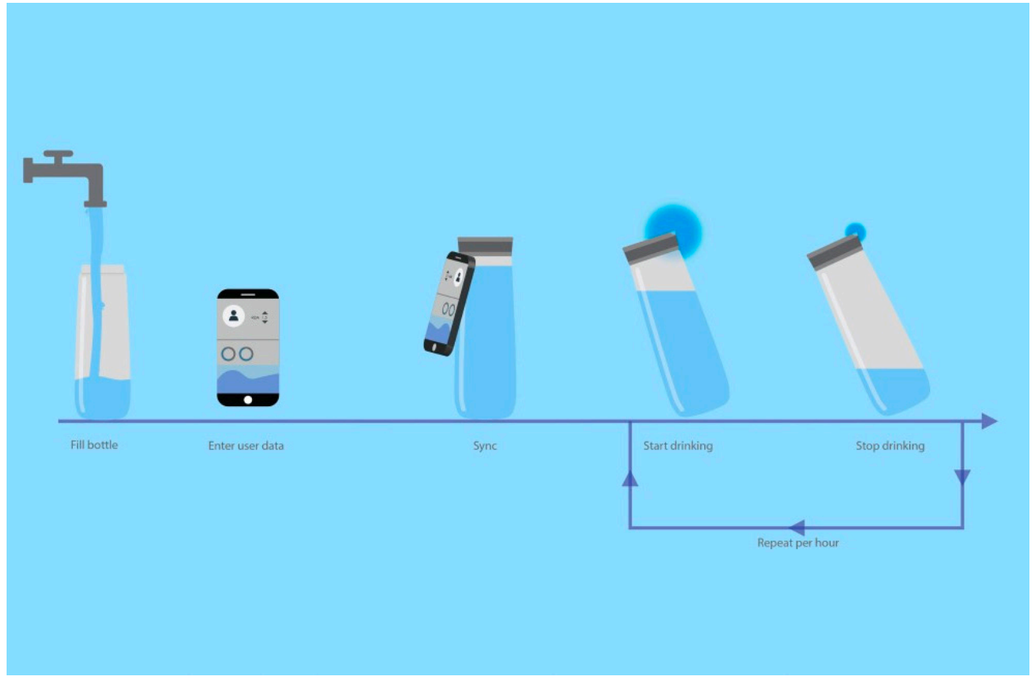
Water Bottles

The LifeFuels Smart Nutrition Bottle is designed for athletes and elite performers. It can sync with a smartphone app that provides time and historical drinking data, and recommends users how much water they should drink. There are three FuelPods that can be inserted into the bottom of the bottle and give certain flavors or ingredients in water by using the app or the button on the bottle.



The Dot Hydration-Tracking Water Bottle has a clever cap that tracks the number of times the bottle has been opened or closed. Since each white dot on the cap indicates a 15minutes time frame and there are 4 dots, users have to drink a bottle of water in an hour.

Water Bottle with App

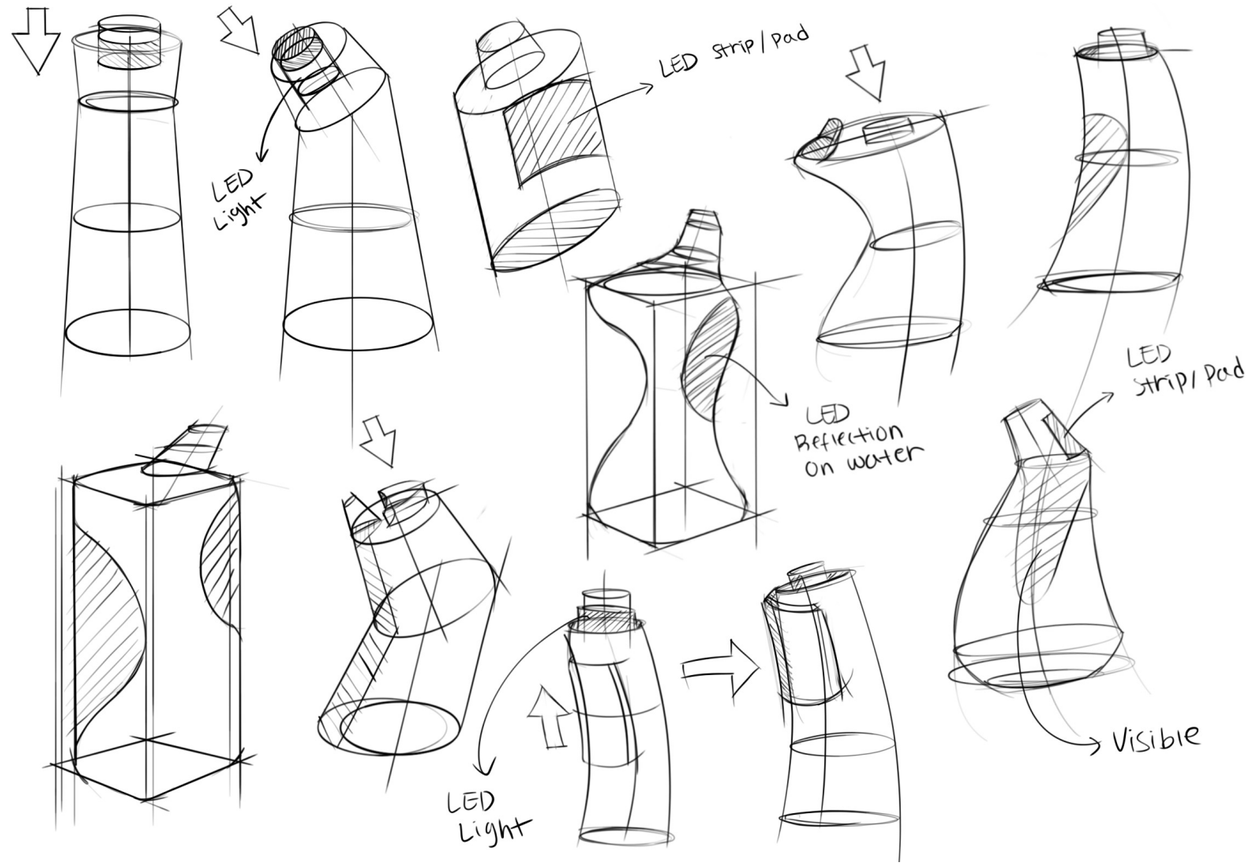


The Seal Bottle is designed for people with kidney diseases to manage their drinking time. The cap of the bottle determines how much and how frequently users have to consume water. Moreover, an LED light on the cap alerts users when they need to drink water. Even the connected app shows what rate they are drinking at and how much water they have left for the day.

Most of the existing products are water bottles that remind people to drink more water everyday or track how much water people have drank. One of the water bottles is provided with an app that shows the rate of daily water intake and how much more water they should consume. The existing precedents are designed for people who spent most of their time outside. However, this new device will be a stationary design, so people can drink more water while they are staying indoors.

02 Development

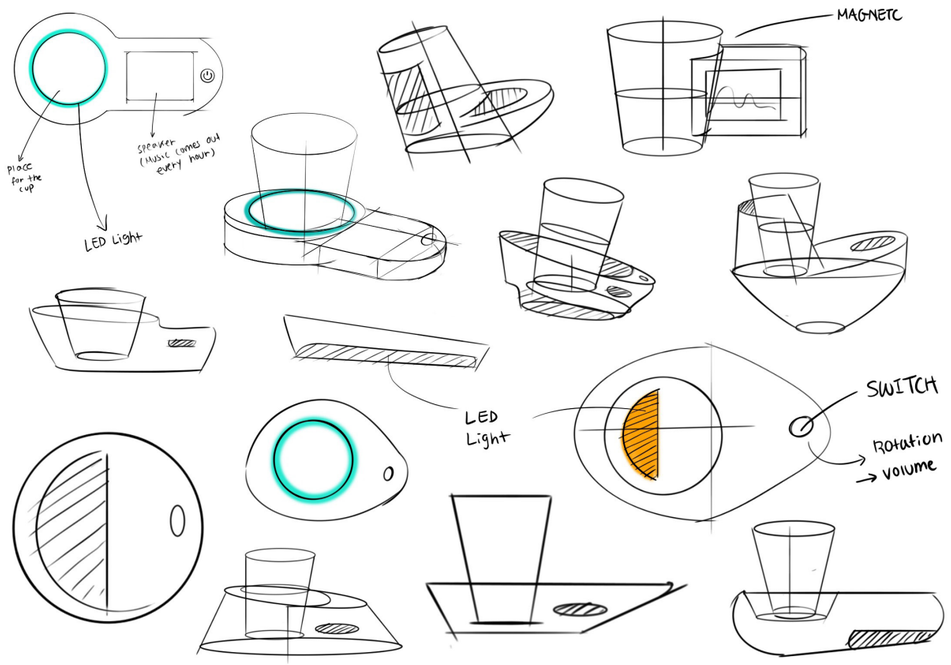
Ideation

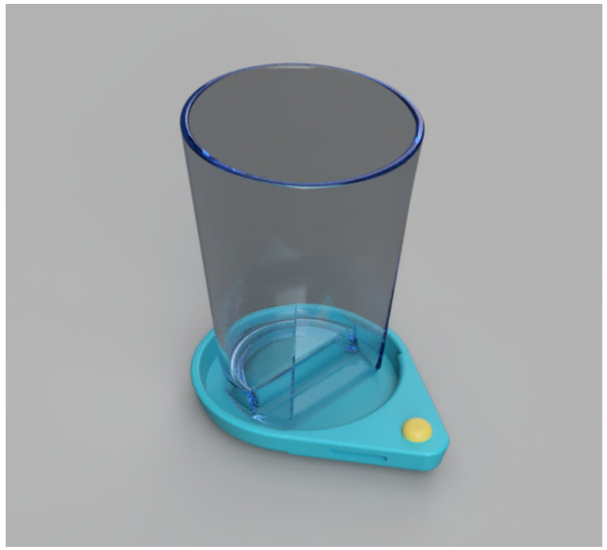


Before designing a device and cup, ideating new water bottles were the first steps I made. However, I learned that people don't use water bottles when they are staying at home or their comfort zones. Most of them used their own cups to drink water at home. Some people liked to carry their cups next to their work environment or bedside.

Through more research and observations, I discovered that people either get too lazy to get up or naturally forget to drink water on time. I wondered what if there's a device that can remind people to drink water every hour? Also, how will it remind them to drink water and how can I make it look aesthetically pleasing and blend well with the environment?

Ideating new forms of the device and cup was very difficult because they should represent what they are through their appearances and should make a smooth balance with the surroundings.

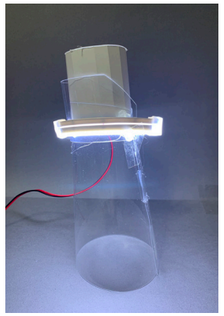




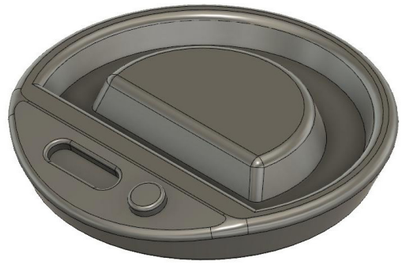
Coming up with the problem, asking questions about it, and ideating solutions were the hardest parts of this project. However, Sip wouldn't be designed without them and through multiple trials and failures. Creating the device through CAD and rendering it helped me look at how the product would look like in real life if it gets manufactured. To make further improvements on this project, it would be interesting to observe how elders would use the Sip.

Exploration

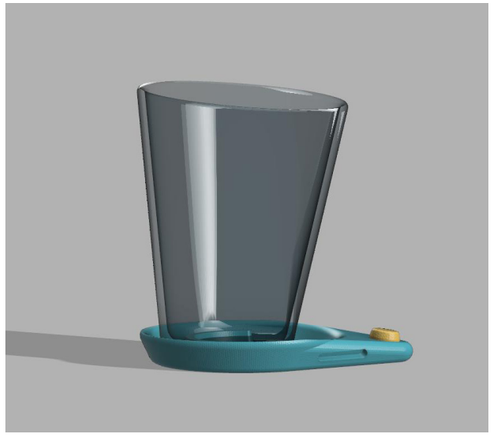








Inspiration Board

The simple elegant form of the tracking device is inspired from the water drip and related to the tabletop design. Blue and aquamarine blue will be the main color to symbolize the fresh water or fluid.

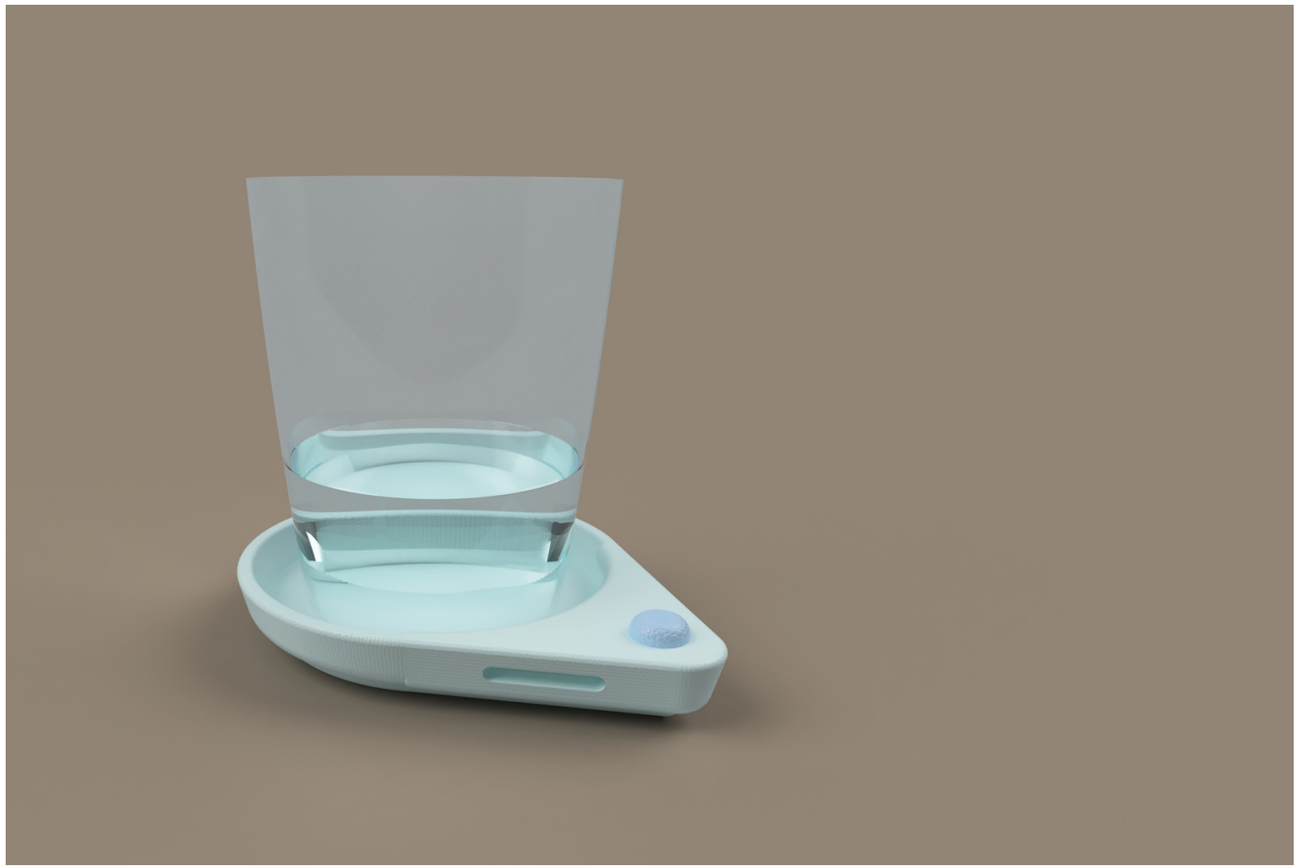
User Testing & Results

The first prototype was tested by a married couple, in their 50s. During the testing process, I received good feedback from them and learned that it doesn't have to be a water bottle. The husband who tested the product told me to think about whether it's really necessary to use water bottles at home because people usually use their water bottles when they go out or spend most of their time outside. He also said that the concept was interesting but the product can be anything as long as it encourages people to drink more water at home. On the other hand, the wife enjoyed having the appearance and functionality of the water bottles. She liked the main functionality where the bottles glow up when they're placed down on the ground, and the light disappears when users lift the bottles. Then, she asked how the light will get turned off and how the brightness will be adjusted depending on the day and night. After the first stage of tests, I completely changed a product into stationary design, which is a device that tracks how much water intake there was and reminds users when they should drink water.

At the second stage, three new iterations were tested by two college students. Through the second stage of the user testing, changing the form and size was very necessary. First, the device was too big and the form was unclear. Reducing the size was very necessary for the device. The size of the speaker also had to be reduced since it can still function even if it's small. It would be better if any kinds of cups can fit in the device considering that everyone has their own favorite cups. Moreover, the LED light should be small enough to fit inside the device. Apparently, a small amount of light can make the glitter effect in the water.

03 Solution

Final Prototype



Functionality:

Sip is the reminder and tracking device that encourages users to drink a cup of water every hour when they are working or staying at home for a while. The soft music will come out to alert users when they should drink a cup of water and the LED light will also help them at night. Through the Sip, users will be able to meet the recommended water intake.

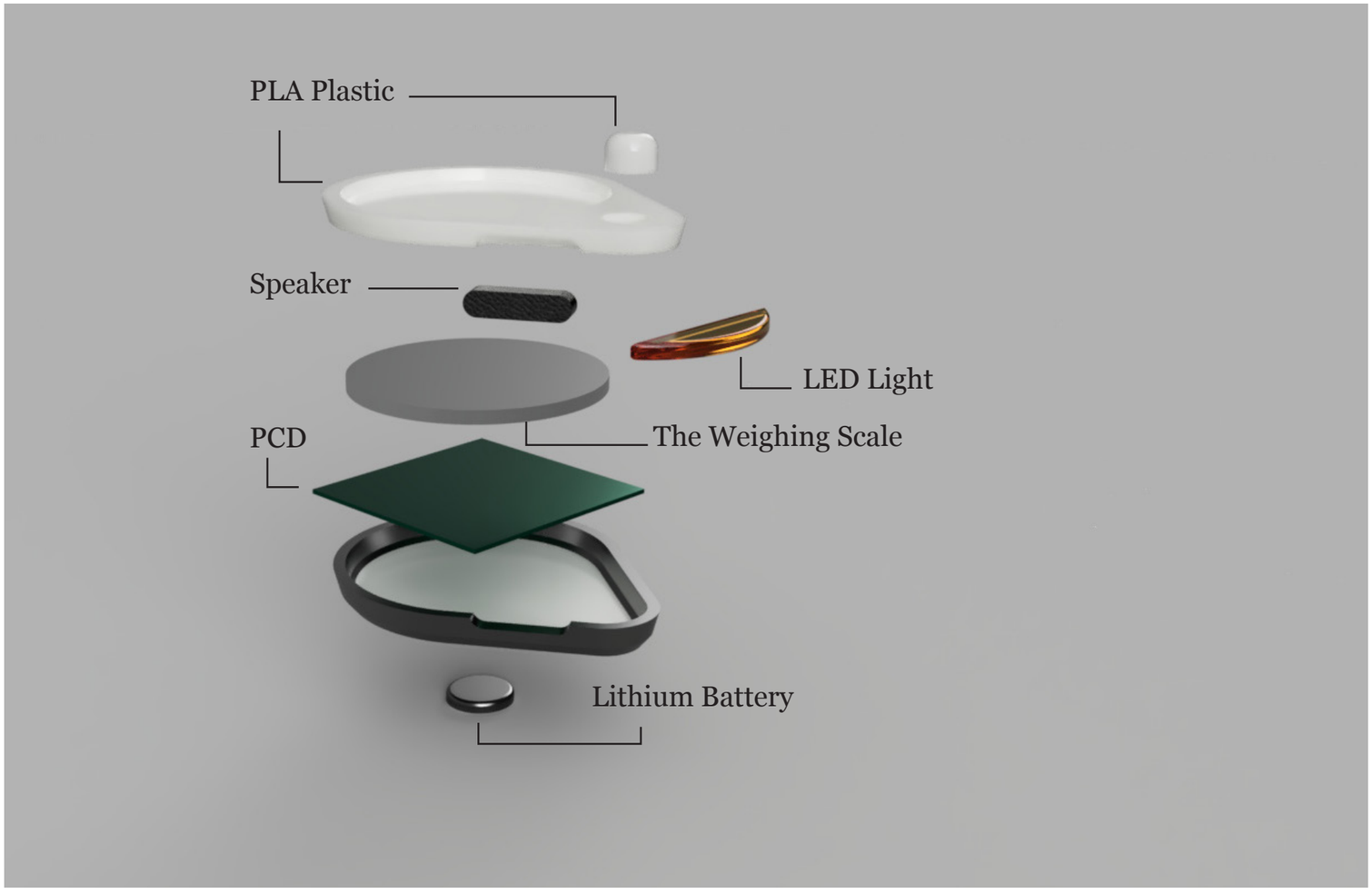
The LED Light around the rim will provide soft luminous light that glows bright enough to see it in the dark. Speaker will play gentle music every hour to remind users to drink water and fill the cup. Filling the cup with water requires some physical movement such as standing up and going to the kitchen. When the user places the cup back on the device, it has to be filled with water by half of the cup which is about 4.25 oz. If the user puts the empty cup back on the device, the weight scale under the device will sense that there's not enough water in the cup. Then, the speaker will continuously beep to warn him that he needs to refill the cup. In order to turn off the music or beep, users need to press the switch button.

Final Prototype

Aesthetic:

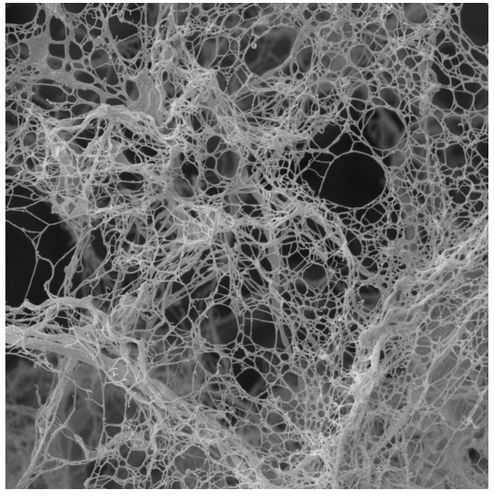
The shape of the device represents a water drip which shows that simplicity and elegance can coexist. The warm LED light under the device will glow the water or cup at night. When light meets the water, glitter or refraction of light will be formed in the water, and a glass cup will capture the effect. The way light glitters in water will remind users of refraction of light on water at summer beach. It will also make the water look unique and texturized.

Materials & Sustainability

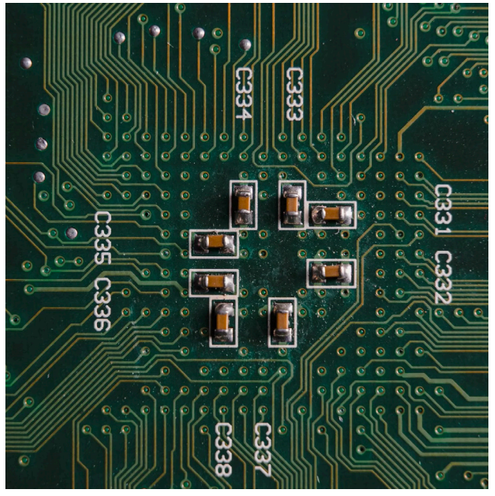


PLA plastic is a biodegradable bioplastic which minimizes the environmental risks. It's also a thermoplastic and made of raw materials such as cornstarch, sugar cane, or tapioca roots. Since many plastic wastes cause global warming and environmental pollution, PLA is a durable and successful sustainable material for the future industries. Due to its good processability and mechanical properties, it has been used for short life-time packaging products such as food packaging (K. Jim Jem). Through the injection molding, the device will be made out of PLA plastic if they are going to be mass produced.

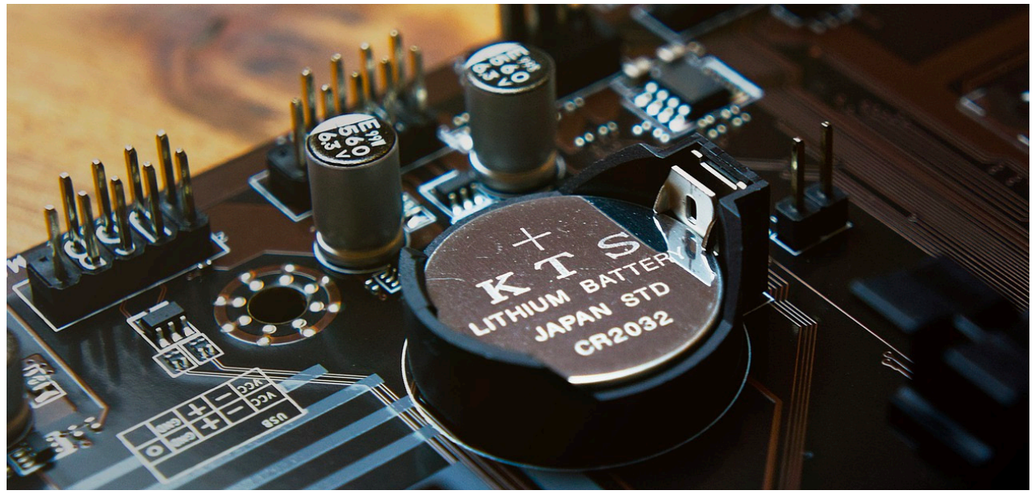
LED light bulbs are extremely energy efficient and long-lasting materials. It can cut energy consumption by over 80% and last up to 25% longer compared to conventional bulbs. LED light also has "the ability to focus the light in a single direction instead of having it every which way" (Rebecca Matulka). The reason why LED light is used for the device is because light can remind where the cup and device are in the dark.



The speaker needs to be small enough to fit in the device but should be able to make enough sound, so users can hear the music from a far distance. The main component part of the speaker will be made of cellulose nanofibers with magnetic nanoparticles that “ensures a uniform particle distribution” (Galland). This means that there will be better distribution of sound and sound will not break apart when volumes get higher. Cellulose nanofibers are produced from wood pulp fibers which are considered as low-cost raw and renewable materials. Compared to the regular speaker that contains a bulky magnet and a coil attached to the speaker membrane, magnetic nanoparticles and cellulose nanofibers can create biocomposite membranes, which remove a heavy magnet and can enhance the sound quality without making a coil contact with the membrane. The hybrid membrane is only sustainable but also can be manufactured into a thin prototype without external magnet, and it will keep its size compact enough to fit in the device.

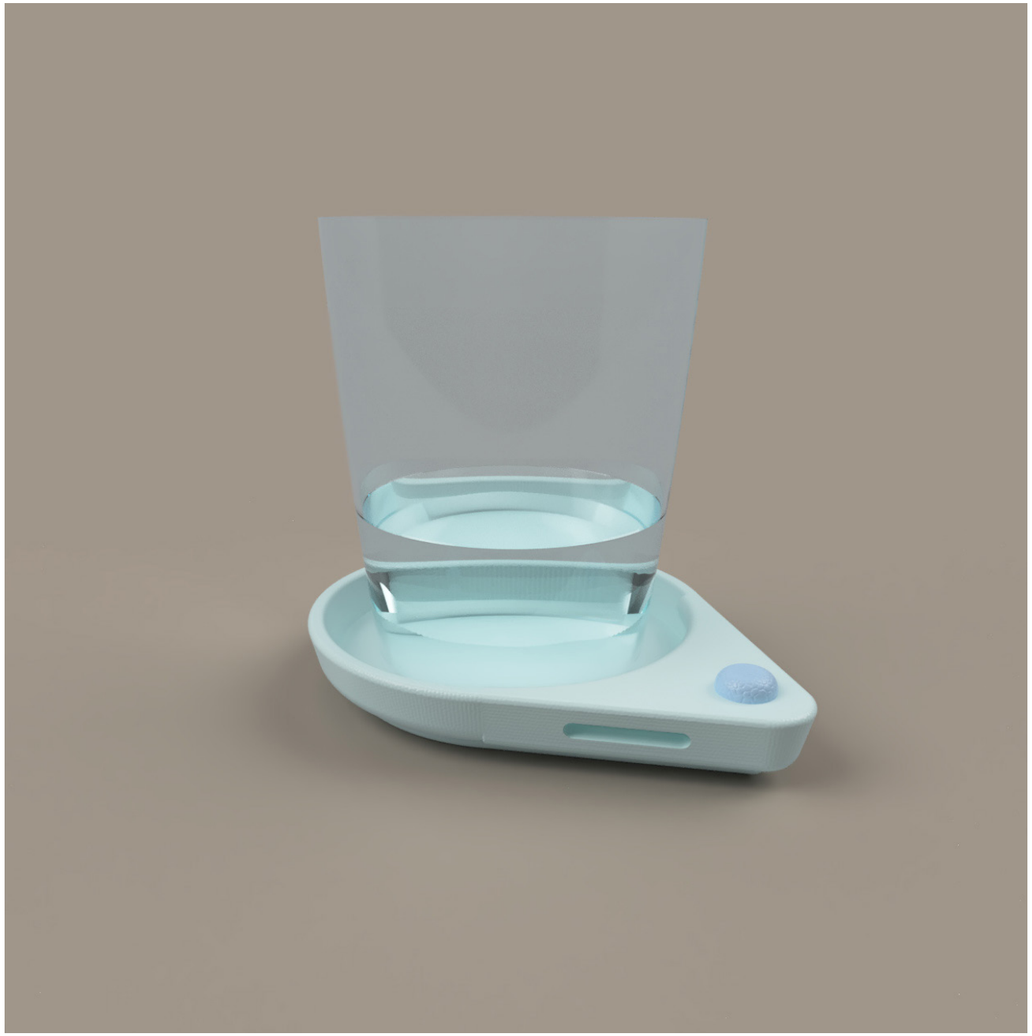


The digital weighing scale exists in the device to keep track of how much water is in the cup. The load cell sensor and printed circuit boards (PCDs) are the main components of the weighing scale. The sensor will be made of recycled metals from electronic waste, and PCDs will be 3D printed and recyclable at the end. 3D Printing is an advanced manufacturing technology that can improve sustainability by reducing “total manufacturing costs, energy consumption, and CO2 emissions” (Dong). Recycling used PCDs also helps diminish the environmental pollution since the recycling process can recover metals and protect the natural resources and energy. Therefore, the load cell sensor can be produced from already used PDCs.



Batteries for the speaker and switch will be lithium coin-cell batteries that can't be rechargeable but cast last 10 years of battery lifetime if they are properly stored at home. Depending on the room temperature and humanity, the lifetime of batteries can change. A green manufacturing and direct recycling process of the batteries are necessary for sustainability. So far, there's no perfect green manufacturing process to make the batteries sustainable to the environment. Using the water-based processing for lithium ion batteries (LIB) and direct recycling are the best ways to protect the economy and environment. Because they can reduce the cost of manufacturing process and batteries, recover the "black mass without using any organic solvents", and reduce the life cycle of CO_2 (Li).

Through Sip, anyone who works or spends most of their time at home will be able to drink enough water and improve on drinking water every day, and it will eventually become a part of their daily rituals.



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